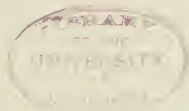






RARA ARITHMETICA



tangit hunc si dicitur quoniam figuram tota
 et oppositae qui est transactu transigitur. Quod
 plura dicitur ad figuram ad hunc non est
 plar. cetera tangit nunc sine ulla dubitatione
 creata. Proportio. et quoniam figuram nunc si se
 cetera hanc quod figuram ad hunc. et ipse qui
 et tangit unum habet in latere. Nam in
 nunc qui est figuram ad hunc ad hunc unum
 tam figuram de medio hanc in latere. Et hanc
 nunc hanc ad hunc figuram quoniam figuram
 latere ad hunc tangit. Et hanc in latere ad hunc
 unum habet nunc figuram ad hunc. et
 unum hanc in latere tangit. et hanc in latere
 hanc ad hunc nunc qui est ipse quod
 hanc in latere tangit. et hanc in latere tangit.



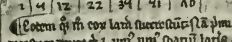
hanc in latere tangit. et hanc in latere tangit.

Dicitur autem nunc in latere tangit. et hanc in latere tangit.

Et hanc in latere tangit. et hanc in latere tangit.

nunc in latere tangit. et hanc in latere tangit.

Dicitur autem nunc in latere tangit. et hanc in latere tangit.



hanc in latere tangit. et hanc in latere tangit.

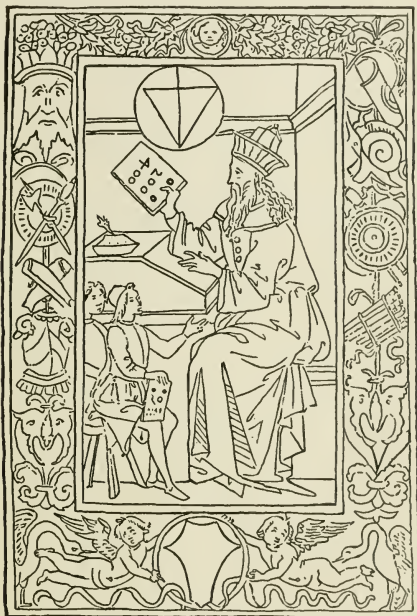


hanc in latere tangit. et hanc in latere tangit.

PLATE I. FROM A MANUSCRIPT OF BOETHIUS, C. 1294, SHOWING FIGURATE NUMBERS

RARA ARITHMETICA

¶ A CATALOGVE OF THE ARITHMETICS
WRITTEN BEFORE THE YEAR MDCI WITH A
DESCRIPTION OF THOSE IN THE LIBRARY OF
GEORGE ARTHVR PLIMPTON OF NEW YORK
BY DAVID EVGENE SMITH OF TEACHERS
COLLEGE COLUMBIA VNIVERSITY



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PREFACE

One of the first and most important questions for the student of mathematical history is that relating to the available sources of information. In the fields of higher mathematics scholars have been more or less successful in bringing together these sources, and in listing them in bibliographies ; but in that humbler field in which primitive mathematics first found root, only a few bibliophiles have sought to preserve the original material, and no one has seriously attempted to catalogue it. Libri, it is true, brought together two large libraries of *Rara Arithmetica*, but he was neither a true book-lover nor a true scholar, for he gathered his treasures purposely to see them dispersed, his commercial spirit scattering at random what should have been kept intact for the use of scholars. Prince Boncompagni, the most learned of all collectors in this domain, lived to see an unappreciative city ignore his offer to make his magnificent library permanent, and at his death it was scattered abroad, as had been the lesser ones of Kloss and De Morgan. The third great collection of early textbooks which has been made in recent years is that of Mr. Plimpton. Of the libraries of arithmetics printed before the opening of the seventeenth century his is the largest that has ever been brought together, not excepting Boncompagni's, and it may well be doubted if another so large will again be collected by one man. De Morgan was able to examine, in the British Museum and elsewhere, less than a hundred arithmetics written before 1601, including all editions ; but Mr. Plimpton has more than three hundred, a number somewhat in excess of that reached by Boncompagni. Indeed there are few arithmetics of much importance that are not found, in one edition or another, in his library.

The writers of these early printed books, not all themselves of the centuries under consideration, were by no means obscure men. Among them was Boethius, whom Gibbon called "the last of the Romans whom Cato or Tully could have acknowledged for their countryman." In the list are the names of Cassiodorus and Capella, who at least represented what there was of culture in their day, and Isidorus, the learned Bishop of Seville. There are also the names of Archimedes, who deemed it a worthy labor to improve the number system of the Greeks; of Euclid, whose contributions were by no means confined to geometry; of Nicomachus and Iamblichus, who represent the declining Hellenic civilization, and of Psellus, who was a witness of its final decay. There, too, are the names of the Venerable Bede, of Sacrobosco, and of Bradwardin, all of whom testify to the culture of mediæval England; of that great Renaissance compiler, Paciolo; of Tartaglia and Cardan, who helped to make the modern algebra, and of such scholars as Ramus, Melanchthon, and Bishop Tonstall. Worthy as such a list may be, it is rendered none the less so by the names of Widman, Köbel, Borghi, Riese, and Gemma Frisius, mere arithmeticians though they were, for few who read their works can fail to recognize that they powerfully influenced education, not only in their own time but for generations after they had passed away.

In view of the fact that the fifteenth and sixteenth centuries constituted the formative period in the history of printed arithmetics, I have felt it a not unpleasant duty to catalogue the volumes in Mr. Plimpton's library that belong to this period and subject, including such later editions as it may contain, — to give a brief statement of their contents, and to supplement this work by a list of other arithmetics published before 1601. That a complete bibliography is impossible is evident to any one who considers the subject. It is a simple matter to consult the few lists of early mathematical works, and to trace the names thus secured through such catalogues as those of the British Museum and the Bibliothèque nationale (unfortunately only just begun), and through bibliographies like those of Graesse and Hain and Copping. It

is also an easy matter to examine the masterly work of Riccardi, the less accurate list of Murhard, the catalogues of Libri, and numerous other works of a similar nature. But it is manifestly impossible to read all of the published catalogues, almost invariably arranged only by authors. Therefore many extant books will necessarily remain undiscovered, and it is probable that some will always elude the eye of the special bibliographer. Such is the work that has been done in preparing this volume, and such is the feeling of insufficiency of achievement that remains. There is, however, a satisfaction in knowing that the bibliography is based in large measure upon an examination of the books themselves in various libraries, and that the secondary sources are of recognized authority. Over five hundred and fifty different works are mentioned, or, including the various editions, nearly twelve hundred books in all. Of the five hundred and fifty books, about four hundred and fifty are, strictly speaking, arithmetics. Of all arithmetics known to have been printed in the sixteenth century, and to have been important enough to have two or more editions, Mr. Plimpton's library lacks less than twenty-five. Of those which were published but once, some are known only by name, while the rest are mostly 'abachetti' or 'Rechenbüchleins'—mere primers of a few pages and of no importance.

It must also be borne in mind that it was inevitable that certain arithmetics of the sixteenth century should have perished utterly, leaving not even a record of their existence. Their very commonness often caused their destruction, a law of which the unique surviving copy of more than seventy thousand New England Primers of the Franklin-Hall press is a lonely witness in our country.

It is inevitable that there should be errors in such a list. Titles have been included when mentioned in even one standard bibliography, although they cannot be found in others, it being practically impossible for one person to verify every item. It is hoped, however, that a foundation has been laid upon which others may build, eliminating or otherwise as the case may be.

Of other works in this field, little need be said. De Morgan's *Arithmetical Books* is still one of our best single sources, although sixty years have elapsed since it first appeared. De Morgan, however, mentions altogether about one hundred and twenty editions of works originally appearing before 1601, against nearly twelve hundred listed here. Unger and Tropffke are both scholarly writers, but their bibliographies are almost exclusively German. Sterner was less of a student, and his list is correspondently less valuable. Historians like Cantor and Zeuthen have given this particular period only nominal attention, save as to a few great arithmeticians, ignoring those contributions which set forth the real work of the people's schools. The titles of the works of such writers have not been given, since any reader of a bibliography like this will know the more general histories.

Mr. Plimpton's library has also a number of valuable manuscripts on arithmetic. Since these are not available for students generally, although of great value in themselves, they have been placed after the printed works instead of being inserted in chronological sequence. A study of our numeral system has justified the inclusion of books which, if printed, would hardly have place. Manuscripts written before the forms of numerals were fixed are often valuable in tracing their development, even though the books themselves are not arithmetical. Only those have been catalogued which bear with some directness upon arithmetic, and which were written before the year 1601, although numerous others, in many respects as valuable, and including several interesting works on the calendar, the sphere, and astrology, are in the library.

One difficulty attendant upon a labor of this kind is to determine what printed books to include. The number might easily have been increased by listing, as De Morgan occasionally did, works that are not at all arithmetical — Peletier's algebra for example. It has been thought better to draw the line in general more closely than he did, and to depart from genuine arithmetics only in the case of the works that discuss at least some

questions relating to the science or art of numbers. No effort has been made to add to the supplementary lists books that are not purely arithmetical, such as treatises on the ancient measures, although those that are in Mr. Plimpton's library, and are of value in the study of the history of arithmetic, have been included.

The arrangement is chronological by first editions, but the Index allows for alphabetical and geographical reference. Although the nature of the work is usually discussed very briefly, an examination of the Index will show that a fairly complete history of Renaissance arithmetic has been included in the work—a history which I hope to present in other form in the future. The uncertainty in the use of such symbols as 4° and 8° has led to the measuring of the page and text. The page varies owing to the binder's work, and the text is not uniform page for page, but this plan seems the most satisfactory one for giving the size of the book. The centimeter has been taken as a unit of measure, since all English and American readers of a work like this will be familiar with it, while our popular units would be unknown to most others. These measures, like the number of lines to a page, of course vary considerably in the same book. The statement 'There were no other editions' is to be understood to mean that I have found no others that were printed before 1601. The illustrations have, in general, been selected with a view to bibliographical needs, although many have a marked historical interest.

In copying the titles it has been the intention to follow the original as closely as possible, without attempting to imitate particular forms of type or to use capitals except as initials. In the cases of misspelled words, omitted capitals, and peculiar punctuation, the errors have been copied as faithfully as possible. At the same time mistakes must have been made in transcribing, although it is hoped that they are not of a serious nature.

DAVID EUGENE SMITH

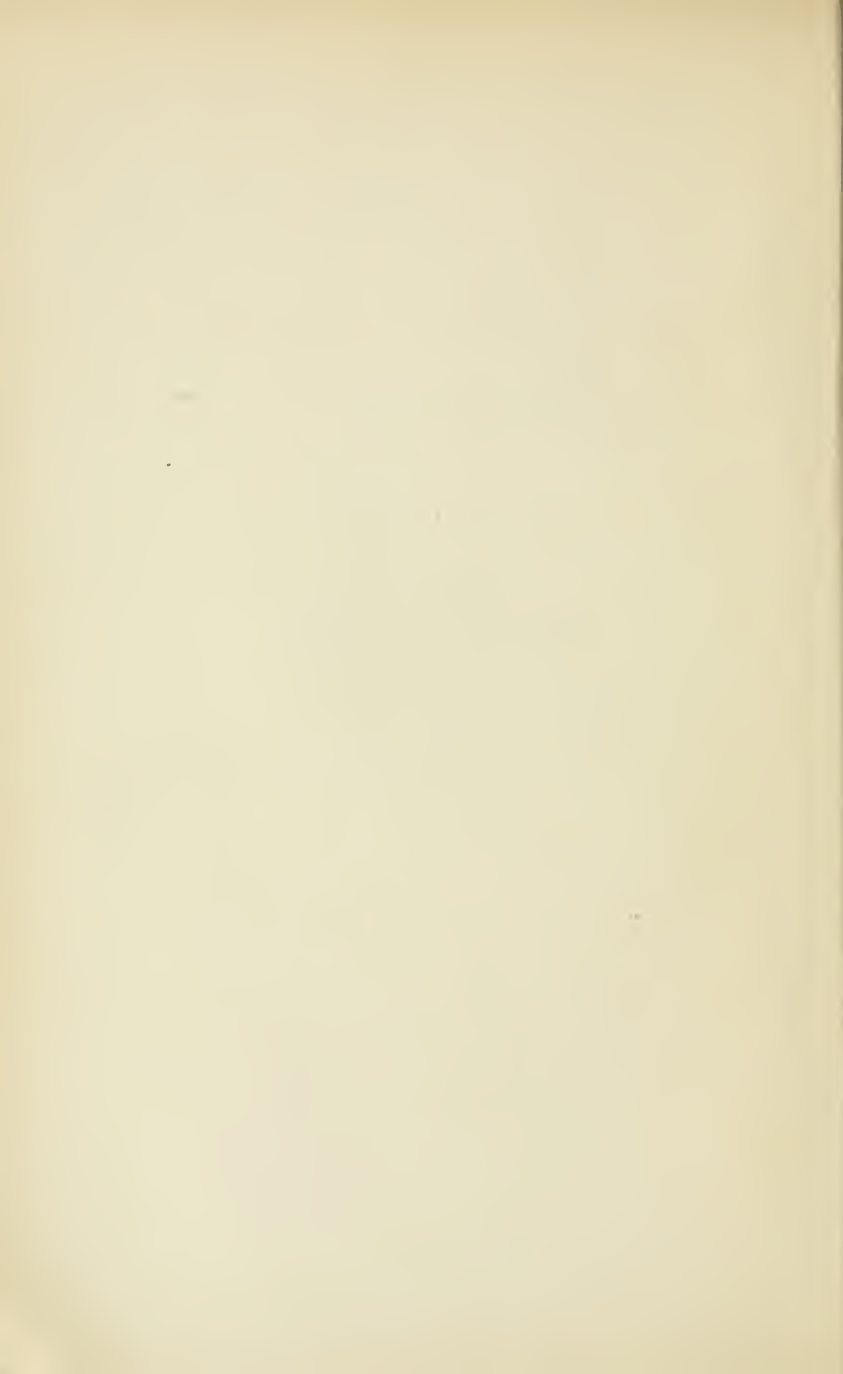
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ABBREVIATIONS

- c., *circa*, about
cm., centimeters
ed. pr., *edito princeps*, first edition
f., ff., folio, folios
fol., 4°, 8°, . . ., folio, quarto, octavo, . . .
ib., *ibidem*, the same place
l., ll., line, lines
p., pp., page, pages
r., recto, the first page of a leaf
s. a., *sine anno*, without date of publication
s. l., *sine loco*, without place of publication
s. l. a., without place or date of publication
v., verso, the second page of a leaf
//, the end of a line of print

PART I
PRINTED BOOKS





PRINTED BOOKS

ANONYMOUS. Ed. pr. 1478.

Treviso, 1478.

Title. 'Incommincia vna practica molto bona et vtile // a ciafchaduno chi vuole vxare larte dela mercha-//dantia. chiamata vulgarmente larte de labbacho.' (F. 1, r. See Fig. 1.)

Colophon. 'A Triuifo :: A di .io. Decēbz :: .i478.' (F. 62, r. See Fig. 4.)

Description. 4°, 14.6 × 20.5 cm., the text being 7.3 × 12.8 cm. 62 ff. unnumb., 32 ll. Treviso, 1478.

Editions. There was no other edition.

So far as known this is the first practical arithmetic to appear in print, for Albert of Saxony's *Tractatus* (p. 9) and the *Ars Numerandi* (p. 23), even if earlier, and the *Etymologies* of Isidorus (p. 8), are not, strictly speaking, of this class.

The author of the book is unknown, but from the opening lines it seems that he was a teacher of arithmetic in Treviso. The printer is also unknown, although it was probably one Manzolo, or Manzolino. The history of the work has been carefully studied by Boncompagni, his results appearing in the *Atti dell' Accademia Pontificia de' Nuovi Lincei*, vol. 16. This particular copy was in the Pinelli collection, and was sold on February 6, 1790, to a Mr. Wodhull. It afterward found its way into the library of Brayton Ives, Esq., of New York, and at the sale of that library was acquired by Mr. Plimpton.

The work is commercial in character, the fundamental processes being taken up in the common order, and these being followed by the rule of three. A curious feature not at all common in early arithmetics is the rule of two. The practical applications are chiefly included under the rule of three and partnership. There is also a brief treatment of the calendar, for Church purposes. The book is lacking in applications to exchange, and probably on this account it did not appeal to the merchant class sufficiently to warrant a second edition.

In considering these early works it is necessary to understand the four types of arithmetics which the Renaissance inherited from the Middle Ages. These types are as follows:

1. *The theoretical books.* These works were based chiefly upon

Incomincia vna practica molto bona et viles
a ciascaduno chi vuole vxare larte dela mercha
agnua chiamata vulgarmente larte de labbaco.



Regato piu e piu volte da alcuni
sonani a mi molto vilecissimi: li
quali pretendeuano a vouer voler
fare la merbadantia: che per lozo
annoze me piace se affadigarme v
no puocho: de vargli in scritto qualche fundameto
cerca larte de arismetria: chiamata vulgarmente
labbaco. Unde io constretto per amor di lozo: et
etiã ad ad vltimati tuti chi pretendano a quella se
gondo la piccola intelligencia del inzegno mio: ho
deliberato se non in tuto: in parte tanie sanfare a
lozo: acio che lozo virtuosi desideri vtle frutto re
ceuere posscano. In nome di dio adoncha: toglio
per principio mio el vito de algorismo così dicēdo.

1. Tre quelle cose: che da la prima origine
hano habuto producimeto: per ratone de
numero sono sta formate. E così come so
no: hano da fir cognoscude. Pero ne la cognione
de tute le cose: quest a practica e necessaria. E per
intrar nel pposito mio: primo sapi lettore: che qn
to fa al pposito nostro: Numero e rna moltitu
dine congregata ouero insiemezata da molte vni
tate. et al meno da vo vnitade. come e. 2. el quale
e lo primo e menoze numero: che se truoua. La v
nitade e quella cosa: da la quale ogn cosa si vitta
vna. Segondario sapi: che se truoua numeri de tre
maniere. El primo se chiama numero simple. lal
tro numero articulo. El terzo se chiama numero

	20	12	
l	l	l	l
Dug	24	32	
	20	12	32
l	l	l	l
	12	6	12
l	l	l	l
172	7	7	3
	l	l	l
	7	20	12
l	l	l	l
m	20	24	
	l	l	l
172	7	7	3
	l	l	l
m	20	24	
	l	l	l

Libro de Marco Benedetto

FIG. 1. FIRST PAGE OF THE TREVISO ARITHMETIC

Boethius (p. 25), who wrote in the beginning of the sixth century, following the Greek models of Nicomachus (p. 186) and Euclid (p. 11). They are devoted to such matters as the theory of figurate numbers, of which the square and cube are all that now remain in elementary textbooks, and the cumbersome Greek ratio-system which testified to the ancient difficulty with fractions. Books of this class were written by

such men as Bradwardin (p. 61), Albert of Saxony (p. 9), and Jordanus (p. 62).

2. *The algorisms (algorismi)*. These were practical arithmetics,

Uoglio però che tu intendi che sono altri modi de multiplicare per scachiero: li quali lassaro al studi o tuo: mettendo li exempli soi solamente in forma. come potrai vedere qui sotto

Oz togli de fare lo predi:to scachiero. 3oe. 3 i 4. fia. 9 3 4. e nota de farlo per li quatro modi come qui da sotto.

$$\begin{array}{r}
 934 \\
 \hline
 3236 \quad 4 \\
 934 \quad i \\
 \hline
 2802 \quad 3 \\
 \hline
 293276
 \end{array}$$

$$\begin{array}{r}
 934 \\
 \hline
 \boxed{3} \boxed{2} \boxed{3} \boxed{6} \quad 4 \\
 \boxed{9} \boxed{3} \boxed{4} \quad i \\
 \hline
 \boxed{2} \boxed{8} \boxed{0} \boxed{2} \quad 3 \\
 \hline
 293276
 \end{array}$$

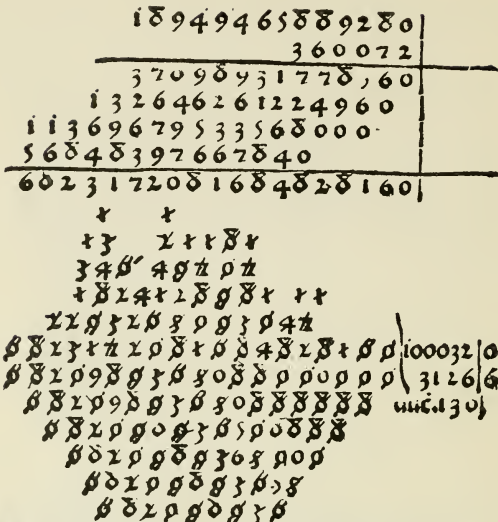
Fig.

	9	3	4	
2	2	0	i	3
9	7	9	2	3
9	0	0	0	i
3	9	3	4	i
3	3	i	i	4
	6	2	6	4
	2	2	6	

Somma.

	9	3	4	
	6	2	6	
	3	i	i	4 6
	9	3	4	
	0	0	0	i 2
	7	9	2	
	2	0	i	3 2
	2	9	3	

FIG. 2. FROM THE TREVISO ARITHMETIC, SHOWING VARIOUS FORMS OF MULTIPLICATION



Et e compita Unae e unuto lo impromisso. 3oe il
 prexio menzonado li. Che se lire 146 16 onze 9
 lazi 5.e 1 valisse duc. 1903 8 11 p 1 3345312
 $\frac{3}{4} \frac{1}{20864}$
 che lire. 1000.e $\frac{1}{5}$ valeranno ducati. 130. 8. 6.
 li quali sono vn quarto de vno ducato. Sicha qlle
 razione e queste stano seguramente bene.
 Auifendo te. che quando hauera da fare qualche
 raxone da importantia: e che tu dubiti: non potrai
 priouare piu seguramete: che voltare la tua raxo-
 ne. al modo che hai visto ne le tre raxoe preditte.
 Unde per queste e per le altre raxone preditte: le
 quale sono in tuto numero quindexeta puo inten

FIG. 3. FROM THE TREVISO ARITHMETIC, SHOWING MULTIPLICATION AND THE GALLEY FORM OF DIVISION

written to supply the mathematical knowledge necessary for business computations, and using the Hindu-Arabic numerals. These numerals were known in India, without the zero, as early as the third century B. C. They were gradually perfected, and by the time they reached Bagdad from India, in the eighth century A. D., they included the zero. An arithmetic employing these numerals was written about 800 A. D. by an Arab scholar, Mohammed ibn Musa, known by the name of al-Khowarazmi (from his birthplace, Khwarazm), and from the Latinized form of his name came the word *algorism*.

3. *The abacus arithmetics*. These were also commercial books; but since they used the Roman numerals, which were not suited to computation, the actual calculations were carried on by means of *calculi* (Latin, pebbles), *getons* (French for things thrown or cast, from the Latin *jacere*, to throw), or *counters*, from which English form we have expressions like 'cast an account.' The table on which the calculi were cast is still called a *counter* in our shops, but, like the sand tables used for computing, it was in early times called an *abacus*. Just at the opening of the Renaissance the contest was still waging between the algorists and the abacists. These arithmetics are not found, however, in Italy, because the merchants of that country abandoned the use of the counters long before this was done in other countries. In Germany the arithmetics frequently have in their titles the expression 'auff der Linien und Federn' (Riese, p. 138, 1522), or 'mit der ziffer unnd mit den zal pfenningen' (Rudolff, p. 151, 1526), 'auff der Linien' referring to the lines on which the counters ('zal pfenningen') were cast, and the 'Feder' referring to the pen with which a figure ('ziffer') was written.

4. *The computi*. The *computus* or *compotus* was a treatise upon the Church calendar, containing such simple directions as were necessary for computing the dates of Easter and the other movable feasts. The chapter on the calendar, of which there is still some trace in our arithmetics, originated in the *computus*. (See Anianus, p. 31, 1488.)

The Treviso arithmetic is a good example of an *algorism*. Fig. 3 shows that multiplication was performed as it is to-day (but see Fig. 2), and that division was performed by the 'galley' method, so called because the work resembled in form an ancient galley with its sails set.

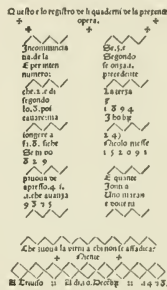


FIG. 4. LAST PAGE OF THE TREVISO ARITHMETIC

ISIDORUS OF SEVILLE. Ed. pr. 1472. Venice, 1483.

Born, probably at or near Cartagena, c. 560 or 570; died at Seville, April 4, 636. One of the most learned men of his time, Bishop of Seville, and writer on theology, philosophy, and the general learning of the Middle Ages.

Title. '¶Incipit epistola Ifidori iunioris hispalensis epi-//fcoipi ad Braulionem cęsar auguſtanū epifcopū.' (F. 1, r.)

With this is: '¶In chriſti nomine incipit liber primus ſancti // Ifidori hispalenſis epifcopi de fūmo bono.// Qd deus fūmus 2 incōmutabilis fit ¶Cap. I.' (F. 1, r., following the first f. 105.)

Colophon. '¶Finit liber etymologiarum // ¶Ifidori hispalenſis epifcopi.' (F. 101, v.)

Colophon of the second part. '¶Finit liber tertius 2 vltim⁹ de sūmo bono // ſancti Ifidori hyſpalenſis epi: Impreſſus // Venetijs per Petrū loſlein de Langenceñ.// ¶.M.cccc.lxxxiiij.¶' (F. 28, r.)

Description. Fol., 19.8 × 27.7 cm., printed in double columns, each being 6.7 × 23 cm. 129 ff. numb. + 4 unnumb. = 133 ff., 58 ll. Venice, 1483.

Editions. Augsburg, 1472; Venice, 1483 (here described); ib., 1485 (?); ib., 1493, fol.; Basel, 1577 (mentioned below). Also two editions s. l. a. (Strasburg, 1470 ?), and one s. l. a. (Cologne, 1476-78 ?).

This book of etymologies written by Isidorus, Bishop of Seville in the seventh century, is the standard authority upon the state of learning in Spain in that period. The subject of arithmetic is treated in book 3, beginning (f. 15): '¶Incipit liber tertius // ¶De vocabulo arithmetice // diſcipline ¶Cap. I.' The work consists entirely of the mediæval theory. The treatment is very brief (5 ff.) and is followed by a few pages on the calendar. Although appearing in 1472, this cannot be called the first printed arithmetic, since it touches so briefly upon the subject. It has therefore been placed after the Treviso arithmetic.

ISIDORUS OF SEVILLE. Ed. pr. 1472. Basel, 1577.

Title. 'Isidori // Hispalenſis // Epifcopi // Originum libri viginti/ex antiquitate eruti.// . . . Baſileæ, // per Petrum Pernam.' (F. 1, r.)

Description. Fol., 20.5 × 31 cm., printed in double columns, each being 8.2 × 24.4 cm., 60 ll. With an edition of Capella. Basel, 1577.

ALBERT OF SAXONY. Ed. pr. c. 1478. Venice (?), c. 1478.

Born c. 1330. He lectured in the University of Paris, was Rector at Vienna in 1365, and was Bishop of Halberstadt from 1366 to 1390. He wrote several scientific works.

Title. 'Eccellētiffimi magistri alberti de // faxonia tractatus pportionum incipit feliciter.' (F. 1, r.)

Colophon. 'Explitiunt pportiones magiftri //alberti de faxonia.' (F. 9, r.)

Description. Fol., 19.7 × 28.1 cm., in double columns, each being 5.6 × 16.7 cm. 9 ff. unnumb., 39 ll. S. l. a. (Venice?, c. 1478).

Editions. S. l. a. (Venice?, c. 1478, here described); Padua, 1482 (12 ff.); ib., 1484 (12 ff.); ib., s. a., but before 1487; Venice, M.cccc.xxxlvii for 1487 (10 ff.); ib., 1494 (10 ff.); ib. (with another work), 1496; ib., 1496 (but no copies extant?); Bologna (with another work), 1502; ib., 1506 (commentary by Vittori); Paris, s. a. An epitome by Padre Isidoro Isolani Milanese was published in Pavia in 1513, and again in 1522. Prince Boncompagni, in an elaborate discussion of the various editions (*Bulletino*, IV, 498), mentions this rare first edition, of which he knew but one other copy, that in the Biblioteca Ambrosiana at Milan. He was of the opinion that it was printed in Venice, in a type used before 1480.

Although the date is uncertain, this *Tractatus* may contest with the Treviso arithmetic (p. 3) and the *Ars Numerandi* (p. 23) the honor of being the first printed work devoted wholly to some phase of arithmetic. It treats of ratios according to the cumbersome method of Boethius as followed during the Middle Ages. It is purely theoretical and represents the university treatment of scientific arithmetic in that period.

Other works of 1472-1480. The mathematical activity in Italy during this period was very considerable. From 1472 to 1480 there were 38 mathematical works printed in the country. In the next decade there were 62 and in the next 100, with 13 of uncertain date between 1472 and 1500, making a total of 213 appearing in a period of less than thirty years.

Before the Treviso book there were printed at least three works which touched briefly upon arithmetic. These were (1) 'De re militari libri

XII,' by Robertus Valturius of Rimini, printed at Verona, 1472, fol., in the second book of which the author treats 'de arithmetica & militari geometria'; subsequent editions *ib.*, 1483 (two editions this year); Paris, 1483 (with title changed); *ib.*, 1534, fol.; *ib.*, 1555 (French translation); (2) 'Speculum Majus,' by Vincent de Beauvais (Vincentius Bellovacensis), the greatest mediæval encyclopædia, printed at Strasburg by Mentelin, 1469(?)–1473, 10 vols., fol. The second part of this work contains one book (no. 16) on mathematics, in which is given a brief treatment of algorism (see p. 5), probably the first written in France (c. 1250), although M. Henry asserted that a MS. of c. 1275, which he edited, was entitled to that distinction. Incomplete editions were also published at Venice in 1484, 1493–4, 1591. The early editions of Priscian, 'De figuris et nominibus numerorum,' are mentioned under the publications of 1565. (3) The Etymologies of Isidorus, Augsburg, 1472 (p. 8).

In 1480 an anonymous work was issued from the Caxton press in London, entitled 'The Mirroure of the World or Thymage of the same.' Chap. 10 of this work began: 'And after of Arsmetrike and whereof it proceedeth,' and this was probably the first English printed matter upon the subject. There was a second edition, London, 1506, and a third s. l. a. (London, 1527 ?), fol. (See also Boethius, p. 25, and Faber, p. 62.) About 1480 there was published at Padua a folio work by Richard Suiseth (Suicetus, Swincetus, Swinshead, Suineshevedus, the first name possibly Roger or Raymund), entitled 'Opus aureum calculationum per Johanem de Cipro emendatum et explicit.', with subsequent editions at Pavia in 1488(?), 1497, 1498, fol., at Venice in 1505, 1520, and at Salamanca in 1520. I have seen an edition of this work, s. a., assigned to c. 1477. For Nicolaus Cusa, see p. 42.

GIORGIO CHIARINI. Ed. pr. 1481.

Florence, 1481.

A Florentine arithmetician of the fifteenth century.

Title. 'Qvesto e ellibro che // tracta di mercatantie // et vsanze de paesi.' (F. 1, r. See Fig. 5.)

Colophon. 'Finito ellibro di tvcti // ichostvmi : cambi : mone // te : pesi : misvre : & vsanze // di lectere di cambi : & ter // mini di decte lectere che // nepaesi sicostvmaet in // diverse terre. Per me France // fco di Dino di Iacopo Kartolaio Fiorẽ // tino Adi X di Dicembre MCCCCLXXXI. In Firenze Apreffo // almusiftero di Fuligno.' (F. 102, r.)

Description. 8°, 13.2 × 21.2 cm., the text being 7.1 × 14.1 cm. 3 ff. blank + 6 unnumb. + 96 numb. (Roman numerals) = 105 ff., 24 ll. Florence, 1481.

Editions. Florence, 1481, 8° (here described); s. a. (1498), 8°. The undated edition was not the first; Coppinger has shown that it was printed in 1498.

While this is not, strictly speaking, an arithmetic, it is the first printed book to give the customs relating to exchange in use among the Florentine merchants at the close of the fifteenth century. It is the source from which several later writers drew their material, and is particularly valu-

QVESTO E ELLIBRO CHE TRACTA DI MERCATANTIE ET VSANZE DE PAESI.

FIG. 5. TITLE OF CHIARINI'S WORK

able in showing the nature of the practical problems of the time. Copies of this first edition are extremely rare, but the work was well enough known for Paciolo to appropriate some of the contents. There is a question as to its authorship.

EUCLID. Ed. pr. 1482.

Basel, 1562.

Flourished at Alexandria c. 300 B.C. He was the author of the 'Elements,' the basis of most of the textbooks on geometry.

Title. 'Die Sechs Erfte Bücher // Euclidis/ // Vom anfang oder grund // der Geometrij.// In welchen der rechte grund/ nitt allain der Geometrij // (verftech alles kunftlichen/ gwifen/ vnd vortailigen ge-//brauchs des Zirckels/ Linials oder Richtscheittes vnd // andrer werckzeuge/ fo zu allerlaj abmessen dienftlich) // fonder auch der fürnemften stuck vnd vortail // der Rechenkhunf/ furgeschriben vnd // dargethon ift.// Aufs Griechifcher fprach in die Teütfch gebracht/ aigene-//tlich erklärt/ Auch mit verftentlichen Exempeln/ gründ-//lichen Figuren/ vnd allerlaj den nutz fürangen stellen-//den Anhängen geziert/ Dermaffen vormals // in Teütfcher fprach nie gefehen // worden.// Alles zu lieb vnd gebrauch den Kunftliebenden Teütfchen/ fo fych der

Geo//metrij vnd Rechenkunft anmassen/mit vilfältiger mühe
vnd arbeits //zum trewlichften erarnet/vnd in Truckh ge//geben/
Durch //Wilhelm Holtzman/genant Xylander/ //von Augspurg.
//Getruckt zu Bafel.' (P. 1.)

Colophon. 'Vollendet durch Jacob Kündig/zu Bafel/in //
Joanns Sporini koften/im jar 1562.// auff den dreyfzigsten tag
des //Winmonats.' (P. 199.)

Description. Fol., 20×31.3 cm., the text being 12.5×25.7
cm. 14 pp. unnumb. + 185 numb. + 1 blank = 200 pp., 39-52 ll.
Basel, 1562.

Editions. The editions of Euclid have not been considered
in this work except in so far as they relate particularly to
arithmetic. This is the first German edition. The Plimpton
library contains the first edition of Euclid (Venice, 1482), but
since this has no arithmetical work except Book V it has not
been included in the list. Several manuscripts of Euclid are,
however, included in the second part of this bibliography be-
cause of their value in tracing the changes in the forms of the
numerals.

This edition of Euclid is mentioned because the editor has thought
it necessary to add to Book II some arithmetical work. In particular
he gives three forms of multiplication, first from left to right, then in the
usual way, and finally for special cases in which the short processes are
involved. He also considers the division of numbers in given ratios,
the extraction of roots, and a few other semi-algebraic calculations.

Euclid's 'Elements' contain much work upon the Greek theory of
numbers, besides what appears in Book V, and several books were pub-
lished in the sixteenth century, embodying this material. These are
mentioned later.

Other works of 1482. In 1482 appeared the first German arithmetic,
if we except the 'Ars Numerandi' (p. 23). It was written by Ulrich
Wagner, a Nürnberg Rechenmeister, and was printed by Heinrich Pet-
zensteiner at Bamberg. Only nine small pieces of parchment proof sheets
remain. They contain the following colophon: 'Anno dñi . . . 1482
kl'16. Iunij p. Henr. peczensteiner Babenberge: finit Ulrich wagner
Rechēmeister zu Nürnberg.' 'Ludus Arithmomachiae,' by John Sher-
wood (Shirewode), was published at Rome in the same year. (See also
p. 63, and on Albert of Saxony see p. 9, c. 1478.)

PROSDOCIMO DE BELDAMANDI, AND LIVERIUS.

Ed. pr. 1483.

Padua, 1483.

PROSDOCIMO DE BELDAMANDI was born at Padua c. 1370-1380, and died in 1428. He was educated at the University of Padua, and also taught there. He wrote on arithmetic, music, and astronomy.

JOHANNES DE LIVERIUS (LIVERIUS, LINERIUS) was a Sicilian writer on astronomy who flourished c. 1300-1350.

Title. 'Prosdocimi de beldamandis algo-//rifmi tractatus perutilis ⁊ neccessarius // foeliciter incipit. qui de generibus cal-//culationum speciē preterit nulla, q̄ faltē // neccessaria ad h^o art^o cōgnitōj fuerat.' (F. 1, r. See Fig. 6.)

Colophon. 'Algorismus. Prosdocimi de beldamādis // vna cum minuciis. Johānis de liueriis. hic // felicite finit Impreff^o padue. Anno .1483 // die zz. februarii.' (F. 21, v.)

Description. 4°, 15 × 20.8 cm., the text being 9 × 14.7 cm. 27 ff. numb., 32 ll. Padua, 1483.

Editions. Padua, 1483, fol. (here described); Venice, 1540, 8° (see p. 15). Boncompagni could learn of only three copies of the first edition, and seven of the second.

This rare work was written for the Latin schools, and is a good example, the first to appear in print, of the non-commercial algorisms of the fifteenth century. It follows 'Boeectius' (Boethius) in defining number and in considering unity as not itself a number, as is seen in the facsimile of the first page. Prosdocimo then treats of the fundamental operations with integers, including mediation (division by 2, which the author places before duplation or multiplication by 2), progressions, and the roots. The treatment of fractions is left to Liverius: 'Incipit Algorismus de mi-//nutijs tam vulgaribus quā phycis magi-//ftri Ioannis de Liuerijs Siculi.' The 'vulgar minutes' were the common fractions, and the 'physical' were the sexagesimal fractions. Towards the end of the 'Algorismus de integris' in the 1540 edition, the date of composition appears: '... per Prosdocimum de Beldamandis de Padua anno domini .1410. die .10. Iunij compilata sufficiant.' (F. D 5, v.) The work of Prosdocimo contains the first reference that I have seen to a slate. 'Indigebat etiam calculator semper aliquo lapide, vel sibi conformi super quo scribere atque faciliter delere posset figuras cum quibus operabatur in calculo suo.' (See Fig. 6.) It is probable, from this statement, that computers of his time actually erased the figures in the galley form of division (see the Treviso arithmetic, p. 3),

Prosdocimi de beldamandis algo-
rismi tractatus perutilis et necessarius
foeliciter incipit. qui de generibus cal-
culationum specie preterit. et nullas. q̄ saltē
necessaria ad h⁹ art⁹ cognitōz fuerat



Primo in quibus pluribus libris algorismi nūcipa-
tis. mōs circa numeros opandi satis uariis e-
atq; diuersos. q̄ licet boni existerēt. atq; veri
erāt. tū fastidiosi. tū pp̄ ip̄az regulaz mul-
titudinē. tū pp̄ eaz deletōes. tū etiā p̄pter
ip̄az operationū pbasōes: vtz. s. bone fuerint uel ue. Et rāz et eti-
am isti modi intrin fastidiosi: q̄ si in aliq̄ calculo astruloico etc. et
ctigillz: calculatozē opatōz suam a capite incipere oportebat: da-
to q̄ erro: suus ad huc satis p̄p̄iquus existeret. et hoc pp̄ figu-
ras in sua opatōe deletas. Undegebāt etiā calculato: semp a. i. q̄
lapide uel sibi sformi. sup quo scribere atq; facilliter delere possz
figuras cū q̄bus opabat in calculo suo. Et q̄a hec oia sana fa: i
diōsa atq; laboriosa mihi uisa sunt: dispositi libellū edere in quo
oia ista abicerent: qui etiā algorismus siue liber de numeris de-
noari poterit. Scias tū q̄ in hoc libello ponet nō intēdo nisi ea
q̄ ad calculū necessaria sunt. alia q̄ in aliis libris practice arisme-
trice tāgunt. ad calculū nō necessaria pp̄ breuitatez dimittendo.

Quia ergo libellus iste de numeris tractare hz: a diffinitōne
nūeri ip̄m icboare uolo. **N**umerus ergo s^m Euclidē. 7^o. siue
Geometrie. et s^m Bobectū p^o: siue arismetice sic diffinit. **N**ūe-
rus. est multitudo siue quātitas discreta ex un: tantis p̄fusa: si e
ex unitatibus aggregata. Et d^o unitas illud: q̄ unaqueq; res di-
cit una. **P**er hāc g^o diffinitōz nūeri hie potes. quo^o unitas nō
ē nūerus. licz sit p̄ncipiū nūeri. dato q̄ nūer⁹ etiā vocari possit lā-
go: s. amē^o nūerz. s. p̄ oī eo quo rē aliquā nūeratē possumus. et
istō lāgo: accipit nūer⁹ in p̄cessu huius libelli. in q̄ etiā vnitas

Nūz quid.
Euclidē.
Bobectus.

Vnitas qd

FIG. 6. FIRST PAGE OF PROSDOCIMO DE BELDAMANDI

as the Hindus had done on their sand or dust abacus, instead of cancel-
ling them in the manner explained in the early printed arithmetics.

The best discussion of the lives and works of Beldamandi and Liverius
is in the Boncompagni *Bulletino*, vol. XII.

Other works of 1483. Valturius (p. 10). In this year the second German arithmetic was printed at Bamberg, only one (incomplete) copy being known. It was possibly written by Ulrich Wagner (p. 12), and, like the 1482 work, it was printed by Petzensteiner, as appears from the following colophon: 'In zale Xp̄i .1483. kl'.17. des Meyen Rechnung // in mancherley weys in Babenberg durch henr⁹ // petzensteiner begriffen : volendet.'

PROSDOCIMO DE BELDAMANDI, AND LIVERIUS.

Ed. pr. 1483.

Venice, 1540.

See p. 13.

Title. 'Algorismvs de In//tegris Magistri Prosdoci//mi Debeldamandis Pataui simul cū algorifmo de de//minutijs feu fractionibus magiftri Ioānis de Liuerij // ficuli. Reintegratus ab erroribus cōmissis a scri//ptoribus, a me Federico Delphino artium, & // medicine doctore, mathematicarum difci//plinarū in celeberrimo gymnasio Pata//uino publico profeffore, additis ali//quibus verbis, in aliquibus locis, // pro maiori claritate. Et da//tus impressiōni ad infra//tiam meorū scholariū // nunc algorifmū // maxime de//fideran//tium. // Venetijs. M. D. XXXX.' (F. 1, r.)

Colophon. 'Venetijs per Ioannem Antonium de Vulpinis de Ca//ftrogiofredo. Anno domini .M. D. XXXX. // die octauo mensis Aprilis.' (F. 52, v.)

Description. 8°, 9.6 × 14.5 cm., the printed part being 7.1 × 12.5 cm. 44 ff. unnumb., 30 ll. Venice, 1540. (This particular copy has 8 ff. more, the sheet F appearing in duplicate.)

See p. 13.

RAPHAEL FRANCISCUS.

Ed. pr. 1484.

S. l. a. (Florence, c. 1516).

RAFFAELE FRANCESCO. A Florentine philosopher of the latter part of the fifteenth century.

Title. 'Verificatio Vniversalis in // regulas Aristotelis de motu non rece//dens a cōmuni Mathema//ticoꝝ doctrina.' (F. 1, r. See Fig. 7.)

Description. 4°, 13 × 19.9 cm., the text being 9 × 16.7 cm. 8 ff. unnumb., 41–42 ll. S. l. a. (Florence, B. Zucchetta, c. 1516).

Editions. Pisa, 1484, 8°; this edition, s. l. a. (Florence, c. 1516).

This is a brief treatment of proportion, hardly worthy of ranking as an arithmetic. The applications relate to problems of Aristotle.

VERIFICATIO VNIVERSALIS IN
regulas Aristotelis de motu non rece-
densa cōmuni Mathema-
ticoꝝ doctrina,

FIG. 7. TITLE OF THE VERIFICATIO OF FRANCISCUS

PIETRO BORGHI. Ed. pr. 1484. Venice, 1484.

PIERO BORGHI. A Venetian arithmetician; died after 1494.

Title. 'Qui comenza la nobel opera de // arithmethica ne la qual fe tracta // tute coffe amercantia pertinente // facta & compilata p Piero borgi // da veniesia.' (F. 2, numbered 1, r. See Fig. 8 for the first folio.)

Colophon. 'Nela inclita cita de venetia a çorni .2.// augusto .1484. fu imposto fine ala pre-//fente opera.' (F. 118, v.)

Description. 4°, 14.3 × 19.3 cm., the text being 8.4 × 13.4 cm. 2 ff. unnumb. + 116 numb. = 118 ff., 37–38 ll. Venice, 1484.

Editions. Venice, 1484, 4° (here described); *ib.*, s. a., which Riccardi thought might be earlier than 1484, since Ratdolt, the printer, published books in Venice as early as 1476; *ib.*, 1488, 4° (see p. 19); *ib.*, 1491, 4° (see p. 20); *ib.*, 1501, 4°; *ib.*, 1505; *ib.*, 1509, 4°; *ib.*, 1517, 4° (see p. 20); *ib.*, 1528, 4° (see p. 21); *ib.*, 1534, 4° (see p. 21); *ib.*, 1540, 4° (see p. 21); *ib.*, 1550, 4° (see p. 22); *ib.*, 1551; *ib.*, 1560; *ib.*, 1561, 4°; *ib.*, 1567; *ib.*, 1577. It was at one time thought on the testimony of Maittaire that there was an edition of 1482, but it has been shown by several bibliographers that the first edition is that of 1484.

This is the very rare first edition of Borghi's treatise, the second commercial arithmetic printed in Italy and long thought to be the first. This particular copy belonged to Count Paolo Vimercati-Sozzi.

The text of the first edition is closely followed in that of 1488 (see p. 19), except for the index, 'Tauola de li capitoli cōtegnudi i q̄sta opa' (f. 118, r.). This does not appear in the second edition, at least in Mr. Plimpton's copy. The letters S H S U which appear twice are thought to stand for J H S U, Jesus, possibly changed on account of some conjectured pronunciation. They appear the second time on f. 118, v., in connection with a set of verses beginning as follows:

‘S H S U

Quanto latua memoria et alto ingegno
vaglia ne larithmetica hai mostrato
nel prefente volume compilato
petro borgo date veneto degno.’

In the verses appears the name of the printer:

‘Ma limpreffor de augufta Errardo experto
di lopera prefente ftampatore
degno e non di mediocre laude certo.’

This folio, as already stated, does not appear in the Plimpton copy of the 1488 edition, and since the later printer was not the same it probably never appeared after 1484.

This work is more elaborate than the Treviso arithmetic, and had far greater influence on education. More than any other book it set a standard for the arithmetics of the succeeding century, and none of the early textbooks deserves more careful study. Borghi first treats of notation (see Fig. 9), carrying his numbers as high as ‘numero de million de million de million,’ and making no mention whatever of the Roman numerals. In the same spirit he eliminates all of the mediæval theory of numbers, asserting that he does this because he is preparing a practical book for the use of merchants. ‘Et nota che sono // nūeri de piui maniere fi cho-//me dichiara Boetio in el fuo // de arithmetiche Ma volen-//do hora tratar de quelle chof//fe che folo amerchadāti apertien: pero tratādo folo de quelli // che ale choffe merchādatefche fono nefefarij io laffero ogni // altra maniera de numeri.’ (F. numb. 1, v.)

The sequence is now peculiar, for multiplication is the first operation treated. (‘Che coffa fia moltiplichar,’ f. numb. 7, r.) First comes the table, arranged in the column form, unlike the Boethian type of arithmetic, which preferred the square array. In addition to the products through ‘9 uia 10 fa 90,’ the products of 12, 16, 20, 24, 32, 36, by 2 . . . 10, are given, these having been necessary on account of the monetary tables of the time. The author then gives the method of

checking by casting out 7's and 9's. ('**C**Dela pruoua del .7.', 'Dela pruoua del .9.', f. numb. 8.) Then follows multiplication 'per colonna' (i. e., by reference to the columns of the table, '**C**Del multiplicar p cholona,' f. numb. 9, r.), with its checks by 7 and 9, and 'per crocetta' (our 'cross multiplication,' '**C**Del multiplicar per chroxeta,' f. numb. 13, v.), showing that these were the common methods in Venice. Division is then explained by the galley form ('**C**Como se die partir p batelo chō lefuou pruoue,' f. numb. 20, r.), our present method, then known as the method of giving, 'a danda,' and described by Paciuolo and Calandri (pp. 54 and 47), not being mentioned. Then follow addition (although this was used in multiplication), subtraction, denominate numbers, common fractions (also beginning with multiplication), rule of three ('De la riegola del .3. '), partnership, barter, alligation, and false position. The rule of three had been developed many centuries earlier by Oriental

**Lbi de arte matematicheba piacere
Lbetengon di certeza el primo grado
Auanti che di quelle tenti el yado
Vogli la presente opera vedere
Per questa lui potra certo sapere
Se erroz fara nel calculo notado
Per questa esser potra certificado
A formar conti di tutto maniere
A mercadanti molta vtilitate
Sara la presente opera e afatozi
Dara in far coze gran facilitade
Per questa vederan tuttli errozi
Ede iquaterni foi la veritate
Danari acquisterano e grandi bonozi
In la patria e de fuozi
Sapran far le rason de tutte gente
Per le figure che son qui depente**

FIG. 8. FIRST PAGE OF THE FIRST EDITION OF BORGHI'S ARITHMETIC

arithmeticians. It was one of the inheritances from the Arabs, and was not improbably learned by the Venetian traders through their contact with the East. Partnership was to the fifteenth what the corporation is to the twentieth century, and it is only very recently that "partnership involving time" was thought to be a necessary subject of study. Barter, a subject until fifty years ago common in American textbooks, was necessary at a time when currency was not so plentiful as now. Alligation was a practical topic in connection with the coinage of money in the days when minting was not the monopoly of great centralized governments. The rule of false position was an Oriental device which we have now replaced by the equation; it was found in school-books in various countries until the second half of the nineteenth century. The problems are generally practical for the time, and they reveal some interesting facts concerning business customs at the close of the fifteenth century.

Other works of 1484. Albert of Saxony, p. 9, c. 1478; Vincent de Beauvais, p. 10.

PIETRO BORGHI. Ed. pr. 1484.

Venice, 1488.

See p. 16.

Title. ‘Chi de arte matematiche ha piacere // Che tengon di certeza el primo grado // Auanti che di quelle tenti el vado // Vogli la presente opera vedere // Per questa lui potra certo

Como si formano million



Million adoucha se die formar per sette figure in questo modo . 1000000 . perche la septima figura tien elluogo de miara de miara: e per che mille miara fano vno million: et essendo in quel luogo la figura che ripresenta vno pero bene edito vno million. Ha in questo modo . 1 1000000 d'ira vno million e cento milia: perche oltra el million: in luogo de centenara de miara: sono la figura che ripresenta vno si che bene edito vno million e cento milia . Ha in questo modo . 1 1 10000 d'ira vno million e cento e diece milia perche oltra el million e cento milia : in luogo de decene de miara: sono la figura che ripresenta vno: si che bene edito vno million e cento e diece milia . Ha in questo modo . 1 1 1 1000 d'ira vno million cento e vndere milia per che oltra el million cento e diece milia: in luogo de numeri de miara sono la figura che ripresenta vno: si che bene edito vno million cento e vndere milia . Ha in questo modo . 1 1 1 1 100 d'ira vno million cento e vndere milia e cento: perche oltra el million cento e vndere milia: in luogo de el semplice centenar: sono la figura che ripresenta vno: si che bene edito vno million cento e vndere milia e cento . Ha in questo modo . 1 1 1 1 1 10 d'ira vno million . cento e vndere milia cento e diece: perche oltra el million cento e vndere milia e cento : in luogo de el semplice decene: sono la figura che ripresenta vno . Ha in questo modo . 1 1 1 1 1 1 d'ira vno million cento e vndere milia cento e vndere . per che anche in luogo de el semplice vnita . sono la figura che ripresenta vno . si che bene edito vno million cento e vndere milia cento e vndere . et cossi procedo perfina . 9999999 . ponendo sempre a suo luogo que le figure representerante quei numeri ouero decene e centenara . che si nomina et cetera . e questo basta cerca lo amastramento del numerar . ben che in infinitum si possa proceder . ma com vna general figura mi forzero dichiarar quanto potesse acabar . et farano questo sotto posta

1000000
 1 100000
 1 1 10000
 1 1 1 1000
 1 1 1 1 100
 1 1 1 1 1 10
 1 1 1 1 1 1
 9999999

FIG. 9. FROM BORGHI'S ARITHMETIC, 1488 EDITION

sapere // Se error fara nel calculo notado // Per questa effer potra certificado // A formar conti di tutto maniere // A merchadanti molta vtilidade // Fara la presente opera e afatori // Dara in far conti gran facilitade // Per questa vederan tutti li errori // Ede iquaterni foi la veritade // Danari acquifterano e

grandi honori // In la patria e' de fuori // Sapran far le rafon de tutte gente // Per le figure che fon qui depente.' (F. 1, r.)

'Qui comēza la nobel opera de // arithmeticha ne laqual fe tracta // tute coffe amercantia pertinen-//te facta 2 compilata per Piero // borgi da Veniefia.' (F. 2, r.)

Colophon. 'Stampito in Veniexia per zouāne de Hall' 1488.' (F. 95, v.)

Description. 4°, 14.8 × 20.7 cm., the text being 12.4 × 14.9 cm. 95 ff., 44 ll. Venice, 1488.

Editions. See p. 16. This is the third edition, and is nearly as rare as the first. Proctor mentions three books from the press of the printer, John Leoviller, of Hall (Halle?).

The text is practically verbatim with that of the first edition (p. 16).

PIETRO BORGHI. Ed. pr. 1484.

Venice, 1491.

See p. 16.

Title. The title page is the same as that of 1488, except for the letters SHSU which precede the former.

Colophon. 'Nela inclita citade venetia a zorni .22.//ottubero .1491. u impofto fine ala pre//fente opera.// Libro dabacho.' (F. 100, v.)

Description. 4°, 15.4 × 20.8 cm., the text being 11.7 × 16.8 cm. 100 ff. unnumb., 40-43 ll. Venice, 1491.

See p. 16. This is the fourth edition.

PIETRO BORGHI. Ed. pr. 1484.

Venice, 1517.

See p. 16.

Title. This is substantially the same as that of the 1484 edition already described.

Colophon. 'Stampata in Venetia per Iacomo pentio da Lecho ad infā//tia de Marchio Seffa & Piero di Rauani compagni // anno dñi .1517. adi .25. de zugno.' (F. 100, v.)

Description. 8°, 15.5 × 21.6 cm., the text being 13.3 × 17 cm. 2 ff. blank + 100 numb. = 102 ff., 41 ll. Venice, 1517.

See p. 16.

PIETRO BORGHI. Ed. pr. 1484. Venice, 1528.

See p. 16.

Title. This is substantially the same as that of the 1484 edition already described.

Colophon. '¶ Stampato in Venetia per Frãccesco Bindoni, & Mapheo // Pafyni compagni. Nel anno .M.D.XXVIII.// Adi .XVIII. Del mese di Zenaro.' (F. 100, v.)

Description. 8°, 15.1 × 20.5 cm., the text being 13.4 × 17.1 cm. 100 ff. numb., 41 ll. Venice, 1528.

See p. 16.

PIETRO BORGHI. Ed. pr. 1484. Venice, 1534.

See p. 16.

Title. This is substantially the same as that of the 1484 edition already described.

Colophon. '¶ Stampato in Vinegia per Frãccesco Bindoni, & Mapheo // Pafini compagni. Nel anno .M.D.XXXIII.// Adi .25. Del mese di Settembre.' (F. 100, v.)

Description. 8°, 15.4 × 20.9 cm., the text being 13.5 × 17.1 cm. 100 ff. numb., 41 ll. Venice, 1534.

See p. 16. The various editions changed but little.

PIETRO BORGHI. Ed. pr. 1484. Venice, 1540.

See p. 16.

Title. 'Pietro Borgo // Libro de Abacho.// Chi d'arte Matematica ha piacere // Che tengon di certezza il primo grado // Auanti che di quelle tenti il vado // Vogli la presente opera vedere.// Per questa lui potra certo sapere // Se error fara nel calculo notado // Per questa effer potra certificado // A formar conti di tutte maniere.// A merchadanti molta utilidade // Fara la presente opera e à fattori // Dara in far conti gran felicitade // Per questa uederan tutti gli errori // E delli quaterni fuoi la ueritade // Danari acquistaranno, e grandi honori.// In la patria e di fuori // Sapran far le raggion de tutte gente // Per le figure che fon qui depente.// Auenga che alquanto per me fu promesso affai

fufficientemente // alla promeffa fatifaceffe, niente dimancho per fatifar alle pre-//giere di qualch'uno, e maffime di alcuni Impreffori, iquali era-//no per ftampar la prefente Opera, ho uoluto alquanto ampliar la di qualche gentilezza oltra quello che prima pmiffe, benche // di quello che fe potria dir, quefto fia vna minima parte, pero cli // chi uoleffe metter pur la centifinia parte di quello che fi potria // poner, el faria molto piu la gionta di quello che fia tutta l'opera // infi. Et pero pro nunc mi paffo con alcune cofette aggiunte nel // ligar de metalli, lequal principiano a carte .77. & anchora in fin // de l'opera con dieci cafi affai piaceuoli & leggiadri comincian//do a carte .98. da quello che dice. Le vno che compra tre pezze // de panno per ducati .70. &c. Et fe le mente di quelli, iquali me // hanno pregato non fuffino à fuo modo fatifatte, prego quelli // me habbino per ifcufato.' (F. 1, r.)

Colophon. 'Stampato in Venetia per Bernardino de Bindoni.// Ne l'anno .M.D.XL. Del mefe di Ottober.' (F. 100, v.)

Description. 4°, 15.5 × 20.9 cm., the text being 13.2 × 17 cm. 2 ff. unnumb. + 98 numb. = 100 ff., 39-40 ll. Venice, 1540.

See p. 16. This is the eleventh edition. The title is considerably extended and some changes are made in the text, chiefly in the way of added matter.

PIETRO BORGHI. Ed. pr. 1484.

Venice, 1550.

See p. 16.

Title. The title page is substantially identical with that of the 1540 edition already described. It bears the date, 'Anno Domini M. D. L.'

Colophon. 'Stampato in Vinegia per Francesco Bindoni, & // Mapheo Pafini. Nell Anno .M D L.// Adi .21. Del mefe di Nouembrio.' (F. 100, v.)

Description. 4°, 15.6 × 20.9 cm., the text being 12.9 × 17.9 cm. 100 ff. numb., 41 ll. Venice, 1550.

See p. 16. This is the twelfth edition, and at least five subsequent editions appeared in the sixteenth century.

ANONYMOUS. Ed. pr. c. 1485. S. l. a. (Cologne ?, c. 1485).

Title. 'Ars numerandi. Incipit cōpendiosus tractatulus quin //tupliciū dēionū numeāliū in quo docet' //luculēt' qūo ordiant' variātur ꝑponūt' //et abinuicem deriuātur dictōnes nume//rales.' (F. 2, r.; see Fig. 10.) Without abbreviations this would appear as follows: 'Incipit compendiosus tractatulus quintuplicium dictionum numeralium in quo docetur luculenter quomodo ordinantur variantur componuntur et ab invicem derivantur dictiones numerales.'

Description. 4°, 14 × 20.6 cm., the text being 10.8 × 15.2 cm. 6 ff. unnumb. (1 blank), 35 ll. S. l. a. (Cologne ?, c. 1470-1485).

Editions. There was no other edition. The date of this rare book is uncertain. The style of type has led to the assertion that it was printed in Mainz by Fust and Schoeffer, about 1470. The book is not mentioned by Hain, nor is any copy known in the French libraries. Coppingier believes that it was printed in Cologne by Ulrich Zell in 1485, and in this he is followed by Zell's biographer, Merlo. The British Museum catalogue gives this date and printer, but questions each. A comparison of the water-marks in this copy with those of the fifteenth century which are described in standard treatises (e. g., Sotheby, E. L., *Principia Typographica*, London, 1858, vol. III) fails to throw any light upon the date. Riccardi attributes it to Zell, c. 1471, who had been an apprentice of Guttenberg, but had left Mainz at the sacking of the city in 1462.

The book is not strictly speaking an arithmetic, but a treatise on grammatical usage as applied to numbers. A considerable portion of the text is occupied with the distinction between ordinals and cardinals, and the methods of using them.

Other works of 1485-1487. Albert of Saxony, 1487, p. 9; c. 1478. In 1485 there was published at Bologna, edited by Pietro Almadiano of Viterbo, a quarto work by Nicolò de Orbelli (Nicolaus Orbellis) entitled 'Compendium considerationis mathematice quo ad arithmetica et geometria sunt necessaria.' Orbelli's 'Cursus librorum philosophie naturalis,' which appeared in 1494, 4°, and at Basel in 1503, 4°, contained 2 pp. on arithmetic. See Isidorus, p. 8, 1483.

Ars numerandi.

Incipit cōpendiofus tractatulus quin
tupliciu dāonū numeālū in quo docet
luculēt' quō ordiant' variātur oponūt'
et abinūicem deriuātur dictōnes nume
rales.

¶ Actionū numeros importātū qdā dicitur
cardinales. qdā pōdāles. qdā distri
butiue siue dispartitiue. qdā ordiales. a qdā
multiplicatiue siue adūbiales. Et notā
dū qd numeri diuersis dichomib9 significāt a ex
varia signōdi manerie cōtrahūt int' se dīntiā et
diūsitatē ut patet. De his aut' dāonib9 p or
dinē est dicēdū. Et pmo de cardinalib9 qd dicitur
iō cardiales. qz sicut ostiū vtiē ēca cardinē. et
innitit' eis: ita dāones alie nūales vtiūt' a res
plicātur ēca istas. Vel dicūt' cardinales qsi pū
cipales. qz dāones alie nūales ab istis hūt ori
ginē. Vel dicūt' qsi pūcipales qz pūcipalit' signēt
nū; Et sciēdū qd duplices sūt dāones cardina
les: qdā scōcrete et quedā abstracte. De cōcretis
aut' cardinalib9 qz de ipis alie deriuant'. Primo ē
vōm que dāones sic pcedūt numerādo. Vnus
duo. tres. quattuor. quinque. sex. septē. octo. nouē
decē. vndecā. duodecā. tredecā. quattuordecā. quindecā
sedecā. sēdecā. a nūq̄ sedecā p x. decēseptē. a
non deb9 interpolī hęc diūsiō et n̄ sint due dāes
decēocto. decēnouem. Viginti. vigintiun9. vigi
tiduo. a sic usq; ad triginta suo modo. Trigin
ta. trigintaun9. trigintaduo. a sic suo modo de
alijs. Quadraginta. Quinquaginta. Sexaginta.
Septuaginta. Octoginta. Nonaginta. Centū.
centūun9. centūduo. a sic suo mō usq; duccētos.
Duccēti. tre. ta. duccētun9. duccētiduo. a' vltim9

Quare pme
numerales
dāes dicūt'
cardinales.

Duplicia sūt
cardinalia.

¶ cōcreta
noia nūalia
sic numerā'

ANICIUS MANLIUS SEVERINUS BOETHIUS.

Ed. pr. 1488.

Augsburg, 1488.

BOETHIUS. Born at Rome c. 480; died there October 25, 524. He was a Roman senator, a philosopher, and the last of the great Latin writers.

Title. 'Arithmetica boetij.' (F. 1, r.)

Colophon. 'Finit arithmetica Boetij bene re//uifa ac fideli studio emendata Im//preffa per Erhardū ratdolt viri fo//lertiffimi eximia iduftria : mira im//primēdi arte : qua nup

Inciunt duo libri de Arithmetica anicij manlij feuerini Boetij viri clariffimi et illuftriffimi ex cōfulis: ordinarij: patricij: ad patricium fim machum.



Incipiunt duo libri de Arithmetica anicij manlij feuerini Boetij viri clariffimi et illuftriffimi ex cōfulis: ordinarij: patricij: ad patricium fim machum.

qđ liber alius afferret inuentū: nec ab illo vnq̄ qđ iucundius benignolētia cōplecteret acceptū. Hęc ipse cōsiderans: artuli non ignaua opum pōdera quibus ad facinus nihil in structius est: cū habendi sitis incanduit: ad meritū nihil vilius cū ea si bi victor anim? calcata subiecit: sed ea que ex grecarū opulētia literarū in romane orationis thesaurum supra cōuectim? Ita enī mei quoq; operis mihi ratio cōstabit: si que ex sapientie doctrinis elicui: sapientiffimi iudicio cōprobent. Cū idea igit̄ vt tam magni laboris effectus nuz tantū expectet examē: nec in aures p̄dire publicas nisi doctę sentētie a stipulatione nitat. In quo nihil mirū videri debet: cū id opus qđ sapiētie inuenta persequit: non auctoris sz alieno incūbit arbitrio. Suis ḡpe instrumentis res rationis expēditur: cū iudicium cogit subire p̄udentis. Sed huic munusculo: nō eadem que ceteris imminēt artibus munimenta cōstitero. Neque enim

fere vlla sic cūctis absoluta partib; nullius ipsa suis tantū est sciētia nita p̄sidys: vt nō ceteraq; quoc; artū adiumenta desideret. Nā in effigiandis marmore statuis: alius effigēndę molis labor est: alia formę de imaginis ratio: nec eiusdē artificis manus polito operis nitor expectat. At picturę manibus tabule cōmissę fabricorū. cere rustica obseruatione decerptę: colorū iusticia mercatorū solertia perquisita: linteā operosis elaborata texturinis: multiplicem materā prestāt. Nōne idē quoque belloꝝ visitur instrumentia: hic spicula sagittę eracuit: illi r alidus thorax nigra gemit incude. At aliis: crudi vmbonis tegmina p̄prij labori orbi infigenda mereatur. tam multę artibus ars vna perficiat. At nostri laboris absolutio lōge ad facilioꝝ currit euentus. Tu enī solus manus sup̄remo operi impones: in quo nihil de decernentiū necesse est laborare cōsensu. Quālibet enī hoc iudiciū multis artibus probet exercitū vno tamē cumulāt examine. Experiare igit̄ licet quantū nobis in hoc studio longis tractus ocis labor adiecerit. An rerū subtilium fixas exercitātę mentis velocitas cōphendat. vtz ieiunę macies orationis ad ea que sunt caligantibus impedita sententijs expedienda sufficiat. Quā in rem mihi alieni quoque iudicij luera querunt. Cum tu vtrāque periciffimus literarę: postis gratię orationis expertibus quantus de nobis iudicare audeant: solā tantū p̄nunciantione p̄scribere. At nō al-

nulla scientia. It. que aliqd ab aliis non desiderat ad inuentū

sola aritmetica nullius indiget adiunio

FIG. 11. FIRST PAGE OF THE 1488 BOETHIUS

		Tetragona.				Longitudo.				Secūda vnitae.	
Prima vnitae.	1	2	3	4	5	6	7	8	9	10	
	2	4	6	8	10	12	14	16	18	20	
	3	6	9	12	15	18	21	24	27	30	
	4	8	12	16	20	24	28	32	36	40	
Latitudo.	5	10	15	20	25	30	35	40	45	50	
	6	12	18	24	30	36	42	48	54	60	
	7	14	21	28	35	42	49	56	63	70	
	8	16	24	32	40	48	56	64	72	80	
	9	18	27	36	45	54	63	72	81	90	
	10	20	30	40	50	60	70	80	90	100	
		Secūda vnitae.				Longitudo.				Tetragona.	

Ratio atq; expositio digeste fornu
le. Cap. 27.



Sigif duo pma late-
tra ppositę formule q
faciunt āgulū: ab vno
ad. 10. et. 10. pceden-
tia respiciat: z his sub-
teriores ordies cōpa-
rent: qui scilicet a. 4. angulum incipi-
entes: in vigenos terminū ponunt:
duplex id est prima species multipli-
catis ostenditur: ita vt prius pri-

mū sola superet vnitae: vt duo vniū
secūd^o scōm binario supradat: vt q/
ternari^o binariū. terti^o tertiū tribus:
vt senari^o ternariū. qrtus qrtū qter-
narij numerositate transcendat: vt
8 qternariū: z p eādē cūcti sequentiā
sefe minoris pluralitate pretereant.
Sivero terti^o angulus aspiciat: q ab
9. inchoās lōgitudinē latitudinēq;
tricens altrinsecus numer^o extēdit:
et hic cū pma latitudine et lōgitudi-
ne cōparetur: triplex species multi-

FIG. 12. MULTIPLICATION TABLE, 1488 BOETHIUS

venetijs nūc // auguftę excellet nominatifimus.// Anno dni .M.cccc.lxxxviiij. Men//fis maij die vigeſima.' (F. 48, r. Fig. 14.)

Description. 4°, 15.1 × 20.8 cm., printed in double columns, each being 5.1 × 14.7 cm. 47 ff. unnumb. + 1 blank = 48 ff., 40 ll. Augsburg, 1488.

Editions. Augsburg, 1488, 4° (here described); Cologne, 1489; Leipzig, 1490; Venice, 'Opera,' 1491-92 (see p. 28); Paris, 1496, 4°; Venice, 1497; ib., 1499 (bearing also the date 1497), fol.; s. l. a. (the Compendium of Muris, c. 1500); Paris, 1501, fol.; ib., 1503 (see p. 29); ib., 1507, 4°; ib., 1510 (see p. 30), fol.; ib., 1511, 4°; ib., 1514, fol.; Vienna, 1515 (the Muris 'Compendium,' in Tannstetter's works); Paris, 1521 (see p. 31), fol.; ib., 1522, fol.; 1528, fol.; Paris, 1530, 8°, 'De differentiis topicis libri quatuor'; Basel, 1536, 8°; Basel, 1546, 'Opera,' fol.; ib. and Paris, 1549; Basel, 1553, 'ajectis explic. per J. Scheubelium,' 8°; Paris, 1553; Basel, 1570; Venice, 1570, 'Opera,'

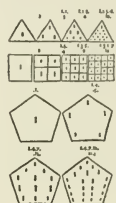


FIG. 13. FIGURATE NUMBERS, 1488 BOETHIUS

fol. There are undoubtedly various other editions of the Arithmetic, or the Epitome by Faber Stapulensis, these works often being bound with such treatises as the Arithmetic of Jordanus Nemorarius Murhard (I, 160) and Rogg (p. 137) mention an edition of Faber's 'Compendium,' s. l., 1480, but it is not given by other bibliographers. (See Hain, I, 468; Brunet, *Man.*, I, 1059; Graesse, *Trésor*, I, 464; Riccardi, I, 1, 159; Boncompagni, *Bulletino*, XII, 148.)

The text is practically that followed by Friedlein in his standard edition of the 'Opera' of Boethius (Leipzig, 1867), except as to numerals. Here, as in the later manuscripts, the Arabic characters have replaced the Roman of the original text. (See Fig. 12.)

The arithmetic of Boethius was based upon the Greek work of Nicomachus (fl. c. 100 A.D.), and related only to the theory of numbers, the 'Ἀριθμητική,' as distinguished from the practical calculations, the

λογιστικῆς, and from the later algorismus (p. 5). Boethius gave an elaborate theory of ratios and devoted much attention to figurate numbers, such as the triangular, square, pentagonal, and cubic. (See Fig. 13.) The work was the standard in the Church schools throughout the Middle Ages.

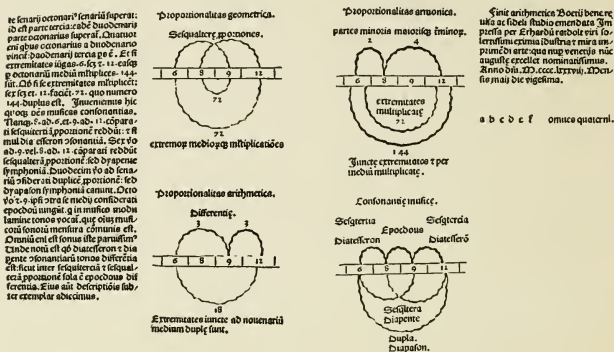


FIG. 14. LAST TWO PAGES OF THE 1488 BOETHIUS

BOETHIUS.

Ed. pr. of the Arithmetic, 1488.

Venice, 1491-92.

See p. 25.

Title. See Fig. 15.

Colophon. 'Impressis venetijs per Joannē de Forli-//uio et Gregorium fratres. Anno salutis .M//cxxxj. die xxvj, mensis Martij.' (F. 352, r.)

On f. 256 (220 as numbered in the book), at the end of the Geometry is the following: 'Venetijs Impressum Boetij opus p Joānez ? Gre//goriū de gregorijs fratres felice exitu ad finē vīq; pductu //accuratissimeq; emēdatū Anno humane restorationis. // 1492. die .18. Augusti. Augustino Barbadico Sereniffi//mo Venetiarum principe Rem pu. tenēte.'

Description. Fol., 21.7 × 32 cm., printed in double columns, each being 6.6 × 24.1 cm. 3 ff. unnumb. + 345 numb. + 1 blank = 349 ff., 66-70 ll. Venice, 1491-92 (see the colophons).

Editions. This is the *editio princeps* of the works of Boethius. For other editions see p. 27.

Defcunt opera Boetii: quę in hoc volumine continentur.

In Porphyrii Isagogen a Uictorino translata[m] editio prima.
 In Porphyrii Isagogen a Boetio ipso translata[m] editio secunda.
 In categorias Aristotelis editio vna.
 In librum Aristotelis de interpretatione editio prima.
 In eundem librum de interpretatione editio secunda.
 De diuisionibus liber vnus.
 De definitionibus liber vnus.
 Ad categoricos syllogismos introductio
 Commentariorum in Topica Liceronis libri sex.
 De Differentiis Topicalibus libri quatuor.
 De syllogismo categorico libri duo.
 De syllogismo hypothetico libri duo.
 De trinitate libri duo.
 De deo[n]omadiis liber vnus.
 De unitate et vno liber vnus.
 Contra euthebiu[m] et Nestoru[m] de duabus naturis: et vna persona
 christi liber vnus.
 De Arithmetica ad Patritium simmacu[m] libri duo.
 De Musica libri quinq[ue].
 De Geometria libri duo.
 De philosophicę consolatione libri quinq[ue].
 De scholasticę disciplinae liber vnus.

Codez Boetij S. Mathie
 Aplij extra moenia Trevi:
 Sumptibus Sij

~~1488~~ 6^m 12.
~~1488~~
~~1488~~

FIG. 15. TITLE PAGE, 1491-92 BOETHIUS

BOETHIUS. Ed. pr. of the Arithmetic, 1488. Paris, 1503.

See p. 25.

Title. 'In hoc libro contenta.// Epitome/ compendiosaq[ue] introductio in libros // Arithmeticos diui Seuerini Boetij: adiecto fa-// miliari commentario dilucidata.// Praxis numerandi certis quibusdam regulis // constricta.// Introductio in Geometriam

breuiusculus an-//notationibus explanata. sex libris distincta.//
 Primus de magnitudinibus et earū circūstan-//tiis.// Sc'dus de
 cōsequētibus/ cōtiguis/ & cōtinuis.// Tertius de punctis.// Quar-
 tus de lineis.// Quintus de superficiebus.// Sextus de corporibus.
 // Liber de quadratura circuli.// Liber de cubicatione sphaere.
 // Perspectiua introductio.// Infuper Astronomicon.' (F. 1, r.)

Colophon. 'Abfolutum in almo Parhifiorum studio/ //Anno
 dñi qui numero defnuit omnia // 1503.' (F. 48, r.)

On f. 84, v. is the following: 'Geometrici introductorij://
 fexti/ etvltimi libri finis.// Editi anno domini // millesimo quin-
 //gētesimo pri//mo: vicefi-//ma quin//ta no-//uem//bris.' And
 on f. 111, v., the following: 'Id opus imprefferūt Volphgangus
 //hopilius et Henricus stephanus // ea in arte focii in Almo
 pari-//fiorum studio Anno Chri//fti Celorum totiuſq; // nature
 cōditoris.// 1503. Die vice//ſimaſepti-//ma Iu-//nij.'

Description. 8°, 20 × 26.8 cm., the text being 15.6 × 22.3
 cm. 48 ff. numb. in the arithmetical part, 113 in all (1 blank),
 54 ll. Paris, 1503.

The editions of Boethius differ more or less in the combinations of
 works which they contain. See p. 27. This is the first edition of the
 Jacobus Faber Stapulensis and Jodocus Clichtoveus 'Epitome.'

BOETHIUS. Ed. pr. of the Arithmetic, 1488. Paris, 1510.

See p. 25.

Title. This is substantially identical with that of the 1503
 edition already described.

Colophon. '¶Abfolutum in almo Parifiorum studio/ // Anno
 domini qui numero definiuit // omnia 1503. Et emiffum ex offi-
 //cina Henrici ſtephani Anno // Chriſti ſaluatoris // omnium
 1510 de-//cima quinta // die Mar-//tij.' (F. xlviij, r.)

Description. Fol., 19.5 × 27.9 cm., the text being 15.4 × 25.6
 cm. 48 ff. numb., 46-56 ll. Paris, 1510.

This is one of the editions containing the commentary of Jodocus
 Clichtoveus on the 'Epitome' of Boethius by Jacobus Faber Stapulensis.
 (See p. 27.)

BOETHIUS. Ed. pr. of the Arithmetic, 1488. Paris, 1521.

See p. 25.

Title. 'Divi Severi//ni Boetii Arithmetica, // dvobvs discreta libris; adie//cto commentario, mysticam nvme//rorum applicationem perfringente, declarata.//

(Woodcut with initials of the printer: S.D.C.). Vænundatur apud Simonem Coli//nævnm, e regione scholæ Decretorum.' (F. 1, r.)

Colophon. 'Excudebat Simon Colinaeus, Parisijs, Anno MDXXI
1521

Quinto//Idus Iulias.' (F. 139, v.)

Description. Fol., 19.9 × 28.2 cm., the text being 13.9 × 26 cm. 4 ff. unnumb. + 136 numb. = 140 ff., 40-52 ll. Paris, 1521.

This is the first edition of Boethius with the commentary of Girardus Ruffus: 'Girardi Rvffi, in duos arithmetice Boetii libros, commentariivs.' (F. 5, r.) This commentary greatly exceeds the text in extent,

and as to ponderosity it leaves little to be desired. As a piece of typography, however, this is one of the best editions of Boethius.



FIG. 16. PRINTER'S DEVICE, 1521 EDITION OF BOETHIUS

ANIANUS AND JOHANNES SACROBOSCO.

Ed. pr. 1488.

Strasburg, 1488.

ANIANUS was a fifteenth-century astronomer and poet, of Strasburg.

JOHANNES DE SACROBOSCO (SACROBUSTO, SACROBUSCHUS, HOLYWOOD, HOLYBUSH, HOLYWALDE, HOLYFAX, HALIFAX) was born at Ilalifax (Holywood), Yorkshire; died at Paris in 1244 or 1256. He studied at Oxford and lectured at Paris. He wrote on astronomy and algorism.

Title. 'Cōpotus manua//lis magī aniani. // metricus cū omēto // Et algorifmus.' (F. 1, r. Fig. 17.) F. 45 begins, 'Incipit textus algorifmi.'

Colophon. 'Impressum Argñ. per Johāmem pryß.// Anno domini .i488 .i8. kall.' decembris.' (F. 44, r.)

Description. 4°, 13.9 × 19.5 cm., the text being 8.8 × 14.4 cm. 53 ff. numb. + 2 unnumb. = 55 ff., 31–34 ll. Strasburg, 1488.

Editions. The editions of Sacrobosco's *Algorismus* were as follows: Strasburg, 1488, 4° (here described); s. l. a. (Venice?, 1490?), 4°; Venice, 1501 (see p. 35); Paris (edited by Clichoveus), 1498; ib., 1503; ib., 1510; Vienna, 1517; Cracow,

Clōpotus manua lis magrī aniani. metricus cū mēto Et algorismus

FIG. 17. TITLE, FIRST EDITION OF ANIANUS

1504, 1509, 1521, and 1522; Paris, 1522; Venice, 1523 (p. 35); Antwerp, 1582. The editions of Anianus were as follows: Strasburg, 1488, 4° (here described); Lyons, 1489; ib., 1490, 4°; ib., 1491, 4°; ib., 1492 (two editions), 4°; Rome, 1493, 4°; Paris, 1494, 4°; ib., 1498, 4°; s. l. a. (Paris?, c. 1495, 4°, see p. 33); s. l. a. (Basel, c. 1500), 4°; Rouen, s. a. (1502), 8°; Paris, 1501, 4°; ib., 1502, 8°; Lyons, 1504 (see p. 35); ib., 1509, 4°; Paris, 1508; ib., 1511; ib., 1515; ib., 1519, 4°; ib., 1529; ib., 1530, 4°; Lyons, 1540, 4°; Frankfort, 1549; Wittenberg, 1550; ib., 1568; Antwerp, s. a. (c. 1558); ib., 1559. There are probably others s. l. a., and some appear

under the name of Sacrobosco. Of this first edition Boncompagni knew only the Munich copy. (*Bulletino*, XII, 126 n.)

The first part of this rare book is the *Computus Manualis* of Anianus, and the second is the *Algorismus* of Sacrobosco, described later. It is probably the first book on mathematics printed in Strasburg (but see p. 10), and it is the first edition of each of the two treatises mentioned, and the first printed work on the computus, the arithmetic of the Church calendar. In the work of Anianus appears for the first time in print the original of the rhyme beginning

‘Thirty days hath September,’

the English version of which is said to have been first published in the 1590 edition of Grafton’s *Chronicles*. It also appeared in an arithmetic published anonymously in 1596. The Latin form of Anianus is as follows :

‘Junius aprils september et ipse nouember
Dant triginta dies reliquis supadditur vnus,
De quorum numero february excipiatur.’ (F. B. 8.)

It is found in various forms in other computi, manuscript and printed. Anianus also gives for the first time in print the astronomical formula : ‘Sunt Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libraque, Scorpio, Arcitenens, Caper, Amphora, Pices,’ which appeared in the works of Bede under the title ‘Verfus Prisciani, de Astronomia,’ as ‘Hinc Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpius, Arcitenens, Capricornus, & Vrna, Qui tenet & Pifcis.’ (1563 edn., vol. I, 517.)

ANIANUS. Ed. pr. 1488.

S. l. a. (Paris ?, c. 1495).

See p. 31.

Title. ‘Cōpotus cum // commento.’ ‘Liber qui Computus inscribitur : vna cum figuris et ma//nibus necessariis tam in fuis locis q̃ in fine libri positis.// Incipit feliciter.’ (F. 1, r.)

Description. 4°, 13.1 × 19.4 cm., the text being 9.3 × 13.1 cm. 39 ff. unumb. + 1 blank = 40 ff., 35 ll. S. l. a. (Paris ?, c. 1495).

Editions. See p. 32. This rare and interesting edition was published about 1495, possibly by Mich. le Noir at Paris, although there is no date or place of publication given. It is one of the best examples of the mediæval computus that appeared in print. Unlike the first edition (p. 31, 1488) it

contains a number of illustrations showing the use of the hand and fingers in assisting in calendar reckoning, the title of 'Com-

Liber qui Compositus Inscrbitur: vna cum figuris et manibus necessariis tam in suis locis q̄ in fine libri positus. Incipit feliciter ..

Lux orta est iusto Psalmista **Ista vera** possunt dupliciter considerari. Primo p̄nt dicit de deo q̄ est lux vera. ideo dicebat dauid. lux orta est iusto. Et de ista luce dicit Job̄. 1. Erat lux vera q̄ illuminat omne hominē veniēte in hunc mundū. Secūdo ponit de scientia.

Et dicit lux quasi scientiē reddere lucidū. quia facit hominē sciētem esse lucidū. In quibus verbis ad cōmendationē sciēte duo breuiter tangūt. Primo eñ tangit sciēte altitudo preciosa p̄ hoc quod dicit lux. Secundo largitudo gloriofa per hoc q̄ dicit orta est. Primū probatur auctoritate et ratio e. auctoritate **Istodor** sic dicentis / Scientia est fons indeficiens. bonitatis via. sui salutaris cognitio. Ratio sic. illud est validū et preciosum quod de inualido et imperfecto facit validum et p̄fectum. scientia ē huiusmodi. ergo etc. maior est manifesta. minor declaratur p̄ p̄m tercio de aīa sic dicentē: Aīa in p̄ncipio sue creationis ē tanq̄ tabula rasa in qua nihil depictū est. depingibilis tñ sciētis et virtutibus. Primū probat auctoritate boetii et ratio in prologo arismetrice / Scientia ē eorū que vera sunt et imp̄mutabilis essentie nota etq̄ cōp̄hensione veritatis. Ratio sic: illud est tanq̄ sūmū bonū quod habet largitiōē gloriofam scīa ē h̄mōi. ergo etc. maior est vera. minor p̄batur p̄ diffinitionē sciēte q̄ talis ē. Scīa est q̄dā habitus aīe rōnalis nō innatus sed acq̄situs oīm hūanarū rerū indagatrie et totius humane vite gubernatrie / q̄ scīa sit habitus p̄t̄. q̄ scīa est aliquod existens in aīa. sed omne illud quod est in aīa aut ē hitus aut potētia aut passio. Et hoc testat Aristot. in secūdo ethicorū. q̄ scīa nō sit passio p̄t̄ q̄ passiones sunt in voluntate scīa nō ē h̄mōi. ergo etc. q̄ nō sit potētia p̄t̄. q̄ q̄libet potentia fit a natura. sicut irascibilis. et cōcupiscibilis. et sic relinquitur q̄ nō sit potentia. q̄ sit hitus aīe rōnalis p̄t̄ p̄ p̄dicta. q̄ aut

a ii

FIG. 18. BEGINNING OF ANIANUS, EDITION OF C. 1495

putus manualis' being thus justified. This differs from the 1488 edition in the notes of the commentator. The original text is, however, substantially unchanged.

ANIANUS. Ed. pr. 1488.

Lyons, 1504.

See p. 31.

Title. 'Compotus cū // commento.' (F. 1, r.)

Colophon. '¶ Liber compoti cum cōmento finit feliciter // Impreffus Lugduni per Claudiū nour//ri. Anno domini .M.cccccc.iiij. // die .iiij. Octobris.' (F. 32, r.)

Description. 8°, 14.5 × 20 cm., the text being 8.9 × 14.1 cm. 32 ff. unnumb., 34-40 ll. Lyons, 1504.

See p. 32. In this edition there is a curious misprint in the calendar verse given on p. 25 (f. 13, r.). It here begins 'Julius (instead of Junius) aprilis septembre & ipse nouember.' Like the edition of c. 1495 (p. 33), this is well illustrated. It differs from the 1488 edition in the notes of the commentator, but is practically identical with that of c. 1495.

JOHANNES SACROBOSCO. Ed. pr. 1488. Venice, 1501.

See p. 31.

Title. 'Algorifmus Domini Ioā-//nis De Sacro Bufco // Nouiter Impreffus, // Cum Gratia Et Priuilegio.' (F. 1, r.)

Colophon. 'Impreffum Venetijs per Bernardinum Venetum // De Vitalibus: Anno Dñi .M.CCCCC.I.// Die Tertio Meñ. Februarij.' (F. 8, r.)

Description. 4°, 14.1 × 19.6 cm., the text being 10.5 × 16.8 cm. 8 ff. unnumb., 39 ll. Venice, 1501.

See p. 32.

JOHANNES SACROBOSCO.

Ed. pr. 1488.

S. l. a. (Venice, 1523).

See p. 31.

Title. 'Algorifmus Domini Joannis // de Sacro Bufco noui- //ter impreffum.' (F. 1, r.)

Colophon. 'Impreffum Venetijs per Melchiorem Seffam & Petrum // de Rauanis Socios. Anno domini .M.D.XXIII.// die .XXIII. Octobris.' (F. 8, r.)

Description. 4°, 14.8 × 18.6 cm., the text being 10.3 × 16.8 cm. 8 ff. unnumb., 40 ll. S. l. a. (Venice, 1523).

JOHANN WIDMAN (?). Ed. pr. c. 1488. Leipzig, c. 1488.

Born at Eger, Bohemia, c. 1460. He was a student at Leipzig in 1480, A.B. in 1482, bachelor of medicine in 1485, A.M. in 1486. He evidently received the doctor's degree about the same time, for he wrote a medical work in 1497 with the title, 'Tractatus clarissimi medicina ꝛ doctoris Johānis widman . . . de pustulis . . .' That he gave lectures on algebra, possibly the first at Leipzig, is proved by a passage found by Wappler in an old Dresden manuscript: 'Quare hodie hora secunda post sermonem atque Baccelaureorum celebrata disputatione Magister Jo. W. De. Eg. Aporismata et Regulas Algobre resumpturus pro hora atque loco conuenienti cum audeturis concordabit . . .'

Title. 'Algorithmus Linealis.' (F. 1, r.) 'Ad euitādum multipli//ces Mercatorum erro//res et alteri⁹. . .' (F. 2, r.)

Description. 4°, 14 × 19.5 cm., the text being 7.8 × 14.5 cm. 14 ff. unnumb., 31-34 ll. Initials in red, by hand. Leipzig, c. 1488.

Editions. Leipzig, s. a. (c. 1488, here described); ib., possibly 1490, 1493; 1516; 1517, and several others.

This rare treatise, the first printed work on calculation by the aid of counters ('apud nostras appellata est calculatio'), is of unknown authorship, but was probably written by Widman. (*Abhandlungen*, V, 152.) At the end of the book is the device of Martin of Würzburg (Martinus Herbipolis), and the book was printed by him, probably c. 1488. After a brief introduction on the use of counters ('projectiies' as they are here called), the author treats of the following topics: De Additione, De Subtractione, De Duplatione, De Mediatione, De Multiplicatione, De Diuisione, De Progreffione, De radicum extractione, De radicum extractione in Cubicis. The book closes with the words: 'Et tantū de Radicum extractione et vltima huius Algorithmi specie Et ꝑ consequens de toto Algorithmo.' There are no applied problems, and the only computations with abstract numbers are performed 'on the line' (i. e. by the 'projectiles' on a line abacus), whence the name 'Algorithmus linealis.' The work is illustrated by woodcuts.

Other works of 1488. Suiseth (p. 10, c. 1480); Borghi (p. 16, 1484).

JOHANN WIDMAN. Ed. pr. 1489. Pforzheim, 1500.

See above.

Title. 'Behennd vnd hüpfch // Rechnung vff allen // kauffmanschafftten.' (Woodcut of a schoolroom.) (F. 1, r.)

Colophon. 'Gedruckt zñ Pfortzheim von Thoman // anzfzhelm Im Jubel Jar als man zalt 1500 // Got fey lob.' (F. 163, v.)

Description. 16°, 10 × 13.2 cm., the text being 6.5 × 10.4 cm. 11 ff. blank + 1 unnumb. + 162 numb. = 174 ff., 26 ll. Pforzheim, 1500.

Editions. Leipzig, 1489, 8°; Pforzheim, 1500, 8° (here described); ib., 1508, 8° (p. 39); Hagenau, 1519, 8° (p. 40);

11

gezogen vß hebreischer zungen oder iudischer
gleich als vil in sich beschliessen als die taffel
im quadrat/welche dann die ander gesetzt ist
als dann hie hernach ietliche an ir selbst form
klerlichen beschreiben ist.

1	2
2	4 3
3	6 9 4
4	8 12 16 5 1
5	10 15 20 25 6
6	12 18 24 30 36 7
7	14 21 28 35 42 49 8
8	16 24 32 40 48 56 64 9
9	18 27 36 45 54 63 72 81

Lern wol mit fleiß das ein mal ein So wirt
dir alle rechnung gemein

1	2	3	4	5	6	7	8	9
2	4	6	8	10	12	14	16	18
3	6	9	12	15	18	21	24	27
4	8	12	16	20	24	28	32	36
5	10	15	20	25	30	35	40	45
6	12	18	24	30	36	42	48	54
7	14	21	28	35	42	49	56	63
8	16	24	32	40	48	56	64	72
9	18	27	36	45	54	63	72	81

FIG. 19. FROM THE 1500 WIDMAN

Augsburg, 1526, 8° (p. 40). The title of the first edition was as follows: 'Behēde vnd hubsche // Rechnung auff allen // kauffmanschafft,' and the colophon (f. 236, r.), 'Gedruckt In

der Fürstlichen Stath // Leipzick durch Conradū Kacheloffen
// Im 1489 Iare.'

106

Nū mach yetliche für sich selb mit seinem gele
nach der regel so kumt als hienach stat

Scherpes	424	13	4	
Profloret	303	13	$\frac{1}{2}$	Sūma fe
floret	ff 204	ß 3	hkr 9	!161 ß 1
Negregant	122	13	$\frac{1}{2}$	hkr $5\frac{1}{2}$
Primera	65	10	$7\frac{1}{2}$	
Secanda	40	7	6	

Wechsel



FIG. 20. EXCHANGE. FROM THE 1500 WIDMAN

This is the second edition, and is even more rare than the first. It was unknown to Boncompagni when he printed his 'Intorno ad un Trattato d'Arithmetica di Giovanni Widmann di Eger' in the *Bulletino*, IX, 188, the best discussion of this arithmetic that has appeared.

Widman's arithmetic was the first great German textbook on the subject, although minor works had already appeared before 1489. It is in the main a practical treatise, with good problems, and it set the standard for Germany much as Borghi's book did for Italy. Among its noteworthy features is the use of the plus and minus signs for the first time in a printed work. (See Fig. 21.) These are not used, however, as signs of operation, but as symbols of excess or deficiency in warehouse measures. The book is illustrated (see Fig. 20) with pictures showing mercantile customs, and with geometric diagrams. Widman acknowledges his indebtedness to men like Sacrobosco, 'als da lert Joannes defacrobusto vñ ander mer,' although his work shows no dependence upon the 'Algorismus' named.

After the 'Inhalt difz buchs in einer gemein,' Widman devotes $2\frac{1}{2}$ pages to 'Numeratio,' $2\frac{1}{2}$ to 'Additio,' $2\frac{1}{2}$ to 'Subtrahiren' (including denominate numbers in these topics), 1 to 'Dupliren,' 2 to 'Medieren' (i.e. multiplying and dividing by 2), $1\frac{1}{2}$ to 'Multipliciren,' 5 to division, $2\frac{1}{2}$ to progressions, and 14 to roots (4 referring to cube root). He then takes up fractions in the same order, this work being followed by compound numbers and proportion. He then gives a large number of type problems, *regulae* as he calls them, although they are not stated in the form of rules as we now know them. These include the 'Regula detri' (rule of three, treated as distinct from proportion), and the *regulae fusti, detri conversa, positionis, equalitatis, legis, augmenti, plurima, sentenciarum, suppositionis, residui, excessus, collectionis, quadrata, cubica, reciprocatiois, lucri, pagamenti, and alligationis.*

Other works of 1489. Boethius, p. 27, 1488; Anianus, p. 32, 1488.

JOHANN WIDMAN. Ed. pr. 1489. Pforzheim, 1508.

See p. 36.

Title. 'Behend vnd hüpfch // Rechnung vff allen // Kauffmanfchafften.' (F. 1, r.)

Colophon. '¶ Gedruck zû Pforzheim von Thoman // Anzfhelm Im iar als man zalt 1508.' (F. 161.)

Description. 8°, 9.7 × 13 cm., the text being 6.5 × 10 cm. 7 ff. blank + 161 numb. = 168 ff., 26 ll. Pforzheim, 1508.

Editions. See p. 37. This is the third edition of this famous arithmetic, and is by the same publisher as the second (1500), but is from different type. It is about as rare as the first edition.

JOHANN WIDMAN Ed. pr. 1489.

Hagenau, 1519.

See p. 36.

Title. 'Behend vnd hüpfch // Rechnung vff allen // Kauffmanfchafften.' (F. 1, r.)

Colophon. 'Getruckt zû Hagenaw durch Thoman // Anshelm. Im iar als man zalt // 1519.' (F. 151, r.)

Description. 8°, 9.7 × 14.3 cm., the text being 6.8 × 11 cm. 1 f. unnumb. + 151 numb. = 152 ff., 20–29 ll. Hagenau, 1519.

Editions. See p. 37. This is the fourth edition of Widman's Arithmetic. As an inscription on the fly leaf says, this copy was presented to Prince Baldasarre Boncompagni by Ludwig Kunze as a 'liber rarissimus.'

See p. 39.

JOHANN WIDMAN. Ed. pr. 1489.

Augsburg, 1526.

See p. 36.

> 2

4	+	5	Wilt du das wyls
4	—	17	sen oder deßigley
3	+	30	cher/So sunnier
4	—	19	die zentner vnd
3	+	44	lb vnd was auff
3	+	22	— ist/ das ist mi
zentner	3	—	11 lb nus d's seß beson
3	+	50	der vnd werden
4	—	16	4539 lb (So
3	+	44	du die zentner
3	+	29	zû lb gemacht
3	—	12	haft vnd das /
3	+	9	+ das ist meer

darzû 2 ddiereß vnd > 5 minus. Nun
solc du für Holz abschlahen allweeg für
ain legel 24 lb. Vnd das ist 13 mal 24.
vnd mache 3 12 lb darzû addier das —
das ist > 5 lb vnd werden 387. Dye sub
erabier von 4539. Vnd bleyben 4152
lb. Nun spich 100 lb das ist ein zentner
pro 4 ff ½ wie kunten 4152 lb vnd tumē
171 ff 5 ½ heller? Vn ist rechte gemacht

Effect

2

FIG. 21. FROM THE 1526
WIDMAN

Title. 'Behennde vnd // hübfche
Rechnüg auff allen // Kauffmanfchaff-
ten.' (Woodcut showing two men
seated at a reckoning table.) 'M. D.
XXXVI.' (F. 1, r.)

Colophon. 'Getruckt zû Augspurg
durch // Haynrich Stayner // M, D,
XXXVI.' (F. 192, r.)

Description. 9.4 × 13.7 cm., the text
being 6.7 × 11 cm. 2 ff. unnumb. + 190
numb. = 192 ff., 25 ll. Augsburg, 1526.

Editions. See p. 37. This copy has
a note in the handwriting of Prince
Boncompagni, together with his colla-
tion of the book. It is interesting not
only for its rarity but for the contem-
porary coloring of the woodcuts.

In the other editions described the third line of Fig. 21 reads 3 + 36,
as it should.

PETRUS DE ALLIACO. Ed. pr. 1490. Augsburg, 1490.

ALYACO, HELIACO, D'AILLY. Born in Compiègne in 1350; chancellor of the University of Paris, Bishop of Cambrai, and Cardinal. He died in 1420.

Title. 'Cōcordātia afronomie cū theologia // Cōcordātia afronomie cū hyftorica // narratione. Et elucidariū duorꝝ pre//cedentium: dñi Petri de Aliaco car//dinalis Cameracēfis.' (F. 1, r.)

Colophon. 'Explicit tractatus de cōcordia afronomie veritatis ꝛ narrationis hiftorice // a dño Petro cardinali Cameracen. completus in ciuitate Basiliē. anno xpī // 1414 : mensis. Maij die decima.' (F. 33, r.) 'Opus concordantie afronomie cum theologia necnon hyftorice verita: nar//ratione explicit feliciter. Magiftri Joannis angeli viri peritiffimi diligēti cor//rectione. Erhardiqꝫ Ratdolt mira imprimēdi arte: qua nuper Venetijs nūc // Augufte vindelicorum excellit nominatiffimus. 4. nonas Januarij. 1490.' (F. 55, v.)

Description. 4°, 15.6 × 20.4 cm., the text being 11.1 × 14.7 cm. 56 ff. unnumb., 39 ll. Augsburg, 1490.

Editions. There was no other edition.

This work has been included in the list because, while chiefly astronomical, it throws considerable light upon the early Computi. It was written to show the relation between theology and astronomy, and hence it has an important bearing upon the study of the mediæval calendar.

ALONSO DELATORE. Ed. pr. 1489. Seville, 1538.

A Spanish savant of the fifteenth century.

Title. 'Vifiō delectable de // la philofophia ꝛ ar//tes liberales: meta//phifica: y philofo-//phia moral .:. // M.d.xxxviiij.' (This is surrounded by an elaborate woodcut.) (F. 1, r.)

Colophon. '¶Fenefce el libro llamado vifion delectable dela Philofophia ꝛ ar//tes liberales. Es impreffo enla infigne y muy leal ciudad // de Seuilla en cafa de Juan Crōberger.//Año de .M.d.xxxviiij.' (F. lxxij, r.)

Description. Fol., 19 × 26.9 cm., the text being 15.3 × 24.3 cm. 72 ff. numb., 42 ll. Seville, 1538.

Editions. Seville, 1489, fol.; ib., 1538, fol. (here described).

This rare treatise is an encyclopædia, with chapters devoted to the various arts and sciences. The arithmetic is found in Chapter IV (see Fig. 22), and consists of only two pages of theoretical discussion.

Parte primera.
Capitulo.iiij. De la arismetica y de sus inuēto-
res: y de su utilidad y modo: y de muy singulares secretos.



Asiando ya 7 atrauesando este sendero: vinieron encima del mōte: a dose comēçaua vn marauilloso camino: el q̄l los guio en vn lugar de casas 7 palacios muy singulares: 7 ala puerta de la villa ballarō vna muy sagacissima 7 muy p̄funda dōzella d̄ sciencia. La qual aunq̄ los miēbros cubiēse cō abito feminil: parec̄cia de baxo d̄ aq̄l ascōder coraçō de muy penetrāte 7 muy ingenioso varō. y en la d̄estra tenia vn grafio d̄ bierro: y en la siniestra vna tabla ēblā queada:

FIG. 22. FROM THE 1538 ALONSO DELATORE

NICOLAUS CUSA. Ed. pr. c. 1490. Strasburg?, c. 1490.

NICOLAUS CUSANUS, NICOLAUS CHRYPFFS OR KREBS. Born at Kues on the Mosel in 1401; died at Todi, Umbria, August 11, 1464. He held positions of honor in the Church, including the bishopric of Brescia. He was made a cardinal in 1448. He wrote several other works on mathematics.

Title. Usually known as the 'Opuscula.' The work begins: 'Prohemium. // [I]n hoc volumine continentur certi tractatus 7 libri altissime contemplō//nis et doctrine: a preclare memorie prestantissimo doctissimoq̄ viro // Nicolao de Cufa.' (F. 1, v.)

Description. Fol., 17.5 × 25.4 cm., the text being 11.7 × 18 cm. 163 ff. unnumb. + 1 blank = 164 ff., 45 ll. S. l. a. (Strasburg?, c. 1490. Some bibliographers place it as early as 1480 and others assign it to Milan as late as 1505.)

Editions. Cusa's 'Opuscula varia' first appeared s. l. a. (Strasbourg?, c. 1490 or earlier). His 'Opera' appeared at Paris in 1511 and 1514 (see below), and again at Basel in 1565.

This contains fifteen of Cusa's tractati, including 'Reparatio kalendarij,' 'De Apice theorie' (4 ff.), 'De mathematicis complementis,' 'De mathematica perfectione.' Of these mathematical chapters the first two are of some interest in the history of arithmetic, the others referring chiefly to mensuration.

NICOLAUS CUSA. Ed. pr. c. 1490.

Paris, 1514.

See p. 42.

Title. 'Hęc in hoc fecūdo vo//lumine contenta.//

Dialogus de ignoto. 2.	De transmutationibus
Dialogus de annunciatione. 3.	geometricis. 33.
Excitationū libri X. 7.	De Arithmeticis complementis. 54.
Coniectura de nouiffimis diebus.// 1.	De mathematicis complementis. 59.
Septem epistolæ. 3.	Complementum theologicum. 92.
Reparatio Calēdarij. 22.	De perfectione mathematica. 111.'
Correctio Tabularum Alphonfi. 29.	

(Woodcut of printing-press, with the words: 'Prelū Afcēfianū.')
'Venūdantur cum cęte//ris eius operibus in Aedibus Afcenfi-
anis.' (F. I, r.)

Colophon. 'Emissvm est hoc librorvm Cvsae opvs // egregivm
Parisiis: ex officina Ascen//siana anno Christi pientissimi om//
nivm Redemptoris MDXIII, octa//va Assvptionis semper
San//ctae semperqve Virginis //Christi Deiqve Matris //Mariae.
qva patroci//nante apvd Filivm //portvm salv-//tis spera-//mvs
et //veniae.' (F. CXVI, r.)

Description. Fol., 20 × 29 cm., the text being 12.7 × 26.8
cm. 114 ff. numb. (Roman numerals) + 2 unnumb. = 116 ff.,
46 ll. Paris, 1514.

Editions. See above.

This second volume of the Paris edition of Cusa's works, edited by Faber Stapulensis, contains the 'tractati' already mentioned on p. 43.

JOHANN WIDMAN (?) Ed. pr. c. 1490. S. l. a. (c. 1490).

See p. 36.

Title. 'Algorithmus Integroꝝ // Cum Probis annexis.' (F. 1, r. See Fig. 23.)

Description. 8°, 14.9 × 20.6 cm., the text being 7.8 × 14 cm. 12 ff. unnumb., 29-31 ll. S. l. a. (c. 1490).

Editions. The various bibliographies assign different dates, but I presume there was only this one edition. De Morgan (p. 99), whose judgment as to the dates of such early works was unreliable, estimated this as "hardly later than 1475," adding, "I think this is the oldest book in my list." Wappler, who has critically investigated the matter (*Abhandlungen*, V, 158) believes that Widman wrote this work, the 'Algorithmus linealis' (p. 36), and also the 'Algorithmus Minutiarum Phisicarum.'

The work opens with a quotation from Boethius, the same indeed as the opening sentence of Sacrobosco's *Algorismus*. After treating of numeration, addition, subtraction, duplication, mediation, multiplication, and division, the author takes up progressions, roots, and the proofs of the various processes. There are no applications in the book.

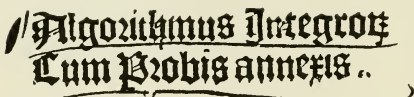
Other works of 1490. Anianus, p. 32, 1488; Boethius, p. 27, 1488. There also appeared c. 1490, at Leipzig, an anonymous work edited by Norico, entitled 'Arithmeticae Textus communis.'

ANONYMOUS. Ed. pr. c. 1491. S. l. a. (c. 1491).

Title. See Fig. 24.

Colophon. '¶ Finis trium Algorifmoꝝ cum propoꝝtionum vel Mercatorum regula.' (F. 10, r.)

Description. 4°, 13.7 × 19.4 cm., the text being 8.6 × 15.6 cm. 10 ff. unnumb., 34-36 ll. S. l. a. (c. 1491).





**Algorithmus Integroꝝ
Cum Probis annexis.**

FIG. 23. TITLE OF THE ALGORITHMUS INTEGRORUM

Editions. This is not the edition described by De Morgan (p. 99), because the title has 'addita etiam regula,' instead of 'addita regula.' The word 'regula' instead of 'regla' at the

Algorismus novus de

integris cōpendiose sine figurarum (more Italorum) deletionē compilatus. Artem numerandi omnemq; viam calculandi enucleatim brevissime edocens. vna cū Algorismis de minutis vulgaribus videlicet et phisicalibus Addita etiam regula proportionū tam de integris q̄ fractis que vulgo mercatorum regula dicitur Quibus habitis. quis modica adhibita diligentia omnem calculandi modum facillime adipisci potest

	<p>Numeratores Adde Et sit Numerator 17 Subtrahere</p>	
--	--	---

In tabulis patris magistri...
hic coloris frangit: nec impit vnaq; alba
nec rubra, nec purpurea, nec nigra, nec candida.
De p. m. m. m. m. qd. qd. qd. qd. qd. qd. qd. qd.
Vivendi ratio, nec est sapientibus magis
q̄ alijs
Indivisa recipienda atq; regula plures mō mō
Quia plures aut talis, mō mō mō mō mō



	<p>Triplifica Et sit divisor semper 12 Denominatorca</p>	
--	--	---

FIG. 24. TITLE PAGE OF THE ALGORISMUS OF C. 1491

end shows it to be different from the one described by Brunet (edition of 1860). It is probably no. 827 of Hain, and the internal evidence makes 1491 the probable year of the composition

or publication. De Morgan says that three editions are known, and Günther on the authority of Chasles gives an edition at Cologne, c. 1510.

This anonymous work is of the class of the arithmetics of Muris, Peurbach, Ciruelo, and other mediæval and early Renaissance writers.

ΠΙταγορας αριθμητρισε introductor

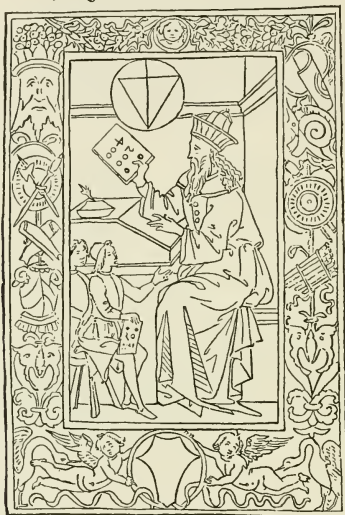


FIG. 25. TITLE PAGE OF CALANDRI

It contains a brief treatment of the 'species' (the fundamental operations) with integers, omitting 'duplatio' and 'mediatio' but including progression and roots. This is followed by a discussion of common fractions ('Algorifmus nouus de // minutijs vulgaribus'), a single page on sexagesimal fractions ('de minutijs Phificalibus'), and a page on proportion. It is one of the first books to identify proportion with the rule of three, or merchants' rule as it was often called. ('De regula proportionum // Sive aliter Regula Mercatorum dicta.') It is not as practical as the elaborate title would seem to indicate.

PHILIPPI CALANDRI. Ed. pr. 1491. Florence, 1491.

A Florentine arithmetician of the fifteenth century.

Title. 'Pictagoras arithmetrice introductor.' (Woodcut of

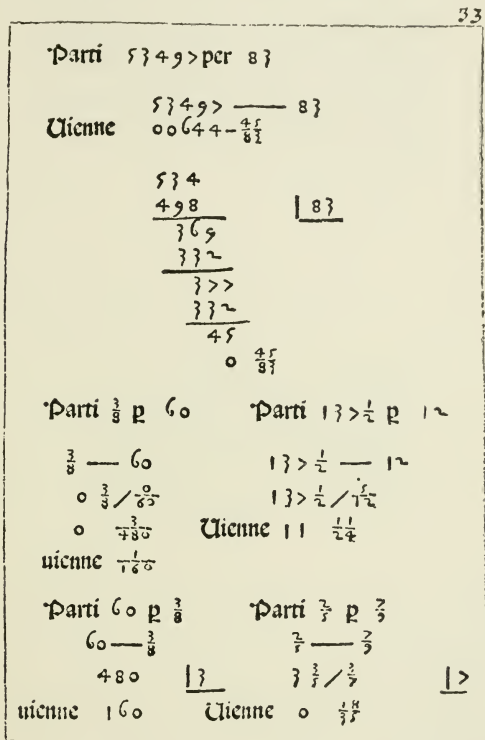



FIG. 26. FROM CALANDRI'S ARITHMETIC

Pythagoras.) (F. 1, v. Fig. 25.) 'Philippi Calandri ad nobilem et studiosum Julia/num Laurentii Medicē de arimethrica opusculū.' (F. 2, r.)

Un conducto emple in
na fonte in 4 di e quã
do e piena non metten
do il conducto e sturã
do il uoratoio suotere
be la decta fonte in 11
di: Uo sapere essendo
uora la fonte e metten
do il conducto e sturã
do il uoratoio in quãti
di fara piena la decta
fonte

$$\begin{array}{r}
 4 \text{ ————— } | 11 \\
 \frac{1}{4} \text{ ————— } | \frac{11}{4} \\
 \frac{11}{4} \\
 \hline
 4 \text{ ————— } | 44 \\
 > \\
 1 \quad 0 \quad \frac{3}{4} \\
 \hline
 > | \quad \quad \quad 44 \\
 \text{Sara piena in } 6 \frac{2}{3} \text{ di}
 \end{array}$$


Uno serpente e in uno
fondo dui pozo che e
adrento 50 braccia: et
uolendo usere fuora o
gni di sale $\frac{1}{2}$ dibraccio
et di poi lanoete scende
 $\frac{1}{2}$ dibraccio: uo sapere
in quãti di fara fuora
del decto pozo


$$\begin{array}{r}
 \frac{1}{2} \text{ ————— } | \frac{1}{2} \\
 > \text{ ————— } | 63 \\
 \hline
 0 \quad \frac{2}{3} \\
 \hline
 63 \text{ ————— } | 50 \\
 \hline
 1150 \\
 \hline
 \text{fara fuora } 15 \frac{5}{11} \text{ di}
 \end{array}$$


FIG. 27. FROM CALANDRI'S ARITHMETIC

Colophon. 'Impresso nella excelsa cipta di Firenze per β // Lorenzo de Morgiani et Giouanni // Thedefco da Maganza fi// nito a di primo di // Gënaio 1491.' (F. 104, v. Fig. 30.)



FIG. 28. FROM CALANDRI'S ARITHMETIC

Description. 8°, 9.8 × 13.2 cm., printed in double columns, each 3.3 × 10.7 cm. to 11.5 cm. 104 ff. unnumb., 9–26 ll. Florence, 1491.

Editions. Florence, 1491, 8° (here described); ib., 1518, printed by Bernardo Zuchetta, 4°.

Of this rare book, the first in De Morgan's list, Mr. Plimpton possesses two copies. It is beautifully printed, and is practical in its presentation of the operations, but traditional in its problems. It is

98



<p>Eglie una torre che e altra + o braccia e dap pie upaisa uno fiume che e largo 30 brac cia. no sapere quanto fara lunga una fine che sia appicata alla ri ua del fiume e alla ci ma della torre</p> $ \begin{array}{r} 40 \text{ --- } 30 \\ \sim 40 \quad 30 \sim \\ \\ 1600 \\ \underline{900} \\ \text{laradice di } 700 \\ \text{fara lunga } 50 \text{ brac} \\ \text{cia} \end{array} $	<p>Eglie unalbero infu la riuu dun fiume elqua le e altro 50 braccia el fiume e largo 30 bra cia e per fortuna di uo ro si ruppe in tal luogo che la cima dellalbero tocana l'riuua del fiu me. No sapere quante braccia sene ruppe e quanto nerimase rito</p> $ \begin{array}{r} 50 \text{ --- } 30 \\ \sim 50 \sim 500 \sim 30 \\ 100 \mid \quad \underline{900} \\ \quad \quad 1600 \\ \text{rimase rito } 16 \text{ brac} \\ \text{cia e } 34 \text{ braccia sene} \\ \text{ruppe} \end{array} $
	

FIG. 29. FROM CALANDRI'S ARITHMETIC

the first printed Italian arithmetic with illustrations accompanying problems, and the first to give long division in the modern form (Fig. 26) known to the Italian writers by the name 'a danda.' Indeed Calandri gives only the 'a danda' method, omitting the galley form, and is therefore fully a century ahead of his time. De Morgan's statement that he uses a divisor diminished by 1 is incorrect, as will be seen from Fig. 26. Figs. 27 and 29 show that the problems of the cistern, the snail (serpent) in the well, the length of the hypotenuse, and the broken tree were familiar in Calandri's time.

Impresso nella celsa citta di Firenze per
 Lorenzo de' Medici et Giovanni
 Beldesio da Mazzanti fi
 nito a di primo di
 l'anno 1471

FIG. 30. COLOPHON OF CALANDRI

Other works of 1491. Anianus, p. 32, 1488; Boethius, p. 27, 1488; Borghi, p. 16, 1484.

FRANCESCO PELLLOS OR PELLIZZATI.

Ed. pr. 1492.

Turin, 1492.

A native of Nice, living in the latter half of the fifteenth century.

Title. 'Sen fegue de la art de arithme-//ticha. et femblätment de ieume-//tria dich ho nominat; Cöpendiö // de lo abaco.//i 2 3 4 5 6 7 8 9 0.' (F. 1, r. Fig. 31.)

Colophon. 'Complida es la opera. ordinada. he condida // Per noble Frances pellos. Citadin es de Nifa... Impreffo in Thaurino lo present cöpendiö de abaco per mei/ //ftro Nicolo benedeti he meftro Jacobino fuigo de fancto ger//mano. Nel anno .1492. ad. Di .29. de feptembrio.' (F. 80, r.)

Description. Sm. 4°, 13.8 × 20.9 cm., the text being 9.2 × 15.2 cm. 80 ff. numb., 39 ll. Some of the initials have been inserted by hand, in red. Turin, 1492.

Editions. There was no other edition.

This is one of the rarest arithmetics known to exist. (Brunet, IV, 475; Graesse, *Trésor*, V, 100; Riccardi, I, 2, 256.) The only good description of the work is that given by Boncompagni in the *Atti dell' Accad. Pontif. de' nuovi Lincei*, XVI, 161, 332, evidently after examining this copy, since it bears a note in his handwriting.

Pellos first considers the fundamental operations with integers, following this by a treatment of proportion, square root, and cube root. He then discusses the subject of fractions in much the same order, the rule of three, certain rules relating to weights, time, money, and other measures, and such topics as partnership, barter, interest, alloys, and the rule of false position, single and double. He closes the work with a chapter on mensuration, or as he calls it, 'De la art de ieumentria' ('ieumetria' in the title), and gives a number of interesting woodcuts. The chief interest of the book attaches, however, to the fact that Pellos came very near the invention of decimal fractions, and that he actually used the decimal point as is shown in the illustration (Fig. 32). It cannot be said, however, that he had any conception of the real value of the decimal fraction as such, the first book devoted to this subject being 'La Disme' of Stevin (1585), hereafter described. Pellos simply uses the decimal point to indicate division by some power of ten, writing a common fraction in the quotient. Thus, to divide 425 by 70, Pellos would divide 42.5 by 7, writing the result $6\frac{5}{70}$.

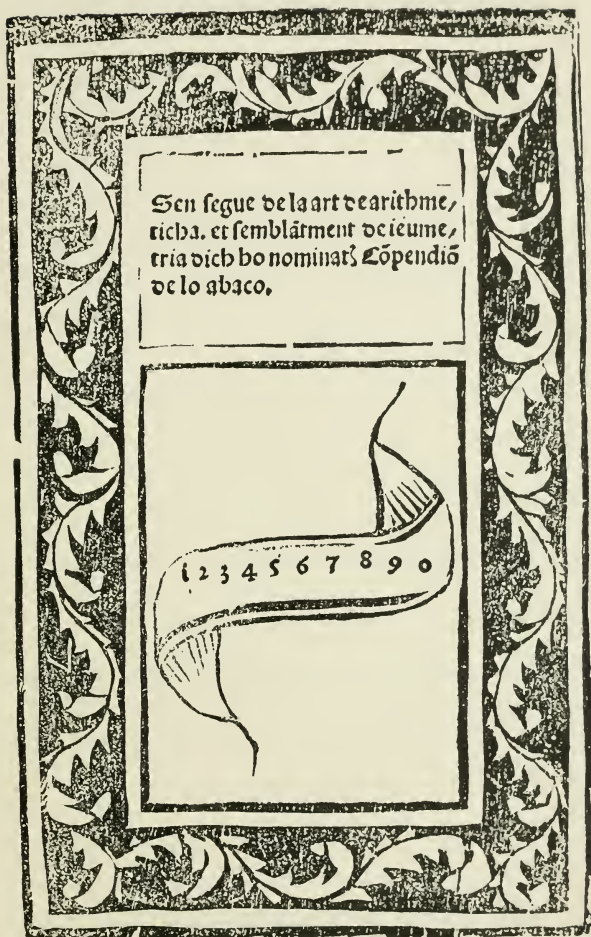


FIG. 31. TITLE PAGE OF PELLUS

$$\begin{array}{r} \text{C Partir per} \quad \underline{201} \\ \hline 79654839.7 \\ \hline \text{quociens} \quad 39827419 \quad \underline{17} \\ \hline \phantom{\text{quociens}} \phantom{\underline{17}} \end{array}$$

$$\begin{array}{r} \text{C Partir per} \quad \underline{30} \\ \hline 583604.3 \\ \hline \text{quociens} \quad 194564 \quad \underline{23} \\ \hline \phantom{\text{quociens}} \phantom{\underline{23}} \end{array}$$

$$\begin{array}{r} \text{C Partir per} \quad \underline{70} \\ \hline 953791.9 \\ \hline \text{quociens} \quad 136255 \quad \underline{69} \\ \hline \phantom{\text{quociens}} \phantom{\underline{69}} \end{array}$$

$$\begin{array}{r} \text{C Partir per} \quad \underline{100} \\ \hline 69765.87 \\ \hline \text{quociens} \end{array}$$

$$\begin{array}{r} \text{C Partir per} \quad \underline{400} \\ \hline 78965.73 \\ \hline \text{quociens} \quad 19741 \quad \underline{173} \\ \hline \phantom{\text{quociens}} \phantom{\underline{173}} \end{array}$$

$$\begin{array}{r} \text{C Partir per} \quad \underline{3000} \\ \hline 87658.791 \\ \hline \text{quociens} \quad 29219 \quad \underline{1791} \\ \hline \phantom{\text{quociens}} \phantom{\underline{1791}} \end{array}$$

¶ Et en aq̄ta maniera podes fayre ábe tons semblas partit̄es
b ij

FIG. 32. FROM THE PELLUS ARITHMETIC

GEORG VON PEURBACH.

Ed. pr. 1492.

Wittenberg, 1534.

PURBACH, PEURBACH. Born at Peuerbach, Upper Austria, May 30, 1423; died at Vienna, April 8, 1461. He studied under Johann von Gmünden (see p. 117), Nicolaus Cusa (see p. 42), and other great teachers, and later he became professor of mathematics at Vienna, where Regiomontanus (Johannes Müller, of Königsberg) was his pupil. His interests were almost entirely in astronomy.

Title. 'Elementa Arithmetices // Algorithmvs de // numeris integris auctore // Georgio Peurbachio. // De Numeris Practis, // Regulis communibus & // Proporcionibus. // Cum præfatione Philippi // Melanchthonis. // M. D. XXXIII.' (F. 1, r.)

Colophon. 'Impressvm Vitebergæ // per Iosephvm Clvg. // Anno M. D. XXXIII.' (F. 39, v.)

Description. 8°, 10.8 × 15.6 cm., the text being 6.4 × 11.2 cm. 39 ff. unnumb. + 1 blank = 40 ff., 22–25 ll. Wittenberg, 1534.

Editions. S. l., 'Explicitum est hoc opus anno Christi dom. 1492.' 4°; Vienna, s. a., c. 1500; Leipzig, 1503, 4°; ib., 1507, 4°, and probably ib., 1510 and ib., 1511; Vienna, s. a. but earlier than 1511, 4°; ib., 1511, 4°; ib., 1512; Nürnberg, 1513; Vienna, 1515, 4°; ib., 1520, 4°; Wittenberg, 1534, 8° (here described); ib., 1536, 8°; ib., 1538; Venice, 1539, 8° (see below); Frankfort, 1544.

The arithmetic of Peurbach went by various names, as 'Opus Algorithmi,' 'Institutiones in arithmetica,' 'Elementa arithmetices,' and 'Introductorium in arithmetica.' It is a brief treatise on the fundamental operations with integers and fractions, and contains a few simple applications. Peurbach was too profound a mathematician to have considered it a work of any importance, but it is probable that he wrote it for the benefit of students who were not yet prepared to take up his work in astronomy.

GEORG VON PEURBACH. Ed. pr. 1492. Venice, 1539.

See above.

Title. 'Elementa // Geometriæ ex Euclide // singulari prudentia collecta à Ioâne Vo//gelin profeffore Mathematico in

//schola Viennenfi.//Arithmeticae practicae per Georgium //
Peurbuchium Mathematicum.//Cum praefacione Philippi //
Melanchthonis.' (Woodcut with motto: 'Dissimilivm. Infida.
Societas.') (F. 1, r.) The arithmetic of Peurbach begins on f.
32: 'Elementa //Arithmetices.//Algorithmvs de nv-//meris
integris, fractis, Regulis //communibus, & de Pro-//portionibus.
// Authore Georgio Peurbachio.//Omnia recens in lucem aedita
fide & //diligentia fingulari.//Cum praefatione Philip. Melanth.'

Colophon. 'Venetijs Ioan. Anto. de Nicolinis de Sabio.//
Sumptu uero D. Melchioris Seffæ. Anno //Domini M D
XXXVIII.//Mense Ianuario.' (F. 67, v.)

Description. 8°, 10.3 × 15.8 cm., the text being 8 × 12.2 cm.
1 f. unnumb. + 68 numb. = 69 ff., 29 ll. Venice, 1539.

See p. 53.

Other works of 1492. Anianus, p. 32, 1488; Boethius, p. 27, 1488.

Works of 1493. Anianus, p. 32, 1488; Anonymous (see Widman),
p. 36, c. 1490; Isidorus, p. 8, 1483; Vincent de Beauvais, p. 10.

LUCA PACIUOLO, DE BORGIO SAN SEPOLCRO.

Ed. pr. 1494.

Venice, 1494.

PACIOLUS, PATIULUS, PACIOLI. Born in Borgo San Sepolcro, Tuscany, c.
1445-1450; died soon after 1509. Not an original mathematician, but the
compiler of several works.

Title. See Fig. 33.

Colophon to the part on arithmetic: 'Et si fequenti pti
pncipali Geo^o. finis decima nouembris ipofitus fuerit : huic tamen
pti : die vigefi//ma eiufdem ipofitus fuit. M^occcc.lxliij. Per eof-
dem correctorem ? imprefforem vt i fine Geo^o. hñ.' (F. 232,
numb. 224, v.) There is also the following date on f. 1, v.,
'M^occc.~lxliij^oxx^a. Nouembris.'

Description. Fol., 21.5 × 30.5 cm., the text being 19 × 24.2
cm. 8 ff. unnumb. + 224 numb. = 232 ff. in the part on arith-
metic; 76 ff. numb. in the part on geometry; making a total of
308 ff., 56-60 ll. Venice, 1494.

Editions. Venice, 1494, fol. (here described); Toscolano, 1523,
fol. (p. 58).

Sūma de Arithmetica Geo- metria Proportioni ⁊ Pro- portionalita.

Continentia de tutta lopera.

De numeri e misure in tutti modi occurrenti.
 Proportioni e proportionalita anotitia del. 5.º de Euclide
 de e de tutti li altri soi libri.
 Chiani ouero euidentie numero. 13. p le q̄nta conti-
 nue proportionali del. 6.º e. 7.º de Euclide extrare.
 Tutte le pri delalgorismo: cioe releuare. p̄tir. mult-
 plicar. sūmare. e sottrare cō tutte sue p̄ue i sani e roz-
 ti. e radici e progressioni.
 De la regola mercantesca dita del. 3.º e soi fōdamen-
 ti con casi exemplari per c.º m.º 8.º. S.º guadagni. perdi-
 te. transportationi. e inuestite.
 Partir. multiplicar. sūmar. e sottrare de le proportio-
 ni e de tutte sorti radici.
 De le. 3. regole del catayn dita positioe e sua origie.
 Euidentie generali ouer conclusioni n.º 66. absolute
 ogni caso che per regole. ordinarie nō si podesse.
 Tutte forte binomii e radici e altre linee irrationali del
 decimo de Euclide.
 Tutte regole de algebra ditte de la cosa e loz fabri-
 che e fondamenti.
 Compagnie i tutti modi. e loz partire.
 Socide de bestiami. e loz partire
 Fitti. pescioi. cottimi. liuelli. logagioni. egodimenti.
 Baratti i tutti modi semplici. composti. e col tempo.
 Cambi reali. fecchi. fittiti. e di minuti ouer comuni.
 Meriti semplici e a capo danno e altri termini.
 Resti. saldi. sconti. de tempo e denari ela recare a un
 di piu partite.
 Di. argenti. eloro affinare. e carattare.
 Molti casi e ragioni straozinarie varie e diuerse a
 tutte occurrentie commo nella sequente tauola ap-
 pare ordinatamente de tutte.
 Dordine a saper tener ogni cōto e scripture e del qua-
 derno in vinegia.
 Tariffa de tutte vitanze e costumi mercanteschi in tut-
 to el mondo.
 Pratica e theorica de geometria e del. 5.º. co. pi regu-
 lari e altri dependenti.
 E molte altre cose d̄ grandissimi piaceri e frutto cō-
 mo diuisamente per la sequente tauola appare.

FIG. 33. TITLE PAGE OF THE 1494 PACIUOLO

This volume, the first great general work on mathematics printed, includes treatises on arithmetic, algebra, and geometry, each being considered from a somewhat scientific rather than practical standpoint. The arithmetic, for example, gives the various methods in multiplication (see Fig. 34) and division, instead of emphasizing the one or two most prominent in business circles. In the same way Paciolo's treatment of

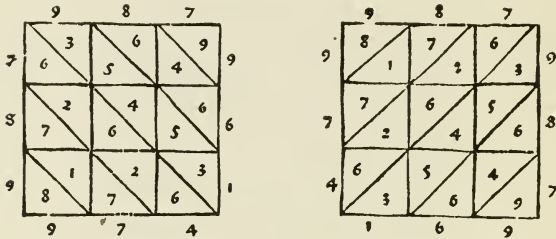


FIG. 34. GELOSIA MULTIPLICATION, 1494 PACIUOLO

the rule of three, the rule of false ('El cataym'), partnership, pasturage, barter, exchange, and interest, while nominally practical, was too elaborate for the mercantile schools. His was the first printed work to illustrate the finger symbolism of number (Fig. 35). Paciolo copies without hesitation, practically verbatim, from the work of Chiarini (p. 10), and doubtless laid under contribution, after the manner of his time, various other works of his predecessors. In algebra he used the common symbolism of the time for the unknown quantities and for roots, but he made use of no symbols of operation. This part of the treatise relates chiefly to surd numbers. In geometry he follows Euclid's Book I very closely, but departs quite radically from the subsequent books. The work had a great influence on subsequent writers, including the English Tostall (p. 132). Paciolo's training had fitted him to write a treatise of this nature. He had been a tutor in the family of a Venetian merchant, had traveled extensively, had come in contact with practical mathematicians, and had studied the ancient mathematics in the cloisters; and traces of all these influences are seen in his work. In 1497 Paciolo wrote at Milan a work entitled 'Divina proportione,' which was published at Venice in 1509 (p. 87). He also published an edition of Euclid at Venice in 1509.

Other works of 1494. Albert of Saxony, p. 9, 1478; Anianus, p. 32, 1488.

hinc sumitur numerus significatus n. 36. vs. 18. finitur et aliter 18. Dicitur /

Sinistra:

Distinctio secunda. Tractatus quartus.

Dextra

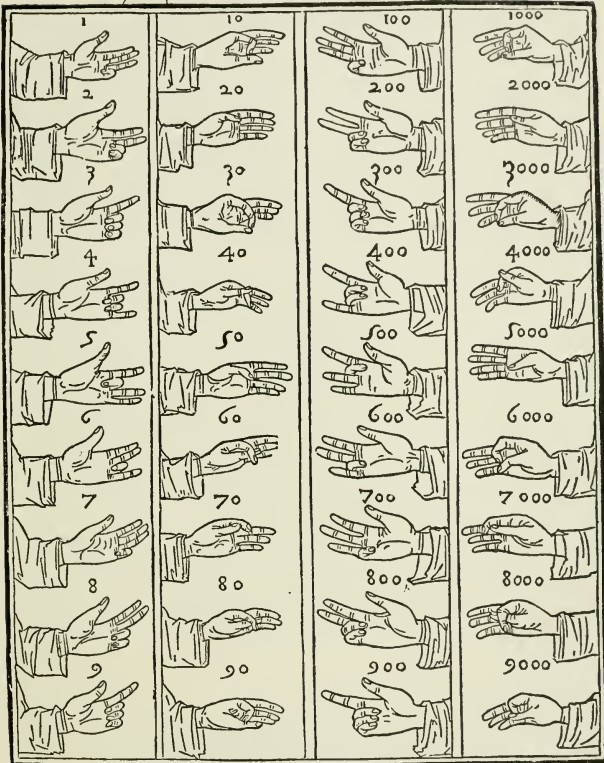


FIG. 35. FINGER SYMBOLISM, 1494 PACIUOLO



LUCA PACIUOLO, DE BORGO SAN SEPOLCRO.

Ed. pr. 1494.

Toscolano, 1523.

Title. 'Summa de // Arithmetica geo//metria. Proportioni : et proportionalita : // Nouamente impresfa In Toscolano fu la riuu dil Benacense et // vnico carpionifita Laco: Amenisfimo Sito: de li antique ? // euidenti ruine di la nobil cita Benaco ditta illuftra-//to: Cum numerofita de Impatorij epithaphij // di antique ? perfette littere fculpiti do-//tato: ? cuz finisfimi ? mirabil co-// lone marmorei: inumeri // fragmenti di alaba-//ftro porphidi ? ferpentini. Cofe certo // lettor mio diletto oculata fi-//de miratu digne fot-//terra fe ritro//uano.// Continentia de tutta lopera: '// (The rest of the title page is substantially identical with that of the 1494 edition.) (F. 1, r.)

Colophon to the part on arithmetic: '¶ Et fi fequēti pti pncipali Geo°. finis decima nouembris ipofitus fuerit: huic tamen pti die vigefima // eiusdē impofitus fuit .M°ccccc.xxiiij. Per eosdem correctorē impresforem vt in fine Geo°. hētur.' (F. 232, v.)

Description. Fol., 21.1 × 30.4 cm., the text being 18.2 × 23.5 cm. 9 ff. unnumb. + 223 numb. = 232 ff. Toscolano, 1523.

Bound with this is the 'Tractatus Geometria. Pars fecunda principalis huius operis ?, primo eius diuifio.' This part of the book contains 75 ff., besides the index.

Editions. See p. 54. De Morgan has shown (p. 2), that there are slight differences between the copies printed in 1523, proving that a second impression was necessary in that year.

See p. 56, and Fig. 36.

PEDRO SÁNCHEZ CIRUELO.

Ed. pr. 1495.

Paris, 1505.

Born at Daroca in Aragon, c. 1470; died at Salamanca in 1560. One of the most learned men of his time. He was professor of philosophy at Alcalá.

Title. 'Tractatus Arithmethice // Practice qui dicitur // Algorifmus.' (A large woodcut with the initials D. R. and the inscription 'Alaventvre. Tout Vient. Aponit. Qvi. Pevt. Attendre. Denis. Rocc.')

(F. 1, r.)

Ad Illustrissimum Principem Sui. Abaldus Urbini
 Duam adonia hereticas Durantia Conitent. Et de latinisq; litteris. Quoniam
 marmis et adtemmatis disciplina cultorem feruissimum: Sfrans luce deburgo
 sancti Sepulchri: de dnis nunciam: et sacre Theologie doctultri. In artem Arith-
 meticez exponere: pro dno



Quantita Magnanimo Duca: e

si nobile e proleste etatez moti philofopi per questo
 giudicio fanno alla substantia para: e concessa coeterna
 pperochie hanno cognofuato per: rez modo alchuna cosa
 in rerum natura senza lei no potere esistere. Iper la qual
 cola te lei intendo (con ladiamo te colui che li nostri senfi
 rege) tracciam: non che per altri pofiti e amari phi-
 losofi nome fia copiosamente traccato e in Theocia e
 poactia. Ma perche lei vici gia ali tempa nostri sono
 molto obfcuri: da molti male apesi: e alle poactie vul-
 gari male applicati: viche in loro operacioni molto va-
 riano: e con gradi e laboziosi affanni metano in opri: si
 te numeri como te misare: vnd: lei parlando non intendo se non quanto che alla
 poactia e opere fia mestiero: mecolando secondo i tuoghi oportuni andota la theo-
 rica: e causa te tale opere: si te numeri como te geometria. Ma prima scio meglio
 quello che sequita se habia appendere: essa quantita vici di tempo secondo il nostro po-
 sibile e viciendola a dachano suo membro assignateno sua propria e vera defini-
 tione e descriptioe. E allora poi sequita quello che Aristotele vici in secondo posterio
 rum. *Tunc enim maxime scitur aliquid cum habeat suam quid est etc.*

Distinctiones et vicia videri et continere quantitates.

Arithmetica prima. Iste vicia distinctionis.

Oico adonia. La quantita esse e immediat: si mmetoz: deo continua e discreta.
 La continua e opota se usi par u fono: copulate e giorte a certo termine con-
 tinua: como longo legri: ferro: e sari: etc. La discreta oueramente numero
 e quella le cui parti non longo giorte ad alchuno termine conuine: como e. 1. 2. 3. etc.
 Ma che prima te la discreta: deo del numero: e poi te la continua: deo geometria: qui-
 lo allo inteno aspecta dhas affente traccatemo.

Distinctio numeri propissima. Arithmetica secunda.

Numero e (secondo dachano philofopante) vna meclandine te vna co-
 pta: e essa vna non e numero: ma ten pandio te dachano numero: e te
 quella mediant laque ogni cola e vna esse vna. E secondo sezerino pocto
 in sua musica: e la vna dachun numero in poteta: e passy in la sua arithmetica re-
 gana e fondamento ogni numero lapella. Inquit piu magnificandola in te cose natu-
 rale vici: in quello che si te vna e vna. Omne qd est: idco est: qua vna nume-
 ro est. E he ancora di numero in infinu membu dulo: per quello che esse Aristotele
 vici: deo. Sequit infimum est: numerus est. E per la tersa ragione tel seprmo te
 finitudo: la sua sent in infinito potere procedere: e quodig numero dato: dati potit
 rano: vnitatem addendo. Ma noi pigliatemo quelle parte a noi piu note e acotmo
 elate. E pro vico con gli altri alchuno essere primo: che quello che solo da la vna e nu-
 mero: e non ha altro numero: che integralmente aponto lo para. Altro e vito co-
 pto: e quello che da altro numero e meclurato: ouero numerato. Exemplum primi
 Como. 3. 7. 11. 13. e 17. etc. E repli secidi: Como. 4. dxi volio misare e numerare: 5.
 dxi. 1. 6. 7. 11. 14. 18. e similitati sono vna numeri compoti: no solo che collino

FIG. 36. FIRST PAGE OF TEXT, 1523 PACIUOLO

Colophon. 'Arithmetice practice feu Algorifmi tractatus a Petro fanchez // Ciruelo nouiter compilatus Explicit Imprefus Parifius In // Bellouifu. Anno dñi, 1505. Die .29. Aprilis.' (F. 14, r.)

Description. 4°, 13.2 × 18.4 cm., the text being 9.7 × 14 cm. 14 ff. unnumb., 35–39 ll. Paris, 1505.

Editions. Paris, 1495, 4°; ib., 1505, 4° (here described); ib., 1509, 4°; ib., 1513, 4° (see below). Ciruelo also wrote a 'Cursus quattuor mathematicarvm artiū liberaliū,' Paris, 1516; ib., 1523; ib., 1526; ib., 1528; Alcalá, 1516, fol.; ib., 1518; ib., 1523, fol.; ib., 1526; ib., 1528. He also edited Bradwardin's arithmetic, Paris, 1495; ib., 1502.

Ciruelo treats very briefly of the fundamental operations with integers, common fractions, and denominate numbers. Following the Spanish custom he uses *cuento* for million. There is little that is noteworthy in the book, and, like Peurbach, Ciruelo could not have taken his contribution to algorism very seriously.

Other works of 1495. Anianus, c. 1495, p. 32, 1488. There also appeared in 1495 the treatise of Herodianus, 'De notis Græcorum Arithmeticiis Græce,' Venice. Of this work there was an edition in 1525, and a Latin edition published at Basel in 1600, but it hardly deserves to be classed as an arithmetic.

PEDRO SÁNCHEZ CIRUELO. Ed. pr. 1495. Paris, 1513.

See p. 58.

Title. 'Tractatus arithmetice // Practice qui dicitur algorifmus. // (A large woodcut with the name Jehanlambert.) Venundantur Parrhifijs a Johāue Lā//berto eiufdem ciuitatis bibliopola in ftē//mate diui claudij manente iuxta gymna//fium coquereti.' (F. 1, r.)

Colophon. '¶Arithmetice practice feu Algorifmi tractatus a Petro fan//chē Ciruelo nouiter compilatus Explicit Impreffus Parifius // per Anthonium Auffourt. Pro Johāne Lamberto eiufdem ci//uitatis bibliopola in ftemmata diui claudij manente iuxta gym//nafium coquereti. Anno dñi .1513. Dievero .21. menfis Martij.' (F. 12, r.)

Description. 4°, 13.1 × 19 cm., the text being 9.6 × 14.8 cm. 12 ff. unnumb., 43–46 ll. Paris, 1513.

Editions. This is the fourth edition (see p. 60), and is an exact reprint of the 1505 copy, save as to spelling and pagination. As a piece of typography it is much better than its predecessors.

THOMAS BRADWARDIN. Ed. pr. 1495. Paris, c. 1510.

BRAGWARDINE, BRANDNARDINUS, BREDWARDYN, BRADWARDYN, DE BRADWARDINA, DE BREDWARDINA. Born at Hertfield (Hartfield) in the diocese of Chichester, c. 1290; died at Lambeth, August 26, 1349. On account of his learning he was called 'Doctor profundus.' He was professor of theology at Oxford, and died as Archbishop of Canterbury. He wrote four works on mathematics.

Titl. 'Arithmetica thome brauardini.//Olivier Senant// Venum exponuntur ab Oliuiario fenant in vico diui Jacobi fub si-//gno beate Barbare fedente.' (F. 1, r.)

Colophon. 'Explicit arithmetica fpeculatiua thōe brauardini bñ re-//uifa et correcta a Petro fanchez Ciruelo aragonenfi ma//thematicas legēte Parifiſius, ipreſſa p Thomā anguelart.' (F. 6, v.)

Description. 4°, 20.3 × 27.8 cm., printed in double columns, each being 6.8 × 19.8 cm. 6 ff. unnumb., 61 ll. Paris, c. 1510.

Editions. Paris, 1495, 4°; ib., 1496, fol.; ib., 1498, 4°; ib., s. a. (c. 1500); ib., 1502, 4°; Valencia, 1503, fol.; Paris, 1504; ib., 1505, 4°; ib., s. a. (c. 1510, here described); ib., 1512; ib., 1530; Wittenberg, 1534, 8°; ib., 1536, 8°. His 'Tractatus de proportionibus' appeared in several editions, as follows: Paris, 1495; Venice, 1505, fol.; Vienna, 1515 (p. 117); and a commentary by Vittori appeared at Bologna in 1506. Some of these editions contained two or three of his works in one volume, and it is probable that his arithmetic and his treatise on proportion appeared in other editions than those mentioned.

Bradwardin was one of the earliest English mathematicians after Bæda and Alcuin. His arithmetic is of the Boethian type, relating to the theory of numbers. He gives much attention to the ancient theory of ratios and to figurate numbers.

BOETHIUS, JORDANUS NEMORARIUS, AND FABER STAPULENSIS. Ed. pr. 1496. Paris, 1496.

For the biography of BOETHIUS see p. 25.

JORDANUS NEMORARIUS (JORDANUS DE SAXONIA) was born at Borgentreich, in the diocese of Paderborn, and died in 1236. He studied at Paris and was the greatest mathematician of his time save Leonardo Fibonacci of Pisa.

JACOBUS FABER STAPULENSIS (JACQUES LE FÈVRE D'ESTAPLES) was born at Estaples, near Amiens, in 1455, and died at Nérac in 1536. He was a priest, vicar of the bishop of Meaux, lecturer on philosophy at the Collège Lemoine in Paris, and tutor to Charles, son of François I. He wrote on philosophy, theology, and mathematics.

Title. See Fig. 37.

Description. Fol., 20 × 29 cm., the text being 13.9 × 27.2 cm. 72 ff. unnumb., 60–63 ll. Paris, 1496.

Editions. The arithmetic of Jordanus went through various editions as follows: Paris, 1496, fol. (here described); ib., 1503, fol.; ib., 1507, fol. (p. 65); ib., 1510, fol.; ib., 1514 (p. 65). Rogg speaks of an edition of 1480, but I do not know of it. Jordanus also wrote an 'Algorithmus demonstratus,' published anonymously at Nürnberg in 1534, 4°. De Morgan, following Schönerus, attributed it to Regiomontanus, but the evidence shows that he only revised it and it may be due to Jordanus. His 'De Ponderibus,' edited by Apianus, was published at Nürnberg in 1533, and at Venice in 1565. An interest attaches to the 1496 edition in that it is the first printed work with which a Scotchman's name is connected, the printer being David Lauxius of Edinburgh, then working in Paris.

The greater part of this volume is devoted to the ten books on arithmetic by Jordanus Nemorarius, with the commentary of Jacobus Faber Stapulensis. The work of Jordanus is similar to that of Boethius, and is concerned only with theory of numbers. In particular, the Greek theory of ratios, as elaborated during the Middle Ages, is extensively treated.

The second part consists of the work of Jacobus Faber Stapulensis on music, in four books.

The third part is the Epitome of the Arithmetic of Boethius: '¶ Jacobi Fabri Stapulensis Epitome in duos libros Arithmeticos // diui Seuerini Boetij ad Magnificum dñum Joannem Stephanum // Ferrerium Epifcopum Verfellenfem.'

The fourth part, consisting of four and a half pages, is a description of the arithmetical game of Rithmimachia, possibly by Shirewode (John Shirwood, Bishop of Durham, who died in 1494), but usually ascribed to Faber Stapulensis. An edition appeared at Erfurt in 1577, 4°.

In hoc opere contenta.

Arithmetica decem libris demonstrata
 Musica libris demonstrata quattuor
 Epitome i libris arithmeticos diu Seuerini Boetij
 Rithmimachie ludus q̄ r pugna nūeroꝝ appellat̄

**S. Soterius Babilonensis: ut
 laudē Arithmetices r Musices.**

Tempore iam multo docte latere forozes:
 Quas retinet comites flaua mīnerua suas.
 Nūc placide terras post tempora multa reuisunt.
 Grata quoq; ante alias Gallica terra placet.
 His olim celebris fuit omnis Acaica tellus.
 Pythagoꝝa patriam diffugiente famon.
 Hellada nunc linquunt: et doctas palladis vrbes.
 Sequaniosq; petunt/parthiosq; lares.
 Hec venit omnimoda numeroꝝum cincta cāterua.
 Atq; docet numeris quidquid in orbe situm est.
 Altera dulcisono cantu/sidibusq; canozis
 Edomuisse viros traditur atq; feras:
 Que sua Picrijs tenet vnica nomina musis
 Q̄ nichil hac musis gratius esse solet.
 Attamen artificem stapule misere manne:
 Qui leta hoc studijs fronte dicaret opus.
 Hoc solum studium atq; hoc illi cura: iuuare/
 Irritus et ne sit/ dispercatq; labor.

FIG. 37. TITLE PAGE OF THE 1496 BOETHIUS

Other works of 1496. Albert of Saxony, p. 9, c. 1478; Bradwardin, p. 61, 1495; Z. Lilius, 'De origine et laudibus scientiarum,' Florence, 4° (one page on arithmetic). There was also published at Paris, s. a.

(c. 1496), an anonymous treatise entitled 'De arte numerādi cōpediū putile icipit feliciter. (Q)uoniam rogatus a pluribꝫ compēdiū artis numerandi ac breuē tractalutu . . .'

Works of 1497. Boethius, p. 27, 1488 (the colophon of the 1497

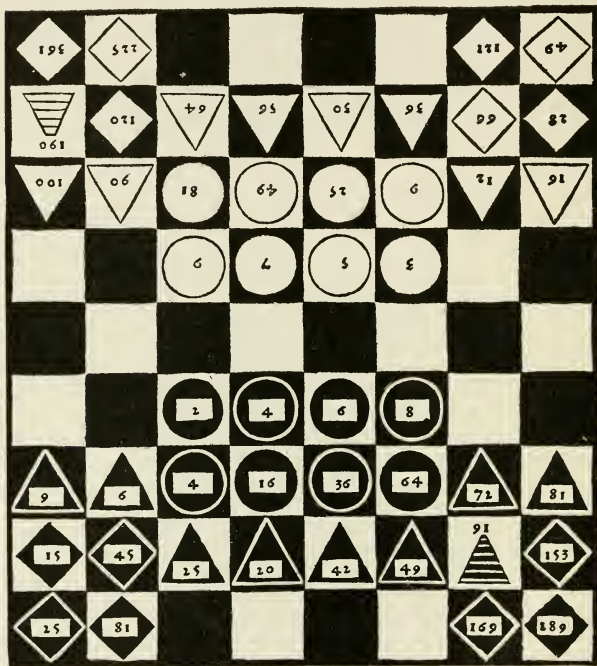


FIG. 38. RITHMIMACHIA, 1496 BOETHIUS

edition has the incorrect date Mcccclxxxvii); Suiseth, 1497 and 1498, p. 10, c. 1480.

Works of 1498. Anianus, p. 32, 1488; Bradwardin, p. 61, 1495; Chiarini, p. 11, 1481; Anonymous, 'Enchiridion sive tractatus de numeris integris, fractis,' etc., 4° (doubtless the work published at Deventer in 1499, p. 67).

BOETHIUS, JORDANUS NEMORARIUS, AND FABER
STAPULENSIS. Ed. pr. 1496. Paris, 1507.

See p. 62.

Title. 'In hoc opere contenta // Arithmetica decem libris demonstrata // Musica libris demonstrata quattuor // Epitome ī libros arithmeticos diui Seuerini Boetij // Rithmimachie ludus q̄ : pugna nūeroꝝ appellat.' (F. 1, r.)

Colophon. '¶ Impreffum Parisij in officina Henrici stephani e regione Schole decretorum sita. // Anno Christi siderum conditoris 1507. Decimo die Nouembris.' (F. 78, r.)

Description. 8°, 20 × 26.6 cm., the text being 18.1 × 21.5 cm. 78 ff. unnumb. + 1 blank = 79 ff., 60 ll. Paris, 1507.

Editions. See pp. 27, 62, for the editions of Boethius and Jordanus.

Like most of the works from the press of Stephanus, this book is beautifully printed. It contains the 'Elementa Arithmetica' of Jordanus, with the demonstrations of Faber Stapulensis, the Epitome of Boethius by Faber Stapulensis, the 'Rithmimachia,' the commentary on Sacrobosco's astronomy by Faber Stapulensis, and the first four books of Euclid 'a Boetio in latinum translate.'

BOETHIUS, JORDANUS NEMORARIUS, AND FABER
STAPULENSIS. Ed. pr. 1496. Paris, 1514.

See p. 62.

Title. 'In hoc opere contenta // Arithmetica decem libris // demonstrata. // Musica libris demōstrata // quatuor. // Epitome in libros Arith-//meticos diui Seuerini // Boetij. // Rithmimachie ludus qui // et pugna numerorū ap-//pellatur.' // (Surrounded by an elaborate woodcut with the following wording: 'Haecsecvndariaes//tetcastigat//issimaxofficina//aemissio' //) '¶ Hęc fecundaria superiorū operum æditio // venalis habetur Parisijs: // in officina Henrici Stephani e regione fchole Decretorum.' (F. 1, r.)

Colophon. '¶ Has duas Quadriuij partes et artium liberalium precipuas atq; duces cū quibusdam ammini-//cularijs adiectis: curauit ex secunda recognitione vna formulis emēdatissime

mandari ad ftudiorum // vtilitatem Henricus Stephanus fuo grauiſſimo labore et ſumptu Parhiſijs Anno ſalutis domini: // qui omnia in numero atq; harmonia formauit 1514. abſolutumq; reddidit eodē anno: die ſeptima // Septembris/ fuum laborem vbicunq; valet ſemper ſtudioſis deuouens.' (F. 71, v.)

Description. Fol., 19.8 × 28.4 cm., the text being 17.7 × 26.8 cm. 71 ff. unnumb., 62 ll.

Editions. See p. 62. This edition is practically identical with that of 1496. It is the ſecond edition of this combination of works and the fourth of Faber's Epitome.

MARTIANUS MINEUS FELIX CAPELLA.

Ed. pr. 1499.

Vincenza, 1499.

Flourished c. 475. He was probably born at Carthage, and he lived at Rome.

Title. See Fig. 39.

Colophon. 'Martini Capellæ Liber finit: Impreſſus Vincentiæ Anno Salutis // M.cccxcix. xvii. Kalendas Ianuarias per Henricum de Sancto // Vrfo Cum gratia & priuilegio decem annorum: ne imprima-//tur neq; cum Commentatiis: neq; ſine: & cætera: quæ in ipſo pri//uilegio continentur. Laus Deo & beatæ Virgini.' (F. 123, v.)

Description. Fol., 20.5 × 30.3 cm., the text being 12.1 × 22.3 cm. 124 ff. unnumb., 37 ll. Vincenza, 1499.

Editions. Vincenza, 1499, fol. (here deſcribed); Modena, 1500, fol. (p. 67); Vienna, 1516, fol.; Baſel, 1532, fol.; Leyden, 1539; Baſel, 1577, fol. (p. 68); Leyden, 1592, 8° (p. 68); ib., 1599, 8°; and later. An Italian translation was published at Mantua in 1578. For bibliography, ſee Boncompagni's *Bulletino*, XV, 506.

This work is a medley of proſe and verſe, and forms a kind of encyclopedia of the arts and ſciences as known for about a thouſand years. It was highly eſteemed in the Middle Ages as a textbook. The ſeventh book is on the Greek theory of arithmetic. It treats of the various claſſes of numbers, ſuch as plane and ſolid, and mentions the ſuppoſed mysteries of the ſmaller numbers, the monad ſuggeſting one God, the dyad good and evil, the triad the Trinity, and ſo on.

Other works of 1499. Boethius, p. 27, 1488; Suiseth, p. 10, c. 1480; Anonymous, 'Enchiridion Algorismi sive tractatus de numeris integris,' Deventer, 4° (p. 64, 1498); George of Hungary, 'Arithmetica summa tripartita,' s. l., reprinted at Budapesth in 1894.

Opus

1. Martiani Capelle de Nuptiis
2. Philologie et Mercurij libri duo
3. de grammatica;
4. de dialectica.
5. de rhetorica.
6. de geometri .
7. de arithmetica.
8. de astronomia.
9. de musica libri septem.

FIG. 39. TITLE PAGE OF THE 1499 CAPELLA

MARTIANUS MINEUS FELIX CAPELLA.

Ed. pr. 1499.

Modena, 1500.

See p. 66.

Title. 'Opvs.// Martiani Capellæ // de nuptiis phi//logiæ et //mercvrrii//liberi//dvo.//De gramatica. Liber. Tertius.//De dialectica. Liber. Quartus.//De Rhetorica. Liber. Quintus.//De geometria. Liber. Sextus.//De Arithmetica. Liber. Septimus.//De astronomia. Liber. Octauus.//De musica. Liber. Nonus.' (F. 1, r.)

Colophon. 'Martiani Capellæ Liber finit. Impreſſus Mutinæ. Anno Salutis. M.//CCCCC. Die .XV. Menſis Maii. Per Dionyſiu. Berthocum.' (F. 100, r.)

Description. Fol., 20 × 29 cm., the text being 13.7 × 24 cm. On f. 69, v., the part on arithmetic begins, and occupies 10 ff. 100 ff. in the entire book, unnumb., 42 ll. Modena, 1500.

MARTIANUS MINEUS FELIX CAPELLA.

Ed. pr. 1499.

Basel, 1577.

See p. 66.

Title. 'Isidori // Hispalensis // Episcopi // Originum libri viginti // ex antiquitate eruti. // Et // Martiani Capellæ // De nuptijs Philologiæ & Mercurij // Libri nouem. // Vterque, præter Fulgentium & Veteres Grammaticos, va//rijs lectionibus & fcholijs illuftratus // Opera atq; Industria // Bonaventvrae Vvlcannii Brygensis. // Cum gratia & priuilegio Caefareae Maieftatis. // Basileæ, // per Petrvn Pernam.' (F. 1, r.)

Description. Fol., 20.5 × 31 cm., printed in double columns, each being 8.2 × 24.4 cm., 7 ff. + 240 columns + index + 550 columns. The part on arithmetic in the work of Capella begins in column 155 and covers 12 pp., or as here numbered 24 columns, 60 ll. Basel, 1577.

Editions. See p. 66.

This edition includes the works of both Isidorus (p. 8) and Capella, and is an excellent specimen of printing. One interesting feature of Capella's work is the evidence that it gives of the use of the abacus in the fifth century. We are still quite uncertain as to the history of this method of calculating in the centuries following Capella.

MARTIANUS MINEUS FELIX CAPELLA.

Ed. pr. 1499.

Leyden, 1592.

See p. 66.

Title. 'M. Capella. // Martiani // Minei Capellæ // Carthaginensis // de Nvptiis Philolo-//giæ, & feptem artibus // Liberalibus // Libri Novem // optime castigati. // Lvgdvni, // Apud Bartholomæum Vincentium. // 1592.' (P. 1.)

Colophon. 'Lugduni, // Excvdebat // Stephanus Seruain. // 1592.' (P. 416.)

Description. 8°, 10 × 15.7 cm., the text being 7.1 × 12.8 cm. 4 pp. blank + 18 unnumb. + 396 numb. = 418 pp., 30 ll. Leyden, 1592.

Editions. See p. 66.

Algorithmus linealis
 cum pulchris conditionibus Regule
 de tri: septem fractionum: reglis socia
 libris. et semper exemplis idoneis Recte
 sicut in scholis Nurnbergen. arithmeticoꝝ docetur
 In florentissimo studio Lipsiensi nup editus Nominus
 litteris eruditis et Mercatoribus utilis et
 maxime incipientibus.

Lectori

Aurea succincte pateat tibi regula de tri
 frangere quo valeas neque minuta vasfer
 et socijs dictas quo possis prederere normas
 Huius vilescant non tibi dona libri
 Huius nurnberga nitet numerandi insignis ab arte
 Huius arti multum contulit illa boni

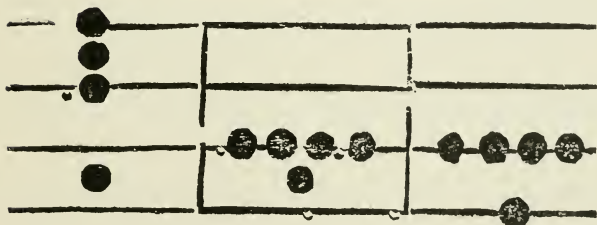


FIG. 40. TITLE PAGE OF LIGHT

BALTHASAR LICHT.

Ed. pr. 1500.

Leipzig, s. a. (1500).

A German Rechenmeister of c. 1500.

Title. See Fig. 40.*Colophon.* 'Impreffum Lipczk per Melchiar Lotter.' (F. 15, v.)*Description.* 4°, 14 × 19.9 cm., the text being 9.3 × 16.2 cm. 15 ff. unnumb., 22–37 ll. Leipzig, s. a. (1500).

Editions. Leipzig, s. a. (1500), here described; ib., 1509; 1513; Leipzig, 1515, 4°, which may be the 'Algorithmus linealis,' s. a. and 1505, by Lotter, referred to by De Morgan (p. 101). There was also an 'Algorithmus linealis, Impressum Lipzik per melchiorem Lotter Anno xċ,' probably printed in 1490, Lotter having printed in Leipzig from 1490 to 1512. (See contra, *Abhandlungen*, V, 154, n., 152, n., and cf. Widman, c. 1490, p. 44.) On f. 1, v., the dedicatory epistle closes with the words 'Vale ex noſtra academia Lyptzeñ Anno 1500,' which throws much doubt on the conjecture that Licht's work appeared earlier.

This is a brief treatise on the line abacus, one of the earliest of the type represented also by Huswirt (see p. 73).

LEONARDUS PORTIUS.

Ed. pr. c. 1500.

S. l. a. (Venice ?, c. 1500).

A Venetian jurist of the fifteenth century.

Title. 'Leonardi // de Portis ivrisconsvlti Vi//centini de sestertio pe//cvniis ponderibvs et // mensvris antiqvis // libri dvo.' (F. 1, r. See Fig. 41.)

Description. 4°, 14.4 × 19.8 cm., the text being 10 × 14.8 cm. 37 ff. unnumb., 30 ll. Venice (?), c. 1500.

Editions. S. l. a. (Venice ?, c. 1500, here described); Florence, 1514 (?); Basel, 1520, 4°; ib., 1530, 8°.

A work on ancient measures, using the Roman numerals throughout, except in the index. Such treatises are of value in studying the history of arithmetic, but are not, in general, included in the bibliographical lists of this work.

Other works of c. 1500. Anianus, c. 1500, p. 32, 1488; Boethius, c. 1500, p. 27, 1488; Bradwardin, c. 1500, p. 61, 1495; Capella, 1500, p. 66, 1499; Peurbach, c. 1500, p. 53, 1492. Widman, 1500, p. 37, 1489. There also appeared about this time, s. l. a., an anonymous 'Algorithmus minutiarum vulgarium,' blackletter, 4° (Libri, 1861 cat., 483), and an anonymous 'Ars numerandi,' 5 ff., 4°, a title given to several books of this period (see p. 23), including 'De arte numerandi siue arismetice (perfectionis) summa quadripartita' (*Abhandlungen*, I, 24; Brunet, *Man.*, 6 (1), 458).

**LEONARDI
DE PORTIS IVRISCONSULTI VI
CENTINI DE SESTERTIO PE
CVNIIS PONDERIBVS ET
MENSVRIS ANTIQVIS
LIBRI DVO.**

FIG. 41. TITLE PAGE OF LEONARDUS PORTIUS

GEORGIUS VALLA. Ed. pr. 1501. Venice, 1501.

Born at Piacenza in 1430; died at Venice in 1499. He was a physician and philologist.

Title. 'Georgii Vallae Placentini viri cla-//riss. de expetendis, et fvgiendis // rebvs opvs, in qvo haec // continentvr.// De arithmetica libri .iii. ubi quaedam a Boetio praetermissa tractantur.// De Musica libri .v. fed primo de inuentione, & commodiatate eius.// De Geometria libri .vi. in quibus elementorum Euclidis difficultates omnes fere // exponuntur, ubi etiã de Mechanicis fpiritalibus, Catoptricis, ac Opticis, deq; // quadrato circuli habetur tractatus.// De tota Aftrologia libri .iiii. in qua fabrica,ufusq; aftrolabi exaratur, & quæ fi-//gnorum in exhibendis medicaminibus fit habenda obferuatio.// De Physiologia libri .iiii. ubi &

Metaphysices q̄dā lectu q̄ dignifs. utiliffimāq; // De Medicina libri .vii. ubi de simplicium natura per ordinem litterarum. // Problematum liber unus. // De Grammatica libri .iii. // De Dialectica libri .iii. // De Poetica liber unus. // De Rhethorica libri .ii. // De Morali Philofophia liber unus. // De Oeconomia, fiue adminiftratione domus libri .iii. in quibus de Architectu-//ra, req; ruftica est locus. // Politicon unicum uolumen, ubi de iure ciuili, ac pontificio primum, Mox de le//gibus in uniuersum, Inde de re militari agitur. // De Corporis commodis, & incommodis libri .iii. quorum primus totus de ani-//ma, Secūds de corpore, Tertius uero de urinis ex Hippocrate, ac Paulo ægi-//neta, deq; Galeni quæftionibus in Hippocratem. // De Rebus externis liber unus, ac ultimus, ubi de Gloria, Amplitudine, & cæte-//ris huiufmodi. // Hæc fummatim, fed infunt, & alia plurima, quæ legēdo licet cognofcere.' (F. 1, r.)

Colophon. 'Venetiis, in aedibus Aldi Roma-//ni impensa, ac studio Ioan-//nis Petri Vallæ filii pi-//entiss. mense Decem-//bri. M.D.I.' (Not in this copy.)

Description. Fol., 28.8 × 43.7 cm., the text being 18.8 × 32.7 cm. 3 ff. blank + 308 unnumb. = 311 ff., 55 ll. Venice, 1501.

Editions. There was no other edition.

The first book consists of 23 brief chapters on the general value and nature of mathematics (18 pp.); the second book, of 18 chapters on the Greek classification of numbers (17 pp.); the third, of 20 chapters on figurate numbers, proportions, and the fancied properties of each number of the first decade (27 pp.); and the fourth, of 13 chapters on the operations (13 pp.). There is nothing that is noteworthy in the treatment. Works on the value of mathematics were quite common at this time, while all university treatises on arithmetic were devoted chiefly to the Greek theory. The thirteen pages devoted to the operations were a rather generous allowance for the time, especially as each page has as much matter as six or eight pages of an ordinary octavo arithmetic of that period.

Valla also wrote a treatise on the astrolabe, 'Insignis philosophi Nicephori Astrolabii expositio' (Paris, 1554), and published an edition of Euclid (Venice, 1492). His collected commentaries, but without the arithmetic and other original works, appeared in Venice in 1498.

ARNALDO DE VILLA NOVA.

Ed. pr. 1501.

Venice, 1501.

ARNAULD DE VILLENEUVE, ARNALD BACHUONE. Born in 1248, at Villa Nova (Catalonia), or possibly Villeneuve, near Montpellier; died in 1314, shipwrecked on the Mediterranean. He is known principally for twenty works on alchemy. He lectured on philosophy and medicine at Barcelona and Paris, and was later a celebrated physician.

Computus Ecclesiasticus ⁊ Astronomicus Editus a Magistro Arnaldo de villa Nova Nouiter Impressum.

Cum Gratia Et Priuilegio.



FIG. 42. TITLE PAGE OF ARNALDO DE VILLA NOVA

Title. 'Computus Ecclesiafticus ꝛ Aftrono//micus Editus a Magiftro Ar//naldo de villa Noua No//uiter Impreffum.// Cum Gratia Et Priuilegio.' (F. 1, r. See Fig. 42.)

Colophon. '¶Impreffum Venetijs per Bernardinū Venetū de Vitalibus.//Anno Dñi.M.CCCCC.J.Die .xvij.Meñ.Februarij.' (F. 11, v.)

Description. 4°, 14.4 × 20.9 cm., the text being 10.5 × 16.6 cm. 11 ff. unnumb., 37-39 ff. Venice, 1501.

Editions. There was no other edition.

This is a good example of the works on the ecclesiastical calendar in use in the Middle Ages. It employs only the Roman numerals and gives no treatment of computation. In spite of the words 'nouiter impressum,' I know of no earlier edition, and indeed these words were not infrequently used when a book was first printed.

JOHANN HUSWIRT, Sanensis.

Ed. pr. 1501.

Cologne, 1501.

A German arithmetician of c. 1500. The name Sanensis suggests his birthplace as Sayn in the Westerwald, and the problems relate to places in that vicinity. Nothing is known of his life.

Title. See Fig. 43.

Colophon. 'Enchiridion algorifmi fagaci cura ftudioqꝫ p Johānē hufwirt sanēfēz //elaboratus. characteri p° ꝛmiffus Colōnie In officina felicitis memorie ho//nefti viri Henrici Quentell. Anno repatoris humane feruitutꝫ Mcccci.' (F. 20, r.)

Description. 4°, 14.3 × 20.6 cm., the text being 9 × 15.4 cm. 20 ff. unnumb., 25-47 ll. Cologne, 1501.

Editions. Cologne, 1501, 4° (here described); ib., 1503; ib., 1504, 4° (p. 77); 1507; 1554; and a French edition (Chasles). It was published with historical notes by Professor Wildermuth, at Tübingen, in 1865. Mr. Plimpton's copy has the bookplates of Dr. Kloss and Chasles.

This is the earliest treatise on algorism printed at Cologne. It is divided into four 'tractati,' and includes the fundamental operations through evolution ('Tractatus Primus'), a brief treatment of abacus or line reckoning ('¶Tractatus Secundus de proiectilibus'), common fractions ('Tractatus Tertius'), rule of three, partnership, and over twenty

miscellaneous rules ('Tractatus quartus de regulis mercatorum' etc.). In the algoristic treatment of integers Huswirt places 'duplatio' (doubling) after multiplication, and 'mediatio' (halving) after division;

2 9

Chiridion no-
uus Algorismi summa
 pere visus De integris. Minutis vulgari
 bus Proiectilibus Et regulis mercatorum
 sine figurarum (more ytalorum) de-
 lectione pcomode tractas
 omnibus cuiuscumque sta-
 tus fuerint sum-
 me neces-
 sari-
 us

Inuide ne latres:lingua compelle furentem
 Nec nimium rabidis garrulus esto labris.
 Aut pete tartareas (superis incognitus) umbras
 Et phlegetonreos labere adules lacus
 Atque illic potius lites. & iurgia misce
 Et viuis pacem concubitare sine

FIG. 43. TITLE PAGE OF THE 1501 HUSWIRT

but when he is dealing with counters and with fractions he places them before multiplication, because they are needed there in abacus calculating. It is interesting to see how these chapters on doubling and halving, of which we have traces in ancient Egypt, persisted throughout the Middle Ages and well into the sixteenth century.

As in several other works of this period, there is evidence of the difficulty of finding a generally acceptable name for the character 0, a difficulty not yet removed in the English language. Huswirt gives four names to this tenth character: 'Decimo X^o theca. circulo? cifra. siue figura nihili appellat'.

There is also noticeable in this work a tendency which is seen in other arithmetics of the time, to name a group of problems after some well-known type. For example, Huswirt's sixth rule is that of the fleeing hare

(*'Regula Sexta de lepore fugiente,'* f. 16, r.), although it has nothing to do with the hound and hare, but relates to a traveler going from Cologne to Rome, and followed five days later by another traveler who in due time overtakes him. (*'Ambulat q̄dam de Colonia versus romā et ambulat q̄tidie 9 miliaria. aliū aut p̄sequit' ipsum post 5 dies,'* etc.)

Other works of 1501. Anianus, p. 32, 1488; Sacrobosco, p. 32, 1488; Boethius, p. 27, 1488; Borghi, p. 16, 1484; H. Torrentini, *'Elucidarius carminum et hystoriarum,'* Deventer, 4° (with a chapter on arithmetic), with subsequent editions as follows: ib., 1503, 4°; Strasburg, 1505, 4°; Hagenau, 1507, 4°; ib., 1510, 4°; ib., 1512, 4°; Strasburg, 1514, 4°; 1515, 4°; Strasburg, 1518, 4°; Paris, 1530, 8°; ib., 1535, 8°; Cologne, 1536, 8°; Paris, 1550, 8°.

Works of 1502. Anianus, p. 32, 1488; Albert of Saxony, p. 9, c. 1478; Bradwardin, p. 6, 1495; Nicolò Calvino, a work on arithmetic and geometry, Milan, of which no extant copy is known (see Riccardi, part I, col. 213).

Tractatus

De multiplicatione Lapin^{um} quartum

Multiplicatio est numeri procreatio. proportionabiliter se habens ad multiplicandū sicut multiplicans ad vni^{us} catem se habet: et nisi grana ad 4. multiplicare est numerum se procreare. que sic multiplicando videlicet 4. pro^{portio}tionantur quemadmodum multiplicans. scilicet 3. vnitati correspondet. quia vtrique est proportio tripla. Item multiplicatio procreatur quod bene multiplicationem digitorum inter se sciat. Cuius talis datur regula. Scribantur digiti subalteme. et cuiuslibet differentia a denario versus de^{cem} gram ponas. quas inter se multiplica. et productum inferius scribe. donec de differentiam vnius a digito alterius subtrahet et priori producto post^{pone}re. et procreetur summa. vt patet in figura

Digtus 8	z	differentia	Exemplum. scilicet 8
Digtus 6		4 differentia	differentias eorū a de
	48		nario. scilicet 4 et z in
			ter se. et erunt 8. que

scribe. Deinde differentiam vnius a digito alterius subtrahet et reliquum priori producto postpone. vt patet in figura. ¶ Illa regula de multiplicacione duorum numerorum infra 20 quozum qualiter duabus figuris scriptus est. propositio itaqz duobus numeris primis inferius cum prima superioris multiplicat et procreabitur numerus vna vel duabus figuris scribendus. si vna scribarur. si duabus. primam harum scribe. secundam seruando in mente. Deinde iterum eadem ad se addas. et productum precedentis configurationam in mente seruaram adiuuge. et procreetur numerus duabus figuris vel vna scribendus. Si vna scribarur. et de vltimis figuris primorum numerorum in vna accipi debet. quam postponis prioribus et erit summa. Si autem duabus primam harum scribe. secundam vnitati a posterioribus figuris accipiendo adde. quas simul scribe. et erit summa

Exemplum	17	multiplica 4 in 7. et
	14	erunt = 8 scribe 8. z
	= 38	seruado in mente. De

inde adde primas figuras ad inuicem dicendo 4 ad 7 sunt 28 et scri^{pta} uara sunt 38. scribe 3 post 8 vnitatem seruando in mente. quam addas figure vltimo accipiendo. et erunt = que postpone 38 et erunt = 38. ¶ Pro digitorum dicendum est facillime intellectu digitorum inter se multiplicandis tabula hic postea ponitur

FIG. 44. COMPLEMENTARY MULTIPLICATION, HUSWIRT (1501)

JOHANN HUSWIRT, Sanensis.

Ed. pr. 1501.

Cologne, 1504?

See p. 74.

Title. The same as in the edition of 1501 (see p. 74).

Colophon. The last folio, with the colophon, is missing from this copy.

Description. There are a few changes in type, but otherwise this edition, which is probably that of 1504, is line for line identical with that of 1501.

ANTON BARTHOLOMEO DI PAXI.

Ed. pr. 1503.

Venice, 1503.

PAXI. A Venetian writer of the fifteenth and sixteenth centuries.

Title. 'Tariffa de pexi e mesvre.// con gratia et privilegio.' (F. 1, r.) 'Prohemio del prestantissimo miser Bartho//lomeo di Paxi da Venetia.' (F. 1, v.) 'Qvi comincia la vtilissima opera chiama//ta tariffa laqual tracta de ogni sorte //de pexi e misvre conrispondenti per tvto //il mondo fata e composta per lo excelen//te et eximio miser Bartholomeo di Paxi da // Venetia.' (F. 2, r. Fig. 45.)

Colophon. 'Stampado in uenefia per Albertin // da lifona uer-cellefe regnante lin//clyto principe miser Leonardo lo//reduno. Anno domini. 1503. A di//26. del mese de Iuio. Finis.' (F. k 5.)

Description. 4°, 15.5 × 21.1 cm., printed in double columns, each being 5.3 × 15.9 cm. 156 ff. unnumb., 33-38 ll. Venice, 1503.

Editions. Venice, 1503, 4° (here described); ib., c. 1510, 4° (p. 79); ib., 1521, 8°; ib., 1540, 8° (p. 79); ib., 1557, 8° (p. 80).

The book is not a textbook on arithmetic, but a collection of information useful to merchants, relating to the measures of weight, value, length, etc., of the various cities and countries with which Venice had trade relations. It is valuable as leading to an understanding of the contemporary arithmetics of Italy, and historians could find much useful information as to the prices and the material of trade by examining this and similar works. An inspection of Fig. 45 will give some idea of the scope of Paxi's Tariffa.

Q. VI COMINCIA LA VTISSIMA OPERA CHIAMA-
 TA TARIPHA LA Q VAL TRACTA DE OGNI SORTE
 DE PEXI E MISVRÈ CONTRISPONDENTI PER TVTO
 IL MONDO FATA E COMPOSTA PER LO EXCELEN
 TE ET EXIMIO MISER BARTHOLOMEO DI PAXIDA
 VENETIA.



AVERemo adūq; prima a dechiarare a
 uostre excellétie tutte lerober che se uéda
 no ī Venetia a pexo grosso & quelle che
 se uédano a pexo sotile e de lordine di pe
 xi de li arzenti:& de le cōditione di pan
 ni de lane francesche fatte in Venetia:&
 etiam dele conditione di panni de seda:
 e panni doro:& del ordine del uédere de
 le specie:& de le sue tare:& del ordine di
 pexi dele farine e bischoti: & del ordine
 de le misure di uini:& del ordine del uen
 der del oio:& in che modo e pexo se uen

deno iguadi:& del ordine di frutti che se uendeno a nome di ster: e
 che pexo hano cadaun ster:e come risponde el pexo grosso con tu
 ta la Italia:& tuto el leuante & ponente:& etiam come ipexi subti
 li e pexi grossi rispondeno con molte terre de Italia : de dalmatia e
 de leuante:& come rispondeno le misure di panni de lana con tu
 ta Italia:e con tuto el leuante:& etiam come rispondeno le mesu
 re di panni de seda:e panni doro e darzento con tuta Italia:& cō tu
 to el leuante & ponente:& come rispondeno le misure dingilterra
 zoe la uirga da londra:e de la taripha dalixādria:& etiam quella de
 damascho & la raripha da leppo.e come torna la sporta dalixādria
 con molte terre de leuante e de ponéte e de la Italia:& come el can
 ter forfori dalixandria risponde con alchune altre terre de leuante
 de ponente e de Italia:& etiam come risponde el canter zeroui con
 alchune terre del leuante del ponente e de Italia:& come respōde el
 cento de le mene con alchune terre del leuante e molte de Italia &
 del ponente:& come rispondeno tuti icantera de leuante e del po
 nente con el pexo subtile da Venetia: & come respōde el canter da
 napoli de reame con molte terre del leuante del ponéte e con mol
 te de Italia:& come risponde el canter de Costātinopoli con mol
 te terre de leuante & etiam de Italia:& come risponde el canter de

ANTON BARTHOLOMEO DI PAXI.

Ed. pr. 1503.

S. l. a. (Venice ?, c. 1510).

See p. 77.

Title. 'Tariffa De Pefi e mefure cor-//refpondenti dal Le uante al Ponēte : da //vna terra a laltra : e a tutte le parte del //mondo : con la noticia delle robe //che fe trazeno da vno Paefe //per laltro. Nouamente //cō diligentia Ri-//ftampata .: ✠' (F. 1, r.)

Colophon. '¶ Finiffe il prohemio de // Miffer Bartholomio di // Pafi da Venefia.// Finis.' (F. 218, v.)

Description. 8°, 10.2 × 15.1 cm., printed in double columns, each being 4.1 × 12.5 cm. 218 ff. numb., 30 ll. S. l. a. (Venice ?, c. 1510.)

See p. 77. This is the second edition of this popular 'Tariffa.' Since it was one of the first books of its kind to appear in Venice, its five editions are easily explained.

ANTON BARTHOLOMEO DI PAXI.

Ed. pr. 1503.

Venice, 1540.

See p. 77.

Title. 'Tariffa // de i pesi, e misvre //corrifpondenti dal Le uante al Ponente : // e da una terra, e luogo allaltro, qua fi p // tutte le parti dil Mondo : con la dichia-//ratione, e notificatione di tutte le robbe : // che fi tragono di uno paefe per laltro.// Composta per M. Bartholomeo di // Pafi da Vinetia. Con la fua // Tauola copiofiffima, e faci-//liffima a trouare ogni cofa // per ordine, nuouamēte // fatta : e con fomma // diligēza reuista, // e stāpata. // In Vinetia. M.D. XL.' (F. 1, r.)

Colophon. 'In Vinegia. Nelli cafe di Pietro di Nicolini da Sabbio. // Ne glianni dilla falutifera Circoncifione dil no-//ftro Signore. M. D. XL. // Dil mefe di Genaiο.' (F. 212, r.)

Description. 8°, 10.3 × 14.7 cm., printed in double columns, each being 3.5 × 12.3 cm. 11 ff. unnumb. + 1 blank + 200 numb. = 212 ff., 30 ll. Venice, 1540.

See p. 77.

ANTON BARTHOLOMEO DI PAXI.

Ed. pr. 1503.

Venice, 1557.

See p. 77.

Title. The title page is practically identical with that of the 1540 edition, except for the date: 'In Vinegia per Paolo Gherardo. // M. D. LVII.' (F. 1, r.)

Colophon. 'In Vinegia per // Comin da Trino. // M. D. LVII.' (F. numbered 200, r.)

Description. 8°, 10.6 × 15 cm., printed in double columns, each being 3.7 × 12.3 cm. 11 ff. unnumb. + 200 numb. = 211 ff., 30 ll. Venice, 1557

See p. 77.

BOETHIUS, JODOCUS CLICHTOVEUS, AND FABER

STAPULENSIS. Ed. pr. 1503.

Paris, 1503.

For the biographies of BOETHIUS and FABER STAPULENSIS see pp. 25, 62. JODOCUS CLICHTOVEUS was born at Nieuport, Flanders; died at Chartres, September 22, 1543. He was educated at the Sorbonne, and was canon of Saint-Jean, at Chartres. Like Faber Stapulensis, he was known chiefly as a commentator.

Title. 'In hoc libro contenta // Epitome/ cōpendiofaq3 // introductio in libros // Arithmeticos diui Seuerini Boetij: adie// cto familiari comētario dilucidata. // Praxis numerandi certis quibusdam re-//gulis cōftricta. // Introductio īgeometriā: ex libris disticta // Prim⁹ de magnitudinib⁹ & earū // circūfantiis. // Secūdus de cofequentibus/ conti-//guis/ & cōtinuis. // (Surrounded by an elaborate woodcut.) ¶ Tertius de pūctis. ¶ Quartus de lineis. ¶ Quītus de fuperficieb⁹. // ¶ Sextus de corporibus. ¶ Liber de quadratura circuli. ¶ Liber de cubica//tione fphere. ¶ Perfpectiua introductio. ¶ Infuper aftronomicon.' (F. 1, r.)

Colophon. 'Id opus imprefferūt Volphgangus // hopilius et Henricus ftephanus // ea in arte focii in Almo pari-//fiorum ftudio Anno Chri//fti Celorum totiufq3 // nature cōditoris. // 1503. Die vice//fima fepeti-//ma Iu-//nij.' (F. cxi, v.)

Description. Fol., 19 × 26.6 cm., the text being 16 × 22.6 cm. 112 ff. numb., 47-54 ll. Paris, 1503.

Editions. This is the first edition of this combination of works, the second (somewhat changed) appearing at Paris c. 1507 (see below), and the third *ib.*, 1510. The epitome appeared as a 'Compendium arithmetices Boethii,' s. l., in 1480, and, with the arithmetic of Jordanus, at Paris, in 1496. There was an edition of Faber Stapulensis, Clichtoveus, and others, at Cologne, c. 1515, 4°. Scheubel published an edition at Basel in 1553, and a work entitled 'Arithmetica Boethii epitome acced. Christiani Morisani Arithmetica' also appeared at Basel in 1553 (pp. 27, 182, 260). The 'Praxis numerandi' of Clichtoveus, of which this is the first edition, appeared separately at Paris in 1510, fol.

The copy here described is bound with the 1509-10 edition of Bovillus (see p. 89). It consists of a brief introduction by Faber Stapulensis, and the arithmetic of Boethius with the commentary of Clichtoveus on Faber's epitome. This is followed by the geometry and perspective of Faber Stapulensis.

BOETHIUS, JODOCUS CLICHTOVEUS, AND FABER
STAPULENSIS. Ed. pr. 1503. Paris, c. 1507.

See p. 80.

Title. 'Introductio // Jacobi fabri Stapulēfis in Arithme // cam
Diui Seuerini Boetij pariter ꝛ Jordani // Ars supputādi tam per
calcu // los $\overline{q_3}$ notas arithmeticas fuis quidem regulis elegāter
exprefsa // Judoci Clichtouei Neoportuenfis. // Queftio haud
indigna de numerorū // et ꝑ digitos ꝛ ꝑ articulos finita ꝑgreffione
ex Aurelio Auguftino // ¶ Epitome rerum geometricaruꝝ ex
Geometrico introductorio // Caroli Bouilli. // ¶ De quadratura
Circuli Demonstratio ex Campano.' (F. 1, r.)

Description. 4°, 12.6 × 17.4 cm., the text being 10.6 × 14.5 cm. 32 ff. unnumb., 45-46 ll. Paris, c. 1507. The dedicatory epistle is dated 'Data āno falutis // noftre Millefimo qngētefimo feptimo tercio calēdas Iunij,' that is, 1507. It was evidently printed at Paris, but it is without date or place.

Editions. See above.

The introduction by Faber Stapulensis to the arithmetic of Boethius and Jordanus was very popular in the university of Paris at the opening of the sixteenth century. It is, like Boethius, purely theoretical. The author begins with a dissertation 'de vtilitate arithmetice discipline,' and then gives an epitome of the two works. This is followed by the 'compendium' of Clichtoveus, merely a set of rules for the operations. Books of this character, evidently intended as the bases of lectures to university students, show in what a hopeless state the Boethian arithmetic found itself at the end of the Middle Ages.

GREGORIUS REISCH. Ed. pr. 1503. Strasburg, 1504.

Born at Balingen, Württemberg; died at Freiburg, 1523. He was a student at Freiburg in 1487, and took his bachelor's and master's degrees there. He then entered the Carthusian order and became prior of the cloister at Freiburg, and confessor of Maximilian I.

Title. 'Aepitoma omnis phylosophiae. ali-//as Margarita phylosophica tractans // de omni genere scibili: Cum additionibus: Quę in alijs non habentur.' (Large woodcut representing the liberal arts. F. 2, r. Plate II.)

Colophon. 'Explicit phylosophica Margarita. Castigatione acri // In nobili Helueciorū ciuitate Argentina Chalchogra-//phatū: Per Ioannē Gruninger Ciuē Argētīnū: ī vigilia // Mathię Anno incarnationis Saluatoris M.cccccc.iiij.// Valete & Plaudite.' (F. 289, v.)

Description. 4°, 15.1 × 20 cm., the text being 11.5 × 15.6 cm. 2 ff. blank + 289 unnumb. = 291 ff., 45 ll. The illustrations are hand-colored. Strasburg, 1504.

Editions. Freiburg, 1503, 4°; Strasburg, 1504, 4° (here described); Freiburg, 1504, 4°; another edition, s. l., by Schott (Freiburg), 1504; Strasburg, 1508; Basel, 1508, 4° (p. 83); ib., 1512, 4°; Strasburg, 1512, 4°; ib., 1515, 4°; Basel, 1517, 4°; Paris, 1523 (first Finæus edition); Basel, 1535, 4° (p. 84); ib., 1583, 4°; Venice, 1594; ib., 1599; ib., 1600. The three Venetian editions (1594, 1599, 1600) are Italian translations by Giovanni Paolo Gullucci, and contain the additions by Orontius Finæus, and also the introduction by Faber Stapulensis to the arithmetics of Boethius and Jordanus (see p. 62), Clichtoveus



A. GEOMETRY



B. ARITHMETIC

on arithmetic (see p. 80), and 'Questione di S. Agostina della progressione dei numeri per li diti, et per li articoli.' Hartfelder (*Zeitsch. f. Gesch. des Oberrheins*, II, 170) has shown that the assertion of Hain, Poggendorff, and others, that it appeared in 1496, is incorrect.

This was the first modern encyclopedia to appear in print. It contains a compendium of the trivium, the quadrivium, and the natural and moral sciences. It is made up of twelve books, of which the fourth, consisting of fifteen folios in the present edition, is on arithmetic. The author first considers the definition of arithmetic, and then gives the mediaeval classification of number, including the system of ratios as set forth by Boethius and his followers. The second part of the work contains a short treatment of algorism, including the fundamental operations and roots. The third tractatus relates to common fractions and the fourth to physical or sexagesimal fractions. The arithmetic closes with a treatment of line reckoning, giving the four fundamental operations and the rule of three. The illustrations are particularly interesting. (See Plate II.)

Other works of 1503. Boethius, p. 27, 1488; Bradwardin, p. 61, 1495; Faber Stapulensis, p. 62, 1496; Huswirt, p. 74, 1501; Jordanus, p. 62, 1496; Orbellis, p. 23, 1485; Peurbach, p. 53, 1492; Sacrobosco, p. 32, 1488; Torrentini, p. 76, 1501; Anonymous, 'Textus arithmeticae comunis, cum Conradi Norici commentatione,' Leipzig, fol.

Works of 1504. Anianus, p. 35, 1488; Bradwardin, p. 61, 1495; Johannes Carolus (see Landshut, below); Huswirt, p. 74, 1501; Reisch, p. 82, 1503; Sacrobosco, p. 32, 1488; Johann Karl von Landshut (Lanzut), 'Algorithmus integrorum,' Leipzig (see also p. 97, 1513, 1515); Henricus Stromer, 'Algorithmus linealis cum Regula de Tri,' Leipzig, 4°, with other editions in 1510; 1512, 4°; 1514; Leipzig, 1516, 4°; ib., 1517, 4°; 1520.

GREGORIUS REISCH. Ed. pr. 1503.

Basel, 1508.

See p. 82.

Title. 'Margarita philosophica // cū additionibus nouis : ab auctore suo // studiofissima reuifōe tertio sup additis. // Jo. Schottus Argen. lectori. S. // Hanc emo/ non preffam mendaci ftigmate/ Lector:// Pluribus aft auctam perlege : doctus eris. // Bafilce. 1508' (F. 1, r.)

Colophon. '¶Tertio induftria complicū Micha//elis Furterij/
et Joānis Scoti//ftudiofiiffime preffa. Ba//fileę.i4.Kal'.Mar//
tias. Anno Chrifti.//1508.' (F. 308, r.)

Description. 4°, 15.2 × 21.9 cm., the text being 12.7 × 16.7 cm. 309 ff. unnumb., 42 ll. In this edition the leading initials are inserted by hand and the illustrations are colored. Basel, 1508.

See p. 83.

GREGORIUS REISCH. Ed. pr. 1503.

Basel, 1535.

See p. 82.

Title. 'Marga//rita philosophica, rati//onalis, Moralis philo-
sophiæ princi//pia, doudecim libris dialogice cōple//ctens,
olim ab ipfo autore recognita :// nuper aūt ab Orontio Fineo
Delphi//nate caftigata & aucta, unā cum ap//pendicibus itidem
emēdatis, & quā // plurimis additionibus & figuris, ab // eodem
infignitis. Quorū omni-//um copiofus index, uerfa // continetur
pagella.//Virefcit uulnere uirtus.//Basileae 1535.' (Surrounded
by an elaborate woodcut.) (P. 1.)

Colophon. 'Basileae excvdebat Henricvs // Petrus, ac Con-
radi Refchij impenfis. An●// M. D. XXXV.' (P. 1577.)

Description. 4°, 15 × 20.8 cm., the text being 9.6 × 13.8 cm. 78 pp. unnumb. + 1498 numb. + 1 blank = 1577 pp., 26-30 ll. Basel, 1535.

Editions. See p. 82. Finæus dates the dedicatory epistle 'Parifijs ex regali collegio Nauarræ. 1523,' and his first edition appeared in that year. This edition gives only part of the elaborate engravings found in the earlier ones. It is, however, much better printed, being set in clear Roman type and having a more open page.

See p. 83.

THEODOR TZWIVEL. Ed. pr. 1505.

Cologne, 1507.

A German arithmetician of c. 1500, from Monte Gaudio (Mongavensis), Westphalia.

Title. See Fig. 46.

Colophon. '¶Algorithmi. qui ars dicitur numerandi. de integris // per figurarum (more Alemānorum) deletionē. Nec//nō de pportionibꝫ ingeniosi Pythagoriste Theodo//rici Tzwyuel. post plurimā praxin iam tandē in hoc //spendiuꝫ reducti finis adest quod et publicā ob vti//litatem in magistrali artis impressori e taberna inge//nuorum liberorum Quentell iterato diffeminari pro

Rithmice
opuscula duo Theodorici Tzvi
uel de numeroꝝ praxi (que algorithmi dicunt) vnū de integris per
figurarū (more alemanoꝝ) deletionē. Alterū de proportionibus cu
ius vsus frequens in musicā harmonicā Sauerini Boetiꝫ

De vtilitate huius libelli Tetrastichon
ioannis Murmelliꝫ Ruremundensis

Si quis arithmetices optat cognoscere praxin
Pythagore numeros discere si quis amat
Scire mathematicen si vult, si deniqꝫ quicqꝫ
De sophia, hunc modicum comparet ere librū

FIG. 46. TITLE PAGE OF TZWIVEL

//curauit. Anno a natali dominico Millesimo quin//genetesimo-septimo.' (F. 9, v. See Fig. 47.)

Description. 4°, 13.9 × 20 cm., the text being 8.8 × 14.5 cm. 10 ff. (1 blank), 46 ll. Cologne, 1507.

Editions. Günther mentions a Münster edition of 1505, but I have not seen it; there was a Cologne edition in the same year; Cologne, 1507, 4° (here described).

The work is divided into two parts, the first beginning as follows: '¶Algorithmus de integris p figurarū (more alemanoꝝ) deleti//onē

artē numerādi enucleatim ꝑpendiofeqꝫ edocens.' (F. 2, v.) This part contains a brief explanation of the writing of numbers and the fundamental operations. The second part begins as follows: '¶Algorithm⁹ de ꝑportiōibꝫ cuius vfus frequēs in muficam har//monicam Seuerini Boetij' (f. 8, v.), and two pages treat of the operations with the mediaeval 'proportionēs' or ratios. A comparison of the title pages represented on pp. 45, 75, 85, and of the works to which they belong, at least two of which were printed in Cologne, leads to the belief that the expression 'per figurarū (more alemanorꝫ) deletionē' (by the deletion of figures in the German way) refers to a contemporary North German custom of not actually canceling the figures in the galley division, as the Italians did.

Other works of 1505. Anonymous (see Licht), p. 70, 1500; Borghi, p. 16, 1484; Bradwardin, p. 61, 1495; Ciruelo, p. 60, 1495; Licht, p. 70, 1500; Suiseth, p. 10, c. 1480; Tor-

rentini, p. 76, 1501; Anonymous, 'Tractatus perutilis in arithmetica speculativa,' Paris; Hermanus Buschius, 'Enchiridion novus Algorismi,' Cologne, s. a. (1504), 4° (see also p. 106, 1514); Nicolaus Horem, 'Tractatus proportionū,' Venice, in a volume with Bradwardin

and Suiseth (see also p. 116, 1515); 'Algorithmus linealis Baccalariū Wolfgangum Monacenseni,' Leipzig, 4°; Georg Leunbach, an arithmetic.

Works of 1506. Albert of Saxony, p. 9, c. 1478; Anonymous, p. 10, 1480; Vittori, p. 9, Albert of Saxony, c. 1478, and p. 61, Bradwardin, 1495; Pietro Borrighione, 'Arismetices praxis,' Turin, 22 ff., with a second edition, ib., 1523; Raphael Maffei, 'Commentarii Urbani,' Rome, fol., an encyclopedia containing a book (no. 35) 'De scientiis mathematicis,' which includes a little arithmetic; Maffei's work was also printed in 1527, and at Paris in 1511, 1515, 1526, and 1530, and at Basel in 1559.

ANONYMOUS. Ed. pr. 1507. Leipzig, 1507.

Title. See Fig. 48.

Colophon. '¶Impressum Liptzck per Baccalariū Vuolfgangū // Monacensem Anno noſtre redemptionis .1507.' (F. 27, r.)

Description. 4°, 14.5 × 19.5 cm., the text being 9.5 × 15.3 cm. 28 ff. unnumb. + 1 blank = 29 ff., 28-34 ll. Leipzig, 1507.

Editions. Leipzig, 1507 (here described); ib., 1509, 4°; s. l. a. (Nürnberg?, c. 1510).

This resembles several of the works on algorism appearing about this time, such as Widman's (?), Licht's, and Huswirt's. It contains a very brief treatment of the fundamental operations, including duplation and mediation. In division, only a single example is given, that of $1456 \div 12$. After a similarly brief treatment of fractions, the Boethian propor-

**Algorithmus de Integris. Mi
nucijs vulgaribus ac ppor
tionibus Cum annexis
detri falsi alijsqz
Regulis**

FIG. 48. TITLE OF THE 1507 *Algorithmus*

tions (ratios) are taken up: 'Sequitur Algorithmus proportionū.' Then follow the Rule of Three and several other rules now entirely forgotten, such as 'Regula legis,' 'Regula augmenti,' 'Regula plurima,' 'Regula pulchra,' and 'Regula falsi.' Such 'regulae' were not stated like modern rules but consisted of groups of similar problems.

Other works of 1507. Boethius, p. 27, 1488; Faber Stapulensis, c. 1507, p. 81, 1503; Huswirt, p. 74, 1501; Peurbach, p. 53, 1492; Torrentini, p. 76, 1501.

Works of 1508. Anianus, p. 32, 1488; Reisch, p. 82, 1503; Widman, p. 39, 1489; Hieronimus de Hangest, 'Liber proportionum,' Paris, 4°.

LUCA PACIUOLO. Ed. pr. 1509.

Venice, 1509.

See p. 54.

Title. After a vocabulary and index the work begins on f. 1, r., as follows: 'Excellentissimo principi Ludouico mariæ Sfor. Anglo Mediolanen//fium duci: pacis et belli ornamento fratris Lucae pacioli ex Burgo fancti // Sepulchri ordinis Minorum: Sacræ theologiæ pffectoris. De diuina pro//portione epiftola.'

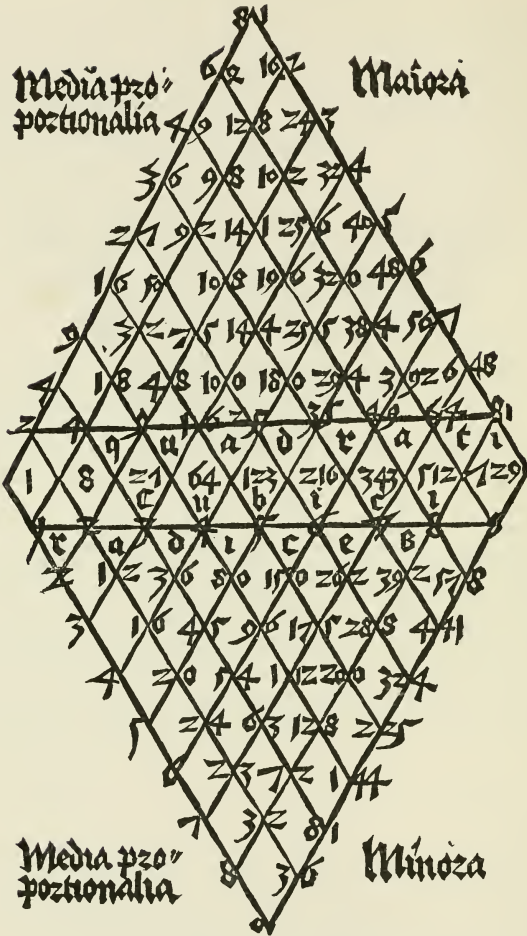


FIG. 49. FROM THE 1507 *Algorithmus*

Colophon. '¶ Venetiis Impreffum per probum virum Paganinum de paganinis de // Brixia. Decreto tamen publico vt nullus ibidem totiꝫ dominio annorum // XV. curiculo imprimat vel iprimere faciat. Et alibi impreffum fub quouis // colore in publicum ducat fub penis in dicto priuilegio contentis. Anno Re//demptionis noſtre. M.D.VIII. Klen. Iunii, Leonardo Lauretano Ve.//Rem.Pu. Gubernante. Pontificatus Iulii.II. Anno.VI.' (F. 27, r., of Part 3. A ſimilar colophon appears at the foot of f. 35, v., of Part 1.)

Description. 8°, 20.5 × 28.3 cm., the text being 9.1 × 21.5 (with marginal drawings). 1 f. blank + 2 unnumb. + 90 numb. 93 ff., 52–57 ll. Venice, 1509.

Editions. There was no other edition.

With ſome hesitancy this book has been included, the only juſtification being the fact that there are ſeveral pages devoted to the diſcuſſion of proportion in general, including the arithmetical, geometric, and aſtronomic. Paciolo excludes the other forms of ancient proportion given by 'Platone e Arifto. e yſidoro i le fue ethimologie. El feuerin Boetio in ſua arithmetica.' (F. 5, r.) Moſt of the treatiſe is, however, devoted to geometry.

CAROLUS BOVILLUS. Ed. pr. 1509–10. Paris, 1509–10.

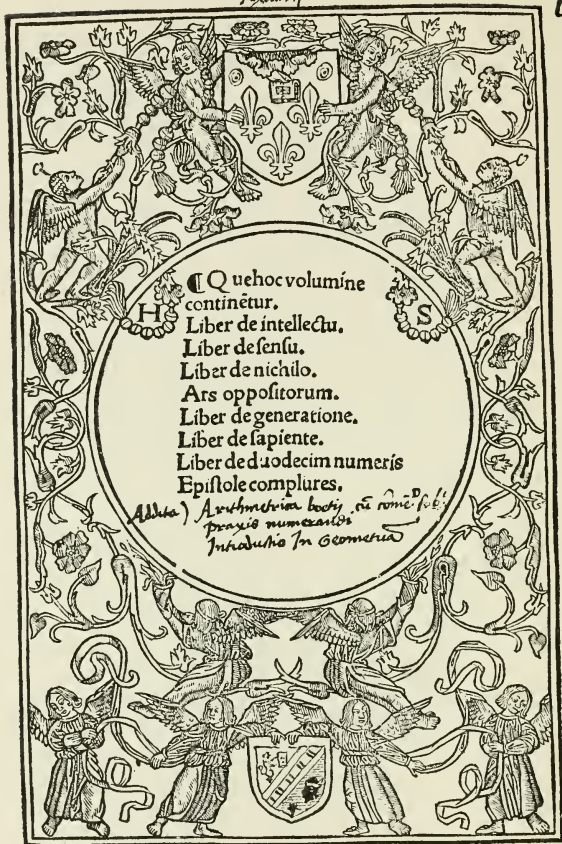
BOUELLES, BOÛELLES, BOUILLES, BOUVEL. Born at Saucourt, Picardy, c. 1470; died at Noyon, c. 1553. Canon and profeſſor of theology at Noyon.

Title. See Fig. 50.

Colophon. 'Libelli De Mathematicis Svpplē//mentis Finis Anno Salutis Humane // 1509 Ianuarij Die Deci//maoctaua // ¶ Editum eſt vniverſvm hoc volvmen Ambianis in edibvs Re//uerendi in Chriſto Patris Franciſci De Halleſſin Eiuſdem Loci Pontificis ./. // Et emiſſum ex officina Henrici ſtephani. Impenſis eiuſdem et Ioannis parui in chalcotypa // arte fociorum Anno Chriſti Saluatoris omnium 1510. Primo Cal. Februarij.// Pariſiis.' (F. 198, v.)

Description. Fol., 19.7 × 27.4 cm., the text being 15.1 × 25.8 cm. 198 ff. numb., 53–54 ll. Paris, 1509–10.

Editions. Fontès has deſcribed (Toulouse *Mem.* (9) VI, 155–167, for 1894) a quarto of 1510, published by Stephanus of



¶ In sup mathematicū opus quadripartitū ¶ De Numeris Perfectis ¶ De
Mathematicis Rosis ¶ De Geometricis Corporibus
¶ De Geometricis Supplementis

FIG. 50. TITLE PAGE OF BOVILLUS

Paris, entitled, 'Caroli Bovilli liber de numeris perfectis.' This book is, however, without title page, and is of course simply ff. 172-180 of this work. I know of no other editions.

The first part on numbers, the 'Liber de duodecim numeris,' begins on f. 148, v., and ends on f. 171, r., with the colophon: 'Libri dvodecim nvmerorvm finis: editi // in domo- R. P. Francisci de Hallevvin/ Pontificis Ambi//anensis. Anno ab autore numerorum Incarnato.// 1510: Maij decimafexta.' It relates solely to the mystery of numbers and to the Greek theory. The part on perfect numbers, numbers which equal one plus the sum of their factors, begins on f. 172, r., and ends on f. 180, r., with the following colophon: '¶Liber perfectorum nvmerorum finis.// Perfecto/ trinoq; deo laudes in gentes. Anno domi-//ni/ 1509: Ianuarij 4.' The dates of the several parts vary from October 25, 1509, to January 18, 1509 (1510 N. S.).

Other works of 1509. Anianus, p. 32, 1488; Anonymous, p. 87, 1507; Borghi, p. 16, 1484; Ciruelo, p. 60, 1495; Licht, p. 70, 1500; Sacrobosco, p. 32, 1488.

Other works of 1510. Anonymous, p. 87, 1507; Anonymous, c. 1510, p. 46, 1491; Boethius, p. 30, 1488; Bovillus, p. 89, 1509; Bradwardin, c. 1510, p. 61, 1495; Clichtoveus, p. 81, 1503; Faber Stapulensis, p. 62, 1496; Jordanus, p. 62, 1496; Peurbach, p. 53, 1492; Sacrobosco, p. 32, 1488; Stromer, p. 83, 1504; Paxi, c. 1510, p. 79, 1503; Torrentini, p. 76, 1501.

Works of 1511. Anianus, p. 32, 1488; Boethius, p. 27, 1488; Maffei (Maphæus), p. 86, 1506; Peurbach, p. 53, 1492; Simon Eisenmann, 'Enchiridion arithmetica,' Leipzig, fol.

JUAN DE ORTEGA. Ed. pr. 1512. Rome, 1515.

JOHN DE LORTZE. A Spanish priest of the Dominican order, from Aragon. He was still living in 1567.

Title. 'Svma // de Arithmetica: Geometria // Pratica vtiliffima: ordina//ta per Johane de Or//tega Spagnolo // Palentino. // Cum Priuilegio.' (Surrounded by an elaborate woodcut. F. 1, r.)

Colophon. 'Impreffo in Roma per Maftro Stephano Guilleri de Lorena // anno del noftro Signore 1515 adi 10 de Nouēbre Regnante Leo//ne Papa decimo in fuo Anno tertio.' (F. 116, r.)

Description. Fol., 20.6 × 30.2 cm., the text being 13.1 × 22.7 cm. 2 ff. unnumb. + 114 numb. = 116 ff., 32-38 ll. Rome, 1515.

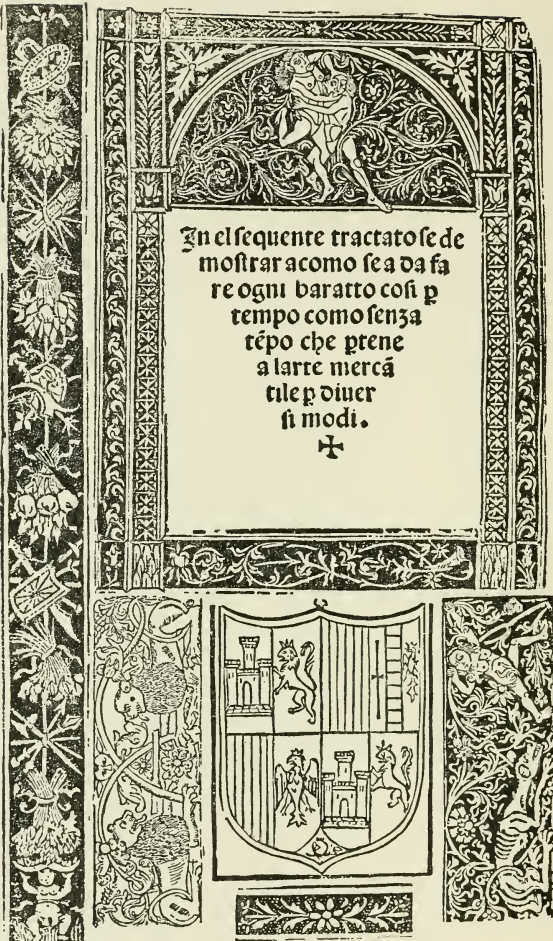


FIG. 51. FROM THE 1515 ORTEGA, INTRODUCTION TO BARTER

Editions. Barcelona, 1512; Lyons, 1512, 4°; ib., 1515, 4°; Rome, 1515, fol. (here described); Messina, 1522; 1534; Seville, 1536; ib., 1537; Paris, 1540 (?); Seville, 1542, 4° (see below); ib., 1552 (p. 94); s. l. (?), 1552; Granada, 1563, 4°. The Lyons edition of 1512 was the first book on commercial arithmetic printed in France. It differs somewhat from the Rome edition of 1515, but the latter differs only a little from the first (Barcelona) edition. Mr. Plimpton's copy of 1515 belonged to Prince Boncompagni and has his collation on the cover. It is beautifully printed and is one of the best examples of the early Italian mathematical typography.

This is one of the most celebrated arithmetics written in Spain in the sixteenth century. It is a purely commercial book, beginning with notation, taking up the four processes with integers, the progressions, the roots, and the checks on operations, and the same operations in the same order with fractions, and then discussing the business rules. These last include exchange, rule of three, profit and loss, partnership, testament problems, barter, alloys, false position, and a little mensuration.

Other works of 1512. Bradwardin, p. 61, 1495; Peurbach, p. 53, 1492; Reisch, p. 82, 1503; Stromer, p. 83, 1504; Torrentini, p. 76, 1501; I. Furst, 'Novus . . . algorithmus.'

JUAN DE ORTEGA. Ed. pr. 1512. Seville, 1542.

See p. 91.

Title. 'Tratado // futilissimo de Arifmeti-//ca y de Geometria : cõ-//puefto y ordenado // por el reuerendo // padre frãy Juã // de Ortega d' // la orden d' // los pre//dicadores.// 1542 // 1234567890.' (The whole is surrounded by an elaborate woodcut border.) (F. 1, r.)

Colophon. 'Sue impreffo el prefente libro // re Arifmetica y Geometria (agora nueuamête // corregido y emendado) en cafa d'Jacom // crõberger: enla muy noble y muy leal // ciudad de Seuilla : a cinco dias // de deziembre de. M.d. y // quarêta y dos añoz.' (F. 232, v.)

Description. 4°, 14.5 × 20.5 cm., the text being 11.3 × 17.2 cm. 232 ff. numb., 34 ll. Seville, 1542.

See above.

JUAN DE ORTEGA. Ed. pr. 1512.

Seville, 1552.

See p. 91.

Title. 'Tractado // Subtilissimo d'Arifmetica y de Geome//
tria. Compuefto por el reuerēdo padre // fray Juan de Hortege,
d'la orden // de los predicadores.// Elhora de nueuo emendado
con mucha // diligētia por Gonçalo Bufto d'muchos // errores
que auia en algunas im//preffiones paffadas.// ¶ Van añadidas
en eſta impreſſion las // prueuas defde reduzir hafta partir que-
//brados. Y en las mas de las figuras de // geometria fus prue-
uas, con ciert os au-//fos ſubjetos al Algebra. Y al fin deſte tra-
//ctado: 13. exemplos de arte mayor.// 1552.' (Title page is
printed in red, and is ſurrounded by an elaborate woodcut in
black.) (F. 1, r.)

Colophon. 'Hizo fin el tractado de Arifmetica Y // Geome-
tria, que compuoſo y ordeno el reuerendo padre // fray Juan de
Hortege, de la orden de los predica-//dores. Fue impreſſo ēla
muy noble ⁊ muy leal // ciudad de Seuilla por Juā canalla, enla //
collacion de fant Juā. Acaboſe a diez // y feys dias del mes de
Abril del // añō de nueſtro criador y redē//ptor Jefu Chriſto de
mill // ⁊ quinientos ⁊ cin-//quenta y dos // años.' (F. 223, r.)

Description. 8°, 14.6 × 20 cm., the text being 11.9 × 17.4 cm.
232 ff. numb. + 7 unnumb. = 239 ff., 33 ll. Seville, 1552.

See p. 93. The 'arte mayor' mentioned in the title is algebra.

JODOCUS CLICHTOVEUS. Ed. pr. 1513. Paris, 1513.

See p. 80.

Title. See Fig. 52.

Colophon. '¶ Expletum eſt hoc opufculum & ex officina emif-
//ſum/ in alma Pariſiorum academia: añō domi-//ni (qui omnia
numero definiuit) decimoter//tio ſupra milleſimū & quingente-
ſimū/ //decimafexta die Decembris. Per // Henricū ſtephanū/
artis excu//ſorię librorū ſedulū & indu//ſtriū opificē/ e regione
// ſchole Decretorū // habitan-//tem.' (F. 43, v.)

Description. 4°, 14 × 19.5 cm., the text being 12 × 15.7 cm.
41 ff. numb. + 3 unnumb. + 2 blank = 46 ff., 42 ll. Paris, 1513.

Editions. There was no other edition.

This is, I believe, the first separate treatise on the mystery of numbers to appear in print. Paciolo had included a good deal of such material in his *Summa* of 1494, and about a century later Bungus published a monumental treatise upon the subject, but Clichtoveus was a pioneer in the publication of a separate work. The result of his labors is properly

**De mystica numerorum significatione opus-
sculum: eorum presertim qui in sacris lit-
teris vsitati habentur / spiritualē ipso-
rum designationem succin-
cte elucidans.**



FIG. 52. TITLE PAGE OF THE 1513 CLICHTOVEUS

included in a list of arithmetics, for, while there is nothing of computation in the work, it is not unrelated to the number theories of the mediæval writers and even of the Pythagoreans.

Clichtoveus discusses, as is usual among such writers, the religious significance of one ('Quid vnitas/ numerorum fons et origio designat. Cap. I.') and the numbers of the first decade. He also mentions several larger numbers which were supposed to have some scriptural significance, not forgetting, of course, 666, 'the number of the beast.'

There is also in this work a chapter, generally unrecognized by writers on the history of the subject, on finger-reckoning: 'Quomodo antiqui: numeros omnes per certas digitorū & manuum figurationes/ significare funt foliti.' Cap. XXVIII.

JOANNES MARTINUS BLASIUS, Villagarcensis.

Ed. pr. 1513.

Paris, 1513.

A Spanish astrologer and arithmetician of c. 1500. In this edition the author's name appears as 'Ioannes Martinus Blafius dioceſis Pacēſis,' and in the 1519 edition as 'Ioannes Martinus Silecevs (and Sciliceus) Dioceſis Pacēſis.'

Title. See Fig. 53.

Colophon. 'Explicit liber Arithme//tices practice magri Joannis Martini Blafij Vil-//lagarciēſis: Parifijs edit^o in honeſtiffima Belua-//corū paleſtra: impreſſus vero a calcographorum ex-//pertiffimo Thoma Kees: Vveſalienſe expenſis pro//biſſimorum

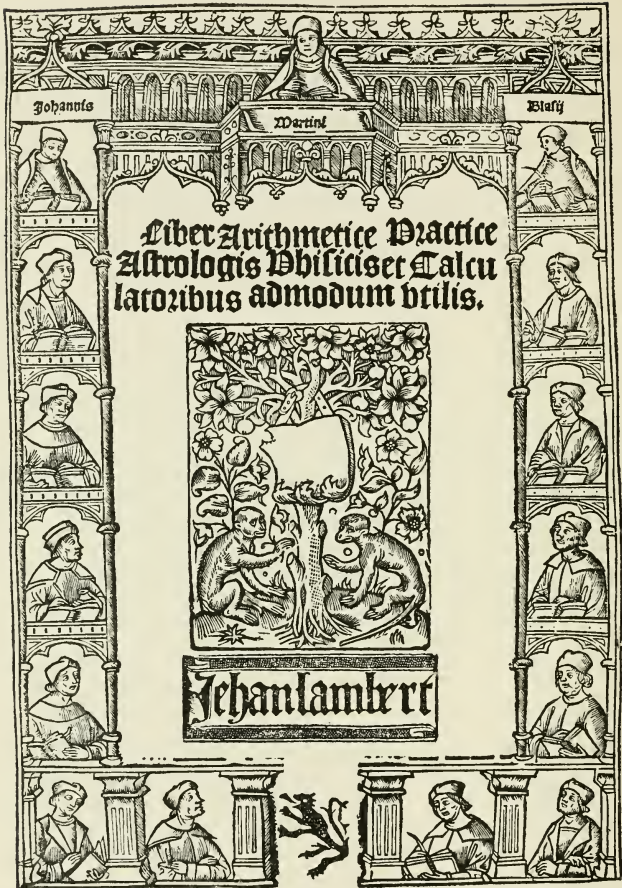


FIG. 53. TITLE PAGE OF THE 1513 BLASIIUS

virorum: Joannis Parui et Joannis // Lambert. Anno domini. 1513. in vigilia diui Jo//annis baptifte.' (F. 26, r.)

Description. Fol., 19.5 × 28.1 cm., printed in double columns, each being 6.5 × 21.3 cm. 26 ff. unnumb., 64–66 ll. Paris, 1513.

Editions. Paris, 1513, fol. (here described); ib., 1514, large 8°; ib., 1519 (see below); ib., 1526, fol.

Although an algorism, the work is mediæval in character. The author first discusses the fundamental operations with integers, including series and roots as was the custom, but not considering duplation and mediation as distinct topics. He is one of the earliest writers to adopt the spelling *substractio*, for subtraction, a custom more or less followed by the Dutch and English arithmeticians for several generations. Blasius closes his 'primus tractatus' with a discussion of compound numbers. 'Tractatus secundus' considers computations with counters, or 'nummi supputatorii.' The 'tertius tractatus' is devoted to common fractions, 'fractiones vulgares'; the 'quartus tractatus' to sexagesimal fractions, 'fractiones phisicæ'; and the 'quintus tractatus' to the rule of three ('Prima regula ? fūdāmētalis quā detri dicunt.'). There are no practical applications of any value.

This first edition differs greatly from the third (1519) described below. It includes only the algorism, while the latter consists of two parts, the first being on Boethian arithmetic, and the second being substantially identical with the 1513 edition.

Other works of 1513. Albert of Saxony, p. 9, c. 1478; Ciruelo, p. 60, 1495; Gyraldus, p. 254, 1553; Licht, p. 70, 1500; Peurbach, p. 53, 1492; Johann Karl von Landshut (Lanzut), 'Algorithmus linealis,' Cracow, with editions, ib., 1515, 1519, 4° (see p. 83, 1504).

JOANNES MARTINUS BLASIUS, Villagarcienſis.

Ed. pr. 1513.

Paris, 1519.

See p. 95.

ORONTIUS FINÆUS, editor. See p. 160.

Title. 'Arithmetica // Ioannis // Martini, Scili//cci, in the-
oricen, et praxim // fciffa, nuper ab Orontio Fine, Del//phinate,
fumma diligētia caſtigata, lon//geq; caſtigatius q̄ prius, ipſo
curā//te impreſſa: omni hominū // conditioni perq̄ // vtilis, //
& neceſſaria. // Virefcit vulnere virtus.' Surrounded by an elab-
orate woodcut, with the following on four ſides: 'Emiſſa ex

officina Henrici Stephani, e regione // scholae Decretorum Com-
morantis, // vbi et vaenalis reperitur. // Parisiis anno Christi.
1519.)' (F. 1, r.)

Description. Large 8°, 20.3 × 28.1 cm., the text being 13.3 ×
20 cm. 64 ff. numb., 52 ll. Paris, 1519.

Editions. See p. 97.

The first half of this rare work, not found in the 1513 edition, is one of the best exponents of the Boethian arithmetic of the time. Finaeus, the editor, refers to the author's work in these words: 'Hanc Ioanes Martinus, Sciliceus, Hispanus, vir Mathematicarum peritus, nostra tēpestate Parisijs edidit.' The author shows a good knowledge of the ancient writers, mentioning particularly Pythagoras, Nicomachus, Euclid, Apuleius, and Boethius, together with Jordanus, Faber Stapulensis, and Clichtoveus. The distinctive superiority of this part of the work lies in the clearness and arrangement of the illustrations of the various classes of numbers defined. The theory of numbers ends on f. 24, v., the practical part beginning on f. 25, v. Among the most noteworthy features of this half of the work is a 'Tabula multiplicationis et divisionis' with all products to 50 × 50.

RAGGIUS FLORENTINUS. Ed. pr. 1514. Florence, 1520.

A Florentine mathematician of the fifteenth century.

¶ In hoc opusculo hec continentur.

Title. See Fig.
54.

¶ Quid sit proportio & quorū species

Colophon. '¶ Im-
preffum Florētiæ
Bernardum Zuc-
chettā // Anno.
M.D.XX. Ianua-
rij. XV.' (F. 11, v.)

**¶ Quo intellectu compositio & diuisio proportionum
accipiatur & male opinantium confutationes**

Description. 4°

¶ Que maior minorue proportio dicenda sit

13.4 × 20.1 cm.,
the text being 9.2

¶ Quid propinquitās & remotio

× 15 cm. 11 ff.
unnumb., 34-37 ll.

¶ Confutationes argumentorum calculatoris

Florence, 1520.

FIG. 54. TITLE PAGE OF RAGGIUS

Editions. Florence, 1514, 4°; ib., 1520, 4° (here described).

This work consists of a theoretical treatment of proportion. While partly arithmetical, this treatment relates to the fundamental theory, and is equally applicable to geometry. The book is dedicated to the illustrious Giovanni Salviati, uncle of Cosimo I, Grand Duke of Tuscany.

GUILLIELMUS BUDAEUS. Ed. pr. 1514. Florence, 1562.

GUILLAUME BUDÉ. Born at Paris in 1467; died at Paris, August 23, 1540. Son of Jean Budé, grand audiercer of France. He became secretary to Louis XII, master of requests to François I, royal librarian, and ambassador to Leo X. He was a man of great erudition, and was instrumental in founding the Collège de France.

Title. 'Trattato // delle Monete // e Valvta loro, // Ridotte dal coftume antico, all'vfo mo-//derno, Di M. Guglielmo // Bvdeo. // Tradotto per M. Giouan Bernardo // Gualandi Fiorentino. // In Fiorenza; // Apresso I Givnti // MDLXII. // Con licenza, & Priuilegio.' (P. 1.)

Colophon. 'In Fiorenza apreffo gli heredi di // Bernardo Giunti // 1562.' (P. 318.)

Description. 8°, 10.5 × 17.2 cm., the text being 6.8 × 13.1 cm. 8 pp. unnumb. + 3 blank + 309 numb. = 320 pp., uncut, 28 ll. Florence, 1562.

Editions. The dedicatory epistle is dated 'Da. Viterbo il xxx. d'Agofto. MDLXI,' so that this is the first (as it is the only) edition of Gualandi's translation of Budaeus. I have not compared it with the 'Libri de asse et partibus ejus,' Paris, 1514; second edition, Venice, Aldus, 1522. Although on the title page it is called a translation, the various books, six in number, begin 'Trattato delle // Monete // di M. Gio. Bernardo // Gualandi Cittadino // Fiorentino,' leading to the belief that it may have been rewritten by Gualandi.

This treatise is purely historical, describing in a prolix manner the ancient measures, a subject of interest to arithmeticians in the sixteenth century on account of the great number of tables of denominate numbers in use in Italy, France, and Germany.

There was also a work by Budaeus entitled 'Minervæ Aragoniæ Assis Budeani supputatio compendiaia ad monetam ponderaque et mensuras Hispaniæ nostre,' etc., published at Saragossa in 1536, 8°.

JOHANN BÖSCHENSTEYN.

Ed. pr. 1514.

Augsburg, 1514.

BESCHENSTEIN, BOESCHENSTAIN, BOSENSTEIN, BOECHSENTEIN, BUCHSENSTEIN, POSCHENSTEIN, BESENTINUS, etc. Born at Esslingen, Swabia, in 1472; died in 1532. He taught Hebrew at the universities of Ingolstadt and Heidelberg, and also at Antwerp and Nürnberg. Luther and Melancthon were among his pupils.

Title. See Fig. 55.

Colophon. 'Getruckt in der Kayserlichen ftat Augfpurg durch // Erhart ôglin Anno 1514 Jar.' (F. 24, r.)

Description. 4°, 14.4 × 19.2 cm., the text being 8.9 × 14.8 cm. 24 ff. unnumb., 30 ll. Augsburg, 1514.

Editions. Augsburg, 1514, 4° (here described); ib., 1516; ib., 1518. Böschensteyn is also said to have published at Augsburg in 1514 'Ein New geordnet Rechenbüchlein auf den linien mit Rechenpfennigen,' 4°, but this is doubtless Köbel's work (p. 102).

This is one of the more interesting of the early German arithmetics. It is mercantile in character, and presents in condensed form the essentials of business arithmetic. Among the peculiarities of the book is the use of 'figures' for 'species.' Böschensteyn gives seven of these fundamental operations: 'Das scind nun die Siben figuren,' 'Die Erft figur Numeratio,' 'Die Ander figur Additio,' etc. He includes Duplatio and Mediatio, and he checks all of his work by casting out nines. His applications are chiefly in the 'Regula de Try,' partnership, and 'Regula Fufti' (where he gives his rule in verse).

JAKOB KÖBEL. Ed. pr. 1514.

Augsburg, 1514.

KOBEL, KOBELIUS, KOBILINUS. Born at Heidelberg in 1470; died at Oppenheim, January 31, 1533. He studied at Cracow, where Copernicus was his fellow-student. He was a man of varied attainments, meeting with success as a Rechenmeister, printer, engraver, woodcarver, poet, and public official.

Title. See Fig. 56.

Colophon. 'Getruckt tzû Augfpurg durch Erhart ôglin.// Anno M.D.XIII.' (F. XXIII, r.)

Description. 4°, 13.7 × 18.9 cm., the text being 9 × 15 cm. 6 ff. unnumb. + 24 numb. (in Roman) = 30 ff., 30-35 ll. Augsburg, 1514.

Ein New geordnet Rech
 en buchlin mit den ziffern
 den angenden schülern zu nutz In
 haltet die Siben species Algorith-
 mi mit sampt der Regel de Try/vnd sechs regeln d
 prich/vñ der regel Justi mit vil andern guten fras
 gen den kindern zum anfang nützlich durch
 Joann Böschensteyn von Esslingen priester
 neulich auß gangen vnd geordnet.



FIG. 55. TITLE PAGE OF THE 1514 BÖSCHENSTEYN

Editions. Köbel's Rechenbuch appeared under such varied titles and in such different combinations with his other books that it is difficult to say whether a given edition is a new work or merely a revision. It will aid the student if he recognizes in the first place that Köbel wrote three distinct books, (1) the 'Rechenbüchlein,' (2) 'Mit der Kryden,' (3) the 'Vysierbuch.' The 'Rechenbüchlein' first appeared at Augsburg in 1514, 4°; the 'Vysierbuch,' a treatise on gauging, at Oppenheim, s. a. (1515); and 'Mit der Kryden' at Oppenheim in 1520.

When the 1518 edition of the Rechenbüchlein (p. 108) appeared the title was changed, and a few pages were slightly altered. The 1531 edition (p. 108), however, shows many changes, certain chapters being entirely rewritten, and others considerably expanded. Although bearing a similar title, this might with some justice be called a different treatise; and yet it is so manifestly a revision of the 1514 work that it may more properly be classed as a new edition.

The three books were sometimes published as one and sometimes separately. The following list of editions is, therefore, probably incomplete, and it should be understood that any book mentioned may have been published with some other one.

Editions of the Rechenbüchlein: Augsburg, 1514, 4° (p. 100); Oppenheim, 1514, 4° (p. 106); *ib.*, s. a. (c. 1515); Augsburg, 1516, 4°; 1517, 4°; Oppenheim, 1518, 4° (p. 108); 'zũm Dritte male gebeffert,' and hence the third revision, although at least the sixth edition); two other editions before 1520 (Unger); Oppenheim, 1522, 8°; *ib.*, 1525, 12°; Frankfort, 1527, 8°; *ib.*, 1531, 8° (p. 108); Oppenheim, 1531; *ib.*, 1532; *ib.*, 1535; Frankfort, 1537, 8° (p. 110); *ib.*, 1544, 8°; *ib.*, 1549; *ib.*, 1564 (p. 111); *ib.*, 1573; 1575; Frankfort, 1584, 8°.

Editions of 'Mit der Krydē od' Schreibfedern/ durch die zeitferal zu rechē // Ein neüw Rechēpüchlein/ den angenden Schülern d' rechnüg zu erē getruckt': Oppenheim, 1520; Frankfort, 1537, 8° (p. 110); probably included in various other editions of the Rechenbüchlein.

**Ein New geordnet Rech
 enbiechlin auf den linien
 mit Rechen pfeninggen: Den
 Jungen angenden zu heis
 lichem gebrauch vnd hend
 eln leychtlich zu lernen
 mit figuren vnd exempel
 Volgethernach klär
 lichen angezaigt.**



FIG. 56. TITLE PAGE OF KÖBEL'S *Rechenbiechlin* (1514)



55	LV	50	XC	4000	IIII ^{ab}
56	LVI	91	XCI	5000	V ^{ab}
57	LVII	92	XCII	6000	VI ^{ab}
58	LVIII	93	XCIII	7000	VII ^{ab}
59	LIX	94	XCIII	8000	VIII ^{ab}
60	LX	95	XCV	9000	IX ^{ab}
61	LXI	96	XCVI	10000	X ^{ab}
62	LXII	97	XCVII	20000	XX ^{ab}
63	LXIII	98	XCVIII	30000	XXX ^{ab}
64	LXIII	99	XCIX	1400	M CCCC
65	LXV	100	C		M III ^c
66	LXVI	101	CI	1500	M VC
67	LXVII	102	CII		M D
68	LXVIII	103	CIII	1514	M VC XIII
69	LXIX	104	CIII	1600	M DC
70	LXX	105	CV		M VIC
71	LXXI	106	CVI	1612	M VIC X II
72	LXXII	107	CVII	1700	M DCC
73	LXXIII	108	CVIII		M VII ^c
74	LXXIII	109	CIX	1715	M VII ^c XV
75	LXXV	110	CX	1800	M DCCC
76	LXXVI	111	CXI		M VIII ^c
77	LXXVII	112	CXII	1820	M VIII ^c XX
78	LXXVIII	112	CXIII ^{2c}	1500	M VIII ^c
79	LXXXIX	200	CC		
80	LXXX	300	CCC		
81	LXXXI	400	CCCC		
82	LXXXII	500	VC		Dem nach mag stu die
83	LXXXIII	600	VIC		bayde zale durch ain
84	LXXXIII	700	VII ^c		ander lernen erkennen
85	LXXXV	800	VIII ^c		und rechen.
86	LXXXVI	900	IX ^c		
87	LXXXVI	1000	I		
88	LXXXVIII	2000	II ^{ab}		
89	LXXXIX	3000	III ^{ab}		

FIG. 57. A PAGE FROM KÖBEL'S *Rechenbuechlin* (1514)

bedeut diß figur der selben tayl ains .

I Dieße figur ist vn̄ bedēit ain fiertel von ainez
III ganzen/also mag man auch ain fünfftail/ayn
 sechstail/ain sybentail oder zwai sechstail 2c. vnd alle
 ander brüch beschreiben/Als $\frac{1}{V}$ | $\frac{1}{VI}$ | $\frac{1}{VII}$ | $\frac{1}{VIII}$ 2c.

VI Diß sein Sechs achtail/das sein sechstail der
VIII acht ain gantz machen .

IX Diß Figur bezaigt ann newen ayilfftail das seyn
XI IX tail/der XI ain gantz machen .

XX Diß Figur bezaichet/zwenzigt ainundreyß
XXXI sigt tail /das sein zwenzigt tail .der ains
 undreißigt ain gantz machen .

II^C Diß sein zwaiahundert tail/der Fierhun
IIIC.LX dert vnd sechzig ain gantz machen .

Auß den obgeschriben Figuren/vn̄ Exempeln magstu
 leichtlich lernen all brüch/die dir in deinen rechen für
 kommen/wie du die. versteen/anschreiben vnn̄ auß
 sprechen solt/Vnd wil dir nün hyernach orden / vnn̄
 setzen etlich Regeln/Fragen/vnn̄ Exempel in gebro
 chen zalen/wie man die durch die Regel Try rechen
 vnd aufflösen solle.

Die Erst Regel So dir ain

frag fürkombt/in deren die erst zale geprochen ist/ vnd
 die mittel vnd leste zale gantz pleiben/ So mustu die
 erst zale auch brechen/in den brüch der bey ir geschri
 ben stet Des gleichen müstu die leste zal auch brechen
 durch den selben brüch vnd geschicht das auß d̄ vrsach
 dye weyl alweg dye erst vnn̄ leste zale in bedēitniß
 gleich sein sollen/vnn̄ so das also geschicht/So solt

Editions of the 'Vysierbuch': Oppenheim, s. a. (1515), 4° (p. 113); Frankfurt, 1527; ib., 1531, 8° (p. 108); Oppenheim, 1531; ib., 1532; s. l., 1584; probably included in various other editions of the Rechenbüchlein (p. 111, 1564).

This is the first edition of this well-known arithmetic. As already stated, the title was occasionally changed, but the work was essentially but little altered. It is a purely commercial book, with all of the operations performed by counters as was still the custom of the time in most parts of Germany. Köbel treats of the rule of three ('die Gulden Regel, die von dem Walen de Try genant wirt'), partnership, reduction, inheritances, and exchange. The fundamental operations include progressions, and Roman numerals are used except in the section on notation (Fig. 57). Köbel makes a curious use of the Arabic method of writing fractions, the terms being written in Roman, as in the case of

$$\frac{\text{IIC}}{\text{IIIC} \cdot \text{LX}} \quad \text{for} \quad \frac{200}{460} \quad (\text{see Fig. 58}).$$

Altogether, Köbel was a vigorous writer, and his Gothic style shows him to have been no more a follower of the Italian arithmeticians than Dürer and Holbein were of the Italian artists.

Other works of 1514. Boethius, p. 27, 1488; Grammateus, p. 123; Jordanus, p. 65, 1496; Stromer, p. 83, 1504; Torrentini, p. 76, 1501; Hermannus Buschius, 'Algorithmus linealis Proiectiliū: de itegris perpulchris Arithmetice artis regulis: earundemque probationibus claris exornatus,' Vienna, 4°, 4 ff. (also catalogued as anonymous, and as written by Johannes Cusanus; see p. 43, c. 1490, for Nicolaus Cusa; see also p. 86, 1505). There was also published c. 1514 an anonymous work entitled 'Arithmetice practicæ Tractatus qui dicitur Algorismus, cum additionibus utiliter adjunctis,' Paris, 4°.

JAKOB KÖBEL. Ed. pr. 1514.

Oppenheim, 1514.

See p. 100.

Title. The title page is missing. Fol. A ij begins: 'Dem Erneuesten Dietherichen // Remerer von Wormbs:genant von Dalburgk: // meinen befundern günstigen lieben Junck-//herzen/ Eubeütich Jacob Köbel //dieffer zeit Statfchreiber zû Op-//penheim/ mein willig dinft // allerzeyt bereydt // zû vor.'

Colophon. 'Getrückt zû Oppenheym.// Anno. 2 c M.CCCCC. XIII.' (F. no. XXIII. See Fig. 59.)

dreien gelen/vnd w3 ym über drey überig bleybt/ das
 heiß dir sagen/vnd schreib es eygentlich auff/ 77och
 dem heiß yn das selb sein gelt noch ein mal gewißlich
 mit fünfen gelen/vñ was ym als dan aber male über
 fünff über bleib/heiß dir auch sagen/d3 schreib aber
 auff/ Zum Letzen/heiß dir dasselbig gelt widerumb
 mit syben zelen/vnd was ym als dan abermale über/
 bleib schreib auch vff/ So d3 also gewyß volbracht
 wirt/so lüg wie viel zum ersten über drey überblyben
 ist/ Finstu dan .i. überigt/ so lege vff die linien LXX.
 Findestu aber .n. so lege dar für vff die linien CXL.
 Findestu gerad iij. überigt/ so lege vff die linien CCX.
 Dar nach lüg was noch dez andern gelē mit fünffen
 über blyben ist. Vnd als manich mal als du eins fin-
 dest/ als oft leg XXI. vff die linien. Zum dritten hab
 acht/ wie viel einiger gale noch syben überblyben ist/
 so du das weißt soltu alweg vor ans XV. vff die linien
 legen/ So das also volbracht so thu die drey gale zu
 sammen/ in ein Sum/vnd was darauß wirt/ douon
 soltu als dick du kanst hundert vnd funfzehen douon
 zyhen/was als dan am lestē überbleib/ so viel ist der
 Sum des gelts gewesen d3 der in seynē seckel gehabt
 hat/vnd ist recht gemacht.

Also wil ich dießem Rechen-
 büchlein/ meinem verheiß noch/ genüg gethon/vnd
 ein Ende geben/vñ so ich empfind mich do mit icht
 nüg geschafft haben/wil ich kunstiglich mit gottes
 vnd der Hochgeleertē hilff d3 meren vnd bessern/auch
 von Dyfieren/Veld zu messen/2c/vnd andere notturf-
 tige ding dē leyen zu heroslichem gebrauch Tolmet-
 schen/vnd auß der Arismetrick vnd Geometrei offen-
 baren.

Getrückt zu Oppenheym.
Anno. 2c M. CCCCC. XIII.

FIG. 59. LAST PAGE OF KÖBEL'S *Rechenbüchlin* (OPPENHEIM, 1514)

Description. 4°, 14.1 × 19.6 cm., the text being 9.2 × 15.8 cm. 5 ff. unnumb. + 24 numb. = 29 ff., 28–34 ll. Oppenheim, 1514.

See p. 106. It is a curious fact that the first and second editions should have appeared in the same year at two different places.

JAKOB KÖBEL. Ed. pr. 1514. Oppenheim, 1518.

See p. 100.

Title. See Fig. 60.


Colophon. 'Alfo Endet sich Seliglich d' Drit // Trüch dif; Rechenbüchleins/ Zü Oppenheym zûfam//men gefegt/ vnd volendt vff Dinftag des Hey//ligen Crüg Erhöhungs tag.// Anno dñi .1518.' (F. XLVI, r.)

Description. 4°, 13.7 × 18.4 cm., the text being 9.2 × 14.8 cm. 4 ff. unnumb. + 46 numb. (I to XLVI) = 50 ff., 32–33 ll. Oppenheim, 1518.

See p. 106.

JAKOB KÖBEL. Ed. pr. 1514. Frankfort, 1531.

See p. 100.

Title. 'Ein new geor//denet Künftlich Rechenbüchlin/ Ja-//cob Kõbels/ Stattfchreiber zû Oppen-//heim/ Auff den Linien vnd Spacien/ mit Rech-//enpfeñigen. Den angehenden Schülern Rech-//nens gantz leichtlich zû lernen. Vnd zû Kellerei//en Ampten/ Kauffmanfchafften/ vnd Kräme-//reien dienlich vnd bräuchlich. Mit vilen erklä-//rungen/ Leren/ Regeln vnd Exempln.//  Mehr dan vormalß ic getruckt/ //gebeffert/ vnd zûgefetzt.// Im Jare M. D. XXXI.// Vifir Büchlin//Den Jungen/ angehenden// Leijfchen Vifirern gantz leichtlich zû lernen// verftehn vnd Rechnen. Wie mañ ein // Vifirrut machen/vnnd damit ein // iedes vafz vifirenn/ folle Zü //ende difes Rechenbüch-//lins angehenckt.' (F. 1, r.)

Colophon. 'Getruckt zû Franckenfurt/ am Mein. In Ver// lag vnnd Gemeynfchafft des Ernhaftetnn // vnd Fürnemen Herrn Jacoben Kõ-//bels/ Stattfchreiber zû Oppen-//heim. Bei Chriftian Ege-//nolffen. Im Mertzen// Nach der geburt // Chrifti. // M.D.XXXI. Jar.' (F. CXII, r.)

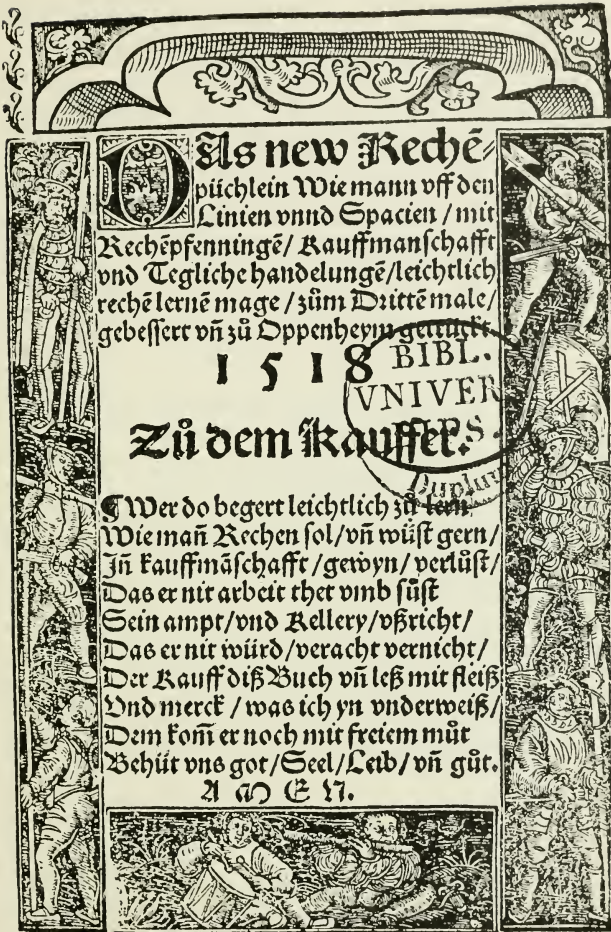


FIG. 60. TITLE PAGE OF KÖBEL'S *Rechēpüchlein* (1518).

Description. 8°, 9.7 × 14.9 cm., the text being 6.9 × 11.5 cm. 112 ff. numb. in Roman, 28–29 ll. Frankfort, 1531.

Editions. See p. 102.

It is often stated that the 'Jacob's staff' used by surveyors was first described by Köbel in this year (1531) and that it received its name in his honor. The name was old before this time, however, as applied to some form of surveying instrument, for in the *Margarita Philosophica* (1503, Bk. VI, tract. II) is a conversation between a master and his disciple, in which it is mentioned: 'MAG. baculo quē Iacob dicunt. DIS. Qualis is est baculus?' The master thereupon describes the instrument, and a picture of it is given.

JAKOB KÖBEL. Ed. pr. 1514.

Frankfort, 1537.

See p. 100.

Title. 'Zwey rech-//enbüchlin: vff der // Linien vnd Zippher/
Mit eym angehenck-//ten Vifirbuch/fo verftendtllich für//geben/
das iedem hieraufz on // eiñ lerer wol zulernen.// ¶ Durch den
Achtbarn vnd wol erfahren // H. Jacoben Köbel Stattfchreiber
// zu Oppenheim.// Franc. Chrif. Egen.' (F. 1, r.)

Colophon. 'Ende/ Im Iar M.D.XXXVII.' (F. numb. 144, r.)

Description. 8°, 9.5 × 15 cm., the text being 7.1 × 11.9 cm. 8 ff. unnumb. + 9–144 numb. = 144 ff., 30 ll. Frankfort, 1537.

Editions. See p. 102.

This is the earliest of Mr. Plimpton's copies containing the three books written by Köbel, (1) 'Rechenbüchlein,' (2) 'Mit der Krydē,' (3) the 'Vysierbuch.' The combination of the three in a single volume formed one of the best books of the time, giving the operations both with counters and according to algorism. The latter is given in the part entitled 'Mit der kreiden // odder fchreibfederen/ durch // die zifferzal zu rechen/ Ein new Rechen-//büchlin/ den angehenden fchülern der // rechnung zu eren getruckt.' (F. 106.) In this work Köbel also includes the usual business problems of the period and the chapter on the calendar required by the Church schools. An unusually complete treatment of gauging is given in the part entitled 'Eyn new Vifir // Büchlin/den Leyen/ zu // leichtem vnd begreiflichem verftandt // verordnet/ Durch H. Jacob // Köbel Stattfchreiber zu // Oppenheim.' (F. 95, r.) It is much more complete than the 1514 edition of the 'Rechenbüchlein' (see p. 106), and is substantially the same as the

1531 edition (see p. 108) except that it contains the third part, 'Mit der Kreiden,' which the latter does not.

The Hindu-Arabic numerals were still considered difficult ('den die Zifer zal am erften zulernen schwere,' f. 9, v.), and teachers still felt it better to begin with the common Roman characters ('wil ich züm erften die selb Teutſche zal . . . hie anzeygen vñ erkleren').

JAKOB KÖBEL. Ed. pr. 1514.

Frankfort, 1564.

See p. 100.

Title. 'Rechenbüch/
// Auff Linien vnd Ziffern.
// Mit einem Vifir büchlin/
Klar // vnd verftdntlich
fürgeben. // Gerechnet
Büchlin/ auff alle // Wahr
vnd Kauffmanſchafft /
Müntz/ // Gewicht/ Elen/
vnd Maß/ viler Land //
vnd Stett verglichen.//
Durch H. Jacob Köbel. //
(Woodcut.) Cum Gratia &
Priuilegio.// Franckfurt/
Bei Chr. Egen. Erben //
M. D. LXIII.' (F. 1, r.)

Colophon. 'Getruckt zu
Franckfurt // am Mayn
bey Christian E.//genolffs
Erben.// M. D. LXIII.'
(F. 194, v.)

Description. 8°, 9.1 ×
15.2 cm., the text being
6.3 × 12.2 cm. 12 ff.
unnumb. + 194 numb. =
206 ff., 28-29 ll. Frank-
fort, 1564. (There were

Von verkerten fragen. 57
acht heft/ vñnd ihm also nachkompt/wie
ſtu leichtlich lernien rechnen/ alles das dir in
g: meinem kauffen vnd verkauffen ſich kom
met in ganzen zalen.

¶ Ein ander Exempel.



Ein Frau oder Hausmutter gehet auff
den markt/ kaufft vberhaupt ein Körblin
mit Rebnerbyrn/darumb gibet sie achtzehn
pfenning / so sie heim kompt / findet sie im
Körblin hundert vnd achtzig byrn / Ist die
frag/wie vil byren sie vmb ein pfenning ha
be? Thu/als ob gelert/ so kompt dir zehen/
Also vil byren hat sie vmb einen pfen
ning / Vnd ist wolſeyl
drumb.

¶ Ein anders/von Hertingen.

Ein Büchlenmeyster geht an einem Seckel
J v

FIG. 61. FROM KÖBEL'S *Rechenbuch* (1564)

at least eight Frankfort editions, of

which this is the sixth.)

Editions. See p. 102.

The first 165 ff. are the same as in the 1537 edition (see p. 110). The rest of the book is not found in the 1537 edition, or in any other edition in the Plimpton library. It consists of a description of foreign and domestic money, with numerous illustrations of coins. This begins

Von Wandern.

¶ Von wandern vber Landt.



¶ Wen Bürger auß Oppenheim/ Einer
Sohn Heynrich/ der ander Conz vō Tre-
ber genant/ wolten mit einander gen Rom
gehen/ Vnd Heynrich was alt / vnd mocht
einen tag nicht mehr denn zehen meilen ge-
hen/ Aber Conz von Treber was jung vnd
starck/ der mocht einen tag 13. meilen gehen/
Deshalben gieng Sohn Heynrich neun tag
che auß Oppenheim denn Conz von Tre-
ber / Also war Sohn Heynrich Conzen 90.
meilen fargangen/ che Conz angehabē hat
aufzugehen.

Nun ist die frag / in wie vil tagen Conz
von Treber Sohn Heynrichen vbergangen/
vnd die zwen zusamen kommen seind?

Die vnd dergleichen frag wirstu also ent-
scheiden. Zum ersten leg die meilen/ die Sohn
Heynrich Conzen fargangen ist/ das seind
90. meilen/ vff dein Rechenbanck/ Vnd n. iii
dann die meilen/ die Conrat einen tag mehr
hat

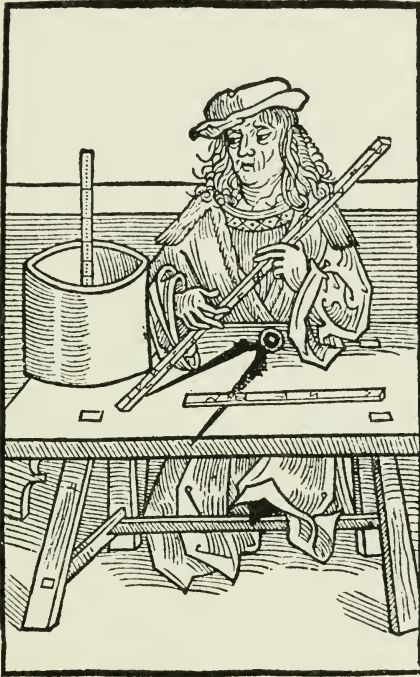
FIG. 62. FROM KÖBEL'S *Rechenbuch* (1564)

(f. 165, r.): 'Von Fremdben vnd Hie//ländischen Müntzen/ So diser zeit
in // Teutsch vnnnd Welschen landen/ inn aller // Kauffmanschafft vnd
Gewerb/ Händeln/ //viler Land art im brauch/ geng/ gibig oder // ver-
ruffen Müntzen/ . . .' The book closes (f. 184, v.) with a set of tables
and (f. 192, v.) a 'Register.'

JAKOB KÖBEL. Ed. pr. 1515. Oppenheim, s. a. (1515).

See p. 100.

Title. 'Eyn New geordēt // Vyfirbüch. Helt yñ.// Wie māñ
vff eins yden Lands Eych // vñ Mafz/ ein gerecht Vyfirüt machē



Getruckt zu Oppenheym

FIG. 63. LAST PAGE OF KÖBEL'S *Vysirbüch* (1515)

// vñ do mit ein ygklich onbekant Vafz // vyfieren/ auch feynen
inhalt erlernen // folle. Den anhebenden Schülern Vi//frens

Leichtlich/ mit Figuren vnnd // Exempeln/ zů lernen/ angezeigt.
 // Angehengt Tafeln. // Die Erften Fyer halten yñ gerechet/
 // fo eyn Fůder weins kaufft wirt/ vmb // Guldē zu XXVI. Od'
 XXIII. A 1b. 2c. // Was die Ome/ das Fyrtel/ vnnd die Mafz
 gelten. // Die Andern Tafeln/ Zeygē an/ Ver// anderūg vñ wech-
 felūg einer Můntz // durch die ander/ als §. in 1b. 2c. // Ge-
 druckt zu Oppenheim.' (F. 1, r.)

Colophon. 'Gedruckt zu Oppenheim.' (F. 32, v. See Fig. 63.)

Description. 4°, 14.4 × 19.7 cm., the text being 9.4 × 14.5 cm. 4 ff. unnumb. + 28 numb. = 32 ff., 30–32 ll. Oppenheim, s. a. (1515). There is no date on the title page nor in the colophon, but the prefatory statement closes with the words, 'Volnendet vff dornftag noch Letare. Anno & c. 1515.'

Editions. See p. 106.

The work is semiarithmetical, quite as much so as the chapters on mensuration in our textbooks; chapters, indeed, which owe their origin in no small degree to these treatises on gauging so often appended to the old arithmetics. This work is illustrated with quaint woodcuts showing the use of the 'Vyfirftab' or gauging measure. (See Fig. 63.)

GIROLAMO AND GIANNANTONIO TAGLIENTE.

Ed. pr. 1515.

s. l. (Venice), 1525.

Venetian arithmeticians of c. 1500.

Title. 'Opera che // insegna // A fare ogni Ragione // de Mercātia // et a pertegare le Terre // Con arte geometrical // Intitolata Componimēto // di arithmetica // Con grati^a & preuilegio // M. D. XXV.' (F. 1, r.)

Description. 8°, 10.3 × 15.1 cm., the text being 7.5 × 12.5 cm. 91 ff., 28–33 ll. S. l. (Venice), 1525.

Editions. Venice, 1515, 8° (De Morgan having erred in saying 'apparently before 1500'); ib., 1520; ib., 1523, 8°; ib. (s. l.), 1525, 8° (here described); ib., 1526; ib., 1527; ib., 1528, 4°; s. a. (1530?), 8°; Venice, 1541; Milan, 1541, 8° (p. 115); s. l., 1547, 8°; Milan, 1548; Venice, 1548 (with probably a second Venetian edition, 1548, under the title 'Thesoro universale de abacho,' by 'lucha ātonio de Uberti,' 8°); ib., 1550; ib., 1554; ib.,

1557; ib., 1561; ib., 1564; ib., 1567; ib., 1570; Milan, 1570; ib., 1576; ib., 1579; ib., 1586. Riccardi also mentions eleven other editions, s.a., and four such appeared in the Boncompagni sale, and four in the Fisher sale of 1906. The work also appeared, and is frequently catalogued, without the authors' names.

These various editions have been the object of critical study by E. A. Cicogna and Prince Boncompagni. The former set forth his results in his *Saggio di bibliografia Veneziana*, Venice, 1847, p. 218, ascribing the work to Girolamo Tagliente 'con l'ajuto del suo consanguineo Giannantonio Tagliente.' In the edition of 1525, here described, only the former name appears, the text beginning, 'Al benigno lettore // Hieronymo Tagliente.' Boncompagni's investigations, setting forth the differences in the various editions, appeared in the *Atti dell' Accademia Pontif. de' Nuovi Lincei*, XVI, 139, 147, 155, 304. See also Riccardi, I, 2, 484, and Boncompagni's *Buletino*, XIII, 247.

There was also a treatise published by the Taglientes entitled 'Regole di mercatura intitolato componimento di arithmetica,' Venice, 1524, 8°, probably another edition of this work. See also the treatise on bookkeeping mentioned on p. 141, 1525.

The book opens with a brief treatment of notation and finger symbols. Then follow in order the multiplication table, the proof of sevens, various methods of multiplication, division by the galley method, addition chiefly of denominate numbers, subtraction, the operations with fractions in the same order, exchange, rule of three, and applied problems. There are numerous interesting woodcuts, and such familiar problems as those of the couriers, the testament, and the sale of eggs are given with illustrations. In spite of the arrangement of topics, there were few textbooks so influential as this in shaping the subsequent teaching of arithmetic.

GIROLAMO AND GIANNANTONIO TAGLIENTE.

Ed. pr. 1515.

Milan, 1541.

See p. 114.

Title. 'Libro // dabaco che in//segna a fare // ogni ragione mercadantile, & // pertegare le terre cō l'arte di // la Geometria, e altre no//bilissime raginoe ftra//ordinarie cō la Ta//riffa come

respon//deno li pefi & // Monede de molte terre del mon-//do con
la inclita citta di Vene//gia. Elquel Libro fe chiama //Thefauro
vniuerfale.' (F. 1, r.)

Colophon. 'Stampato in Milano per Io. Antonio da Borgho.//
Nell'anno del. M. D. XLI.' (F. 80, v.)

Description. 8°, 10 × 14.6 cm., the text being 7.7 × 12.3 cm.
80 ff. unnumb. + 7 blank = 87 ff., 23-30 ll. Milan, 1541.

Editions. See p. 114.

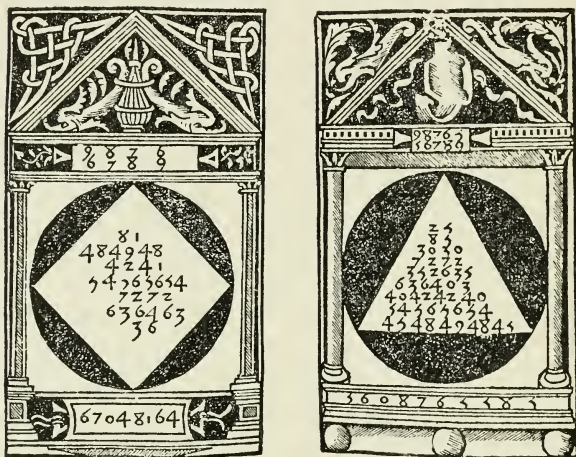


FIG. 64. FROM THE 1541 TAGLIENTE

This differs but little from the 1525 edition, the 'Opera che insegna' (see p. 114), except in having a set of tariff tables at the end: '«Qui comenza el terzo Libro di la fruttifera opera //chiamata la Tariffa' (f. K iii, v.). There is some slight change in the phraseology, particularly at the beginning of the various sections. For two curious forms of multiplication see Fig. 64. Such arrangements of the work in multiplication were quite common, particularly in the early Spanish and Italian arithmetics of the first half of the sixteenth century. That they should have found place in a popular mercantile treatise is, however, rather surprising.

VARIOUS AUTHORS. Ed. pr. 1515.

Vienna, 1515.

JOANNES DE MURIS (JEAN DE MEURS, MURS, MURIA) was born in Normandy, c. 1310; died after 1360. He wrote on arithmetic, astronomy, and music.

THOMAS BRADWARDIN. See p. 61.

NICOLAUS HOREM (NICOLAS ORESME) was born at Caen (?) c. 1323; died at Lisieux, July 11, 1382. He taught in the Collège de Navarre at Paris, and in 1377 became Bishop of Lisieux. He wrote also an 'Algorismus Proportionum,' in which the idea of fractional exponents first appears.

GEORG VON PEURBACH. See p. 53.

JOANNES DE GMUNDEN (JOHANN VON GMUNDEN, JOHANN WISSBIER? NYDEN? SCHINDEL? JOHANNES DE GAMUNDIA) was born c. 1380, at Gmunden on the Traunsee, or Gemünd in Lower Austria, or Gemünd in Swabia; died at Vienna, February 23, 1442. He was educated at Vienna, and taught there, being the first professor of mathematics alone in Austria.

Title. See Fig. 65.

Colophon. 'Impeffum Vienne per Joannem Singrenium // Expenfis vero Leonardi : Luce Alantfe // fratrum Anno domini .M.ccccc.xv.// Decimono die Maij.' (F. 54, r.)

Description. 4°, 14.3 × 18.4 cm., the text being 9.7 × 15.5 cm. (without the marginal references). 54 ff. unnumb., 26 ll. Vienna, 1515.

Editions. There is no other edition of this combination of works. See pp. 53, 61, 118, for the individual treatises.

This interesting work consists of five parts. The first is the arithmetic of Joannes de Muris. While it is called an extract from the arithmetic of Boethius, it is merely suggested by that treatise and is really the work of Muris. This part of the work begins on f. 2 with the following title: 'Incipit Arithmetica cōmunis ex // diui Seuerini Boetij Arithmetica per M. Joannem // de muris compendiofe excerpta. // Prohemium.' De Morgan (p. 3) mentions a possibly earlier edition, s. l. a., 4°. (See also p. 86, 1505.)

The second part of the volume begins on f. 17, v., and is the work on proportion by Thomas Bradwardin. It is a theoretical treatment of the subject, and has the following title: 'Tractatus breuis proportionū : ab-//breuiatus ex libro de Proportionibus. D. Thome // Braguardini Anglici.'

The third part begins on f. 27, v., and is a treatise by Nicolaus Horem, with the following title: 'Tractatus de Latitudinibus forma-//rum scdm doctrinā magiftri Nicolai Horem.' This subject attracted considerable attention in the latter part of the Middle Ages.

The fourth part is the algorism of Peurbach, and has the following title on f. 37, v.: 'Opusculū Magistri Georgij // Peurbachij doctif.' As already stated (p. 53), this work takes up the four fundamental operations and progressions, giving merely a theoretical discussion of the subject.

The fifth part (f. 44, v.) begins: 'Incipit tractatus de Minucij's phi-//ficis: compofitus Vienne Auftrie per magiftrum // Joannem de Gmunden.' This is the treatise of Gmunden on sexagesimal fractions, or, as they were called in the Middle Ages, physical fractions. These fractions, still used by us in our degrees (or hours), minutes, and seconds, served the purposes of the later decimal fractions. They were carried much farther than is now the case, a number like $3^{\circ} 15' 40'' 15''' 45^{IV}$ meaning merely $3 + \frac{15}{60} + \frac{40}{60^2} + \frac{15}{60^3} + \frac{45}{60^4}$, or $3 \frac{75221}{288000}$. The present symbolism ($^{\circ}$, $'$, $''$) is relatively modern.

The book is particularly interesting because it combines in one volume five well-known books by mediæval writers. In no other

Contenta in hoc libello.

Arithmetica communis.

Proportiones breues.

De latitudinibus formarum.

Algorismus M. Georgij Peurbachij in integris.

**Algorismus Magistri Joannis de Gmunden
de minucij's pbificis.**

FIG. 65. TITLE PAGE OF THE VIENNA WORK OF 1515

single volume could the inadequacy of the mediæval treatment of mathematics be better seen. Indeed, a manuscript of 1515, found by Gerhardt in the Wolfenbüttler Bibliothek, expressly states that the lectures on arithmetic given in the universities of that period were based on the above works of Muris, Bradwardin, Peurbach, and Joannes de Gmunden. (*Monatsberichte der K. P. Akad. d. Wissensch. zu Berlin*, 1867, p. 43.)

JOANNES DE MURIS. Ed. pr. 1515. Mainz, 1538.

See p. 117.

Title. 'Arithme//ticae specvlativae // Libri duo Ioannis de Muris ab in//numeris erroribus quibus hacte//nus corrupti, & uetustate fer//mè perierant diligen//ter emendati, // Pvlcherri-
mis qvoqve exemplis, Formisq; nouis declarati & in // ufum ftudiofæ iuuentutis Mogun-//tinæ iam reccens ex-//cufi. // Mo-
gvntiae excvdebat // Ivo Scoffer anno. // M. D. XXXVIII.'
(F. 1, r.)

Colophon. 'Mogvntiae excvdebat // Ivo Scheffer anno. // M. D. XXXVIII.' (F. 90, v.)

Description. 8°, 9.6 × 14.5 cm., the text being 6.6 × 11.9 cm. 4 pp. unnumb. + 3-88 numb. + 5 blank + 1 with woodcut = 96 pp. Mainz, 1538.

Editions. This is the second dated edition of the arithmetic of this popular mediæval teacher. (See p. 117.) It is more complete than the one of 1515, but it does not, like the latter, give the marginal references to Boethius, upon which it is so largely based. (See also Boethius, p. 27.)

See p. 117.

JOANNES FÆNISECA. Ed. pr. 1515. Augsburg, 1515.

An Augsburg teacher of c. 1500.

Title. See Fig. 66.

Colophon. 'Impreffa Auguſtę Vindelicorum/communibus im-
penfis Io/ //annis Miller atq; Ioannis fœnifeceę. Anno a natiuita
//te domini. M.D. XV. ad. IIII. Cal.' Maias.' (F. 20, r.)

Description. 4°, 15.1 × 21 cm., the text being 11 × 13.8 cm. 20 ff. unnumb., 7-39 ll. Augsburg, 1515.

Editions. There was no other edition.

This is an extract from a larger volume, for the folios have been numbered by hand 40-59, and the register begins with 'aa i.' Only two pages (aa ii, v., and aa iii, r.) are devoted to 'Arithmetica,' and these relate only to the Boethian system. The rest of the book is devoted chiefly to geometric figures, the mediæval astronomy, and music. Such

a book shows the superficiality and general emptiness of the work of the schools that were supposed to stand for culture in the period of the early Renaissance.



Opera Ioannis Foenisecae Augt.
hec in se habent.

Quadratum sapientię: continens in se septem
artes liberales veterum.

Circulos biblię .iiii. in quibus metaphysica
mosaica.

Commentaria horum.

Ad hęc libri rubrica inferius
signati: necessarii sunt.

	serino	{ Grammatica	don.alex.gua.lasca.Poetę
		{ Logica	
		{ Rhetorica	
		{ Monastica	
	εθου	{ Oeconomica	
	.i.mos	{ Politica	
		{ Alarithmus subalterrus	nouus
		{ Arithmetica	boetius
		{ Geometria	boetius
mathēatica		{ Perspectiua subalterna	perusiacobi
		{ Musica	boetius
		{ Astronomia	boetius ephemerides
		{ Geographia	ptolemęus Historię
		{ Phytica	
philosophia		{ Medicina subalterna	dioscorides
theologia		{ Metaphysica	biblum triplex
			aa i.

FIG. 66. TITLE PAGE OF FENISECA'S *Opera* (1515)

ANONYMOUS. Ed. pr. c. 1515. Leipzig, s. a. (c. 1515).

Title. 'Melchiar Lotthervs Ivnior candido lectori salutem.'
(Line 1.) 'Articularis Bedae presbyteri numerorū computatio.'
(Line 24.)

Description. One sheet, 28 × 36.4 cm., the text being 21.6 × 26.7 cm. 42 ll. Printed on one side of a single sheet.

Editions. There was no other edition, and only this copy is known of this one.

This broadside was published by Lotter c. 1515, and is a brief statement of the numerical finger-symbolism of the ancients, particularly as described by the Venerable Bede. The symbolism is practically the same as that described by such writers as Paciolo and Aventinus (see pp. 57 and 136.)

GASPAR LAX. Ed. pr. 1515. Paris, 1515.

Born at Sarriena, Spain, c. 1487; died at Saragossa, February 23, 1560. He taught at Paris and Saragossa. His only works are the two here described.

Title. See Plate III. 'Proportiones magiftri Gasparis // lax aragonensis de farinyena . . .' (F. 101, r. Separately catalogued, see below.)

Colophon. 'Explicit Arithmetica fpeculatiua Magiftri Gasparis Lax Aragonensis de Sarinyena duode//cim libris demonstrata. Impreffa Parifius opera ac characteribus Magiftri Nicolai de la barre.//Expensis honesti viri Hemundi le feure Bibliopole Parifius in vico diui Jacobi fub signo Crescē//tis albi vitam degentis. Anno Domini .1515. Die vero.13. Mensis Decembris.' (F. 100, v.)

Description. Fol., 19.8 × 26.5 cm., the text being 14.1 × 21.8 cm. 100 ff. unnumb., 59-61 ll. Paris, 1515.

Editions. There was no other edition.

A very prolix treatment of theoretical arithmetic, based on Boethius and his mediæval successors. As the title shows, Lax was a Spanish teacher, one of several from the southern peninsula who taught in the University of Paris in the fifteenth century. Among the others were Rollandus (originally from Lisbon, mentioned later in connection with the manuscripts) and Ciruelo (p. 58). All of the contributions of these scholars were of this general theoretical character. De Morgan facetiously remarks, 'For anything that appears the author (Lax) could not count as far as 100.'

GASPAR LAX. Ed. pr. 1515. Paris, 1515.

See above.

Title. 'Proportiones magiftri Gasparis //lax aragonensis de farinyena.//Venundatur Parifius In vico diui//Jacobi ab Emundo le feure fub fi-//gno crescentis albi vitam degente.' (F. 101, r.)

Colophon. 'Expliciunt proportiones Ma//giftri Gasparis Lax Aragonen//sis de Sarinyena impreffe Pa//rifius opera Magiftri Nicolai // de la barre pro Emundo le feure // Anno dñi M. d. xv. die vo vi. mē//fis Octobris.' (F. 26, 126 of the whole book, r.)

Description. Fol., 19.5 × 26.6 cm., printed in double columns, each being 7 × 21.5 cm. 26 ff. unnumb., 66 ll. Paris, 1515.

Editions. There was no other edition.

Bound with the 'Arithmetica Speculativa' (p. 121). This is a prolix treatment of mediæval ratios after the Boethian manner, and as such it ranks with works like those of Bradwardin (p. 61), Jordanus (p. 62), and Faber Stapulensis (p. 82).

Other works of 1515. Boethius, p. 27, 1488; Bradwardin, p. 61, 1495; Köbel, p. 102, 1514; Lanzut, pp. 83, 97, 1504, 1513; Licht, p. 70, 1500; Ortega, p. 93, 1512; Peurbach, p. 53, 1492; Torrentini, p. 76, 1501; Juan Andrés, 'Sumario breve de la practica de la arithmetica,' Valencia (from the book it appears that it was written in Saragossa in 1514; it was reprinted at Seville in 1537); V. Rodulphus Spoletanus, 'De proportione proportionvm dispvtatio,' Rome, 4°.

Works of 1516. Johann Böschensteyn, p. 100, 1514; Capella, p. 66, 1499; Ciruelo, p. 60, 1495; Köbel, p. 102, 1514; Stromer, p. 83, 1504; Widman, p. 36, c. 1488.

PIETRO MARIA BONINI. Ed. pr. 1517. Florence, 1517.

A Florentine writer of the first half of the sixteenth century.

Title. 'Lvcidario darithmetica.' (Large woodcut. F. 3, r. Fig. 67.)

Colophon. '¶Impresso nella excelfa cipta di Firenze per // Gianftephano di Carlo da Pauia //adi 7 di Gennaio.' (F. 18, r.)

Description. 8°, 10.9 × 15.9 cm., the text being 8 × 12.7 cm. 19 ff. unnumb., 24 ll. Florence, 1517.

Editions. There was no other edition. This interesting volume was known to De Morgan only by hearsay when he wrote his *Arithmetical Books*. It came into his possession, however, after that work was published, as is shown by his autograph on the title page (see Fig. 67). It is not often mentioned by bibliographers, and is one of the rare books of the century. In the Boncompagni sale (no. 1441) there is mentioned



PLATE III. TITLE PAGE OF LAX



LIBRARY
OF THE
UNIVERSITY
OF
CALIFORNIA

an edition of 1547; but this is a misprint for 1517, as appears from Riccardi, vol. I, col. 153-4. Riccardi mentions only three copies known to him or to Boncompagni, but there was one in the Fisher sale (London, 1906).

The book is a small octavo, the first two-thirds being given to mercantile problems on exchange and the reduction of money. The last part treats exclusively of mensuration: 'Speculationi geometriche di piu sorte: & prima laquadratura del triangolo.'

Other works of 1517. Anonymous, 'Algorithmus linealis' (see Widman), p. 36, c. 1488; Borghi, p. 16, 1484; Feliciano, p. 146, 1526; Köbel, p. 102, 1514; Reisch, p. 82, 1503; Sacrobosco, p. 32, 1488; Widman, p. 36, c. 1488.

☞ LVCIDARIO DARITHMETICA.



FIG. 67. TITLE PAGE OF BONINI'S *Lucidario*

HENRICUS GRAMMATEUS.

Ed. pr. 1518.

Frankfort, 1535.

HEINRICH SCHREIBER; HENRICUS SCRIPTOR; Latinized Greek, GRAMMATEUS. Born at Erfurt, at least as early as 1496. He describes himself as 'Henrich Grammateus// von Erfurt/der sieben freien künften Meyfter.' He was a student at Cracow and at the University of Vienna (1507). The dates of his birth and death are unknown, but a record at Vienna reads: 'Anno domini millesimo quingentesimo septimo in festo sanctorum Tibureii et Valeriani martirum . . . Henricus Scriptoris de Erfordia.' He also taught at Vienna.

Title. See Fig. 68.

Description. 8°, 9.2 × 15.2 cm., the text being 6.7 × 11.3 cm. 96 ff. unnumb., 31 ll. Frankfort, 1535.

Editions. Vienna, 1518, 8°; Frankfort, 1535 (here described); s. l. (Frankfort), 1544; Frankfort, 1572.

Grammateus also published an 'Algorithmus proportionum una cum monochordi generis Dyatonici compositione . . .', Cracow, 1514, 4°; 'Libellus de compositione regularum provasorum mensuratione,' Vienna, 1518; 'Behend unnd khunstlich Rechnung nach der Regel und welhisch practic,' Nürnberg,

1521, 8°, an extract from the work here described; 'Algorismus de integris Regula de tri cum exemplis,' Erfurt, 1523; 'Eyn

Eyn new künstlich be-
hend vnd gewis Rechenbüch-
lin vff alle Rauffmanschafft.
Gemeynen Regeln de tre.
Welchen practic. Regeln falsi.
Etelichen Regeln Cofse.
Nach } Proportion des gesangs / in Diato-
nio außzurheylen monochoirdū / Or-
gelpfeiffen / vnd andie Instrumēt /
durch erfingung Pirhagore.
Büchhalten durch das Zornal / Baps vnd
Schuldbüch.
Vifir rüten zu machen durch den Qua-
drat / vnd Triangel / mit andern lustigen
stücken der Geometrei.
M. Henricus Grammateus.



FIG. 68. TITLE PAGE OF THE 1535 GRAMMATEUS

kurtz neue Rechenn unnd Visyrbuechleynn gemacht durch
Heinricum Schreyber,' Erfurt, 1523.

That the book was written at Vienna in 1518 appears by the dedi-
cation to 'Dem Edlen fürsichtigen weissen Johan//sen Tschertte einer

des Senats zu Wien,' which ends: 'Gebē // zu Wi//en in O-//sterreich im jar // nach der geburt vn-//fers Seligmachers. M. D. XVij.' In the chapter on bookkeeping is the date 1535, so that probably the work was revised for this edition.

¶ Additio.

Alhie sein zu addiren die quantitet eines namens/als *N.* mit *N.*: prima mit prima/secunda mit secūda/tertia mit tertia zc. Vnd mañ brauñhet solche zeichen als $+$ ist mehꝛ/vnd $-$ /minder/in welcher sein zu mercken drei Regel.

¶ Die Erst Regel.

Wann ein quantitet hat an beyden orten $+$ oder $-$ so sol manñ solche quantitet addiren hin zū gesagte das zeychen: $+$ oder $-$

als 9 pu.	$+$ 7 <i>N.</i>	6 pu.	$-$ 4 <i>N.</i>
6 pu.	$+$ 5 <i>N.</i>	8 pu.	$-$ 10 <i>N.</i>
facit 15 pu.	$+$ 12 <i>N.</i>	14 pu.	$-$ 14 <i>N.</i>

¶ Die ander Regel.

Ist in der dbern quantitet $+$ vnd in der vndern $-$ /vnd $+$ übertriffet $-$ /so sol die vnder quantitet von der dbern subtrahirt werden/vñ zu dem übrigen setz $+$ So aber die vnder quantitet ist grösser/so subtrahir die kleinern vñ der grössern/vñ zu dem das do bleit endt ist/setz $-$

als 6 pu.	$-$ 6 <i>N.</i>	4 pu.	$+$ 2 <i>N.</i>
12 pu.	$-$ 4 <i>N.</i>	6 pu.	$-$ 6 <i>N.</i>
18 pu.	$+$ 2 <i>N.</i>	10 pu.	$-$ 4 <i>N.</i>

¶ Die dritt Regel.

So in der obgesagten quantitet würt fundē $-$ vnd in der vndern $+$ /vnd $-$ übertriffet $+$ /so subtrahir eins von dem andern/vnd zum übrigen schreib $-$ Ist es aber/das die vnder quantitet übertriffet die dbern/so ziehe eins von dem andern/vnd zu dem ersten setz $+$ als

FIG. 69. FROM THE 1535 GRAMMATEUS

The work is for the most part a mercantile arithmetic, the operations being given according to both the abacists (with counters) and the algorists (by the Hindu-Arabic numerals), and a chapter on bookkeeping being appended. Grammateus gives, however, some consideration to the theory of numbers, the rules of the Coss (algebra), music,

bookkeeping, and gauging. In the treatment of the 'Regula falsi,' or rule of false position, the signs + and - are first found in this connection (f. E iij). (See Widman, p. 40, 1489, who uses them for another purpose, and Vander Hoecke, p. 183, 1537.) Grammateus also uses these signs in writing algebraic binomials, as shown in Fig. 69. It is interesting to know that Rudolff (p. 150) learned algebra from Grammateus, as he states in the following words: 'Ich hab von meister Heinrichen so Grammateus genennt / der Cofs anfengklichen bericht emphanngen. Sag im darumb danck.'

Other works of 1518. Böschensteyn, p. 100, 1514; Calandri, p. 48, 1491; Feliciano, p. 145, 1526; Köbel, p. 102, 1514; Riese, p. 139, 1522; Torrentini, p. 76, 1501; Pérez de Oliva, 'Dialogus in laudem Arithmeticae,' Paris.

ANONYMOUS. Ed. pr. 1519.

Venice, 1519.

Title. See Fig. 70.

Colophon. 'Venetijs in Edibus Petri Liechtenstein // Anno virginei partus .1519.' (F. 12, v.)

Description. 4°, 15.6 × 20.4 cm., the text being 10.1 × 16.3 cm. 12 ff. (1 blank), 33-38 ll. Venice, 1519.

**Cōputus nouus ⁊ ecclesiasticus: totius
fere Astronomie fundamentum pulcherrimum con-
tinens. Clerico non minus vtilis ꝫ neces-
sarius: cum additionibus quibus-
dam nouiter apressis.**
* * *

**Anno. 1519. Venetijs in Edibus
Petri Liechtenstein.**

FIG. 70. TITLE PAGE OF THE *Cōputus nouus*

Editions. There was no other edition, so far as I know, although there are several anonymous computi, and some may be the same as this.

This is one of the rare works setting forth the computus as it was taught in the Church schools of the Middle Ages. (See p. 7.)

The verses on the calendar mentioned on p. 33 (Anianus, 1488) here appear as follows:

‘Aprilis: Junius: September atq; Nouember
Hij trigenta habent vnum reliqui superaddunt
Februarius vigint infuper octoq; dies.’ (F. 9.)

Other works of 1519. Feliciano, p. 146, 1526; Blasius, p. 97, 1514; Widman, p. 37, 1489.

JOHANNES FRANCISCUS PICUS MIRANDULA.

Ed. pr. 1520.

S. l., 1520.

A nephew of Pico de Mirandola, and biographer of his uncle. He was murdered in 1533. Like his uncle he was a savant of reputation.

Title. ‘Ioannis Francisci Pici Mirandvlæ domini, et // Concordiæ comitis, examen vanitatis do//ctrinae gentivm, et veritatis Chri//stianæ disciplinae, // distinctvm in libros sex, qvorvm tres // omnem philosophorvm sectam vni//versim, reliqui Aristoteleam // et Aristoteleis armis // particvlatim im-//pvgnant. // vbicvnqve avtem Christiana et // asseritvr et celebratvr // disciplina.’ (F. 1, r.)

Description. Fol., 20.6 × 30.6 cm., the text being 16.9 × 24 cm. 6 ff. unnumb. + 208 numb. + 1 blank = 215 ff., 44 ll. S. l., 1520.

Editions. There was no other edition. The dedication (f. 2, v.) bears date M. D. XX, and the privilege M. D. XIX.

The book hardly deserves place in a list of this kind. It has, however, been included because of the following brief chapters on the nature of arithmetic: ‘Quod fuper mathematicis artibus arithmetica & geometria, fuperq; mediis Astrologia & musica, gentium philofophi non conueniunt. Cap. vii’; ‘De opinione pythagoricorū, & de ratione et philolai & postidonii . . . Cap. ix’; ‘Quid aduerfus arithmetica facultatē pyrrhonii disputauerint. Cap. vii’ (of liber III).

ANONYMOUS.

S. l. et a. (c. 1520).

Title. ‘Von dem Rächnen auff den Linien.’ (Running headline.)

Thirteen fragments of proof sheets of an unknown German arithmetic, three duplicates. The date is purely conjectural. The work was of at least 46 pages, since the folios were numbered and part of f. 23

is among the fragments. The title of the book probably appears in the running headline above given, although this may be the title of only part of the work. There was at least one illustration of line reckoning in the book. The lines are 6.4 cm. in length, but there is no complete page among the fragments. Several anonymous works have already been mentioned, with some such title as 'Algorismus linealis,' and possibly this is one of them. It would probably be possible to identify it if one should examine the types and compare the fragments with possible originals.

ESTIENNE DE LA ROCHE, Villefranche.

Ed. pr. 1520.

Lyons, 1520.

Born at Lyons, c. 1480.

Title. See Fig. 71.

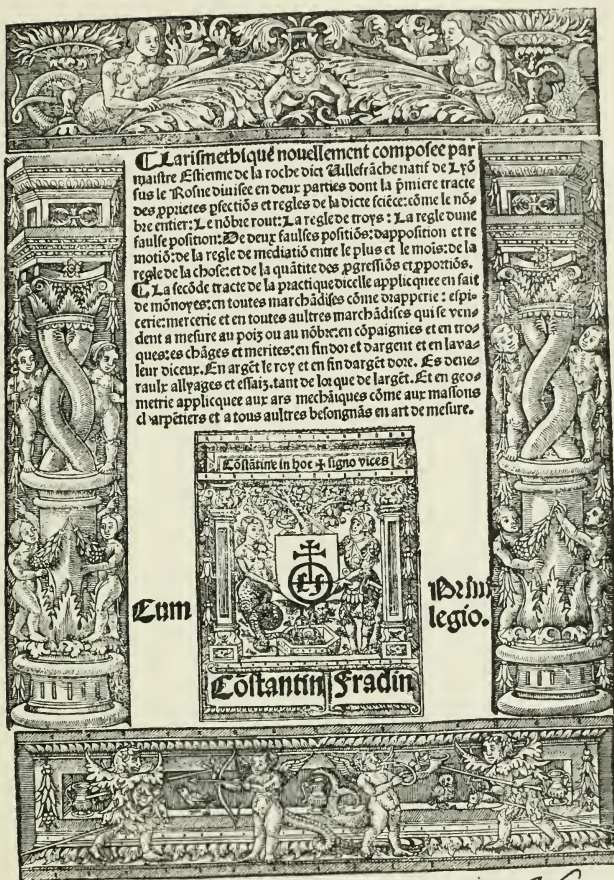
Colophon. '¶Cy finift larifmetique de maiftre Eftienne de la roche dict ville franche natif de Lyon // fus le rofne. Imprimee par Maiftre guillaume huyon. Pour Conftantin fradin mar-//chant ? libraire du dict Lyon. Et fut acheuee lan .1520. le 2^e. de Juing.' (F. 234, r.).

Description. Fol., 17.3 × 25.5 cm., the text being 13 × 21 cm. 1 f. blank + 4 ff. unnumb. + 230 numb. = 235 ff., 49 ll. Lyons, 1520.

Editions. Lyons, 1520, fol. (here described); ib., 1538, fol. (see p. 130).

This is the best of the early French arithmetics. Since it is semi-mercantile in character, it was naturally printed at Lyons, then the commercial center of France, the theoretical books being usually printed at Paris under the influence of the Sorbonne. De la Roche gives a very complete treatment of the operations with integers, fractions, and compound numbers, and a large number of business applications. Perhaps no arithmetic published in France in the sixteenth century gives a more comprehensive view of the science and art of arithmetic and of the applications of the subject. Unfortunately, however, de la Roche took much of his work bodily from a manuscript of his master, Chuquet, which he had in his possession, and which has since been published.

Other works of 1520. Köbel, p. 102, 1514; Peurbach, p. 53, 1492; Raggius, p. 98, 1514; Stromer, p. 83, 1504; Suiseth, p. 10, tc. 1480; Tagliente, p. 114, 1515; Anonymous (Tagliente?), 'Libro de Abaco,'



de la Roche de la Roche vicé de Lyō.

FIG. 71. TITLE PAGE OF THE FIRST EDITION OF DE LA ROCHE

Venice, 8°; Anonymous, 'Libretto de Abaco,' s. l., 8°; Anonymous, 'Algorismus novus de integris, de minutiis vulgaribus, de minutiis physicis,' Augsburg. To an edition of Sacrobosco's Sphere the commentator, Johannes Guyion, prefixed a treatise on arithmetic, 'De quantitate discreta,' Avignon, s. a., c. 1520. There was published, s. l. a., possibly at Lyons in this year, 'Le liure des gectz grandement profitable pour messeigneurs les marchans et aultres,' 4°, a work on counter reckoning (see p. 7).

ESTIENNE DE LA ROCHE, Villefranche.

Ed. pr. 1520.

Lyons, 1538.

See p. 128.

Title. 'Larifmetique & Geometrie de maistre // Estienne de la Roche dict Ville Fran//che, Nouuellement Imprimee & des fautes corrigee, // a la qvelle font adiouftees les Tables de diuers comptes, avec leurs Ca//nons, calculees par Gilles Huguetan natif de Lyon, Par lesquelles on pourra facil//lement trouver les comptes tous faitz, tant des achatz que uentes de toutes mar//chandises. Et principalement des marchandises que se uendent, ou achètent a la // mesure, cōme a Laine, a la Canne, a la Toyse, a la Palme, au Pied, & aultres fem//blables. Au poix, cōme a la Liure, au Quintal, au Millier, a la Charge, au Marc, // & a Lonce, a la Piece, au Nōbre, a la Douzaine, a la Groffe, au cent, & au Millier. // Avec deux Tables feruantz aulx Librayres uendeurs & acheteurs de papier. En//semble une Table de despence, a scaoir a tant pour iour, combien on despēd Lan // & le Moys, & a tant le moys, combien reuient lan & le iour, & a tant pour an, cō//bien on despēd tous les moys, & a combien reuient pour chascun iour. // Davantage, les Tables du fin dor & dargent, pour scaoir (selon que le Marc de billon tiendre // daloy, ou de fin) combien il ualdrā de poix de fin or, ou dargent fin. // On les uend . . . lenfeigne de la Sphære, // cheulx Gilles & Jacques Huguetan freres. // 1538.' (F. 1, r.)

Colophon. '¶ Cy finist Larifmetique & Geometrie de maistre Estienne de la Roche dict Villefranche // Imprime a Lyon par maistre Jacques myt Lan. 1538.' (F. 160, r.)

Description. Fol., 21.1 × 33 cm., the text being 16.3 × 30.6 cm. 2 ff. unnumb. + 158 numb. = 160 ff., 59–60 ll. Lyons, 1538.

Editions. See p. 128.

The Huguetan referred to is the one mentioned on p. 188.

BÆDA. Ed. pr. 1521.

Basel, 1563.

'The Venerable Bede' was born in England, probably near Wearmouth, Durham, c. 673, and died in 735. He was the most distinguished scholar of his time, and his works cover all the branches of learning then known.

Title. 'Opera // Bedae // Venerabi-//lis Presbyte-//ri, Anglo-saxonis: vi-//ri in divinis atqve hv-//manis literis exercitatisimi: omnia in octo to-//mos distincta, prout statim post Præfa-//tionem suo Elencho enu-//merantur.// Addito Rerum & Verborum Indice // copiosissimo.// Cum Cæfareæ Maieftatis gratia & priuile-//gio, Regisque Galliarum ad // decennium.// Basileæ, per Ioannem // Heruagium, Anno M. D. LXIII.' (Surrounded by an elaborate woodcut with inscriptions.) (F. 1, r.)

Description. Fol., 24.2 × 38 cm., the text being 17.7 × 28.6 cm., printed in double columns, each 8.5 cm. wide, 61 ll. 152 pp. unnumb. + 271 numbered by columns (i.e., 2 numbers to a page) = 423 pp. in vol. 1. 8 vols. bound in 4. Basel, 1563. Only the first volume, containing the arithmetic, is described here.

Editions. Some of his arithmetical work is said to have been published in 1521, fol.; 1525 (in part, see p. 140); 1529 (in part, see p. 159); Paris, 1544–45 (first edition of the Opera); ib., 1554; Basel, 1563, fol. (here described). See also c. 1515, anonymous. His 'Historia Ecclesiastica' appeared as early as 1473.

The first volume contains the 'De Arithmetiis nmeris liber' (cols. 98–116), with little save an elaborate multiplication table and a dialogue on number, names, and symbols; 'De Arithmetiis proportionibvs' (cols. 133–146), with the 'Propositiones ad acuendos iuuenes' often attributed to Alcuin, but certainly not Bæda's; 'De ratione calcvli' (cols. 147–158), chiefly multiplication tables of Roman money; 'De nmerorvm divisione' (cols. 159–163); 'De loqvella per gestvm digitorvm, et temporvm ratione' (cols. 164–181), or, as the headline states it, 'De indigitatione,' giving us almost our only knowledge of the finger reckoning or symbolism of the Middle Ages in western Europe, and possibly spurious:

'De ratione vnciarvm' (cols. 182-184), a treatise on Roman fractions; an extensive treatment of the calendar and the computus, with a description of the astrolabe.

FRANCESCO GHALIGAI. Ed. pr. 1521. Florence, 1552.

A Florentine arithmetician of the first part of the sixteenth century. He died February 10, 1536.

Title. 'Practica // d'Arithmetica. // di // Francesco Ghaligai // Fiorentino. // Nuouamente Riuifta, & con fomma // Diligenza Ristampata. // In Firenze // Appreffo i Givnti // M. D. LII.' (F. 1, r.)

Colophon. 'In Firenze // Appreffo i Givnti // M. D. LII.' (F. 114, r.)

Description. 4°, 15.2 × 20.3 cm., the text being 12 × 17.3 cm. 2 ff. unnumb. + 112 numb. = 114 ff., 37-38 ll. Florence, 1552.

Editions. Florence, 1521, 4° (see Boncompagni's *Bulletino*, VII, 486; XIII, 249); ib., 1548, 4°; ib., 1552, 4° (here described). The 1521 edition is entitled 'Summa De Arithmetica,' but it is the same as the 1552 edition here described. Some bibliographers mention other editions, as of 1540, 1551, 1562, 1572, 1582, 1591, but Boncompagni's careful investigation, supported by Riccardi's, throws doubt upon all these.

The book is written in the general style of the Italian works of the sixteenth century, more or less resembling Borghi (p. 16). It was intended for the use of merchants, and contains a large number of practical problems showing the conditions of trade at the time of its publication. Books 10 to 13 relate to algebra, and their chief interest attaches to the symbolism employed.

Other works of 1521. Boethius, p. 31, 1488; Grammateus, p. 124, 1518; Paxi, p. 77, 1503; Sacrobosco, p. 32, 1488.

CUTHBERT TONSTALL. Ed. pr. 1522. London, 1522.

TUNSTALL. Born at Hackforth, Yorkshire, in 1474; died November 18, 1559. He was educated at Oxford, Cambridge, and Padua, was a man of great learning and energy, and held important positions in the Church and State. He was bishop of London, and later of Durham.

Title. 'De arte svppvtandi // libri qvattvor // Cvtheberti // Tonstalli.' (Surrounded by a woodcut. F. 1, r. See Fig. 72.)

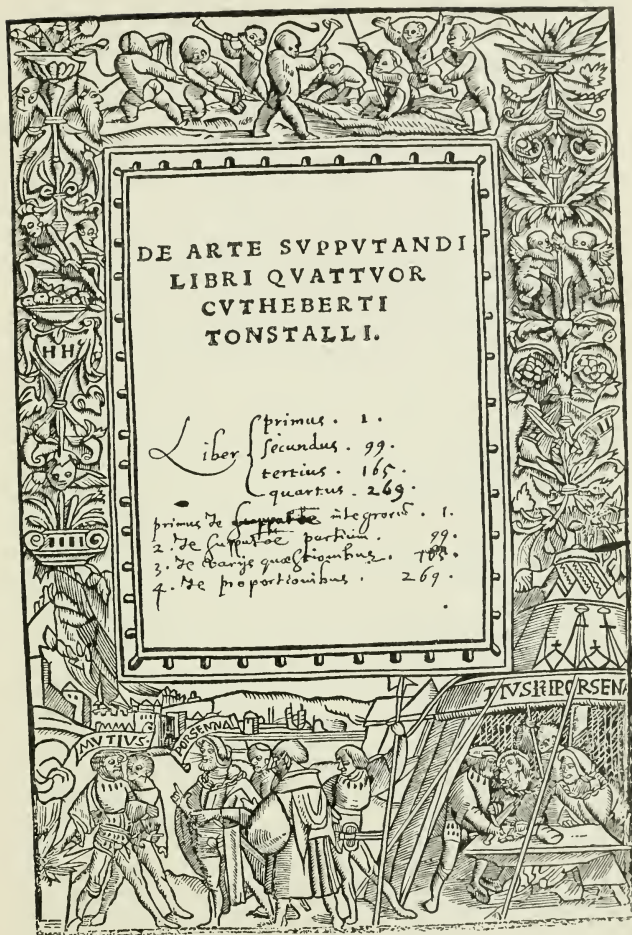


FIG. 72. TITLE PAGE OF THE FIRST EDITION OF TONSTALL

Colophon. 'Impress. Londini in aedibvs Ri-//chardi Pynsoni. Anno ver-//bi incarnati .M.D.XXII.// Pridie idvs octo-//bris. Cvm pri-//vilegio a // rege in-//dvl-//to.' (F. 202, r.)

Description. 4°, 15.7 × 20.9 cm., the text being 10.5 × 16.4 cm. 202 ff. unnumb., 29 ll. London, 1522.

Editions. London, 1522, 4° (here described); Paris, 1529, 4° (p. 135); ib., 1535; ib., 1538, 4° (p. 135); Strasburg, 1543; ib., 1544, 8° (p. 136); ib., 1548; ib., 1551.

This is the first edition of the first book wholly on arithmetic that was printed in England. (But see p. 10, 1480.) In the dedicatory epistle Tonstall states that in his dealing with certain goldsmiths he suspected that their accounts were incorrect, and he therefore renewed his study of arithmetic so as to check their figures. On his appointment to the See of London he bade farewell to the sciences by printing this book in order that others might have the benefit of a work which he had prepared for his own use. The treatise is in Latin, and, although it was written for the purpose of supplying a practical handbook, is very prolix and was not suited to the needs of the mercantile class. It is confessedly based upon Italian models, and it is apparent that Tonstall must have known, from his residence in Padua and his various visits to Italy, the works of the leading Italian writers. The book includes many business applications of the day, such as partnership, profit and loss, and exchange. It also includes the rule of false, the rule of three, and numerous applications of these and other rules. It is, however, the work of a scholar and a classicist rather than a business man.

The word 'supputandi,' in the title, was not uncommon at that time. Indeed there was some tendency to use the name 'supputation' for arithmetic and to speak of calculations as 'supputations.'

Tonstall dedicates the work to his friend Sir Thomas More, whose talented daughter Erasmus addressed as 'Margareta Ropera Britanniae tuæ decus,'—ornament of thine England. More speaks of Tonstall in the opening lines of his *Utopia*: 'I was colleague and companion to that incomparable man Cuthbert Tonal, whom the king with such universal applause lately made Master of the Rolls; but of whom I will say nothing; not because I fear that the testimony of a friend will be suspected, but rather because his learning and virtues are too great for me to do them justice, and so well known, that they need not my commendation unless I would, according to the proverb, "Show the sun with a lanthorn."' The *Utopia* was first printed in 1516, so this sonorous praise was written some years before Tonstall's arithmetic appeared.

Some idea of the prolixity of the treatise may be obtained from the number of closely-printed quarto pages assigned to certain topics. The chapter 'De Numeratione' fills 11 pages, 'De Additione' 14 pages, 'De Svbdvctione' 15 pages, 'De mvltiplicatione' 14 pages, 'De partitione' 27 pages (the old galley method being used exclusively), and so on for the other subjects. Some 66 pages, for example, are given to the theory of ratio and proportion.

The title page was engraved by Holbein, and was evidently printed after the book was completed, because in this copy the errata appear on the reverse of the first folio. The work was printed by Richard Pynson, the successor to Caxton.

Following the arithmetic is an appendix: 'Appendix ex Bvdæi libro de as-//fe excerpta: in qua prifca Latinorum et Gręcorū // fupputatio, ad æftimationem pecunię, tum Gallicę, // tum Angli-//cę reuocatur.'

Tonstall also published a work in 1518: 'In Lavdem matrimonii oratio,' second edition in 1519, now very rare.

CUTHBERT TONSTALL. Ed. pr. 1522. Paris, 1529.

See p. 132.

Title. 'De arte svppvntandi libri qvatvor // Cvthberti Tonstalli. (Picture of a tree from which is falling a broken branch, and the words: Noli altum fa//pere, fed time.) Parisiis ex officina Roberti Stephani // M.D.XXIX.' (P. 1.)

Colophon. 'Parisiis // excvdebat Robertvs Stepha-//nvs. Ann. M.D.XXIX. Prid. id. ivn.' (P. 279.)

Description. 4°, 13 × 18.8 cm., the text being 9.4 × 15.9 cm. 271 pp. numb. + 8 unnumb. + 2 blank = 281 pp., 36-38 ll. Paris, 1529.

Editions. See p. 134.

The text is the same as in the first edition of 1522. There has been added, however, a second appendix with the following title: 'Gvlielmi Bvdæi Parisiensis, // secretarii regii, breviari-//vm de asse.'

CUTHBERT TONSTALL. Ed. pr. 1522. Paris, 1538.

See p. 132.

Title. 'De arte svp-//putandi libri qua-//tuor, Cutheberti // Tonftalli. // (Large woodcut.) Parisiis. // Ex officina Roberti Stephani. // M.D.XXXVIII.' (P. 1.)

Colophon. 'Excudebat Robertvs Stephanvs Parisiis, // ann. M. D. XXXVIII. // xvi. cal. novemb.' (P. 259.)

Description. 4°, 14.4 × 20.1 cm., the text being 9.5 × 16 cm. 259 pp. numb., 39 ll. Paris, 1538.

See p. 134.

CUTHBERT TONSTALL. Ed. pr. 1522. Strasburg, 1544.

See p. 132.

Title. 'De arte // svppvtan // di, libri qvatvor // Cvthberti Tonstalli, // hactenus in Germania nus // quam ita impreffi. // Ioan. Stvmivs. // Arithmetica Cvthbertvs // Tonstallus præ cæteris dilucide & pure tradidit: atq; // ita tradidit, ut ars ipfa dum hic author extat, con // tenta scriptore, doctorem non maximopere aliquem // requirat. Non nego, posse ex alijs quoque difci: // fed hic docet erudite, perfpicue latine, id quod non fa // ciunt cæteri: nec abest longe à perfectione, qui eius // præcepta intelligit. // Argentorati, ex offi. // Knobloch. per Georg. Machærop.' (P. 1.)

Colophon. 'Argentorati, ex officina // Knoblochiana, per Ge // orgivm Machaero // poevm, mense // februario // anno, // M. D. XLIII.' (P. 478.)

Description. 8°, 9.5 × 15 cm., the text being 6.8 × 11.4 cm. 25 pp. blank + 453 numb. = 478 pp., 26 ll. Strasburg, 1544. This copy is bound with the arithmetic of Victorius Strigelius.

Editions. See p. 134. This is the same as the edition of 1529, having the second appendix there mentioned. It is the second Strasburg edition. It is interesting to see that the classical influence on the Continent was such that seven out of the eight editions appeared in Paris or Strasburg.

JOHANNES AVENTINUS.

Ed. pr. 1522.

Regensburg, 1532.

THURNMAYER. Born at Abensberg, Bavaria, July 4, 1477; died at Regensburg, January 9, 1534. He wrote on history.



Title. See Fig. 73.

Colophon. 'Ratifponę apud Ioannem Khol // Anno. MD-XXXII.' (Large woodcut and date, 'Io. Kol 1532.') (F. 12, r.)

Description. 4°, 14.2 × 19.5 cm., the text being 9.9 × 14 cm. 12 ff. unnumb., 26 ll. Regensburg, 1532.

Editions. Nürnberg, 1522; Regensburg, 1532, 4° (here described).

The book is primarily a treatise on numerical finger symbolism, and contains the most complete explanation of that subject extant. It gives

 **ABACVSAT** 
QVE VETVSTISSIMA, VETERVM
 latinorum per digitos manuꝝ nume
 randi (quinetiam loquendi) cōsue
 tudo, Ex beda cū picturis & ima
 ginibus, inuēta reginoburgij
 siue ræobonæ, in biblio
 theca diui hæmerani,
 Atqꝫ hoc conuē
 tu augustali
 Reuerendi
 Atqꝫ doctissimi Domini Lucæ bonfij de
 cani patauini secretarij Reuerendissi
 mi Cardinalis Laurentij Campegij
 zc. Auspicijs A Io. Auen
 tino Edita.

Germania Illustranda.

FIG. 73. TITLE PAGE OF THE 1532 AVENTINUS

illustrations showing the representation of the numbers up to one million by means of the fingers and arms (see Fig. 74). This finger symbolism is found in the works of Bæda, it was practical in both the East and

West during the Middle Ages, and it is mentioned by several sixteenth-century arithmeticians. (Compare Fig. 74 with Fig. 35, p. 57.)



FIG. 74. FINGER SYMBOLISM FROM AVENTINUS

ADAM RIESE. Ed. pr. 1522.

Leipzig, 1538.

RYSE, RIS, RIES. Born at Staffelstein, near Bamberg, c. 1489; died at Annaberg, March 30, 1559. One of the most celebrated Rechenmeisters of the sixteenth century, and the most influential of all the Germans in replacing the counter reckoning ('auff der Linien') by the written computations ('auff Federn').

Title. 'Rechnung auff // der Linien vnd Federn // Auff allerley handtirung ge-//macht/ durch Adam Rifen.// (Woodcut of counting house, with reckoning on the line abacus.) Item auff's new vberfehen vnd // an viel örten gebeffert.// M.DXXXVIII.' (F. 1, r.)

Colophon. 'Gedruckt zu Leiptzigg // durch Valentinum // Schumann. 1538.' (F. 63, v.)

Description. 8°, 9.7 × 15.1 cm., the text being 7.2 × 11.5 cm. 63 ff. unnumb. + 2 blank (with manuscript notes) = 65 ff., 28–33 ll. Leipzig, 1538.

Editions. In order to make clear the different editions of Riese's work, it is necessary to distinguish between the four arithmetics which he published. These were as follows:

1. 'Rechnung auff der linihen gemacht durch Adam Riesen vom Staffelsteyn // in massen man es pflegt tzu lern in allen rechenschulen gruntlich begriffen anno 1518.' (Graesse, followed by Unger, p. 50, who knew of no extant copy.) A second edition appeared in 1525 ('Getruckt tzu Erffordt durch Mathes Maler M. CCCCxxv Jar,' 8°, 43 ff.), and a third in 1527. This was embodied in his second arithmetic which is here described. The work is rare.

2. 'Rechnung auff // der Linien vnd Federn,' Riese's best-known work. The title of the first (1522) edition was as follows: 'Rechnung auff der linihen vnd federn in zal/mafs/vnd gewicht auff allerley handierung/ gemacht vnd zusammen gelesen durch Adam Riesen von Staffelstein Rechenmeister zu Erffurd in 1522 Jar. Itzt vff sant Annabergk durch in fleyssig vbersehen/ vnd alle gebrechen eygentlich gerechtfertigt/vnd zum letzten eine hübsche vnderrichtung angehengt.' The following editions of this work are known to me: Erfurt, 1522; *ib.*, 1525, 8°; Nürnberg, 1527; 1528, 8°; Erfurt, 1529, 8°; *ib.*, 1530; Leipzig, 1533, 8° (first edition containing Helm's Visirbuch; see p. 142); Frankfort, 1535, 12°; Annaberg, 1535, 8° (p. 141); 1536, 12°; Leipzig, 1538, 8° (here described); 1541; Frankfort, 1544, 8°; Leipzig, 1544; s. l., 1548, 8°; Leipzig, 1548, 8°; *ib.*, 1550; Breslau, 1550; Frankfort, 1552, 8°; Leipzig, 1554; 1556, 12°; Frankfort, 1558, 8° (p. 141); Leipzig, 1562, 12°; Frankfort, 1564, 8°; Frankfort, 1565, 8° (p. 142); Frankfort (a. Oder?), 1568, 8°; Stettin (Frankfort?), 1570, 8°; Leipzig, 1571, 8° (p. 142); Frankfort, 1574; Magdeburg, 1579, 8°; Frankfort, 1581, 12°; *ib.*, 1585, 8°; Leipzig, 1586; Frankfort, 1586; Wittenberg, 1587; Nürnberg, 1592, 8°; Frankfort, 1592, 8° (p. 143); Leipzig, 1598, 12°. There were several editions after 1600. It is possible that some of the editions here mentioned may be of Riese's fourth book, the titles being much alike and printers varying them from time to time.

3. 'Ein Gerechent Büchlein,' first published at Leipzig in 1533; second edition in 1536. See p. 171.

4. 'Rechnung nach der lenge / auff den Linihen vnd Feder,' first published in 1550, 4°. See p. 250.

Kuckuck's remark, that over twenty-six editions of Riese's arithmetics appeared, greatly underestimates the number. More than forty appeared in the sixteenth century alone, and several were published in the seventeenth century.

This was probably the most popular commercial arithmetic of the sixteenth century. So firmly did it impress itself upon the schools that 'nach Adam Riese' is a common expression in Germany to-day, nearly four hundred years after the first of his books appeared. It was to Germany what Borghi's book was to Italy and Recorde's to England. It differed from Riese's first book in that it emphasized computation by the aid of the Hindu-Arabic numerals instead of the counters. There is no other book that gives as good a picture of the sixteenth-century mercantile problems of Germany, and of the methods of solving them.

Other works of 1522. Albert of Saxony, p. 9, c. 1478; Boethius, p. 27, 1488; Budaeus, p. 99, 1514; Köbel, p. 102, 1514; Ortega, p. 93, 1512; Sacrobosco, p. 32, 1488; Francisco Pelacani, 'Arithmetica prattica,' Florence; Ludovico Vincento (Vincentino) degl' Arrighi, 'La operina . . . da . . . bellissima Ragione di Abbacho,' Rome, 4°, with editions at Venice in 1532, 1533, chiefly on chirography.

Works of 1523. Borriglione, p. 86, 1506; Ciruelo, p. 60, 1495; Grammateus, p. 124, 1518; Paciuolo, p. 54, 1494; Reisch, p. 82, 1503; Sacrobosco, p. 35, 1488; Tagliente, p. 114, 1515. Rodrigo Fernández de Santaella (or Valencia, see p. 269, 1555), 'Ars coputandi,' Saragossa, fol. There was also written in this year, but published s. l. a., a work by Vincenzo Barziza entitled 'Operetta nouamente composta,' 8°, 39 ff., containing a few mercantile rules and tables.

Works of 1524. Feliciano, p. 145, 1526; Tagliente, p. 115, 1515.

Works of 1525. Herodianus, p. 60, 1495; Köbel, p. 102, 1514; Riese, p. 139, 1522; Rudolff, p. 151, 1526; Tagliente, p. 114, 1515; Bede et al., 'Valetius Probus et Petrus Diaconus de notis Romanorum, Demettius Alabaldus de minutiis, ponderibus et mensuris, Ven. Beda de computo per gestum digitorum,' etc., Venice, 4°; Angelus Mutinens (i.e. of Modena), 'Thesavro de Scrittori opera artificiosa le quale con grandissima arte, si per pratica come per geometria insegna . . .,' s. l., M.D.XXv, has four folios at the end relating to arithmetic, with the note 'Angelus Mutinens composuit,' and there seems to have been an edition in 1525, and another s. a. published at Rome; Giovanni

Tagliente published two editions of a work chiefly on bookkeeping, 4°, 24 ff., Venice, beginning, 'Considerando io Ioanni Taiente quanto e necessaria cosa ali nostri magnifici gētilhomeni & ad altri mercatanti.'

ADAM RIESE. Ed. pr. 1522. Annaberg, 1535.

See p. 138.

Title. The title page is missing.

Colophon. '¶ Nach difer vnderrichtung kanstu auffß be//hen-
deft alle Exempel in der Falfi machen: Wöl//left folch Büch-
lin vnnnd kurtze erklerung ietzt/ // welches ich zum andern mal
lasse aufzge-//hen/ zu danck an nemen/ wil ich ver-//dienen/
vnd dir auffß cheft ich // mag die Practica nach al-//lem fleiß
heraufzftrei//chen. Datum//auff sanct // Annaberg// // Dinftag
nach // Martini. Im Iar // M. D. XXV.' (F. 55, r.) On f. 69,
v., is the following colophon: 'Alfo ift kürzlich // beſchriben
vnd // begriffen // die Confection // der Viſier rüten mit // Irer
übung vnd gebrauch.// ¶ End:// An. M. D. XXXV.// Im Christ-
monat.' This latter is evidently the date of printing of the entire
book.

Description. 8°, 8.8 × 13.2 cm., the text being 6.8 × 11.6 cm.
69 ff. unnumb., 31 ll. Annaberg, 1535.

Editions. See p. 139.

This contains the 'Viſirbüchlin' of Erhart Helm, as in the 1533
edition, but it does not give his name. See the 1565 edition (p. 142).

ADAM RIESE. Ed. pr. 1522. Frankfort, 1558.

See p. 138.

Title. The title page is missing. Page numbered 2 begins as
follows: 'Vorrede in diß Rechen-//büch/ Adam Rifen.'

Colophon. '¶ End.// Zu Franckfurt bei Chr. Egeb. erben//
Anno 1558.' (F. numb. 87, r.)

Description. 8°, 9.4 × 15 cm., the text being 6.5 × 12.2 cm.
87 ff. numb. + 1 blank = 88 ff., 31 ll. Frankfort, 1558.

Editions. See p. 139.

This contains the 'Viſirbüchlin' of Erhart Helm, as in the 1533
edition.



ADAM RIESE. Ed. pr. 1522.

Frankfort, 1565.

See p. 138.

Title. 'Rechenbüch/Vff Lini//en vnnd Ziphren/In allerley // Handtierung/ Gefchefften vnd Kauff-//mannschafft. Durch Adam // Riften.// Mit new en künstlichen Regeln vnd Ex-//emplen gemehrt/ Inhalt fürge-//ftelten Registers.//Vifir vnd Wechselrüten kunftlich vnd // gerecht zumachen/ auß dem Quadrat/ // Durch die Arithmetic vnd Geometri.// Von Erhart Helm/ Mathema//tico zu Franckfurt/be // fchriben.//Alles von newem jetzund widerumb erfe-//hen vnd corrigirt.// (Woodcut of counting house) Franck, Bei Chr. Egen. Erben. 1565.' (F. 1, r.)

Colophon. 'M. D. LXV.' (F. 113, r.)

Description. 8°, 9.3 × 15.5 cm., the text being 6.5 × 11.9 cm. 105 ff. numb. + 8 unnumb. = 113 ff., 28 ll. Frankfort, 1565.

Editions. See p. 139.

See p. 140. The Visirbuch of Helm begins, with no separate title page, on f. 77, v.: 'Vifirbüchlin // Hernach folget der ware // Proceß/ vnnd kurtzeß weg/ wie mann Vifir rülhen machen sol/ aufz dem // Quadraten/ Auff alle Eich.' The name of the author, 'Erhart Helmen,' appears in the headlines of each folio recto. This part of the book is strictly speaking not an arithmetic, but it includes a few explanations of those processes that are necessary in gauging. It also includes a table of square roots to the equivalent of three decimal places, and a brief explanation of roots. It was published in separate form in 1529.

ADAM RIESE. Ed. pr. 1522.

Leipzig, 1571.

See p. 138.

Title. 'Rechnung auff //der Linien vnd Federn/ // auff allerley Handtierung// Gemacht durch// Adam Riften.// (Woodcut of Adam Riese, with motto: 'Anno 1550 Adam Ries Seins Alters Im LVIII.')

Auffs neue durchelesen/ vnd // zu recht bracht.// 1571.' (F. 1, r.)

Colophon. 'Zu Leipzig druckts // Hans Rhambaw/ // Im Jar // 1571.' (F. 94, v.)

Description. 8°, 9.7 × 15.6 cm., the text being 6.9 × 11.8 cm. 94 ff. unnumb., 24 ll. Leipzig, 1571.

Editions. See p. 139.

See p. 140. This is substantially identical with the 1538 edition except as to the title page.

ADAM RIESE. Ed. pr. 1522.

Frankfort, 1592

See p. 138.

Title. See Fig. 75.

Description. 8°, 9.5 × 15.5 cm., the text being 6.7 × 11.8 cm. 1 f. unnumb. + 79 numb. = 80 ff., 26–27 ll. Frankfort, 1592.

Editions. See p. 139. Bound with this is Helm's work of 1592 (described later).

FRANCESCO DAL SOLE. Ed. pr. 1526. Ferrara, 1546.

A French arithmetician, born c. 1490, and living in Ferrara at the time of writing his books.

Title. See Fig. 76.

Colophon. 'In Ferrara Nella Stampa di .M. Giouanni de buglhat & .M. Antonio // Hucher Compagni, Ad Infantia de .M. Rinaldo, cuoco dello Illuftriffi-//mo signor Duca, nel mefe di zenaro 1546.' (F. 42, v.)

Description. 4°, 14 × 19 cm., the text being 12.1 × 16.5 cm. 2 ff. unnumb. + 40 numb. = 42 ff., 31 ll. Ferrara, 1546.

Editions. Sole published a 'Libretto di Abaco' in Venice in 1526, 8°, and this is merely a revision of that work. A third edition appeared in 1564 (see p. 146).

This is little more than a primer of arithmetic. It contains the fundamental operations, a few of the more important applications, eight pages of products and roots, and several pages on astrology. The part on astrology includes some theory of the calendar, as may be seen by the title: 'Incominciano le regoline daftrologia, p ritrouare ha quāti di et minute fa la luna, la lrā dñicale, et infinite gētileffe, Delli circuli, elementi, et natura, del monde.' The most distinctive feature of the arithmetic is the combination of number and space concepts. For example, in addition the author considers not only abstract but compound numbers as well as geometric magnitudes. ('Regola dellæ additioni in generalita, tanto geometrica, quanto arithmetica. Ca. 6.')

The same idea is carried out in the other fundamental operations.

Op. 560. Hain.

Adam Riese

Rechenbüchlin

auff Linien vnd Ziphren / für
die junge angehende Schüler / in al-
lerley Handthierung / Geschäften / vnd
Kauffmanschafft / mit neuen künstlichen
Regeln vnd Exempeln gemehrt.

Auff

Manchens Lande vnd Sein Münz / Gewicht /
Elen vnd Maß gerichtet / Inhalt angehengten
Registers.

Sehe alles von neuem widerumb kuffigersehen
vnd corrigiert.



Druck. in Christoph. Egen. Egen. 1592

FIG. 75. TITLE PAGE OF THE 1592 RIESE

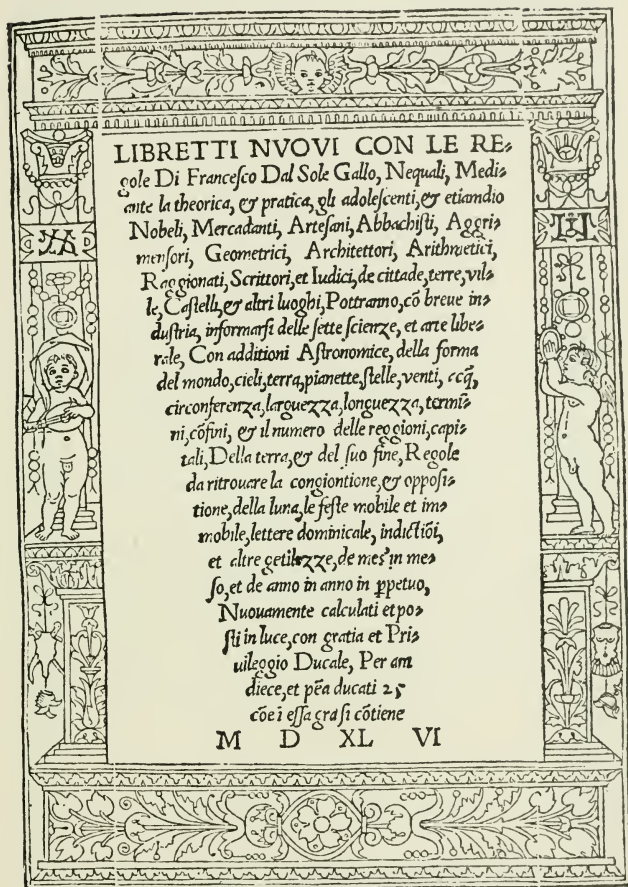


FIG. 76. TITLE PAGE OF THE 1546 FRANCESCO DAL SOLE

FRANCESCO DAL SOLE. Ed. pr. 1526. Ferrara, 1564.

See p. 143.

Title. 'Instrvtioni // et Regvle // di Francesco // dal Sole, // Francese. // Cittadino di Ferrara, Sopra il fon- // damento delle alme scientie d'Abbac- // co, Arithmetica, Geometria, Cof- // mo-grafia, & Mathematica, No- // uamente riftampate, & con // particolare additioni di // effo Authore, // aggiunte. // In Ferrara, Aprefso Francefco di Rossi // da Valenza. // M. D. LXIII.' (F. 1, r.)

Description. 4°, 14.8 × 20 cm., the text being 11.1 × 15.5 cm. 4 pp. unnumb. + 71 numb. = 75 pp., 38 ll. Ferrara, 1564.

Editions. See p. 143.

Although the title of this edition is quite different from that of the first, as shown in Fig. 76, the work is essentially the same. A set of verses entitled 'Il Sole' (The Sun), a play upon the author's name, which appeared in the first edition, gives place to some Latin lines in this one.

FRANCESCO FELICIANO da Lazesio.

Ed. pr. 1526.

Venice, 1526.

Born at Lazisa, near Verona; he was living in 1563.

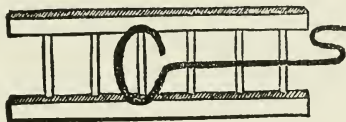
Title. See Fig. 77.

Colophon. '¶ Stampato nella inclita Citta di Vinegia, aprefso // fanto Moyfe nelle cafe nuoue Iuftiniane: Per // Frãcefco di Aleffandro Bindoni, & Ma- // pheo Pafini, compagni. Nelli anni // del fignore, 1527. Del mefe // di Zenaro. Regnante il // Sere-niffimo Princi- // pe meffer An- // drea Gritti. // A B C D E F G H I K L M N O P Q R S T V. // Tutti fono duerni.' (F. 80, r.)

Description. 4°, 15.1 × 20.8 cm., the text being 13.4 × 17.1 cm. 80 ff. unnumb., 41 ll. Venice, 1526.

Editions. Feliciano published two works, of which the first was entitled 'Libro de Abaco,' and appeared in the following editions: Venice, 1517 (the colophon date is 1518), 8°; ib., 1519, 8°; ib., 1524, 8°; ib., 1532, 8°. His second work was a revision of his first, and is the one here described, and this appeared in the following editions: Venice, 1526, 4° (here described); ib., 1527, 4°; ib., 1536, 4° (p. 148); ib., 1545, 4° (p. 149); ib., 1550, 4° (p. 149);

Libro di Arithmetica & Geometria
 Speculatiua & praticale: Composto per maestro
 Francesco Feliciano da Laziso Veronese
 Intitolato Scala grimaldelli:
 Nouamente stampato.



Chi vol aprir vna ferraglia forte
 In cima d'vna Torre ouer Castello
 Bisogna hauer la Scala acciaio di quello
 Gionger si possa alle ferrate porte
 Aprelo fa mestier l'huom seco porte
 (Non hauendo la Chiaue del sugello)
 Vn ferro che apellato e grimaldello
 Si non d'aprir l'impresa sue sien corte,
 Tal questo mio libretto mostra come
 Sagir si possa allalte serrature
 Et quelle aprir senza fatica graue,
 Infinite ragion, ponti, & misure
 Questo chiarisce con modo suauo
 Cui scala e grimaldello e il proprio nome,
 Ma non lodar mie come
 Co'l tuo lieto biasmar, chel biasmo nasce
 Sol de cui nel mal dir s'alegra e pasce.

M. D. XXVI.

Con gratia & priuilegio.

FIG. 77. TITLE PAGE OF FELICIANO

ib., 1560, 4° (p. 149); ib., 1560, 4° (another edition); ib., 1561 (the colophon of one 1560 edition); Verona, 1563, 8° (p. 150); s. l. (Venice ?), 1563, 4°; Venice, 1570. There were also seventeenth-century editions extending as late as 1692. For the 1602, 1629, and 1669 editions see pp. 150, 151. This first edition was evidently begun in 1526, but completed in January 1527, as the colophon shows. It is often assigned to the latter year.

Feliciano's second work was highly esteemed as a textbook for schools. It follows the lines laid down by Borghi (p. 16), and the author acknowledges his indebtedness to him and to Paciulo (p. 54). The first part of the book is commercial in character, and in the second part the author treats of roots, rule of false, and algebra, the third part being devoted to geometry from the practical side. More complete than the Treviso book, more modern than Borghi, more condensed and practical than Paciulo, few books had greater influence on the subsequent teaching of elementary mathematics. The fanciful name, 'Scala grimaldelli,' is explained in the verses on the title page. Just as it is necessary in attacking a castle to have a ladder (scala) and a skeleton key (grimaldello) to open locks, so in attacking mathematics it is necessary to have a book that answers the same purposes.

FRANCESCO FELICIANO da Lazesio.

Ed. pr. 1526.

Venice, 1536.

See p. 145.

Title. 'Libro di Arithmetica ⁊ Geometria // ſpeculatiua ⁊ pratica-
tiale: Compoſto per maeftro // Franceſco feliciano da Lazifio
Veroneſe // Intitulato Scala Grimaldelli: // Nouamente ftampato.'
(F. r, 1. The rest is substantially as in the first edition, Fig. 77.)

Colophon. 'ŒStampato nella inclita Citta di Vinegia, apreſſo
// fanto Moyſe nelle caſe nuoue Iuſtiniane: Per // Frãceſco di
Aleſſandro Bindoni, & Ma-//pheo Paſini, compagni. Nelli anni //
del ſignore. 1536. Del meſe // di Zenaro. Regnante il // Sereniſſi-
mo Princi-//pe meſſer An-//drea Gritti. // ABCDEFGHIKLM
NOPQRSTV. // Tutti fono duerni.' (F. 80, r.)

Description. 4°, 15.6 × 20.8 cm., the text being 13.4 × 17.1 cm. 80 ff. unnumb., 41 ll. Venice, 1536.

See above.

FRANCESCO FELICIANO da Lazesio.

Ed. pr. 1526.

Venice, 1545.

See p. 146.

Title. This is substantially the same as in the 1526 edition (p. 147).

Colophon. With the exception of the date (1545), this is substantially as in the 1536 edition.

Description. Substantially as in the 1536 edition. Venice, 1545.

Editions. See p. 146.

FRANCESCO FELICIANO da Lazesio.

Ed. pr. 1526.

Venice, 1550.

See p. 146.

Title. This is substantially the same as in the 1526 edition.

Colophon. 'Stampato nella inclita Citta di Vinegia, per // Francefco Bindoni, & Mapheo Pafini, // Nelli anni del noftro Signore. // M. D. L. // Registro. // A B C D E F G H I K L M N O // P Q R S T V. // Tutti fonno duerni.' (F. 80, r.)

Description. 4°, 15.6 × 20.8 cm., the text being 13.4 × 17.2 cm. 80 ff. unnumb., 41 ll. Venice, 1550.

Editions. See p. 146.

FRANCESCO FELICIANO da Lazesio.

Ed. pr. 1526.

Venice, 1560-61.

See p. 146.

Title. This is substantially the same as in the 1526 edition (p. 147), but bears the date M.D LX.

Colophon. 'Stampato nella Inclita Citta di Vinegia, Per Fran- // cefco de Leno. Nell' anno del N. Signore. // M. D. LXI.' (F. 79, r.)

Description. 4°, 15.9 × 21.1 cm., the text being 14.3 × 17.4 cm. 79 ff. unnumb., 41 ll. Venice, 1560 (colophon 1561).

Editions. See p. 146. Riccardi mentions two identical editions of this year, one of them, here described, with the colophon date 1561.

FRANCISCO FELICIANO da Lazesio.

Ed. pr. 1526.

Verona, 1563.

See p. 146.

Title. This is substantially the same as in the 1561 edition.*Description.* 4°, 14.9 × 19.4 cm., the text being 13.6 × 17.1 cm., 41 ll., 64 ff. unnumb. (part III missing). Verona, 1563.*Editions.* See p. 146.

The third part, on geometry, is missing in this copy.

FRANCESCO FELICIANO da Lazesio.

Ed. pr. 1526.

Verona, 1602.

See p. 146.

Title. This is substantially the same as in the 1526 edition except 'De nuouo riftampato, & da molti errori corretto, & accrefciuto di molte cofe da M.// Filippo Marcario Veronefe Rafo-nato publico della Magnifica Città.// Con le gionta della Regola del Catain del medefimo.// In Verona, Apreffo Dionigi Filiberi. CIO IO C II.' (P. 1.)*Colophon.* 'In Verona, // Nella Stamparia di Angelo Tamo. 1602.' (P. 284.)*Description.* 4°, 14.7 × 19.2 cm., the text being 11.5 × 15.7 cm. 5 pp. blank + 7 unnumb. + 276 numb. = 288 pp., 32 ll. Verona, 1602.

FRANCESCO FELICIANO da Lazesio.

Ed. pr. 1526.

Padua, 1629.

See p. 146.

Title. 'Scalla // Grimaldelli // Libro di // Aritmetica, et Geometria // Speculatiua, & Pratticale // Di M. Francesco Feliciano Veronefe. // Diviso in tre libri. // . . . In Padoua, Per Donato Paf-guardi, & compagni. 1629. // Con licenza de' Superiori.' (F. 1, r.)*Description.* 4°, 15 × 20.5 cm., the text being 11.4 × 16 cm. 4 pp. unnumb. + 276 numb. = 280 pp., 32-34 ll. Padua, 1629.*Editions.* See p. 146.

FRANCESCO FELICIANO da Lazesio.

Ed. pr. 1526.

Venice, 1669.

See p. 146.

Title. 'Scala // Grimaldelli // libro di // aritmetica, e geometria // Speculatiua, e Pratticale // Di M. Francesco Feliciano // Veronese. // Diviso in Tre Libri. . . . Di nuouo riftampato, e da molti errori corretto, & accrefciuto di molte cofe da // M. Filippo Macario Veronefe Rafonato publico della Magnifica // Città. Con l'aggiunta della Regola del Catain del medefimo. // Al Molt' Illuftrre Signor, e Padron Colendifs. il Signor Gio: Battista Sorer. // Venetia, MDCLXIX. // Preffo Gio: Giacomo Hertz.' (F. 1, r.)

Description. 4°, 16.1 × 22 cm., the text being 11.8 × 16 cm. 6 pp. blank + 6 unnumb. + 240 = 252 pp., 41 ll. Venice, 1669.

Editions. See p. 146. #

See p. 148. It speaks well for this work of Feliciano's that this edition should have appeared one hundred and forty-three years after the book was first published.

CHRISTOFF RUDOLFF. Ed. pr. 1526. Nürnberg, 1534.

Born at Jauer c. 1500, but the dates of his birth and death are unknown.

Title. 'Kunftliche rech//nung mit der ziffer vnnnd mit // den zal pfenningē // fampt-// der Wellifchen Practica // vnd allerley vorteil // auff die Regel de Tri. // Item vergleichūg mancher-// ley Land vñ Stet // gewicht/ Elnmas // Muntz ec. Alles durch // Chriftoffen Rudolff zu/ Wein verfertiger. // 1534.' (F. 1, r.)

Colophon. 'Getrukt zu Nürnberg bey // Johan Petreio // im iar nach // der geburt Chrifti // M.D.xxxiiii.' (F, 120, r.)

Description. 8°, 10.2 × 14.9 cm., the text being 6.7 × 11.8 cm. 119 ff. unnumb. + 1 blank = 120 ff., 31 ll. Nürnberg, 1534.

Editions. Rudolff published three books as follows: (1) the Coss, an algebra, in 1525 (see p. 258 for the Stifel edition of 1553); (2) the Künstliche Rechnung, here described; (3) a collection of problems in 1530 (see p. 159). Of the Künstliche Rechnung the following editions appeared in the sixteenth century: Vienna (Nürnberg ?), 1526, 8°; Nürnberg, 1532, 8°; ib.,

1534 (here described); ib., 1537, 8°; ib., 1540 (below); ib., 1546; Nürnberg, 1553, 8° (below); ib., 1557 (p. 153); Vienna, 1561; Vienna (Augsburg ?), 1574; Augsburg, 1588, 8°.

This work is an extension of the first part of the Coss, and is divided into three parts: (1) Grundbüchlein, the fundamental operations with abstract and concrete numbers, integers, and fractions, with and without the abacus; (2) Regelbüchlein, the rule of three ('Regel de Tri') and Welsch practice ('Wellisch rechnung'); (3) Exempelbüchlein, problems and results. It was one of the best-known of the practical arithmetics of that period. The rule of three is esteemed highly by Rudolff, for he says: 'sie bechleufzt in sich die aller nützlichste Regel, dadurch unzeliche rechnung in kauffen und verkauffen aufzgericht werde.' Of the Italian method of solving applied problems, the 'Welsch practice,' he says: 'Dieweil die Wellisch rechnung nichts anderes ist, daß ein gefchwinder aufzug in der Regel de Tri gegründet, wirt sie auch derhalben practica gesprochen.'

Other works of 1526. Ciruelo, p. 60, 1495; Blasius, p. 97, 1513; Tagliente, p. 114, 1515; Widman, p. 37, 1489. Sterner mentions an anonymous Rechenbüchlein as printed this year at Nürnberg.

CHRISTOFF RUDOLFF.

Ed. pr. 1526.

Nürnberg, 1540.

See p. 151.

Title. This is substantially the same as in the 1534 edition, but bears the date 1540. (F. 1, r.)

Colophon. 'Getruckt zu Nürnberg bey Johān//Petreo/Anno M. D. XL.' (F. 117, r.)

Description. 8°, 8.8 × 13.9 cm., the text being 6.8 × 12 cm. 117 ff. unnumb., 30 ll. Nürnberg, 1540.

Editions. See above.

CHRISTOFF RUDOLFF. Ed. pr. 1526. Nürnberg, 1553.

See p. 151.

Title. 'Künftlich rech//nung mit der ziffer vnd mit//den zal pfenningen/ sampt der // Wellischen Practica/ vnd allerley // fortheyl auff die Regel // De Tri.// Item vergleichung manch//erley Gewicht/ Elnmas/ Müntz ꝛc. auff // etlich Landt vnd Stett. // Gemehrt mit 293 Exempeln/ von man//cherley Kauffhendeln/

mit erklerung/ wie // die felben zu machen vnd in die // Regel zu fetzen fein.// Auffs new widerumb fleiffig vberfehen/ // vnd an vil orten gebessert.// Alles durch Christoffen Rudolff zu // Wien verfertigt.// 1553.' (F. 1, r.)

Colophon. 'Gedruckt zu Nürnberg/ durch // Gabriel Hayn.// 1553.' (F. 206, v.)

Description. 8°, 10 × 15.7 cm., the text being 6.8 × 11.8 cm. 206 ff. unnumb. + 2 blank = 208 ff., 24–26 ll. Nürnberg, 1553.

Editions. See p. 152.

As the title states, this is a revision of the 1526 book, with some added matter and a considerable number of new examples. The new matter begins on f. T 8. The book closes with a list of gauger's characters, 'die visier ziffer,' not found in the 1534 edition, the integers being represented by what are practically the mediæval numerals, and the fractions being generally unit fractions.

CHRISTOFF RUDOLFF. Ed. pr. 1526. Nürnberg, 1557.

See p. 151.

Description. This edition of Rudolff's arithmetic is substantially verbatim with that of 1553 (p. 152). 8°, 9.5 × 15 cm., the text being 7 × 11.8 cm. 206 ff. unnumb., 26 ll. Nürnberg, 1557.

ANONYMOUS. Ed. pr. 1527.

Cologne, 1527.

Title. 'Compendia-//ria artis nvmerandi ratio, et // expeditif-
fima practicandi uia, figuris Arithme//ticis omnes numerorū for-
mulas cōprehen//dens, additis quibusdam, ut raris, ita // utilibus
regulis.// Radicis Cvbicae Extractio.//

	1	3	8	8	6	1	5	1			
Cubus	6	5	3	5	3	4	2	9	9	5	2

Radix	4	0	2	8	6	0	6	0	0	0	0
	1	2	1	2	0	6	0	0	0	0	0
	9	6	4	8	0	0	0	0	0	0	0
	3	8	8	6	2	1	4	4	.	.	.

(F. 1, r.)

Colophon. 'Coloniae apvd Melchiorem // Nouefienfem Anno
.M. .D. XXVII.//Menfe maio.' (F. 29, r.)

Description. 4°, 13.4 × 19.4 cm., the text being 8.9 × 14.3 cm. 29 ff. unnumb., 32 ll. Cologne, 1527.

Editions. There was no other edition. The dedicatory epistle is dated 'Coloniæ. Anno 1527. Calendis Maijs.'

This extremely rare little work, almost unknown to bibliographers, begins with a theoretical discussion of the nature of number and arithmetic. This is followed by a 'compendiaria . . . artis numerandi ratio in tres tractatus digesta.' Of these the first treats of the 'species' and the rule of three in integers; the second of fractions, and the third of business problems. The work is too theoretical to have had any influence on commercial arithmetic.

JOHANNES WOLPHIUS. Ed. pr. 1527. Frankfort, 1534.

A German mathematician, born c. 1500.

Title. 'Rvdi//menta Arithmetices // Authore Iohanne Vuolphio // Herfbrugienfe.// Elemen//tale Geometricvm, ex // Euclidis Geometria, à Ioanne Vœgelin, // Haylpronnenfi, ad omnium Mathe//matics studioforum utili//tatem decerptum. // Franc. Chriftianus Ege-//nolphus excudebat.' (The title page is surrounded by an elaborate woodcut. F. 1, r.)

Colophon. At the end is the date 'M.D.XXXIIII.' (F. 56, r.)

Description. 8°, 9.7 × 15 cm., the text being 6.8 × 11.7 cm. 56 ff. unnumb., 24–29 ll. (The arithmetic occupies only 27 ff.) Frankfort, 1534.

Editions. Nürnberg, 1527; Frankfort, 1534, 8° (here described); ib., 1537; Strasburg, 1539, 8°; ib., 1540; Frankfort, 1548, 8° (below); ib., 1561.

This brief treatise on arithmetic covers the work required in some of the Latin schools of the sixteenth century. It contains little besides numeration and the fundamental operations, including duplation, mediation, the rule of three, and fractions. There are only a few applications, coinage and partnership being the most prominent.

JOHANNES WOLPHIUS. Ed. pr. 1527. Frankfort, 1548.

See above.

Title. 'Rvdi-//menta Arithmeti-//ces, Autore Iohanne Vuol-//phio Herfbru-//gienfe.// Elementa-//le Geometricvm, // Ex

Euclidis Geometria, a Ioanne // Vægelin, Haylpronnenfi, ad o//
mnium Mathematices studio//forum utilitatem de//cerptum//
Franc. Chri. Ege.' (F. 1, r.)

Colophon. At the end is the date 'M. D. XLVIII.' (F. 60, r.)

Description. 8°, 9.9 × 15.3 cm., the text being 8.2 × 11.8 cm.
60 ff. unnumb., 22–27 ll. (The arithmetic occupies only 28 ff.)
Frankfort, 1548.

PETRUS APIANUS. Ed. pr. 1527. Ingolstadt, 1527.

PETER BIENEWITZ, or BENNEWITZ. Born at Leisnig, in 1495; died at
Ingolstadt, April 21, 1552. He wrote chiefly on astronomy, and in his
Cosmographia (1524) he first showed how to determine longitude by observ-
ing the distance of the moon from certain fixed stars. He was professor of
astronomy at Ingolstadt, and was one of the few university professors of
his time who gave instruction in arithmetic in the German language.

Title. See Fig. 78.

Colophon. 'Gedrückt vnd volendt zû Ingolftadt // durch Ge-
orgium Apianum von Leyß//nick//jm Jar nach der geburt Christi
// 1527. am 9. tag Augufti.' (F. 299, v.)

Description. 8°, 10 × 14.8 cm., the text being 7 × 11.7 cm.
299 ff. unnumb. + 1 blank = 300 ff., 27 ll. Ingolstadt, 1527.

Editions. Ingolstadt, 1527, 8° (here described); Frankfort,
1537, 8° (p. 157); ib., 1544, 8°; ib., 1564, 8°; ib., 1580. Graesse
mentions an 'Arithmetica,' Leipzig, 1543, 8°, but questions it,
and Romstöck does not give it in his article on Apianus in the
Astronomen, Mathematiker, und Physiker der Diöcese Eichstädt.

Apianus follows Rudolff so closely as to give ground for comment.
His arithmetic differs from the latter's chiefly in the arrangement of the
matter. The work is largely commercial, and includes the fundamental
operations and the ordinary rules and applications of the period. There
is a chapter on counters at the end of the book. Indeed, Apianus advises
their use, saying: 'die Sumering der Register durch die rechenpfeñing
auff der lini brauchfamer ist dañ durch die federn oder kreide.' The
work is also interesting on account of its quaint illustrations. The
title page (p. 156) is noteworthy on account of the engraved 'Pascal
triangle' a century before Pascal studied this numerical form, and
some years before Stifel mentioned it, and because of the picture of line
reckoning. I know of no example of the 'Pascal triangle' in print

before this one, although the arrangement had doubtless long been more or less familiar to mathematicians.



FIG. 78. TITLE PAGE OF THE FIRST EDITION OF APIANUS

Other works of 1527. Feliciano, p. 146, 1526; Riese, p. 139, 1522, the first Nürnberg edition so far as I know; Tagliente, p. 114, 1515; W. Peer, 'Ain new guet Rechenbuchlein,' Nürnberg, 8°.

PETRUS APIANUS. Ed. pr. 1527. Frankfort, 1537.

See p. 155.

Title. 'Ein neue vnd wolge//gründte vnderweifung aller // Kauffmans Rechnung in dreien Bü//chern/ mit fchönen Regeln vnd fragstücken be-//griffen. Sunderlich was fortel vnnnd behendig-//keit in der Welfchen Practica vnnnd Tolle-//ten gebraucht wurt/des gleichen vor//mals weder inn Teutfcher noch in // Welifcher Spraach nie getruckt.// ¶ Durch Petrum Apianum von Leyfznick der // Afronomei zû Ingolftatt Ordinarium.// (Woodcut of merchants using counters.) Franc. Chri. Egen.' (F. 1, r.)

Colophon. 'Zu Franckfurt/ bei Chriftian Egenolff/ // Anno Domini. M. D. xxxvij.// Im Herbftmon.' (F. 183, v.)

Description. 8°, 9.8 × 15.3 cm., the text being 7 × 11.5 cm. 183 ff. unnumb. + 1 blank = 184 ff., 25-28 ll. Frankfort, 1537.

See p. 155.

JOHANNES FERNELIUS. Ed. pr. 1528. Paris, 1528.

JEAN FERNEL. Born at Clermont in 1497; died at Paris, April 26, 1558. He was a physician, with a taste for mathematics and astronomy. He wrote numerous works on medicine and mathematics.

Title. 'Ioannis Fer//nelii Ambianatis // de proportionibus Libri duo.// Prior, qui de fimplici proportio-//ne eft, & magnitudinum & nu-//merorum tum fimplicium tum // fractorum rationes edocet.// Pofterior, ipfas proportiones cõ-//parat: carúm q3 rationes colligit.// Parisiis // Ex ædibus Simonis Colinaei // 1528.' (F. 1, r. Fig. 78.)

Colophon. '¶ Libellorvm de proportionibvs, Ioanne // Fernelio Ambianate authore, finis.' (F. 28, v.)

Description. Fol., 22.2 × 31.5 cm., the text being 15.6 × 24.4 cm. 4 ff. unnumb. + 24 numb. = 28 ff., 44-45 ll. Paris, 1528.

Editions. There was no other edition.

This is one of the best of the sixteenth-century treatises on the medieval proportion. It follows the Boethian treatment, as seen also in the work of Bradwardin.

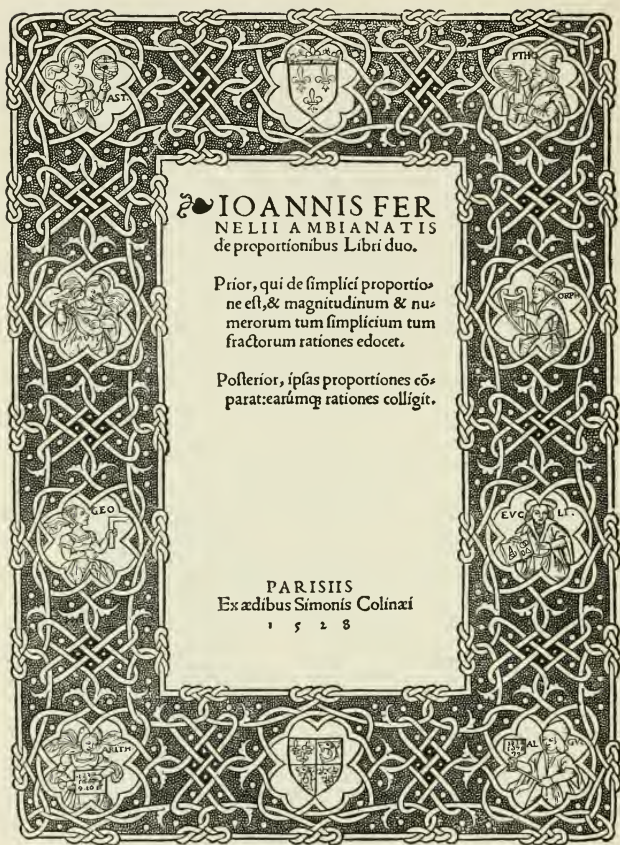


FIG. 79. TITLE PAGE OF FERNELIUS

Other works of 1528. Borghi, p. 16, 1484; Cassiodorus, p. 211, 1540; Ciruelo, p. 60, 1495; Riese, p. 139, 1522; Tagliente, p. 114, 1515; Christiernus Torchillus Morsianus, 'Arithmetica brevis et dilucida in quinque partes digesta,' Cologne, 8° (but see p. 182, 1536).

Works of 1529. Anianus, p. 32, 1488; Riese, p. 139, 1522; Tonstall, p. 135, 1522; Bæda, 'De natura rerum et temporum ratione libri duo,' Basel, cap. I being 'De computu vel loquela digitorum'; there was an edition by Noviomagus, Cologne, 1537 (see also pp. 131, 140, 263, 1521, 1525, 1554).

CHRISTOFF RUDOLFF. Ed. pr. 1530. Augsburg, 1530.

See p. 151.

Title. See Fig. 80.

Exempel Büchlin
Rechnung belangend. dar
bey / ein nuzliche Instruction / wölli
cher gestalder die vergleychnus / der Elnmaß
durch den Zirckel / der Pfund durch abwe
gen / der Thrayd / Weyn / vnd Olmaße.
Durch abfechtenn der Münz / durch
ganghafften yren werde / gegen ein
ander zue rlernen vñ ergründesey.
Zu Wien in Osterreich / durch
Christoffen Rudolff / seynē
schülern zu sonderer übüg
auch allen handehie
rungen personen
zu nuz vnd gü
tem ver
fertige.

M. D. XXX,

FIG. 80. 'TITLE PAGE OF THE FIRST EDITION OF RUDOLFF'S *Exempel Büchlin*

Colophon. 'Getruckt in der löblichen Reychftat Aug//fpurg/
durch Heynrichen Stayner///Volendet am 31 May im jar//M. D.
XXX.' (F. 75, v.)

Description. 8°, 9.9 × 15.1 cm., the text being 7.4 × 12.2 cm.
75 ff. unnumb. + 2 blank = 77 ff., 28 ll. Augsburg, 1530.

Editions. Augsburg, 1530, 8° (here described); Nürnberg,
1538; ib., 1540.

This is the third of Rudolff's works (see p. 151). As the name implies, it is merely a collection of problems, two hundred and ninety-two in number. Most of these problems are of a genuine business nature, and they furnish a good idea of the ordinary commercial needs of the first half of the sixteenth century in Germany.

ORONTIUS FINAEUS. Ed. pr. 1530-32. Paris, 1530-32.

ORONCE FINÉ. Born at Briançon in 1494; died at Paris, October 6, 1555. He was made professor of mathematics in the (later called) Collège de France in 1532. He wrote extensively on astronomy and geometry, but was not a genuine scholar.

Title. See Fig. 81.

Colophon. 'Excvsvm est avtem ipsvm opvs Pa//rifijs in uico
Sorbonico, impenfis Gerardi Morrhij, & Ioannis Petri. Anno //
M, D. XXXII.' (F. 216, r.)

Description. Fol., 24.1 × 37 cm., the text being 18.4 × 27.7
cm. 9 ff. unnumb. + 208 numb. = 217 ff., 48 ll. Paris, 1530-32.

The title page of the geometry appears on f. 49, r., with the date M. D. XXX; the cosmography on f. 101, r., with the date M. D. XXX; the horography on f. 157, r., with the date M. D. XXXI.

Editions. Paris, 1530-32, fol. (here described); ib., 1535; ib.,
1542, fol. (p. 163); ib., 1544, 8° (p. 163); ib., 1554; ib., 1555,
4° (p. 163); Venice, 1587, 4° (p. 164). Leslie's statement that
the work appeared in 1525 is unfounded. For the 'De rebus
mathematicis,' 1556, see p. 279.

This is the first edition of the works of Finaeus, perhaps the most pretentious French mathematician of his time, and was published during the years 1530-32. The dedicatory epistle is dated 'Lutetiæ Parisiorum Calendis Ianuarij 1531,' or 1532 new style. The part on arithmetic is



FIG. 81. TITLE PAGE OF THE FIRST EDITION OF FINAEUS

divided into four books dealing respectively with integers, common fractions, sexagesimal fractions, and proportion. There are no applications

ORONTII FINEI DELPH.

per 29 primi elementorum Euclidis facile manifestatur. & angulus $A B H$, an-
gulo $A G F$ est æqualis (nam uterq̄ rectus) igitur per 4 sexti eiusdem Euclidis,
fit sicut $H B$ ad $B A$, ita $F G$ putei laticudo ad $G A$ compositam ex $G B$ & $B A$ longi-
tudinem, siue profunditatem.

Exemplum.

Sit exempli gratia $B H$ 20 partium, qualium latus quadrati est 60: $B E$ autē me-
tiatur, & sit in exemplum 6 cubitorum, tot etiam cubitorum erit $G F$: sunt enim la-
tera parallelogrammi $B E F G$ opposita, quæ per 34 eiusdem primi sunt inuicem
æqualia. Duc igitur 6 in 60, fiet 360: quæ diuide per 20, & habebis pro quoti-
te 18. Tot igitur cubitorum erit $A G$:

à qua si dempseris $A B$ trium uer-
bi gratia cubitorum, relinquatur
 $B G$ desyderata & in profundum
dep̄ssa putei lōgitudō 15 cubitorum.

Alia eiusdem
obseruatiōnis
demonstratiō.

IDEM QVOQVE SIC OB-
tinebis. Metire $H E$: sit q̄ exempli
causa 5 cubitorū. Deinde multi-
plica 5 per 60, fiet 300: hæc diui
per 20, producentur 15, uelut an-
tica. Bina namq̄ triangula $A B H$ et
 $H E F$ sunt rursus æquiangula,
quoniam angulus $A H B$ angulo
 $E H F$ ad uerticem posito, per 15
primi Euclidis est æqualis. itē re-
ctus qui ad B , recto qui ad E pari-
ter æquat. reliquus igitur $B A H$
reliquo $H F E$ per 32 eiusdem pri-
mi est æqualis. Vnde per supe-
rius allegatā quartā propositionē
sexti, sicut $H B$ ad $B A$, ita $H E$ ad $E F$, eadem $B G$ per hypothesim æqualem.

Notandum.

Cum autem acciderit puteum rotundam habere figuram, habenda erit cōsyde-
ratio diametri putealis orificij, & reliqua omnia ueluti prius absolueda.

Secundus mo-
dus metiendi
profundā per
quadrantem.

RELIQVVMETS, V T
eandem rerum in profundū de-
p̄ssarum, per uulgatū quadrā-
tem metiri doceamus altitudinē.
Sic itaq̄ puteus circularis $E F G$
 H , cuius diameter sit $E F$, aut illi
æqualis $G H$. Adp̄lica igitur qua-
drātem ipsi putei orificio: in hūc
modū, ut finis lateris $A D$ ad datū
punctum E constituatur. Leua
postmodū, aut deprime quadrā-
tem (libero semper demisso per-
pendiculo) donec radius uisualis
per ambo foramina pinnaciorū
ad inferiorem & ē diametro sig-
gnatū terminū H perducat. Quo
facto & immoto quadrāte, uide
in quā

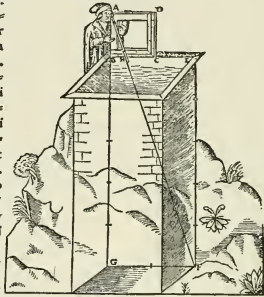


FIG. 82. FROM THE FIRST EDITION OF FINAENS

worthy the name, and the work has little to commend it. Some interesting illustrations showing the use of the mediæval Quadrans are shown in Fig. 82.

ORONTIUS FINAEUS. Ed. pr. 1530-32. Paris, 1542.

See p. 160.

Title. 'Orontii // Finci Delphin. Re//gii Mathematicarvm // Professoris:// arithmetica // practica, libris qva//tuor absoluta, omnibus qui Ma//thematicas ipfas tractare volunt // perutilis, admodúmque neceffa//ria: Ex nouiffima authoris reco//gnitione, amplior, ac emenda//tior facta.// Ædito tertia.// Parisiis.// Ex officina Simonis Colinaei.// 1542.// Cum gratia & priuilegio Chri//ftianiffimi Francorum Regis.' (F. I, r.)

Description. Fol., 20.9 × 30.1 cm., the text being 16 × 28.2 cm. 2 ff. unnumb. + 66 numb. = 68 ff., 40 ll. Paris, 1542.

See p. 160.

ORONTIUS FINAEUS. Ed. pr. 1530-32. Paris, 1544.

See p. 160.

Title. 'Orontii // Finæi Delphi//natis, Regij Mathe//maticarū Lutetiæ // Profefforis, // Arithmetica // Practica, in compendiū per Authorem // ipfum redacta, multifq; accessionibus // locupletata: Ijs qui ad liberam quāuis, // nedū Mathematicā adspirant philofo//phiā perutilis, admodúm q; necessaria. // Lvtetiae Parisiorvm // Apud Simonem Colinaeum. // 1544. // Virefcit vulnere virtus.' (F. I, r.)

Description. 8°, 11 × 17 cm., the text being 8.6 × 12.8 cm. 95 ff. numb. + 1 unnumb. = 96 ff., 31 ll. Paris, 1544.

See p. 160.

ORONTIUS FINAEUS. Ed. pr. 1530-32. Paris, 1555.

See p. 160.

Title. 'Orontii Finæi // Delphinatis, Regii // Mathematicarum Lutetiæ // profefforis, // de arithmetica practi//ca libri quator: Ab ipfo authore uigi//lanter recogniti, multifque // accessionibus recens // locupletati. // Lvtetiae Parisiorvm, // apud Michaëlem Vascofanum, // 1555. // Ex privilegio regis. // Virefcit uulnere uirtus.' (F. I, r.)

Description. 4°, 15.4 × 20.7 cm., the text being 11.6 × 17.2 cm. 4 ff. unnumb. + 72 numb. = 76 ff., 34-35 ll. Paris, 1555.

ORONTIUS FINAEUS. Ed. pr. 1530-32. Venice, 1587.

See p. 160.

Title. 'Opere // di // Orontio Fineo // del Delfinato: // Diuise in cinque Parti; // Arimetica, Geometria, Cofmografia, & Oriuoli, // Tradotte // Da Cofimo Bartoli, Gentilhuome, & Academico Fiorentino: // Et gli Specchi, // Tradotti dal Cauialier Ercole Bottrigarò, Gentilhuomo Bolognese. // Nuouamente pofte in luce: // con privilegio. // In Venetia, Preffo Francefco Francefchi Senefe, 1587.' (F. 1, r.)

Description. 4°, 14.9 × 20.9 cm., the text being 10.1 × 16.8 cm. 8 ff. unnumb. + 81 numb. = 89 ff. (in the part devoted to arithmetic), 35-39 ll. Venice, 1587.

Editions. See p. 160. That this is the first Italian edition appears in the printer's dedicatory epistle to Guidubaldo de' Marchesi del Monte, in which he mentions 'in quefta occasione dell' hauere ftampato l'opera d'Orontio nella noftro Tofcana lingua,' with the date 'Di Venetia, il di 7. di Luglio, 1587.'

See p. 160.

ANDREAS ALCIATUS. Ed. pr. 1530. Hagenau, 1530.

Born at Alzano, near Milan, May 8, 1492; died there June 12, 1550. He was an Italian jurist.

Title. See Fig. 83.

Description. 8°, 10.3 × 15.4 cm., the text being 7.8 × 11.1 cm. 50 ff. and 2 plates unnumb., 28 ll. Hagenau, 1530.

Editions. There was no other separate edition, but the works of Alciatus appeared at Basel in 1571, 3 vol., fol.

The work of Alciatus extends only to f. D 1. The 'Oratio de legibus' of Melanchthon then extends to f. F 5. This is followed by 'Budæi quædam de moneta Græca,' etc. The work of Alciatus is not an arithmetic, but a history of weights and measures. As such it is of value for the historical development of commercial mathematics.

Other works of 1530. Boethius, p. 27, 1488; Bradwardin, p. 61, 1495; Clatovenus, p. 292, 1558; Maffei, p. 86, 1506; Riese, p. 139, 1522; Tagliente, p. 114, 1515; Torrentini, p. 76, 1501; Johann Kolross, a primer entitled 'Enchiridion: das ist Handbüchlin tütscher

Orthographi . . . Auch wie mann die Cifer vnd tüdtische zaal verston sol,' Basel, with another edition, ib., 1534, 8°. There was also an anonymous work entitled 'La vraye manière pour apprendre à chiffrer et compter,' published at Lyons, s. a., 12°, c. 1530.

ANDAL

CIATI LIBELLVS,

DE PONDERIBVS ET

mensuris.

ITEM

Budæi quædam de eadem re, adhuc non usq̃.

ITEM

*Philippi Melanchthonis, de iisdem, ad
Germanorum usum, sententia.*

*Alciati quoq; & Philippi Melanchthonis,
in laudem Iuris Ciuilis, orationes duæ
elegantissimæ.*

Haganoæ apud Iohan. Sec.

Anno M. D. XXX.

Mense Martio.

FIG. 83. TITLE PAGE OF ALCIATUS

JOACHIM FORTIUS RINGELBERGIUS.

Ed. pr. 1531.

Leyden, 1531.

JOACHIM STERCK RINGELBERGH. Born at Antwerp, c. 1499; died c. 1536. He taught philosophy and mathematics in various cities of Germany and France.

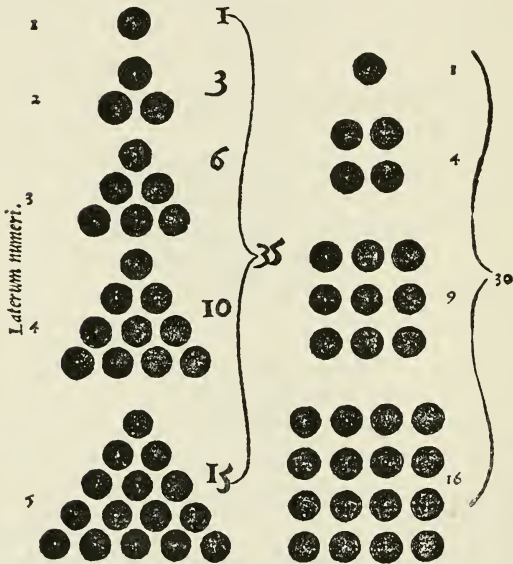
Title. 'Ioachimi // Fortii Ringel-//bergij Andouerpiani opera, // quæ proxima pagina // enumerantur. // Virtute duce // comite Fortvna. // Apvd Gryphivm // Lvgdvni, // anno // M. D. XXXI.' (P. 1.)

Colophon. 'Lvgdvni apvd // Seb. Grypivm, // anno // M. D. XXXI.' (P. 687.)

Description. 8°, 10.3 × 15.7 cm., the text being 8.4 × 12.2 cm. 687 pp. numb. + 30 = 717 pp., 22–29 ll. Leyden, 1531.

16 IO. FORTII RING.

Pyramidum numeri hoc pacto digcruntur.



Omnis

FIG. 84. FROM THE FIRST EDITION OF RINGELBERGIUS

Editions. Leyden, 1531, 8° (here described); ib. (at least the arithmetic part), 1539, 8°; Basel, 1541, 8° (see p. 167); Leyden,

1556, 8° (see p. 168). The 'Epistola ad Lectorem' is dated 'Louanij Idib. Augusti, Anno M. D. XXIX.'

This work of Ringelbergius is somewhat encyclopedic in character. The 'Liber de Ratione studij,' with 'Annotationes' thereon and a 'Horoscopus libri ratione studij' to show that it was written in an auspicious time, is followed by six other books. These relate to Grammar, Dialectics, Rhetoric, Mathematics, and Divination, closing with a book entitled 'Communis civisdam Naturæ fuit.' The book on mathematics includes a chapter on arithmetic in which, in 17 pages (about 10 pages excluding the illustrations), the author treats of the Boethian ratios, figurate numbers (see Fig. 84), and the fundamental operations with figures and upon the line abacus. The part relating to astronomy had already been published at Basel in 1528, and the cosmography in Paris in 1529.

Other works of 1531. Köbel, p. 101, 1514; Juan Gutiérrez de Gualda, 'Arte breue y muy prouechos de cuenta castellana y arismetica,' Toledo, 4°; ib., 1539; Saragossa, 1557, 1564; Alcalá, 1570; H. C. Agrippa, 'De occulta philosophia libri tres,' s. l., with later editions, Cologne, 1533, fol.; 1541; Lugduni, 1550, 8°; s. l., 1565; Basel, 1567, 8°; s. l. a. (Paris, 1567 ?), included by De Morgan without much reason.

JOACHIM FORTIUS RINGELBERGIUS.

Ed. pr. 1531.

Basel, 1541.

See p. 165.

Title. 'Ioachimi // Fortii Ringelber // gii Andoverpiani lvevbra // tiones, uel potius absolutifsima *κυκλοπαίδεια*: nem // pe liber de Ratione studij, utriusq; linguæ, Grāmatiche, // Dialectice, Rhetorice, Mathematicæ, & fublterioris // Philofophiæ multa. Quorū *ἔλεγχος* sub fequenti pa // gina enumeratur. Atq; hæc omnia eo iudicio & // ordine funt tradita, ut uel fola cuiq; // meliorum literarum studiofo // fatis ad fummum inge // nij cultum effe // pofint. // Basileæ. // Anno M. D. XLI.' (P. 1.)

Colophon. 'Basileæ apvd Bartholo // mevm Vvesthemermv // anno M. D. XLI.' (P. 797.)

Description. 8°, 10.3 × 15.7 cm., the text being 8.2 × 11.8 cm. 796 pp. numb. + 2 unnumb. = 798 pp., 25 ll. Basel, 1541.

See p. 166. Although the title differs from that of 1531, the work is the same.

JOACHIM FORTIUS RINGELBERGIUS.

Ed. pr. 1531.

Leyden, 1556.

See p. 165.

Title. 'Ioachimi // Fortii // Rin-//gelbergii // Andoverpiani // Opera, // Quae proxima pagina enumerantur. // Lvgdvni, // Apud Ioannem Frellonium.' (P. 1. The rest of the page is torn off.)

Colophon. 'Lvgdvni, // ex officina typogra-//phica Michaelis // Sylvii, // M. D. LVI.' (P. 663.)

Description. 8°, 10.5 × 15.2 cm., the text being 9 × 13 cm. 4 pp. unnumb. + 4 blank + 660 numb. = 668 pp., 26-31 ll. Leyden, 1556.

See p. 166. Although the title differs from that of 1531, the work is the same.

MICHAEL PSELLUS. Ed. pr. 1532.

Venice, 1532.

Called the Younger, to distinguish him from a philosopher of the same name who lived about 870 A.D. Born at Constantinople in 1020; died in a cloister in 1110. He studied at Athens and taught philosophy at Constantinople.

Title. See Fig. 85.

Description. 8°, 9.9 × 14.9 cm., the text being 7.4 × 11.4 cm. 1 f. blank + 104 unnumb. = 105 ff., 24-25 ll. Greek, Venice, 1532.

Editions. Venice, 1532, 8°, Greek (here described); Paris, 1538, Greek, 4°; Paris, 1545, Greek and Latin; Augsburg, 1554, 8°, Greek and Latin; Wittenberg, 1556, Latin; Basel, 1554 and 1556, 8°, Greek and Latin; Paris, 1557, 8°, Latin (p. 170); Wittenberg, 1560, Latin; Paris, 1585, Latin; Leipzig, 1590, 8°, Greek and Latin (p. 170); Heidelberg, 1591, Latin; Tours, 1592, Latin.

Psellus was one of the last of the Greek writers on arithmetic. This part of his work is devoted solely to the theory of numbers, and it represents the arithmetical inheritance derived from the older Hellenic civilization. The treatise covers the mediæval Quadrivium—arithmetic, music, geometry, and astronomy—and is the only late Greek work on arithmetic that attracted attention in the Renaissance period. The arithmetic is merely a primer for the study of Nicomachus.

Other works of 1532. Aventinus, p. 136, 1522; Capella, p. 66, 1499; Feliciano, p. 146, 1526; Köbel, p. 102, 1514; Rudolfi, p. 151, 1526; Stifel, p. 223, 1544; Vincento, p. 140, 1522; Johann Brandt, 'Kunst-

Τοῦ ποφωτάτου φελοῦ, σύνταγμα δ'σύνο-
πτον εἰς τὰς τέσσαρας μαθηματικὰς
ἐπιστήμας, Ἀριθμητικῶ, Μουσικ-
κὴν, Γεωμετρικὴν, καὶ
Ἀστρονομικὴν.

Ἐν ἰαυθ' Ἀριθμῶν σωτοματῆρα φράσις.
Τῆς Μουσικῆς σύνοψις ἠκριβωμένη.
Σύνοψις αὐθις, Γεωμετρίας λόγων.
Ἀθροιστὶς δ'σύνοπτως Ἀστρονομίας.

SAPIENTISSIMI PSELL
li opus dilucidum in quattuor Ma-
thematicas disciplinas, Arith-
meticam, Musicam, Geome-
triam, & Astronomiam.

Numerorum hic contractior explicatio.
Elaboratum Musices Compendium.
Cōpendiū rursus Geometrię rationū.
Astronomię coactio perspicua.

VENETIIS. M D XXXII.

¶ **Cum gratia.**

FIG. 85. TITLE PAGE OF THE FIRST EDITION OF PSELLUS

liche Rechnung mit der Ziffern vnd Pfennigen, Auff allerley handt-
tierung,' Cologne, 8°, 39 ff.; Georg Reichelstain, 'Kauffmans hand-
büchlin. Aller Rechenschafft behendigkeyt, auff Linien vnd Ziffern,'
Frankfort, sm. 8°, with another edition in 1534.

MICHAEL PSELLUS. Ed. pr. 1532.

Paris, 1557.

See p. 168.

Title. 'Michael // Psellvs de // Arithmetica, // Mvsica, Geo-
metria: // & Proclus de // Sphæra, // Elia Vineto Santone inter-
prete. // (Woodcut with motto: Inpingvi Gallina.) Parisiis, //
Apud Gulielmum Cauellat, in pingui gallina, // ex aduerfo collegij
Cameracenfis. // 1557.' (F. 1, r.)

Description. 8°, 10.6 × 16.2 cm., the text being 6.6 × 13.3
cm. 2 ff. unnumb. + 76 numb. + 3 blank = 81 ff. (18 ff. on
arithmetic), 22 ll. Paris, 1557.

Editions. See p. 168. This is one of the Latin editions.

See p. 168.

MICHAEL PSELLUS. Ed. pr. 1532.

Leipzig, 1590.

See p. 168.

Title. 'Pselli // Philofophi & Mathemati-//ci clarifsimi //
Arithmetica // Edita ftudio // M. Chriftophori Meureri, // Mathe-
matum Profefforis publici // in Academia // Lipsienfi. // 1590. //
Plato interrogatus, cur homo fit a-//nimal fapientifsimum: *ὅτι*
ἀριθ- // *μείν ἐπίσταται*, refpondit. // Lipsiæ.' (F. 1, r.)

Colophon. 'Lipsiæ, imprimebat Michaël // Lantzenberger. //
Anno M. D. XC.' (F. 24, v.)

Description. 8°, 9.5 × 15.8 cm., the text being 6.6 × 12.3 cm.
24 ff. unnumb., 30 ll. Leipzig, 1590.

Editions. See p. 168. The Latin dedicatory epistle is dated
'Lipsiæ XV. Cal. Nouemb. Anno post Chriftum natum 1590.'
The text is in Greek and Latin.

See p. 168.

MICHAEL PSELLUS. Ed. pr. 1532.

Leipzig, 1616.

See p. 168.

Title. 'Pselli // arithmetica // Guilhelmo Xylandro // inter-
prete // Cum Præfatione // Chriftophori Meureri D. // Mathe-
matum Profefforis // in Academia Lipsienfi. // 1616. // Lipsiæ //
Typis Abrahami Lambergi.' (F. 1, r.)

Description. 8°, 9 × 14.4 cm., the text being 6.6 × 12.1 cm. 39 pp., 1-8 unnumb., then numb. 1-31; 24-25 ll. Leipzig, 1616.

See p. 168.

ADAM RIESE. Ed. pr. 1533.

Leipzig, 1536.

See p. 138.

Title. See Fig. 86.

Description. 4°, 14.6 × 19 cm., the text being 9.6 × 15.1 cm., and the tables 9.5 × 12 cm. 79 ff. unnumb. + 1 blank = 80 ff., 17-24 ll. in the Introduction (3 ff.), the rest of the book consisting of tables. Leipzig, 1536.

Editions. Leipzig, 1533; ib., 1536, 4° (here described).

This is a set of mercantile tables for the multiplication and division of denominate numbers.

GEORGE AGRICOLA. Ed. pr. 1533.

Paris, 1533.

Born March 24, 1490, at Glauchau, Saxony; died November 21, 1555, at Chemnitz. He was rector of a school at Zwickau (1518-1522), and in later life a physician. He wrote a number of scientific works.

Title. See Fig. 87.

Description. 8°, 10.2 × 15 cm., the text being 6.8 × 12.4 cm. 7 pp. unnumb. + 3-261 numb. + 6 blank + 1 with woodcut = 273 pp., 28 ll. Paris, 1533.

Editions. Paris, 1533, 8° (here described); Venice, 1533, 8°; ib., 1535, fol.; Basel, 1549, 8°; ib., 1550, fol. There was also an 'Epitome omnium Georgii Agricolae de mensuris et ponderibus per G. Philandrum' published at Lyons in 1552, 8°.

The work can hardly be called an arithmetic, but, like a few others included in this list, it is a valuable book of reference on the history of ancient measures. It consists of five books as follows: 'Liber primus, de mensuris Romanis' (p. 9); 'Liber secundus de Mensuris Græcis' (p. 75); 'Liber tertius, de Pondere rerum quas metimur' (p. 144); 'Liber quartus, de Ponderibus Romanis' (p. 188); 'Liber quintus, de Ponderibus Græcis' (p. 219). The book is also valuable to the student of Roman and Greek numerals, and of the various symbols of measures. Such works explain the origin of certain systems of

Ein Gerechent Büch=
lein / auff den Schöffel / Eimer /
vnd Pfundt gewicht / zu eh=
ren einem Erbarn / Weisen
Rathe auff Sanct An=
nenbergk.

Durch Adam Riesen.

1533

Zu Leiptzick / hatt gedruckt dis
gerechent Büchlein
Melchior Lotter.

Volendet vnd ausgangen am abendt
des Newen Jars

1536

measures employed before the metric system was developed, and of such symbols as are still used by apothecaries.

GEORGII

AGRICOLAE MEDICI LIBRI

quinque de Mensuris & Ponderibus, in quin-

bus pleraque à BVDAEO &

PORTIO parum animaduersa

diligenter excutuntur.

Opus nunc primum in lucem editum.



PARISIIS,

Excudebat Christianus Wechelus, in uico Iacob

baeo, sub scuto Basileensi. Anno

M. D. XXXIII.

FIG. 87. TITLE PAGE OF THE FIRST EDITION OF AGRICOLA

Other works of 1533. Agrippa, p. 167, 1531; Apianus, p. 62; Jordanus, p. 62, 1496; Riese, p. 139, 1522; Schonerus (editor), p. 178, 1534; Vincento, p. 140, 1522; Anonymous, 'Libretto de Abaco,' Venice; Anonymous (sometimes attributed to Regiomontanus), p. 178, 1534.

GIOVANNI MANENTI. Ed. pr. 1534. Venice, 1534.

ZUAN MANENTI. A Venetian mathematician of the sixteenth century.

Title. See Fig. 88.

Colophon. 'In Vinegia per Giouan' Antonio di Ni-//colini da Sabio A Infantia de. M.// Zuan Manenti. Nelli Anni del // fignore. MDXXXIII.//del Mefe di Genaro.// Neffuno ardifca Stampar quefte Tariffe// de cambii & de diuerfe cofe fotto pe//na de excommunicatione late // fententie come nel Priui-//legio fe contiene.// M D XXXIII.' (Large woodcut.) (F. 400, v.)

Description. 12°, 7.5 × 13.9 cm., the text being 5.4 × 10.6 cm. 402 ff. (2 blank) unnumb., 21–26 ll. Venice, 1534.

Editions. There was no other edition.

As the title indicates, this is a set of tables of exchange, and it was intended for the use of Venetian bankers and merchants.

GIOVANNI SFORTUNATI. Ed. pr. 1534. Venice, 1534.

JOHANNES INFORTUNATUS. An Italian arithmetician, born at Siena c. 1500.

Title. See Fig. 89.

Colophon. 'Stampata in Vinegia per Nicolo di Ariftotile // detto Zoppino.// M.D. XXXIII.' (F. 129, r.)

Description. 4°, 15.4 × 21 cm., the text being 13.2 × 16.9 cm. 129 ff., 40–41 ll. Venice, 1534.

Editions. Venice, 1534, 4° (here described); ib., 1543, 4°; ib., 1544 (colophon 1545, see p. 177), 4°; ib., 1545, 4° (p. 177); s. l., Venice, c. 1550; ib., 1561, 4° (p. 177); ib., 1568. The privilege is dated 1532.

Sfortunati wrote his treatise along the lines followed by Borghi and Feliciano, and in his preface he acknowledges his indebtedness to them and to 'Maestro Luca dal Borgo dell' ordine di fanto Francesco' (p. 54) and to the 'operetta di Filippo Calādi Cittadino Fiorentino' (p. 47). Like these authors, he was a popular writer, as the seven editions of his book go to prove. His work is fairly complete as to the operations with integers and fractions, and is satisfactory as to the examples illustrating the Italian business life of the sixteenth century. The treatise closes with some work in practical mensuration and some mercantile tables.

TARIFFA
 DE CAMBIE ALTRO
 Còposta per Zuà Manenti.



Con priuilegio del Illustr. Senato veneto
 ch'altri che Z. Manenti infra anni X stã
 par ne far stãpar nò la possã, so'to le pe
 ne còtenute in quello. M D XXXIII.

Libet hic est...
...
...

FIG. 88. TITLE PAGE OF MANENTI

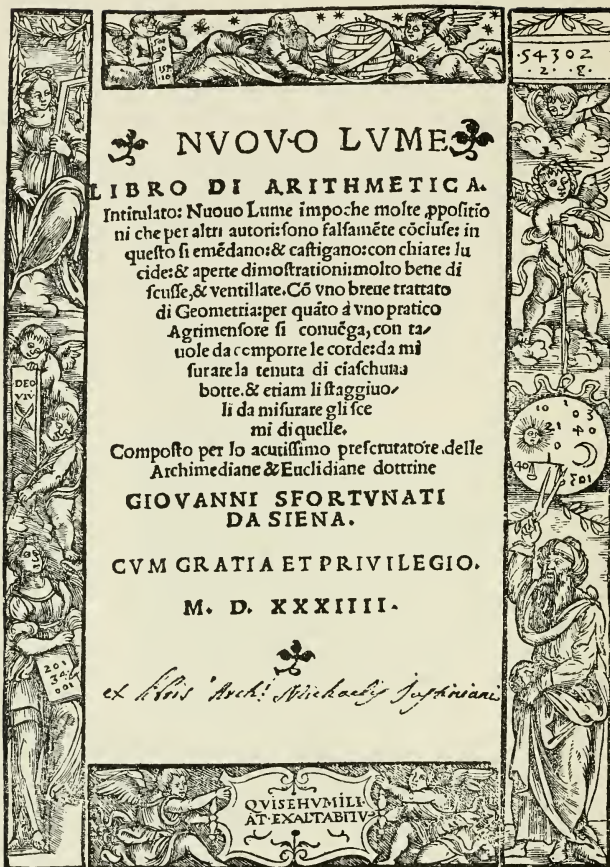


FIG. 89. TITLE PAGE OF THE FIRST EDITION OF SFORTUNATI

GIOVANNI SFORTUNATI.

Ed. pr. 1534.

Venice, 1544-45.

See p. 174.

Title. The title page is practically identical with that of 1534, except for the date: M. D. XLIII.

Colophon. 'Stampata in Vinegia per Bernardino de Bindoni // Milaneſe Anno domini. M. D. XLV.' (F. 129, r.)

Description. 4°, 14.8 × 20 cm., the text being 12.2 × 16.7 cm. 2 ff. unnumb. + 127 numb. = 129 ff., 40 ll. Venice, 1544-45.

Editions. See p. 174. It will be noticed that the dates in the colophon and on the title page do not agree.

See p. 174.

GIOVANNI SFORTUNATI. Ed. pr. 1534. Venice, 1545.

See p. 174.

Title. The title page is practically identical with that of the 1534 edition.

Colophon. 'In Vinegia per Giouan' Antonio & Pietro fratel-//li de Nicolini da Sabio. Ad infantia di // Giacomo da Coneano libraro a fan // Fantin. M: D. XLV.' (F. 129, r.)

Description. 4°, 15.4 × 21.2 cm., the text being 12.9 × 16.8 cm. The text is practically identical with that of the 1534 edition.

See p. 174.

GIOVANNI SFORTUNATI. Ed. pr. 1534. Venice, 1561.

See p. 174.

Title. The title page is practically identical with that of the 1534 edition.

Colophon. 'In Venetia per Franceſco del Leno, // M D LXI.' (F. 129, r.)

Description. 4°, 15.4 × 21.6 cm., the text being 12.9 × 17.3 cm. 5 ff. blank + 129 numb. = 134 ff., 41-43 ll. Venice, 1561.

See p. 174.

ANONYMOUS. (Schonerus editor.)

Ed. pr. 1534.

Nürnberg, 1534.

Johannes Schonerus (Schöner) was born at Karlstadt, near Würzburg, January 16, 1477, and died at Nürnberg January 16, 1547. He was a preacher at Bamberg, and later (1526-1546) a teacher of mathematics in the Aegidiengymnasium at Nürnberg, in which Melanchthon took such interest.

Title. See Fig. 90.

Colophon. 'Norimbergæ apud Io. Petreium, // Anno M. D. XXXIII.' (F. 32, r.)

Description. 4°, 15 × 20.9 cm., the text being 11.6 × 15.6 cm. 32 ff. unnumb., 29-43 ll. Nürnberg, 1534.

Editions. This is merely an edition of the anonymous mediæval 'Algorithmus Demonstratus,' with notes by Schonerus. As might be expected, therefore, it is purely theoretical, being a late variation of the Boethian works. In the preface Schonerus speaks of it as the 'Algorithmus Demonstratus incerti auctoris.' De Morgan thought that it might have been written by Regiomontanus, but he was wrong in asserting that Schonerus attributed it unquestionably to him. As a matter of fact the authorship goes back at least to the fourteenth century. There is said to have been an edition published at Nürnberg in 1533, attributed to Regiomontanus, but I have not seen it.

JOHANN ALBERT. Ed. pr. 1534.

Wittenberg, 1561.

A Wittenberg Rechenmeister of c. 1500-1565.

Title. 'Rechenbüchlin // Auff der Federn/ Gantz // leicht/ aus rechtem Grund/ In // Gantzen vnd Gebrochen/ Neben // angehefftem vnlängft ausgelaffnem Büch-//lin/ Avff den Linien/ Dem einfel-//tigen gemeinem Man/vnd anhe-//benden der Arithmetica // zu gut.// Durch Johann. Albert/// Rechenmeister zu Wittembergk/zufamen//bracht. Auff new/mit allem vleis vber-//sehen/ gemehrt vnd gebeffert/ // zum dritten mal.// Wittemberg.// 1561.' (F. 1, r.)

Colophon. 'Gedruckt zu // Wittenberg/ // durch Geor-//gen Lawen // Erben.// 1561.' (F. 118, v.)

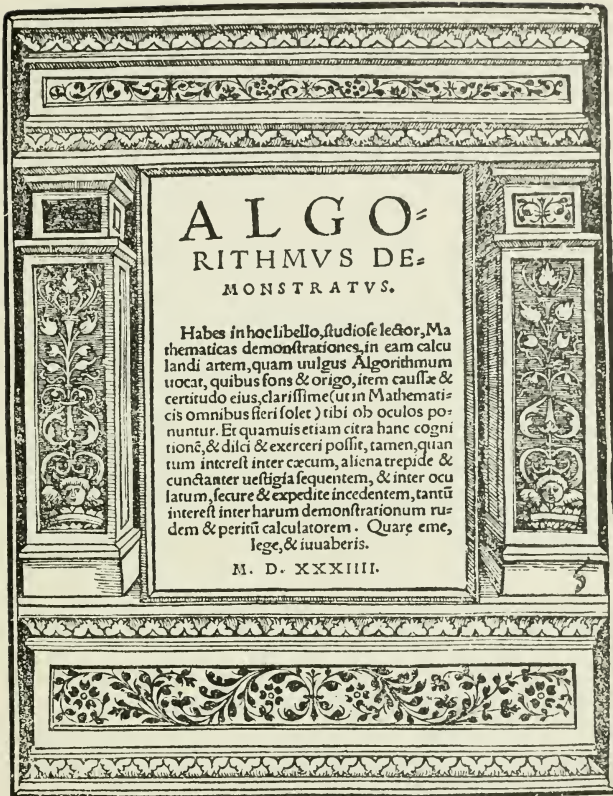


FIG. 90. TITLE PAGE OF THE 1534 *Algorithmus Demonstratus*

Description. 8°, 9.4 × 15.1 cm., the text being 6.7 × 10.8 cm. 120 ff. unnumb. (two blank), 7–24 ll. Wittenberg, 1561.

Editions. Wittenberg, 1534; ib., 1541, 12°; Frankfort, 1541 (the colophon is dated 1542), 8°; Wittenberg, 1553, 8°; ib., 1554; Frankfort, 1558, 8°; Magdeburg, 1559, 8°; Wittenberg, 1561, 8° (here described); ib., 1564, 8°; Magdeburg, 1579, 8°; Wittenberg, 1586, 8°. That this edition was revised in 1541 appears from the dedication, which is dated ‘im taufent/ fünff-//hundert/ ein vnd vier-//tzigften Jar.’ Murhard also mentions an ‘Introductio Arithmetices,’ Cologne, 1542, 8°.

Although from the title it would seem that algorism (‘Auff der Federn’) is emphasized, counter reckoning (‘die Species auff den Linien’) is first described (ff. A 3–F 2). This is followed by the second part, the algorism: ‘Das Ander Rechenbüchlein/auff der //Feder/auffs aller kürztzeit // vnd leichtest ver-//faffet’ (f. F 3). In each part there are many commercial problems, and the book ranks as one of the most practical of its day. It is a valuable source of information as to the commercial activities of its time.

Other works of 1534. Borghi, p. 16, 1484; Bradwardin, p. 61, 1495; Jordanus, p. 62, 1496; Kolross, p. 164, 1530; Ortega, p. 93, 1512; Peurbach, p. 53, 1492; Reichelstain, p. 169, 1532; Rudolff, p. 151, 1526; Wolphius, p. 154, 1527; Rabbi Elias Misrachi, מלאכת המספר or ספר המספר (perhaps 1533? 1532?), Constantinople, 4° (another edition, with a Latin translation by Schreckfuchs, and a commentary entitled קצור מלאכת המספר by Münster, Basel, 1546, 4°).

GIOVANNI MARIANI. Ed. pr. 1535. Venice, 1580.

ZUANE MARIANI. A Venetian arithmetician of the sixteenth century.

Title. ‘Tariffa perpetua // Con le ragion fatte per scontro di // qualunque Mercadante si voglia, // che dimoftra quanto monta ogni // quantità de cadauna mercantia ad // ogni pretio, sì a pefo come a nume // ro. Buona per ogniuno in Venetia, // Dalmatia, & altri luoghi; nelli quali // si ragiona, & si fpende a moneda // Venetiana. Et è buona per Verona, // Breffa, Bergamo, Milan, Cremona, // Mantoua, & altri luoghi dôue si // ragiona, & si fpende a moneda Im- // periale, & Breffana: Con la reduitiō // di moneda Venetiana in mone- // da Imperiale, & della imperiale in //

Venetiana. Et è buona a ridurre // ogni forte de ori in moneda cor//rente, sì Venetiana come Im-//periale: & Breffana ad // ogni precio.' (F. 1, r.)

Colophon. 'Stampata in Venetia per gli Heredi di // Francesco Rampazetto. // Ad instantia de lAutore Zuane // Mariani. // L'Anno .M. D. LXXX.' (F. 299, r.)

Description. 12°, 8.5 × 15.2 cm., printed in double columns, each being 2.6 × 13.3 cm. 279 ff. numb. + 20 unnumb. = 299 ff., 32 ll. Venice, 1580.

Editions. This is apparently the first of two books by Mariani, the various editions appearing as follows: Venice, 1535; ib., 1553; ib., 1559; ib., 1564, 8°; ib., 1567; ib., 1569, 16°; ib., 1572; ib., 1575; ib., 1579; ib., 1580, 12° (this edition); ib., 1591, 16°. The second book, also a Tariffa, appeared three times at Venice, viz. in 1538, 1555, and 1558. That these were different works I know only from such bibliographers as Riccardi and Libri.

Like other books with the same title, this is simply a set of tables for the use of merchants. It includes both interest and exchange tables, and is adapted to the needs of Northern Italy.

Other works of 1535. Agricola, p. 171, 1533; Angelus Mutinens, p. 140, 1525; Finaeus, p. 160, 1530-32; Grammateus, p. 123, 1518; Köbel, p. 102, 1514; Reisch, p. 82, 1503; Riese, p. 141, 1522; Tonstall, p. 134, 1522; Torrentini, p. 76, 1501; Pedro Melero, 'Compendio de los números y proporciones,' Saragossa, 4°.

HUDALRICH REGIUS. Ed. pr. 1536. Freiburg, 1550.

A German teacher of the first half of the sixteenth century.

Title. 'Vtrivs-//qve arithme-//tices epitome, ex variis // authoribus concinnata, per // Hvdalrichvm // Regium. // Nvnc Tertio omnia // diligenter reuifa & emendata. // Friburgi Brifgoiæ, // Stephanus Grauius excu-//debat, Anno // M. D. L.' (F. 1, r.)

Colophon. 'Fribvrgi Brisgoiæ, // Stephanus Grauius // excu- debat, // Anno M. D. L.' (F. 104, v.)

Description. 8°, 10 × 15.3 cm., the text being 7 × 11.1 cm. 1 f. unnumb. + 103 numb. = 104 ff., 17-22 ll. Freiburg, 1550.

Editions. Strasburg, 1536, 8°; Freiburg, 1543, 8°; ib., 1550, 8° (here described).

This work was intended for the Latin schools. It is only slightly practical, and as compared with a book like that of Gemma Frisius it is reactionary. The first part (to f. 48) treats only of Boethian arithmetic, the theory of numbers, closing with the words: 'Hactenus de numerorum Theo//rijs, nunc de eorundem // Praxi.' The practical part gives the operations in the usual style of the Latin writers of the time, and closes with several pages on the use of counters.

Other works of 1536. Boethius, p. 27, 1488; Bradwardin, p. 61, 1495; Budaeus, p. 99, 1514; Feliciano, p. 148, 1526; Ortega, p. 93, 1512; Peurbach, p. 53, 1492; Riese, p. 139, 1522; Torrentini, p. 76, 1501; Christiernus Torchillus Morsianus, 'Arithmetica practica,' Basel, 8°, with subsequent editions, ib., 1538, 1553, 8° (but see p. 159, 1528); Georg Wälckl, 'Die Wälſch practica/gezogē auß der kunſt der Proportion,' Strasburg (Nürnberg?), 8°; Rycharde Benese, 'This boke sheweth the maner of measuryng of all maner of lande, as well of woodlande, as of lande in the felde, and comptynge the true nombre of acres of the same,' London, 4°. (De Morgan includes this book because of its computations and early mathematical tables. Subsequent editions appeared in 1537, 1540, c. 1558, 1562, and 1564.) L. Culman, 'Wie iunge und alte Leut recht petten sollen,' Nürnberg, 8°; ib., 1537.

ABRAHAM BÖSCHENSTEYN. Ed. pr 1536. S. l., 1536.

The son of Johann Böschensteyn (see p. 99).

Title. 'Ein nützlich // Rechenbüch-//lin der Zyffer/darauff ein // yeder/ durch fein aygen fleysz mit // kleyner hüff/lernen mag anfang//klich rechnen/ Aufzgangē durch // Abraham Bōſchenſteyn/ Vnnd // yetzo zūm dritten mal mit fleysz // vberſehen vnnd Corrigiert/ mit // erlichen zūgethanen Exem//plen/ Durch Johann // Bōſchenſteyn/ den altē.// M. D. XXXVI.' (F. 1, r.)

Description. 8°, 9.5 × 14.5 cm., the text being 6.8 × 11.9 cm. 40 ff. unnumb., 20–23 ll. S. l., 1536.

Editions. There was no other edition, but the book seems to have been written in 1530, for the dedicatory epistle is dated 'Gebē am 19.//tag Aprilis/ An-//no 15. m̄ 30 //jar d' min//derenn //zal.' The work is very rare.

In the epistle the author mentions his father's work (p. 99): 'Wie wol meyn Herr vatter/herr Johaⁿ B^oſchenſteyn vor 17. jaren auch der gleych z^u Augſpurg inn den Truck mitgetheylt hat/vnnd z^um drittenn mal getruckt worden.' Seventeen years before 1530 was 1513, when Johann's book was probably written, since it was published in 1514.

Abraham's work is not much of an improvement on his father's, and resembles it in many respects. It gives seven 'Species,' including 'Duplicatio' and 'Mediatio,' as Johann's work had done. The principal additions are in the applied problems.

GIEL VANDER HOECKE. Ed. pr. 1537. Antwerp, 1537.

A Dutch arithmetician of the first half of the sixteenth century.

Title. See Fig. 91.

Colophon. 'Gheprent Thantwerpen op die Lombaerden veſte // teghen die gulden hant ouer by mi Symon Cock.// Int Jaer ons Heeren ; M.CCCC. ende // XXXVII. den. ix. dach Februarij.' (F. 180, v.)

Description. 8°, 9.4 × 14.7 cm., the text being 7.6 × 12.8 cm. 5 ff. unnumb. + 176 numb. = 181 ff., 26–32 ll. Blackletter, as shown in Figs. 91, 92. Antwerp, 1537.

Editions. So far as I know this edition of 1537 is the first, the date 1514 in the British Museum catalogue being evidently an error for 1544. The book was again published by the same printer in 1544, and there was an edition in 1548. (See *Bibliotheca Mathematica*, 1906, p. 211.)

The author begins with the fundamental processes with integers, considering the subject in a practical way. He then considers the same processes with counters on the line abacus. This preliminary work is followed by chapters on denominate numbers, fractions, the rule of three, roots, and the mediæval proportion. The second part of the treatise is devoted to algebra and the applications of arithmetic. The work closes with a brief treatment of mensuration. It is especially noteworthy on account of the early use of the plus and minus signs, not heretofore noticed by writers on the history of the subject. There is no other Dutch book of this period that makes as much use of these signs (see Fig. 92), and Vander Hoecke should be recognized as among the pioneers in appreciating their value in connection with algebraic quantities. (See Grammateus, p. 125, 1518, who used them in a similar way.)

Een sonderlinghe

boek in dye edel conste Arithmetica, met veel schoone perfecte regulen/ als Die numeracie vanden ghetale metten specië int gheheele/ en int ghebroken.

Die regule van d:pen int gheheele en int ghebrokē.

Die regule van een valsche positie/ en twee valsche positien van diueerschen ghewichte/ mate/ en ghelde.

Soe hebby die edel regule Cos/ die langhe verborghen heeft gheweest/ welke regule is die doze van alle questien. Dese regule hebby met haer speciën/ als Numeratio/ additio/ subtractio/ multiplicatio/ en diuisio/ en met haer egalitatie oft ghelikhēde/ en met die regule der quantiteyt/ annex der regulen Cos.

Itē van alle coopmanscappē/ als van laken/ specerijē/ en mercerijē/ diemē vercoopt bi gewichte/ mate/ en nōmer/ en dat selue ooc te werckē doer die regule van practikē

Die regule van gheselschap/ met diueerschen inlegge.

Soe die selue regule met diueerschen inlegge/ met diueer

Die regule van smaeldeelinge oft om (scē tide stellingen bidē transpoozten vanden landen/ profitelijē voer alle ontfanghers vā subuencien.

Die regule van mangelingē/ van affapen/ van goude/ en van siluer/ en van mannen van wapenen.

De fabrike vand' wijroedē oft visser roedē/ en het vse

De practike van eenen sliche lants te mē. (rē vā diē ten also wel dat onbegangelijc is midts den water/ oft anders/ als dat beganghelijc is.

Ghetalculeert en verfaemt met grooter naersicheyt/ bi Siels vandē hoecke. En gheprent Chantwerpen op die Lombaerde veste. By mi Symon Godt.

Item wil di afrechen $\mathbb{R} \frac{12}{27}$ van $\mathbb{R} \frac{27}{48}$ so ad
 deert beyde de quadranten coëf $\mathbb{I} \frac{1}{144}$ daer na multi
 pliceert dye een quad:ace met een anderen coemt \mathbb{I} die
 treet van $\mathbb{I} \frac{1}{144}$ rest $\frac{1}{144}$ nu de \mathbb{R} daer af is $\frac{1}{12}$

Rrationale.

Die irrationale sedit tace — oft met + naer den
 opsch vanden wercke / als trecht $\mathbb{R} \frac{3}{5}$ van $\mathbb{R} \frac{3}{4}$
 rest $\mathbb{R} \frac{3}{4} - \mathbb{R} \frac{3}{5}$

Item wil di afrechen $\mathbb{R} \frac{1}{5}$ van $\mathbb{R} \frac{4}{5}$ rest $\mathbb{R} \frac{1}{5}$

Item wil di afrechen $\mathbb{R} \frac{3}{4}$ van $\mathbb{R} 3 - \frac{3}{16}$ reste
 $\mathbb{R} \frac{3}{16}$

Item \mp van \mp oft — van — subtraheert ende +
 van — oft — van + addeert inde subtractie so ver
 re als si addeertic sijn oft subtraheertic.

Multiplicatie inden \mathbb{R} van rationaalen.

Wildi multipliceren inden \mathbb{R} soe weet dat ghy
 moet stellen alle de nominers van een den natu
 re als \mathbb{R} te multipliceren met simplen nominer soe
 moet ghy den nominer multipliceren nae de qualiteyt
 des \mathbb{R} : Als wildi multipliceren $\mathbb{R} 9$ met 4 so set 4 in
 sinen \mathbb{R} : multiplicceert 4 in haer seluen coemt $\mathbb{R} 16$ nu
 multiplicceert 9 met 16 coët 144 hier wt treet \mathbb{R} coët
 12 soe veel is $\mathbb{R} 9$ ghemultipliceert met 4 / want $\mathbb{R} 9$
 is 3 dit multiplicceert met 4 coemt 12 als vo:en.
 Wildi multiplicceert $\mathbb{R} 8$ met 5 so multiplicceert 5 cu

FIG. 92. FROM VANDER HOECKE'S *Arithmetica*

Other works of 1537. Apianus, p. 155, 1527; Bæda, p. 159, 1529; Benese, p. 182, 1536; Köbel, p. 110, 1514; Rudolff, p. 152, 1526; Wolphius, p. 154, 1527; Andrés, p. 122, 1515; B. C. Symphorien Champier, 'Libri VII,' Basel, 8° (one chapter 'De Arithmetica'); Culman, p. 182, 1536; Anonymous, 'An Introduction for to lerne to reckon with the Pen and with the Counters after the true cast of Arsmetyke, or Awgrym,' St. Albans.

NICOMACHUS. Ed. pr. 1538. Paris, 1538.

Born at Gerasa; flourished c. 100 A.D. He was a neo-Pythagorean philosopher and mathematician, and attempted, unsuccessfully, to do for the Greek theory of numbers what Euclid had done for geometry. Two works of his are extant, this treatise and a 'Harmonices Manuale.'

Title. See Fig. 93.

Description. 4°, 15.7 × 23.1 cm., the text being 9.4 × 17.7 cm. 77 pp. numb., 32 ll., Greek. Paris, 1538.

Editions. This is the first edition of the arithmetic of Nicomachus in Greek. A second edition appeared, 'Explicata per Joach. Camerarium,' at Augsburg in 1554 (p. 263). For the commentary of Iamblichus, see p. 188.

The arithmetic of Nicomachus is the most celebrated of the few Greek treatises upon the subject. It was written during the decline of Greek learning, and is not a work of great merit, being chiefly a compilation of the general number theory of the Pythagoreans. There are several commentaries upon the 'Introductio,' that of Iamblichus (c. 325 A.D., see p. 188) being the best known of the ancient ones, and that of Camerarius (see p. 262) being the most important one of the Renaissance.

After a philosophical introduction, Nicomachus classifies numbers as even and odd, and the odd as prime and composite. Perfect, excessive, and defective numbers are also considered, and the elaborate system of ratios which later characterized the work of Boethius and the mediæval writers is given. Polygonal and solid numbers and proportions are treated in the second part, a ratio being loosely defined as 'the relation between two terms,' and proportion as 'the composition of ratios.' The work differs essentially from Euclid in its presentation, being inductive instead of deductive in treatment. It is also a matter of interest that the first multiplication table, the 'mensa Pythagorica' of mediæval writers, to be found in any treatise appears here, although Hilprecht found them on the Babylonian cylinders of about 2000 B.C. The best edition of the works of Nicomachus is that of Hoche (Leipzig, 1866).

ΝΙΚΟΜΑΧΟΥ ΓΕΡΑ:

ΣΙΝΟΥ ΑΡΙΘΜΗΤΙΚΗΣ ΒΙΒΛΙΑ ΔΥΟ.

NICOMACHI GERA:

SINI ARITHMETI-
cæ libri duo.

Nunc primum typis exaesi, in lucem eduntur.

Fideli sperata cedat



PARISIIS.
In officina Christiani wecheli.
M. D. XXXVIII.

FIG. 93. TITLE PAGE OF NICOMACHUS

GILLES HUGUETAN. Ed. pr. 1538.

Lyons, 1538.

A Lyons arithmetician, born c. 1500.

Title. See Fig. 94.

Colophon. 'Icy finiffent les tables des comptes compofees et calculees // par Gilles huguetan : Et imprimees cheux // ledict Gilles et Jacques huguetan // freres. Lan // 1538.' (P. 115.)

Description. Fol., 21.3×32.9 cm., the text being 18.1×27.3 cm. 25 pp. unnumb. + 90 numb. = 115 pp., 59-64 ll. Lyons, 1538.

Editions. There was no other edition.

Because it is composed largely of multiplication and division tables, and of other tables of use to stationers and merchants, this work is not often included among the arithmetics of the century. It should be so classed, however, since the first eleven folios are devoted to the explanation of the fundamental operations both with written numbers and with counters. The illustrations of counter reckoning are striking, the 'gectz' (counters) being represented full size. The book is one of the earliest Lyons arithmetics in which the line abacus is mentioned.

IAMBlichus. Ed. pr. 1538.

Arnheim-Deventer, 1668.

Born at Chalcis, in Cœle-Syria, c. 283; died at Alexandria, c. 330. He was a neo-Platonic philosopher and a voluminous writer. Four of his works are extant, this introduction to the arithmetic of Nicomachus being one.

Title. See Fig. 95.

Description. 4°, 15×19.8 cm., printed in double columns, Greek on the left and Latin on the right, each column being 5×14.8 cm. 12 pp. unnumb. + 181 numb. = 193 pp., 34 ll. Bound with the Camerarius edition of Nicomachus (p. 262, 1554). Arnheim-Deventer, 1668.

Editions. There was no other edition in the sixteenth century than that of 1538.

See Nicomachus, p. 186. This commentary by Iamblichus forms the fourth part of his treatise on the Pythagorean philosophy, the greater part of which is still extant.

Other works of 1538. De la Torre, p. 41, 1489; Glareanus, p. 191, 1539; Mariani, p. 181, 1535; Morsianus, p. 182, 1536; Peurbach, p. 53,

LES TABLES DE DI

VERS COMPTES, AVEC LEVRS CANONS,

calculees par GILLES HUGVETAN, natif de Lyon,
Par lesquelles on pourra facilement trouver les Comptes tous faictz, tant des achatz
que ventes de toutes marchandises, soit en gros, ou en detail, a la Mesure, ou au Poix,
a la Charge, ou au Nombre.

Les Tables aussi du fin Dor & Dargent, pour scavoir, selon que le Marc de billon
tiendra de fin, ou daloy, combien il uauldra de poix de fin Or, ou Dargent fin.

Deux Tables seruantz aux Libraires. Et une Table de Despence, a scavoir a tant pour
Iour, combien on despend lan & le Moys, & a rayson du Moys combien reuient pour
an & pour chascun Iour, & a tant pour An combien on despend le Moys, & chascun
Iour.

La maniere de Aualuer, ou Reduyre par icelles Tables toutes Monnoyes, en Liures,
solz, & deniers.

† L A R T & science de Nombrer, Adiouster, Soustraire, Multiplier,
& Partir, par le compte des Geetz.



On les uend a Lyon, a lenseigne de la Sphare, cheux
Gilles, & Jaques Huguctan, freres.

1538

FIG. 94. TITLE PAGE OF HUGUETAN

1492 ; Psellus, p. 168, 1532 ; Riese, p. 138, 1522 ; Roche, p. 130, 1520 ;
Rudolfi, p. 160, 1530 ; Tonstall, p. 135, 1522 ; Tomas Klos, 'Algorithmus :

JAMBLICHUS CHALCIDENSIS

Ex Cœle-Syria

IN

NICOMACHI GERASENI
Arithmetica introductionem,

ET DE

F A T O.

*Nunc primum editus, in Latinum sermonem conversus,
notis perpetuis illustratus*

a

SAMUELE TENNULIO,

Accedit

JOACHIMI CAMERARII

Explicatio in duos Libros Nicomachi,
cum Indice rerum & verborum locupletissimo.

A R N H E M I Æ,

Prostant apud **JOH. FRIDERICUM HAGIUM,**
Daventriæ typis descripsit **WILHELMUS WIER,**
c15 15 c LXVIII.

FIG. 95. TITLE PAGE OF THE 1668 IAMBlichUS

to iesth nauka Liczby, Polska rzeczca wydana : Przez Ksiedza Tomasa
Kłosa, Cracow (reprinted at Cracow in 1889) ; Eysenbut, 'Ein künstlich
Rechenbuch,' Augsburg, 8°.

HENRICUS LORITUS GLAREANUS.

Ed. pr. 1539.

Paris, 1543.

LORITI, LORETI. Born at Mollis, canton of Glarus, Switzerland, in June, 1488; died at Freiburg, Breisgau, May 28, 1563. He was professor of mathematics and philosophy at Basel (1515-1521), and professor in the Collège de France, Paris (1521-1524), and later taught at Basel and Freiburg. He wrote on arithmetic, music, and geometry.

Title. See Fig. 96.

De V1. Arith-
METICAE PRACTI-
CAE SPECIEBV5, HEN-
RICI GLAREANI
Epitome.

PARISIIS

*Ex officina Iacobi Gazelli, sub in-
signi Inuidiæ, è regione gym-
nasti Cameracensis.*

1549

FIG. 96. TITLE PAGE OF THE 1543 GLAREANUS

Description. 8°, 10.6 × 17 cm., the text being 6.7 × 12.9 cm. 2 ff. unnumb. + 21 numb. = 23 ff., 29 ll. Paris, 1543.

Editions. Glareanus is sometimes mentioned as the author of two works on arithmetic, the 'Isagoge Arithmetica' and the work here described. Under the former title the following editions are mentioned by various writers: Freiburg, 1539, 8° (unless Tropfke is correct in saying there was an edition of 1538); Paris, 1554, 8°; Lyons, 1554, 8°. Under the above title the following editions appeared: Paris, 1543, 8° (here described). The dedication is dated 'Friburgi Brisgoiae . . . M. D. XXXVIII,' so there may have been an edition as early as 1538); Freiburg, 1543, 8°; Cracow, 1549; Freiburg, 1550, 8° (below); Paris, 1551, 8° (p. 193); Freiburg, 1555; ib., 1558, 8°; Paris, 1558, 8°. The biographer of Glareanus, Schreiber (Freiburg, 1837), gives these as the same work.

Besides this book, Glareanus also published an 'Arithmetica et musica operum Boethii demonstrationibus et figuris auctior,' Basel, 1546, fol., and a 'Commentarius in Arithmetica et Musicam Boethii,' Basel, 1546, fol.; ib., 1570, 4°.

A handbook for the Latin schools. In it Glareanus first treats of notation, including the Greek, Roman, and Arabic systems; then of the elementary operations with integers; then, briefly, of progressions and proportion. There is nothing in the little book to commend it.

HENRICUS LORITUS GLAREANUS.

Ed. pr. 1539.

Freiburg, 1550.

See p. 191.

Title. 'De. VI. Ari//thmeticae // Practicae Speciebus // Henrici Glareani // P. L. Epitome. // Fribvrgi Brisgoiae. // Cum gratia ac Priuilegio Regio, // ad annos fex.' (P.)

Colophon. 'Apud Friburgum Brifgoicum // Anno M. D. L. // Stephanus Grauius // excudebat.' (P. 77.)

Description. 8°, 10 × 15.8 cm., the text being 6.4 × 11.7 cm. 2 pp. unnumb. + 2 blank + 74 numb. = 78 pp., 22 ll. Freiburg, 1550.

HENRICUS LORITUS GLAREANUS.

Ed. pr. 1539.

Paris, 1551.

See p. 191.

Title. 'De fex Arith-//meticae Practi-//cae Speciebus, // Henrici Glareani // Epitome. // Parisiis, // Apud Gulielmum Cauclat, in pingui Gallina, // è regione colleij Cameracensis. // 1551.' (F. 1, r.)

Colophon. 'Excudebat Lutetiae Parifiorum Benedictus // Preuotius Typographus in vico Fre-//mentello, sub Stella Aurea: // III. Non. Ianuarij, // 1551.' (F. 23, r.)

Description. 8°, 10.4 × 16.1 cm., the text being 6.4 × 11.9 cm. 2 ff. unnumb. + 21 numb. + 1 blank = 24 ff., 29 ll. Paris, 1551.

See p. 192.

HIERONYMUS CARDANUS.

Ed. pr. 1539.

Milan, 1539.

GERONIMO or GIROLAMO CARDANO, JEROME CARDAN. Born at Pavia, September 24, 1501; died at Rome, September 21, 1576. He was a physician and professor of mathematics at Milan (1534-1559) and professor of medicine at Pavia and (1562-1570) Bologna. Later he was a papal pensioner at Rome. He was one of the most acute mathematicians of his century, and wrote numerous treatises on mathematics and natural science.

Title. See Fig. 97.

Colophon. 'Anno a Virgineo partu. // M. D. XXXIX. // Io. Antonini Castellioneus Me//diolani Imprimebat Im-//penfis Bernardini // Calufci.' (Printer's mark, with 'B.C.')

Description. 8°, 9.9 × 15.3 cm., the text being 8.2 × 12.7 cm. 304 ff. unnumb., 33 ll. Milan, 1539.

Editions. Milan, 1539, 8° (here described); Nürnberg, 1541; ib., 1542. See also p. 338, 1570. A 1537 edition is given by Villicus, and I have seen it mentioned in a dealer's catalogue; but I think the date a misprint, or that some one has taken the date of the preface instead of looking at the colophon.

This is one of the most pretentious arithmetics of the sixteenth century, and it did much to influence the advanced teaching of the subject. It is in no sense a practical book, having been written by a mathematician

for the use of scholars. It opens with a discussion of the kinds of numbers considered in arithmetic, such as integers, fractions, surds, and denominate numbers. This is followed by the fundamental operations

**HIERONIMI
CARDANI MEDICI MEDIOLA
NENSIS, PRACTICA ARITH-
metice, & Mensurandi singularis. In qua
que preter alias cōtinentur, versa
pagina demonstrabit.**



FIG. 97. TITLE PAGE OF CARDAN

with these numbers and a treatment of proportion. The properties of numbers occupies a considerable space and includes much of the ancient theory. The work then runs into algebra, combining this with arithmetic.

There are numerous business applications in the treatise, such as partnership, exchange, profit and loss, and mensuration, but these are treated from the theoretical standpoint rather than from that of the practical needs of the merchant class. The great prominence of the author and the scholarly nature of the work account for the various editions of the book. His well-known 'Ars Magna' (algebra) appeared in 1545.

JOHANN NOVIOMAGUS. Ed. pr. 1539. Paris, 1539.

NEOMAGUS, JAN BRONCKHORST. Born at Nimwegen in 1494; died at Cologne in 1570. He was for a time professor of mathematics at Rostock. He not only wrote on numbers, but edited works of Bæda and Ptolemy.

Title. See Fig. 98.

Description. 8°, 9.7 × 15.4 cm., the text being 6.7 × 12.3 cm. 117 pp. numb. + 2 unnumb. = 119 pp., 26–28 ll. Paris, 1539.

Editions. Paris, 1539, 8° (here described); Cologne, 1544, 8° (below); Deventer, 1551 (p. 197).

The book was intended for the classical schools. It sets forth the Roman and Greek notations, the fundamental operations both with the Hindu numerals and upon the line abacus, the finger notation as found in the works of Bæda, the astrological numerals of the Middle Ages, and the Boethian theory of numbers.

Other works of 1539. Capella, p. 66, 1499; Peurbach, p. 53, 1492; Ringelbergius, p. 166, 1531; Vogelín (see Peurbach, p. 53, 1492); Wolphius, p. 154, 1527; Anonymous, 'Abacho novo con il quale ogni persona puol imparar Abacho senza che alcuno li insegni,' Venice; Anonymous, 'An introduction to algorisme, to learne to reckon with the penne,' London, 8°, with another edition *ib.*, 1581, 8°; Juan Gutiérrez de Gualda, p. 167, 1531.

JOHANN NOVIOMAGUS. Ed. pr. 1539. Cologne, 1544.

See above.

Title. 'De Nvme//ris Libri II. Qvo//rum prior Logifticen, & ueterum nu//merandi confuetudinem: pofterior// Theoremata numerorum complecti//tur, autore Ioan. Nouiomago.// Nunc recéns ab ipfo autore recogniti.// (Woodcut with motto: 'Discite Ivsticiam moniti.') Coloniae Ioan. Gymnicus excudebat,// Anno M.D.XLIIII.' (F. 1, r.)

De Numeris li-

BRI DVO, QVORVM PRIOR
Logisticen & veterum numerandi consuetudi-
nem, posterior Theoremata numerorum com-
plectitur, ad doctissimum virum Andre-
am Eggerdem professorem
Rostochiensem.

Nunc recens in lucem emissi auctore
Ioanne Nouiomago.



PARISIIS

Ex officina Christiani Wecheli, sub scuto
Bafilienfi, in vico Iacobæo: & sub
Pegafo, in vico Bellouaceni.
M. D. XXXIX.

FIG. 98. TITLE PAGE OF NOVIOMAGUS

Description. 8°, 10 × 14.8 cm., the text being 6.7 × 11.5 cm. 59 ff., 25 ll. Cologne, 1544.

Editions. See p. 195.

This is merely a reprint of the first edition (p. 195, 1539).

JOHANN NOVIOMAGUS. Ed. pr. 1539. Deventer, 1551.

See p. 195.

Title. 'De nvme//ris libri II. qvo-//rvm prior logistica, et //ueterum numerandi confuetudinem: pofte-//rior Theoremata numerorum com//plectitur, Autore Ioan.// Nouiomago.// Nvnc recens ab ipso //autore recogniti.// (Woodcut, and 'T. B. Fons Iouis.') Daventriæ, //Theodoricus Bornius excudebat.// Anno M. D. LI.' (F. 1, r.)

Description. 8°, 9.8 × 14.9 cm., the text being 6.8 × 10.7 cm. 50 ff. unnumb., 25 ll. Deventer, 1551.

Editions. See p. 195.

Like the 1544 edition, this is a reprint of that of 1539.

JODOCUS WILLICHIUS. Ed. pr. 1540. Strasburg, 1540.

WILKE, WILCKE, WILD. Born at Resel, East Prussia; died at Lebus, November 12, 1552. He was professor of Greek (1540), and then of medicine, in the university of Frankfort an der Oder.

Title. See Fig. 99.

Colophon. 'Argentorati ex officina // Cratonis Mylii, // mense Sept. // anno // M. D. XL.' (P. 125.)

Description. 8°, 10.2 × 15.4 cm., the text being 8.2 × 11.4 cm. 2 pp. unnumb. + 123 numb. = 125 pp., 26 ll. Strasburg, 1540.

Editions. Strasburg, 1540, 8° (here described); ib., 1545.

This is a book intended for the classical schools. It is written chiefly in Latin, but contains numerous extracts from the Greek. It is based upon Greek models, and contains several quotations from Nicomachus. The plan of treatment is catechetical (see Fig. 100), and it is interesting to note that this work appeared in the same year in which Recorde may have published his 'Ground of Artes' in England (see p. 213), a book in which the author also adopted the catechism form. It is manifestly inspired by Boethius, and is hair-splitting in theory and useless in practice. Willichius begins in a grandiloquent style, 'De Arithmetica, quæ

Mathefos mater est, finitione.' The history of arithmetic has few more curious examples than the first chapter of this work, with its learned references to Pythagoras, Augustine, the Platonists, and 'an Arab philosopher named Algebras.' ('Eadem Autem hodie ab autore quodam Arabe Philofopho, cui nomen erat Algebras, nomine regularum Algebræ

IODOCI VVILLICHII

RESELLIANI,
Arithmetice libri
tres.



ARGENTORATI
M, D. XL.

Cum Gratia & Privilegio.

FIG. 99. TITLE PAGE OF WILLICHIVS

explicatur.' P. 19.) Willichius follows the ancient Greek plan of dividing arithmetic into two parts, the first being the practical, the *logistica* of the classical civilization ('*ἡνα πρακτικῆ*, qua supputatio domestica sit . . . apud ueteres à ratiocinando *λογισικῆ* dicta est,' p. 19), and the second being theoretical, the ancient arithmetic. ('*Ἔστ θεωρητικῆ*, qua velut sanctiora mysteria continentur, & hæc sola intelligentia animi

confat,' p. 20). In his number mysticism he calls unity Jupiter ('Vnitas est Iupiter,' p. 22), saying that others call it Cupid, others Amicitia, and others Concordia, and quotes 'Zarathas the teacher of Pythagoras' as calling one the father and two the mother of numbers. ('Proinde apte Zarathas Pythagoræ præceptor dixit, *μόναδα* esse numerorum patrem, *δίαδα*

50 ARITHMETICAE

NICOLAVS.

Quis est alter numerus par? **IVST.** Est pariter impar, uel à paribus impar, *Græcis ἀρτιοπρῆστος*, uel *ἀρτίαις* ὡς *εἰσος*. Est autem, cum primum diuiditur, mox fit indiuisibilis, ut 14. 18. 22. **NICOL.** Quomodo cum finit horum numerorum exquisitus magister Euclides? **IVST.** Sic: *ἀρτίαις ὡς εἰσος* ὄντι, ὁ ὑπὸ ἀρτίου ἀριθμὸς μαθηματικὸς ἢ ὡς εἰσος ἀριθμῶν. Ita numerus diuidens par est, sed diuisorius mox impar exurgit. **NICOL.** Cur id nominis illi inditum est? **IVST.** Ideo, quod quilibet eius ordinis numeri pares, facti sunt per imparem multiplicationem: ut bis ter, senarium, bis quinq; denarium faciunt. Verum si cui altius contemplari libet, eundem uocabit imparem in sua quantitate, sed parem in denominatione. Est exempli gratia, denarius, cuius altera pars est quinarium, qui quantitate, hoc est, modum congregatione est impar, sed quia à binario denominatur, par iudicabitur. **Quæ ratio nominis ex Boethio colligitur: Alia autem Euclidi esse uidentur.** **NICOL.** Sunt ne huic de illo aliquot theoremata? **IVST.** Quidni? Vnum est. Si numerus dimidium impar habuerit, pariter impar est tantum. Nam hic dicitur à extremum, quod *maxi=*

Pariter im=
par.

Cur uocatur
pariter impar

Symbola ex
pariter impa=
ri.

FIG. 100. FROM THE ARITHMETIC OF WILLICHIUS

autem matrem,' p. 22.) The contrast between this work and that of Gemma, which appeared in the same year, is very marked. It must be admitted, however, that the book has some value in interpreting the ideas of such followers of Nicomachus as Boethius, Jordanus, and Faber Stapulensis, as is shown in Fig. 100. It has at least the merit of having been written for beginners.

GEMMA FRISIUS. Ed. pr. 1540. Wittenberg, 1542.

More properly GEMMA RAINER or REGNIER, the Frisian. Born at Dockum, in East Friesland December 8, 1508; died at Louvain, May 25, 1555. He received the degree of Doctor of Medicine in 1541, when he abandoned his mathematical studies. He wrote upon astronomy and arithmetic, and his son Cornelis was a contributor to the former science.

Title. See Fig. 101.

Colophon. 'Impreffum Vitebergæ apud // Georgium Rhau.// Anno M.D.XLII.' (F. 80, r.)

Description. 8°, 10 × 15.3 cm., the text being 7.8 × 15.3 cm. 80 ff. unnumb., 23 ll. Wittenberg, 1542.

Editions. Antwerp, 1540, 8°; Wittenberg, 1542, 8° (here described); ib., 1543, 12°; Paris, 1543 (?); Wittenberg, 1544, 8° (p. 202); Paris, 1545 (Peletarius' edition); Antwerp, 1547; Wittenberg, 1548; Paris, 1549, 8° (p. 202); Paris, 1550, 8° (p. 203); Wittenberg, 1550, 12°; Antwerp, 1550; Wittenberg, 1551, 8° (p. 203); Paris, 1551; Antwerp, 1552, 8° (p. 203); Paris, 1553, 8° (p. 204); Wittenberg, 1553; ib., 1555; Lugduni, 1556, 8°; Paris, 1557; Leipzig, 1558, 8° (p. 204); s. a., but c. 1558; Paris, 1559; Leipzig, 1559; Paris, 1561, 8°; Wittenberg, 1561, 8° (p. 204); Leipzig, 1562; Antwerp, 1562; Paris, 1562; ib., 1563 (p. 205); Wittenberg, 1563, 8° (p. 205); Cologne, 1565; Leipzig, 1565, 8°; Lugduni, 1566, 8°; Wittenberg, 1567, 4°; Paris, 1567; Venice, 1567, 4° (p. 205); Leipzig, 1568; Paris, 1569, 8°; Wittenberg, 1570, 12°; Cologne, 1571, 8° (p. 206); Paris, 1572; Leipzig, 1572; ib., 1575, 8° (p. 206); Cologne, 1576, 8°; Paris, 1578, 8° (p. 207); Wittenberg, 1579; Leipzig, 1580; Antwerp, 1581, 8° (p. 207); ib., 1582, 8° (the first with Forcadel's notes?); Wittenberg, 1583, 8° (p. 208); Paris, 1585, 8°; s. l., 1588; Leipzig, 1588, 8° (p. 208); ib., 1591; ib., 1592, 8° (p. 208); Cologne, 1592, 8°; Wittenberg, 1593; Frankfurt, 1597 (the only German translation?). There were numerous editions after 1600. Treutlein (*Abhandlungen*, I, 18), following Murhard, says there were at least twenty-five editions in the sixteenth century. In reality there were more than twice as many; the above list, probably incomplete, mentions fifty-nine.

The editions of Gemma varied but little until Peletarius, several years before the former's death, added his notes. These amplified the text, but they made no changes of importance.

This was the most popular arithmetic of the sixteenth century, at least among those intended for the Latin schools. It combined the older

ARITHMETICAE PRACTICAE METHODVS FACILIS,
 per Gemmam. Frisium Medicum ac Mathematicum.



VITEBERGAE, M. D. XLII.

A. Frisius

FIG. 101. TITLE PAGE OF THE 1542 GEMMA FRISIUS

science of numbers with the commercial arithmetic of the Italian writers in such way as to appeal in a remarkable degree to the teachers of the period. The book opens with a discussion of the various fundamental operations, presented without much explanation and with numbers of relatively small size. These operations include the subjects of duplication and mediation as was customary in the Latin books of that time. The author closes the first part of his work with a treatment of progressions and the rule of three. The second part is devoted to fractions, the sequence being the same as with integers. The third part includes such common rules of business as partnership, alligation, and rule of false, together with roots and a little algebra. The fourth part treats of proportion, and has a few pages on arithmetical recreations.

GEMMA FRISIUS. Ed. pr. 1540. Wittenberg, 1544.

See p. 200.

Title. This edition is substantially the same as that of 1542 with the following exceptions: F. 1, r., title page: 'Vitebergæ Anno M,D,XLIII.'

Colophon. 'Anno M,D,XLIII.' (F. 88, r.)

Description. 8°, 9.5 × 15 cm., the text being 7.9 × 11.3 cm. 88 ff. unnumb., 23 ll. Wittenberg, 1544.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540. Paris, 1549.

See p. 200.

Title. 'Arithmetiçæ practiçæ // Methodvs facilis per // Gemmam Frisivm, Medicvm // ac Mathematicum, Iam recens ab ipfo // authore emendata & multis in lo//cis infigniter aucta.// Hvc accesservnt Iacobi Pe//letarii Cenomani annotationes: Eiu//dem item de Fractio//nibus Aftronicis compendium: Et de cognofcēdis per // memoriam Calendis, Idib. Nonis, Feftis mobilibus, & loco // Solis & Lunæ in zodiaco.// (Woodcut with motto: 'In pingvi. gallina.') Parisiis.// Apud Gulielmum Cauellat, in pingui gallina, ex // aduerfo collegij Cameracenfis.// 1549.' (F. 1, r.)

Description. 8°, 10.5 × 16.6 cm., the text being 7 × 12.7 cm. 1 f. unnumb. + 95 numb. = 96 ff., 26 ll. Paris, 1549.

Editions. This is the ninth edition (see p. 200), and the first which I have seen with the notes of Peletarius, although these notes bear the date 1545 (f. 77, r.) They are here given in an appendix ('Iacobvs Peletarius Lectori,' f. 77, r.), but later, as in the 1571 edition (see p. 206), they are introduced in the body of the text.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540. Paris, 1550.

See p. 200.

Title. Except for the date (1550) the title page is the same as that of the 1549 edition (p. 202).

Description. 8°, 10.3 × 16.1 cm., the text being 7.3 × 13 cm. 1 f. unnumb. + 95 numb. = 96 ff., 26 ll. Paris, 1550.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540. Wittenberg, 1551.

See p. 200.

Title. 'Arithme//ticae practicae // methodvs facilis, per // Gemmam Frifium Medi-//cum ac Mathe-//maticum.// (Woodcut showing computing with counters.) Vvitebergae.// Anno M. D. LI.' (F. 1, r.)

Description. 8°, 9 × 14.2 cm., the text being 6.4 × 11.2 cm. 87 ff. unnumb. + 1 blank = 88 ff., 23 ll. Wittenberg, 1551.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540. Antwerp, 1552.

See p. 200.

Title. 'Arithme-//ticæ practicae metho-//dus facilis, per Gemmam Frifium Me-//dicum ac Mathematicum, iam re-//cens ab ipfo auctore emen-//data, & multis in locis // insigniter aucta.// Cor. Graphevs.// Si numerandi artem, cunctis ex artibus illam // Vel primam, exactè difcere lector amas, // Hanc gemmā, ingenio fumus quam Gemma libello // Hoc paruo includit, carpito, doctus eris.// Sunt conati alij prolixis tradere chartis // Hanc artem, at

multis non placet ille labor.//Porrò hic Gemma fuam gemmam
fic temperat, ipfa // Vt placeat cunctis commoditate breui.//
☞Antuerpiæ, apud Gregorium Bontium //à Cæf. Maieft. libra-
rium admiffum.// Cum gratia & priuilegio.// 1552.' (F. 1, r.)

Description. 8°, 9.5 × 13.9 cm., the text being 7.4 × 11.8 cm.
4 ff. unnumb. + 76 numb. = 80 ff., 28 ll. Antwerp, 1552.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540. Paris, 1553.

See p. 200.

Title. Except for the date (1553) the title page is the same
as that of the 1549 edition (p. 202).

Description. 8°, 9.8 × 14.8 cm., the text being 6.8 × 12.7 cm.
1 f. unnumb. + 95 numb. = 96 ff., 26 ll. Paris, 1553.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540. S. l. (Leipzig), 1558.

See p. 200.

Title. 'Arithme-//ticæ practicæ // methodvs facilis, per //
Gemmam Frisium Medicum ac // Mathematicum // (Woodcut as
in the 1542 edition.) Anno M. D. LVIII.' (F. 1, r.)

Description. 8°, 10.1 × 15.4 cm., the text being 7.8 × 11 cm.
87 ff. unnumb., 22-23 ll. S. l. (Leipzig), 1558.

Editions. See p. 200.

See p. 201. A set of manuscript notes in the back, in a sixteenth-
century hand, gives an interesting synopsis of arithmetic as taught in
the universities of that time.

GEMMA FRISIUS. Ed. pr. 1540. Wittenberg, 1561.

See p. 200.

Title. 'Arithme-//ticæ practicæ me-//thodvs facilis, per Gem-
//mam Frisium Medi-//cum ac Mathematicum.// (Woodcut as
in the 1542 edition.) Vvitebergæ // ex officina Hæredvm //
Georgii Rhavv // M.D.LXI.' (F. 1, r.)

Colophon. 'Vvitebergæ // ex officina Hæredvm // Georgii
Rhavv // M.D.LXI.' (F. 88, v.)

Description. 8°, 9.8 × 14.9 cm., the text being 7.7 × 11.2 cm. 88 ff. unnumb., 23 ll. Wittenberg, 1561.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540. Paris, 1563.

See p. 200.

Title. The title page is substantially the same as that of 1549 (p. 202), with the following addition: 10th line, 'Quibus demum ab eodem Peletario additæ sunt Radicis // vtriufque demonftrationes.'

Description. 8°, 10.4 × 16.3 cm., the text being 7.1 × 12.5 cm. 2 ff. unnumb. + 102 numb. = 104 ff., 26 ll. Paris, 1563.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540. Wittenberg, 1563.

See p. 200.

Title. 'Arithme-//ticæ practicæ me-//thodvs facilis, per // Gemmam Frifium Medicum ac // Mathematicum.//VVitebergæ // M.D.LXIII.' (F. 1, r.)

Colophon. 'VVitebergæ // ex officina Hæredvm.// Georgii Rhavv.// M.D.LXIII.' (F. 88, r.)

Description. 8°, 10.5 × 15.6 cm., the text being 8.1 × 11.2 cm. 88 ff. unnumb., 23 ll. Wittenberg, 1563.

Editions. See p. 200.

GEMMA FRISIUS. Ed. pr. 1540. Venice, 1567.

See p. 200.

Title. 'Aritmetica //prattica facilissima, // composta da Gemma Frisio Medico, // et Matematico; // Con l'aggiunta dell' Abbreuiamento de i Rotti Afronomici di // Giacomo Pelletario; & del conofcere à mente le Calende, // gl' Idi, le None, le Fefte Mobili, il luoco del Sole, & della Luna nel // Zodiaco; & la dimoftratione della Radice Cubica: lequali tutte // cofe dal latino, ha in quefta lingua ridotte Oratio Tosca- // nella della famiglia di Maeftro Luca Fiorentino; & halle de- // dicatæ // allo illvstre

fignore, il signor//Ettore Podocataro.// (Woodcut.) In Venetia, Apreffo Giouanni Bariletto.// MDLXVII.' (F. 1, r.)

Colophon. 'Registro.// *A B C D E F G H I K L M.// Tutti fono Quaderni; eccetto M, // che è Quinterno // In Venetia, // Apreffo Giouanni Bariletto.// MDLXVII.'

Description. 4°, 14.9 × 20.7 cm., the text being 10.6 × 17.4 cm. 5 ff. unnumb. + 51 numb. = 56 ff., 40–42 ll. Venice, 1567.

Editions. See p. 200. This is the only Italian edition of the sixteenth century.

See p. 201. The 'Maestro Luca Fiorentino' mentioned in the title page was a well-known arithmetician of Florence. A manuscript of his of c. 1425 is described in the second part of this work.

GEMMA FRISIUS. Ed. pr. 1540.

Cologne, 1571.

See p. 200.

Title. 'Arithme-//ticae practicae // methodvs facilis, per Gemmam // Frisium, Medicum ac Mathematicum, iam re-//cens ab ipfo autore emendata, & multis // in locis insigniter aucta.// Hvc accesservnt Iacobi Pe-//letarij Cenomani annotationes: Eiusdem item de // Fractionibus Afronomicis compendium: Et // de cognoscendis per memoriam Calendis, // Idibus, Nonis, Festis mobilibus, // & loco Solis & Lunæ in // Zodiaco.// Nunc verò a Ioanne Stein recognita, & no-//uis aucta additionibus.// (Woodcut with motto: Benedices // Coronæ Anni // Benignitatis // Tvæ. Psal. 64 //) Coloniae, // Apud Maternum Cholinum. // M. D. LXXI. // Cum gratia & priuilegio Cæs. Maieft.' (P. 1.)

Description. 8°, 9.5 × 15.8 cm., the text being 6.5 × 12.1 cm. 3 pp. unnumb. + 281 numb. = 284 pp., 28–30 ll. Cologne, 1571.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540.

Leipzig, 1575.

See p. 200.

Title. 'Arithme-//ticae practicae // methodvs facilis, // per // Gemmam Frisium // Medicum ac Mathematicum.// (Woodcut representing a counting house, with line reckoning.) Lipsiæ // Iohannes Rhamba excudebat. // M. D. LXXV.' (F. 1, r.)

Description. 8°, 9.5 × 15.3 cm., the text being 7.8 × 11 cm. 87 ff. unnumb., 23–24 ll. Leipzig, 1575.

See p. 201. The book has been rebound with added pages which have been used for manuscript. These notes are in Latin, in a German sixteenth-century hand, and include both work on the fundamental operations and numerous commercial problems.

GEMMA FRISIUS. Ed. pr. 1540.

Paris, 1578.

See p. 200.

Title. The title page is substantially the same as that of 1542 (p. 201), except for the following: 'In me Mors, // In me Vita. // Parisiis, // Apud Hieronymum de Marnef, & viduam // Guliel. Cauellat, sub Pelicano monte D. Hilarij. // 1578.' (F. 1, r.)

Description. 8°, 10.9 × 17.3 cm., the text being 7.4 × 14.1 cm. 3 ff. unnumb. + 93 numb. = 96 ff., 29 ll. Paris, 1578.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540.

Antwerp, 1581.

See p. 200.

Title. 'Arithmeticae // practicae methodvs fa- // cilis, per Gemmam Frisivm, Medi- // cum, ac Mathematicum conscripta: iam recens ab Auctore // pluribus locis aucta & recognita. // In eandem Ioannis Steinii & Iacobi // Peletarii Annotationes. // Eiusdem de Fractionibus Astronomicis Compendium, // & de cognoscendis per memoriã Kalendis, Idibus, No- // nis, Festis mobilibus, loco'q3 Solis & Lunę in Zodiaco. // (Woodcut of astronomer.) // Antverpię. // Apud Ioannem Bellerum ad insigne Aquilę // aureę. Anno 1581.' (P. 1.)

Description. 8°, 9.7 × 15.7 cm., the text being 6.5 × 13 cm. 5 pp. unnumb. + 178 numb. + 1 blank = 184 pp., 31 ll. Antwerp, 1581. With this copy is bound: 'Ivl. Pacii // a Beriga // Institutiones // Logicę, // in vsvm scholarvm // Bernensivm // editę. // Bernę. M.D.C.'

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540. Wittenberg, 1583.

See p. 200.

Title. 'Arithme-//ticæ Practicæ // Methodus facilis, // per // Gemmam Frisivm // Medicum ac Mathematicum. // (Woodcut as in the 1542 edition.) Vvitebergæ // Ex officina Matthæi VVelacij. // M. D. LXXXIII.' (F. 1, r.)

Description. 8°, 9.5 × 15 cm., the text being 7.9 × 11.2 cm. 87 ff. unnumb., 23 ll. Wittenberg, 1583.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540. Leipzig, 1588.

See p. 200.

Title. 'Arithme-//ticæ practicæ // methodvs facilis, // per // Gemmam Frisivm // Medicum ac Mathematicum. // Lipsiæ, // Anno M. D. LXXXVIII.' (F. 1, r.)

Colophon. 'Lipsiæ, // ex officina typo-//graphica Abrahami // Lambergi. // Anno // M. D. LXXXVIII.' (F. 87, r.)

Description. 8°, 9.4 × 15 cm., the text being 7.8 × 11.5 cm. 87 ff. unnumb., 24 ll. Leipzig, 1588.

See p. 201.

GEMMA FRISIUS. Ed. pr. 1540. Leipzig, 1592.

See p. 200.

Title. 'Arithme//ticæ Practicæ // Methodvs facilis, // per // Gemmam Frifium Medi-//cum ac Mathematicum. // (Woodcut as in the 1542 edition.) Lipsiæ, // Anno // M. D. XCII.' (F. 1, r.)

Colophon. (Woodcut of Pegasus.) 'Lipsiæ, // ex officina typo-//graphia Abrahami // Lambergi. // Anno // M. D. XCII.' (F. 88, r.)

Description. 8°, 9.2 × 15.5 cm., the text being 8.1 × 11.4 cm. 88 ff. unnumb., 24 ll. Leipzig, 1592.

See p. 201.

HENRICUS URANIUS. Ed. pr. 1540. Solingen, 1540.

A German classicist, born at Reesz, Prussia. He lived at Emmerich (Emrich) when he wrote this work.

Title. See Fig. 102.

Description. 8°, 10 × 15 cm., the text being 7.9 × 11.7 cm.
20 ff. unnumb., 28 ll. Solingen, 1540.

Editions. There was no other edition.

This is a semi-historical discussion of the various measures which the sixteenth century received from the Roman civilization, or which were

DE RE

NVMARIA, MENSVRIS ET PON-
deribus Epitome ex Budæo, Portio, Alciato
& Georgio Agricola concinnata
per Henricum Vranium
Ressensem.

I N Z O I L V M.

*Zoile quid properas? nihil hic quod rodere possis,
Omnia sunt doctis ante probata uiris.*

*Ocyus hinc fugito, si nescis quo sit eundum:
En monstrabo, malam Zoile adito crucem.*



SALINGIACI, Ioannes Soter
excudebat. AN. M. D. XL.

FIG. 102. TITLE PAGE OF URANIUS

mentioned in the most commonly read classics of the Renaissance period. No arithmetical operations are given in the book. It begins with the fractional parts of the *as*, the twelfth being called the *uncia* (the Troy ounce), the sixth the *sextans*, the fourth the *quadrans*, and so on.

PHILIP MELANCHTHON. Ed. pr. 1540. Leyden, 1540.

Born at Bretten, Baden, February 6, 1497; died April 19, 1560. His family name was Schwarzerd; he assumed the Greek equivalent, Melanchthon, when he entered the university of Heidelberg (1509). He was one of the most famous classicists of the Renaissance, and a leader in the Reformation.

Title. See Fig. 103.

MATHEMATI-
 TICARVM DISCI-
 PLINARVM, TVM
 ETIAM ASTROLO-
 GIAE ENCO-
 MIA,
 *
 PER PHIL. MELANCHT.

ITEM
 Phænomena Ioachimi Camerarij,
 elegantissimo carmine
 descripta.



APVD SEB. GRYPHIVM
 LVGDVNI,
 1540.

FIG. 103. TITLE PAGE OF MELANCHTHON

Description. 8°, 9.9 × 15.2 cm., the text being 7.2 × 12.2 cm. 40 pp. numb., 30 ll. Leyden, 1540.

Editions. There was no other separate edition.

The work of Melanchthon consists of three letters: (1) to Simon Grynaeus, dated 'Vitebergæ, mēse Augusto. M. D. XXXI'; (2) to Johann Reiffenstein, dated 'Menſe Augusto. Anno M. D. XXXVI'; (3) to Johann Schonerus (see p. 178), dated 'Vuittebergæ, Meſe Augusto, Anno M. D. XXXVI.' These epistles are all upon the value and the nature of mathematical thought, and are replete with classical and religious references. As mathematics they have no value.

The verses of Camerarius, 'Ioachimi Camerarii Phaenomena ad clarissimum iuvenem Danielum Stibarum,' relate chiefly to astronomy.

MAGNUS AURELIUS CASSIODORUS.

Ed. pr. 1540.

Paris, 1550.

CASSIODORIUS. Born at Scylaceum, c. 470; died, probably at Rome, c. 564. A Roman statesman and historian.

Title. 'Aurelij Caſiodori Se-//natoris Cos.que Romani // de quatuor Mathematicis diſciplinis // Compendium. // Pariſiis // Apud Vaſcofanum, uia Iacobæa ad inſigne Fontis. // M. D. L.' (F. 1, r.)

Description. 4°, 15.9 × 20.8 cm., the text being 9.7 × 17.2 cm. 1 f. unnumb. + 7 numb. = 8 ff., 25-29 ll. Paris, 1550.

Editions. Paris, 1540; ib., 1550, 4° (here described); ib., 1580. The 'Opera' appeared in Paris in 1598 (and 1584?). The Compendium is embodied in the 'Disciplinarum liberalium orbis, ex P. Consentio et Magno Aurelio Cassiodoro,' published at Basel in 1528.

This brief treatise on the nature of arithmetic, music, geometry, and astronomy, the four mathematical disciplines, was held in high esteem in the Middle Ages.

Other works of 1540. Anianus, p. 32, 1488; Beldamandi, p. 15, 1483; Benese, p. 182, 1536; Borghi, p. 21, 1484; Ortega, p. 93, 1512; Paxi, p. 79, 1503; Rudolff, p. 152, 1526; p. 160, 1530; Scheubel, p. 233, 1545; Wolphius, p. 154, 1527; Anonymous (Ortega?, p. 91, 1512), 'Œuvre tres ſubtile y profitable de l'art y ſcience de arismetique y geometrie translate nouvellement d'Eſpagnol en Francoys,' Paris, 8°.

Works of 1541. Agrippa, p. 167, 1531; Albert, p. 180, 1534; Cardan, p. 193, 1539; Riese, p. 139, 1522; Ringelbergius, p. 167, 1531; Tagliente, p. 115, 1515; Georg Rheticus, Arithmetic, Strasburg.

ANONYMOUS. Various authors.

Ed. pr. 1542.

Cologne, 1542.

Title. See Fig. 104.

ARITHMETICIS INTRODV^{is au los}
 TICES INTRODV^{ring}

ctio ex uarijs authoribus cons
 cinnata.

Sum Friderici Megala. Collensis.

1554.



Hippocampus
 Equus
 fluuialis
 in N. 10

AWK Cappe

Coloniæ excudebat Ioannes Gymnicus

Anno M. D. XLII.

Sehr schön, Leg, Druck, Sperrig sehr,
 So hümpf allezeit sein facit sehr...

FIG. 104. TITLE PAGE OF THE 1542 ANONYMOUS WORK

Description. 8°, 9.7 × 15.1 cm., the text being 6.9 × 12.3 cm.
 20 ff. unnumb., 25–29 ll. Cologne, 1542.

Editions. Cologne, 1542, 8° (here described); ib., 1546; Dortmund, 1549, 8° (see below).

This is one of several anonymous compilations made in the sixteenth century for use in the Latin schools. It has no merit, save that of brevity. It contains a brief treatment of the fundamental operations, followed by a chapter 'De Progrefione,' the 'Regvla mercatorvm feu de tribus,' and 7 pages 'De minutijs.' I notice that folio B 6, v., is an exact copy of Wolphius (see p. 154) folio B 1, v. This is the same as the work next mentioned, published at Dortmund in 1549.

ANONYMOUS. Ed. pr. 1542.

Dortmund, 1549.

Title. 'Brevis // Arithme//tices Intro//dvctio ex Variis // Authoribus con//cinnata. Tremoniae excud. Melch. Soter./ Anno M.D.LXIX.' (P. 1.)

Description. 8°, 9.8 × 14.9 cm., the text being 6.1 × 12.3 cm. 48 pp. unnumb. (1 blank), 25 ll. Dortmund, 1549.

See above.

ROBERT RECORDE. Ed. pr. c. 1542.

London, 1558.

Born at Tenby, Pembroke, c. 1510; died in Southwark prison, probably soon after June 28, 1558 (the date of his will). He was educated at Oxford and Cambridge, and taught mathematics at the former and probably at the latter university. He became royal physician and wrote on medicine as well as mathematics.

Title. See Fig. 105.

Colophon. 'Imprinted at London in Paules churchyard // at the figne of the Brafen Serpent // by Reginalde VVolve.// Anno Domini M. D. LVIII.' (F. 205, v.)

Description. 8°, 8.9 × 13.1 cm., the text being 8 × 11.8 cm. 205 ff. unnumb., 31 ll. London, 1558.

Editions. There is considerable uncertainty as to the date of the first edition of this work of Recorde's. It appeared, however, between 1540 and 1542. For a discussion of the question see the *Dictionary of National Biography*, and De Morgan, p. 22. The former says there were twenty-seven editions of the book, but there were at least twenty-eight (see p. 214). On account of the influence of the work on English education, the bibliography

has been extended through the seventeenth century. London, c. 1542; ib., 1543, 8°; ib., 1549, 8°; ib., 1551, 8°; ib., 1556; 1552; London, 1558, 8° (here described); ib., 1561, 8° (the earliest seen by De Morgan); 1570; London, 1571, 8°; ib., 1573; ib., 1577; ib. 1579, 8° (p. 217); ib., 1582, 8° (the Mellis edition);

THE GROVND OF

ARTES:

Teaching the woork and practise of
Arithmetike, both in whole numbers
and fractions, after a more easper
and cracter soite, then anye lyke
hath hitherto bene
set forth: With di-
uers new ad-
ditions.

Made by W. ROBERTE
RECORDE
Doctor of Physike.

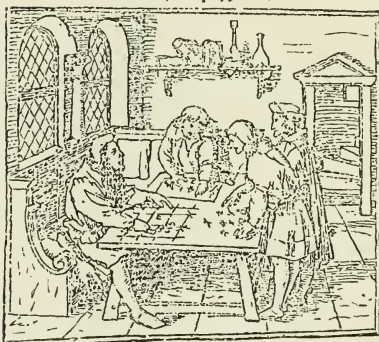


FIG. 105. TITLE PAGE OF THE 1558 RECORDE

ib., 1586, 8°; ib., 1590, 8° (the Dee and Mellis edition); ib., 1594, 8° (p. 207); ib., 1596, 8° (p. 219); ib., 1618, 8°; ib., 1623, 8°; 1636; London, 1646, 8° (p. 219); ib., c. 1646 (p. 220); 1652; 1654; London, 1662, 8° (p. 220); ib., 1668, 8° (p. 221); 1673; 1699. Presumably all of these were published at London.

A D D I T I O N .

none other examples for to learne the nume-
ration of this forme.

But this shall you marke, that as you byd
in the other kynd of Arithmetik set a prick
in the places of thousandes, in this woork
you shall set a starre, as you see before.

S. Then I perceave Sumeration : but I
praye you, how shall I do in this art to adde
two summes or more together?

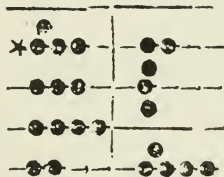
A D D I T I O N .

Master.

The easiest way in this arte, is to adde
but two summes at ones together:
how be it, you maye adde more, as I wil tel
you anone. therefore whenne you wylle
adde two summes, you shall firste set downe
one of them, it forceth not whiche, and then
by it draw a lyne crosse the other lyres. And
afterwarde sette downe the other summe, so
that that lyne maye

be betwene them: as
if you woulde adde
2659 to 8342, you
must set your summes
as you see here.

addition
two
summes.



And then if you
lyst, you maye adde
the one to the other in the same place, or els
you may adde them bothe together in a new
place: which way, because it is most plynest

3

FIG. 106. COUNTER RECKONING FROM THE 1558 RECORDE

The first arithmetic to be published in England was that of Tonstall (p. 132). There must have been several other books published between that date and the first appearance of Recorde's, because in the preface to the latter the author says: 'And if any man obiect, that other books haue bene written of Arithmetike alreadie fo sufficiently, that I needed not now to put penne to the booke, except I wil cōdemne other mens writings: to them I anfwere. That as I cōdeme no mans diligence, fo I know that no man can fatisfie euery man, and therefore like as many do esteeme greatly other bookes, fo I doubt not but some will like this my booke about any other Englifh Arithmetike hitherto written, & namely such as shal lacke instructors, for whose sake I haue plain-ly fet forth the exāples, as no book (that I haue seene) hath hitherto: which thing shall be great case to the rude readers.' (From the 1594 edition.)

This is, however, the first commercial arithmetic of any note used in the English schools. It is written in the form of a dialogue between the master and his pupil, and the language is so formal that it seems strange that the book should have been so successful. The first part is devoted to integers, the fundamental operations being followed by a section on denominate numbers. This is followed by proportion and the 'golden rule' of three, the backer rule of three (inverse proportion), the double rule of three (compound proportion), the rule of three composed of five numbers, and the rule of fellowship (partnership). The second part relates to fractions, and includes the same general topics as the first, together with alligation and the rule of false. Counter reckoning is given (Fig. 106) as well as computation with Arabic numerals.

Among other works, Recorde wrote 'The Castle of Knowledge' (p. 253) and 'The Whetstone of Witte' (p. 286), the latter being chiefly on algebra. His geometry, 'The Pathway to Knowledge,' appeared in London in 1551, 4°; *ib.*, 1574, 4°.

Recorde's works were the most influential English mathematical publications of the sixteenth century. Thomas Willsford, in his 1662 edition of the 'Ground of Artes,' was able to say with much truth that this book was 'entail'd upon the People, ratified and sign'd by the approbation of Time.'

Other works of 1542. Albert, p. 180, 1534; Cardan, p. 193, 1539; Finæus, p. 163, 1530-32; Gemma, p. 200, 1540; Ortega, p. 93, 1512; Diego el Castillo, 'Tratado de quentos,' Salamanca, 4°; Giambattista Verini, 'Spechio del mercatanti,' Milan, 8° (Brunet says, 'Libro de Abaco e gioco de memorie,' Milan, sm. 8°); Han vander Wehn, 'Exempelrechenchaft der Regel de Tri, die man nennt die Kaufmanns güldene Regel ganz und gebrochen,' s. l., 8°.

ROBERT RECORDE. Ed. pr. c. 1542. London, 1579.

See p. 213.

Title. 'The // Grounde of Artes :// teaching the work and pra-//ctife of Arithmetike, bothe in whole numbers // and Fractions, after a more eafyer and // exacter forte than any like hath hither-//to bin fet foorth :// Made by Mayfter Roberte Re-//cord, Doctor in Physike, and now of late // diligently ouerfeene and augmented // with new and neceffarie // Additions.//

I. D.

That vvhich my freende hath vvell begonne,
For very loue to common vveale,
Neede not all vvhole to be nevv done,
But nevv encrease I do reueale.

Some thyng heerein, I once redreft,
And novve agayne for thy behoofe,
Of zeale I doe, and at request,
Both mend and adde, fitte for all prooffe.

Of Numbers vfe, the endleffe might,
No vvitte nor language can expresse,
Apllie and Trie, both day and night,
And then this truth thou vvilt confesse.

Printed at London by H. Bynneman.// Anno Domini. 1579.'
(F. 1, r.)

Colophon. 'Imprinted at London by Henry // Binneman, and John Harifon.// Anno Domini M.D.LXXVII.' (F. 261, r.)

Description. 8°, 8.7 × 13.9 cm., the text being 6.5 × 11.7 cm. 261 ff. unnumb., 27 ll. London, 1579.

It will be noticed that the colophon is dated 1577. This is therefore one of the cases where a large edition was printed, and a new title page was added from year to year as necessary. The edition is more rare than its date would suggest.

ROBERT RECORDE. Ed. pr. c. 1542. London, 1594.

See p. 213.

Title. 'The // Grovnd of // Artes, teaching // the perfect worke and practife // of Arithmeticke, both in whole numbers // and Fractions, after a more eafie and exact // fort, than hitherto

hath been fet foorthe.// Made by M. Robert Record, // D. in Phificke.// And now lately diligently corrected and beauti-//fied with fundry new Rules and neccessary Addi-//tions : And further endowed with a third part, of // Rules of Practife, abridged into a briefer method // than hitherto hath bene published : with di-//uerse such neccessairie Rules as are // incident to the trade of // Merchandife.// Whereunto are also added diuerse Tables and In-//ftructions that will bring great profite and delight vnto Merchants, Gentlemen, and others, // as by the Contents of this Trea-//tise fhall appeare.// By Iohn Mellis.// At London, // Imprinted by T.D. for Iohn Harifon, at the Greyhound in // Paules Churchyard.// 1594.'// (P. 1.)

Colophon. 'Imprinted at London by Thomas Dawfon, for Iohn // Harrifon, dwelling in Paules // Churchyard, at the signe of // the Greyhound, // 1594.' (P. 558.)

Description. 8°, 10.1 × 15.5 cm., the text being 7.6 × 13.1 cm. 34 pp. unnumb. + 493 numb. 33-525 + 1 blank = 528 pp., 30-31 ll. London, 1594.

Editions. See p. 213. This is probably the third edition by Mellis. In the dedication he says : ' And feeing that within this 8. yeares, two impreffions of thefe my labors dedicated to your Worfhup are already worne out . . . ', although not much reliance can be placed on the statement, since it also appears in the 1596 edition.

See p. 216. The first two parts, covering 404 pp. of this book, are substantially identical with the 1558 edition (p. 213). The third part (pp. 405-557), the work of John Mellis, also appeared in the 1591 edition. It includes the ' Rules of Practife,' ' The order & worke of the Rule of three in broken Numbers, after the trade of Marchants, digreffing fomething from M. Recordes,' ' Loffe and Gaine,' ' Rules of Payment' (equation of payments), barter, exchange, interest, and other business applications, together with a chapter on ' Sportes and Paftimes done by Number.' These mathematical recreations had already appeared in printed textbooks, and they played an interesting rôle until the latter half of the nineteenth century. Those in this treatise related to number guessing, the rules being easily developed by our present algebra, but rather mysterious by sixteenth-century arithmetic.

ROBERT RECORDE. Ed. pr. c. 1542. London, 1596.

See p. 213.

Title. The title page is missing.

Colophon. 'Imprinted at London by Richard // Field, for Iohn Harrison, dwelling // in Pater nofter Row at the // figne of the Greyhound.// 1596.' (P. 559.)

Description. 8°, 9.8 × 15.5 cm., the text being 8 × 13.3 cm. 559 pp., 30–31 ll. London, 1596.

Editions. See p. 213. A note on the last page says that this copy was bought in 1686 for 1s. 6d., not a very low price at that time for a book only ninety years old. This edition is practically identical with that of 1594 (p. 217).

ROBERT RECORDE. Ed. pr. c. 1542. London, 1646.

See p. 213.

Title. 'Records Arithmetick :// or, // The Grovnd // of Arts : // Teaching // The perfect work and Practice of Arithmetick, // both in whole Numbers and Fractions, after a more // easie and exact form than in former time hath been fet forth :// Made by M. Robert Record, D. in Phyfick. // Afterward, augmented by M. John Dee. // And fince enlarged with a third part of Rules of Pra-//ctife, abridged into a briefer method than hitherto hath been // publifhed, with divers neceffary Rules incident to the Trade // of Merchandife : with Tables of the valuation of all Coyns, // as they are currant at this prefent time. // By John Mellis. // And now diligently perufed, corrected, illuftrated and en-//larged ; with an Appendix of figurate Numbers, and the Extraction // of their Roots, according to the method of Chriftian Vrfitius : with // Tables of Board and Timber meafure ; and new Tables of Intereft // upon Intereft, after 10 and 8 per 100 ; with the true value of // Annuities to be bought or fold prefent, Refpited, or in Rever-//fion : the firft calculated by R. C. but corrected, and the // latter diligently calculated by Rob : Hartwell, Philomathemat. // Scientia non habet inimicum nifi ignorantem. // Fide. ----- fed ----- Vide. // London, // Printed by

M. F. for John Harifon, and are to be fold by // Geo: Whittington, and Nath: Brooks, at the sign of // the Angell in Corn-hill. 1646.' (P. 1.)

Description. 8°, 10 × 15.5 cm., the text being 8.6 × 13.7 cm. 27 pp. unnumb. + 629 numb. = 656 pp., 31 ll. London, 1646.

Editions. See p. 213.

Like the 1594 edition this has the additional 'third part' by John Mellis. The Hartwell chapter on roots begins on p. 573, and is based, as the title says, on the work of Urstisius.

ROBERT RECORDE. Ed. pr. c. 1542. London, 1646 (?).

See p. 213.

Title. This edition is said to have been published in 1646, but no date appears in the book itself. It has the same title page as the one dated 1646, except as follows: The words 'Records Arithmetick' (l.1) are here omitted; the last lines read 'Printed by M. F. for John Harifon, and are to be // fold at his Shop in Pauls-Church-yard.' The number of words on some of the lines in the title page is different, but with the above exceptions the page is the same. The body of the book is from the same setting of type as in the other edition of 1646.

Description. 8°, 10.2 × 15.7 cm., the text being 8.6 × 13.7 cm. 27 pp. unnumb. + 629 numb. = 656 pp., 32 ll. London, s. a. (1646?).

See p. 216.

ROBERT RECORDE. Ed. pr. c. 1542. London, 1662.

See p. 213.

Title. The title page is practically the same as that of 1646, except as to the imprint: 'Printed by James Flefher, and are to be fold by Jofeph // Cranford, at the signe of the Gunn in St. Pauls // Church-yard. 1662.'

Description. 8°, 10.7 × 16.5 cm., the text being 9.2 × 13.9 cm. 22 pp. unnumb. + 536 numb. = 558 pp., 33 ll. London, 1662.

See p. 216.

ROBERT RECORDE. Ed. pr. c. 1542. London, 1668.

See p. 213.

Title. The title page of this edition is practically the same as that of 1646, except as to the imprint: 'Printed by James Flesher, and are to be sold by // Robert Boulter, at the Turks-head in Bishopsgate-//street, next the great James. 1668.'

Description. 8°, 10.4 × 16.4 cm., the text being 9.2 × 13.7 cm. 22 pp. unnumb. + 536 numb. = 558 pp., 33 ll. London, 1668.

JOHANN FREY. Ed. pr. 1543. Nürnberg, s. a. (1543).

A Nürnberg gauger of the middle of the sixteenth century.

Title. See Fig. 107.

Colophon. 'Gedruckt zû Nürnberg durch // Georg Wachter.' (F. 36, r.)

Description. 8°, 9.5 × 15.5 cm., the text being 7.1 × 10.9 cm. 36 ff. unnumb., 21-26 ll. Nürnberg, s. a. (1543).

Editions. There was no other edition. The book bears no date except in the dedicatory epistle to the reader, which closes with the words, 'Anno 1543.' This epistle gives, also, the only reference to the author, who there speaks of himself as 'ich Johān Frey/ burger zu Nürnberg.'

The subject of gauging occupied a great deal of attention on the part of German writers on arithmetic in the sixteenth century, and occasionally, as in this instance, separate books were prepared. It was not so common in England as on the Continent, not appearing, for example, in as extensive a work as the Dee and Mellis edition of Recorde mentioned above. It had, however, some standing in the early American arithmetics, and is found as a separate chapter as late as the middle of the nineteenth century. The title page gives some idea of the work of the gauger before the days of standardization of casks. The American rule for gauging a cask was substantially as follows: Add to the head diameter 0.7, 0.65, 0.6, or 0.55 of the difference between the head and bung diameters (according to the degree of curvature of the staves), and multiply the square of this sum by the length; divide by 359 for ale or beer gallons, and by 294 for wine. Thus a cask with bung diameter 36 in., head diameter 30 in., and length 48 in., contains 153.65 ale gallons.

This particular work is interesting because, although it was printed in 1543, some of the numerals are quite like those of a hundred years earlier. The mediæval 4, 5, and 7 are exclusively used in the engraved

Ein new Visier büchlein/

welches innhelt/wie man durch den Quadraten
auffeynes yeden lands Lich/ein Rätten zübe
reyten/vñ damit yetlichs vnberants vafß
Visieren/vnd solches innhalt erkens
nen sol/Auffs new gebeffert
vnd gemert.



FIG. 107. TITLE PAGE OF FREY

figures, although the types used in the body of the book give the later forms. These mediæval figures may be seen in several illustrations in the second part of this bibliography.

ANONYMOUS. Ed. pr. 1543.

Paris, 1543.

The author of the *Theologoumena* is unknown. He lived after Anatolius (Bishop of Laodicea, 270 A.D.) and probably after Iamblichus (fourth century).

Title. See Fig. 108.

Description. 4°, 15.2 × 23 cm., the text being 9.1 × 18.1 cm. 7 pp. unnumb. + 61 numb. (5-65) + 2 blank = 70 pp., 30 ll. Paris, 1543. Greek text, except the dedicatory epistle, which, being dated 'Lutitiæ Pariflorum 1543. 6. Calendas Iulias,' shows this to be the first edition.

Editions. This edition was unknown to De Morgan. The best edition is that of Fr. Ast, Leipzig, 1817.

A work of little importance, on the Greek theory of numbers. Gow (p. 88) describes it as a 'curious farrago.' Cantor (*Geschichte der Mathematik*, Kap. 22) says that the author may have drawn on Iamblichus. The most valuable feature of the work is the light which it throws on an earlier work by Speusippus, nephew of Plato.

Other works of 1543. Archimedes, p. 228, 1544; Gemma, p. 200, 1540; Glareanus, p. 192, 1539; Recorde, p. 214, c. 1542; Regius, p. 182, 1536; Sfortunati, p. 174, 1534; Tonstall, p. 134, 1522; Nicolaus Medlerus, 'Rudimenta Arithmeticæ practicæ,' s. l., 8° (with subsequent editions: Wittenberg, 1550; ib., 1558; Leipzig, 1556; Weissenfels, 1564, 8°).

MICHAEL STIFEL. Ed. pr. 1544.

Nürnberg, 1544.

STIFEL, STYFFEL. Born at Esslingen, April 19, 1487; died at Jena, April 19, 1567. He was a priest, a reformer, and a fanatic, but was one of the most skillful arithmeticians of his time.

Title. See Fig. 109.

Colophon. 'Excudebatur Norimbergæ // apud Ioh. Petreium.' (F. 325, r.)

Description. 4°, 15.5 × 20.2 cm., the text being 10.2 × 15.1 cm. 326 ff. (1 blank, 6 unnumb.), 33 ll. Nürnberg, 1544.

Editions. Stifel wrote five works on mathematics, all but one appearing after his period of religious fanaticism. These works, with their various editions, are as follows:

1. 'Ein Rechen Büchlein vom End Christ. Apocalysis in Apocalysim,' Wittenberg, 1532. A little-known work on the theory and mysticism of numbers.



ΤΑ ΘΕΟΛΟ-

ΓΟΥΜΕΝΑ ΤΗΣ ΑΡΙΘΜΗΤΙΚΗΣ.

Habes hic o studio-
SE LECTOR, NOVVM OPVS-
culum antehac nusquam excusum, in quo ita
Numerorum ratio explicatur, vt non sit obscu-
rum intelligere hanc arithmetica ad interiorē
illā de philosophia disputationem, quam
Theologiam veteres vocabant,
conferre plurimum.



PARISIIS.

Apud Christianum wechelum sub scuto Basi-
liensi, in vico Iacobæo: & sub Pegaso, in vi-
co Bellouacensi. M. D. XLIII.

FIG. 108. TITLE PAGE OF THE *Theologoumena*

ARITHMETI CA INTEGRA.

Authore Michaelē Stifelio.

~~Cum præfatione Philippo Melancthonis.~~



Norimbergæ apud Iohan. Petreium.
Anno Christi M. D. XLIII.

Cum gratia & priuilegio Cæsareo
atq; Regio ad Sexennium.

FIG. 109. TITLE PAGE OF STIFEL'S SECOND ARITHMETIC

2. 'Arithmetica Integra,' Nürnberg, 1544, 4° (here described); ib., 1545, 4°; 1546; Nürnberg, 1548; ib., 1586, 4°.
3. 'Deutsche Arithmetica' (p. 231), Nürnberg, 1545, 4°.
4. 'Rechenbuch von der Welfchen vnd Deutchchen Practick/ auff allerley vorteyl vnd behendigkeit/ mit erklerung viler Exempeln/ . . .', Nürnberg, 1546.
5. 'Die Coss', Königsberg, 1553-54, 4° (p. 259); 1571; 1615.

The dedication and Melanchthon's preface, both of which have been removed from this copy, are dated 'Vuitebergæ 1543.' This copy has evidently been owned by some one unsympathetic with Melanchthon, because not only has the preface been removed but the reformer's name has been crossed out of the title page (Fig. 109). The work is one of the most scholarly arithmetics and algebras that came out in Germany in the sixteenth century. It is divided into four books, the first being an arithmetic and giving not only the theory of the subject, but a considerable amount of practical work. The second book is on irrational numbers, a chapter which we now insert in algebra, and the third is on algebra itself, the name of which subject is said to be 'à Gebro Afronomo, auctore eius,' a common opinion at that time. This work did for Germany what Cardan's and Tartaglia's did for Italy. It was a storehouse from which subsequent writers drew, and, although not a practical mercantile book, it materially influenced even the elementary textbook makers. Stifel himself recognized the demand for such a work, for he says: 'Quanq; autem plurimi de Arithmetica libelli extent, & quotidie plures noui gignunter, ego tamen adhuc nullum uidi qui integrā artem traderet.' Stifel makes much use of the plus and minus signs.

ARCHIMEDES. Ed. pr. 1544.

Basel, 1544.

Born at Syracuse, c. 287 B.C.; died there in 212 B.C. The greatest of Greek mathematical physicists.

Title. See Fig. 110.

Colophon. 'Basileae, per Ioannem // Hervagivm, anno ab orbe re-//dempto, M.D. XLIII. menfe Martio.' (P. 69 of the last part.)

Description. Fol., 21.8 × 31.7 cm., the text being 13.2 × 23.5 cm. 455 pp. (7 blank and 12 unnumb.), 51 ll. The work is made up of four parts, all of the same date, separately pagged, and bound together. The 'Ψαμμίτης, De harenæ numero,' is the sixth work in the collection. Basel, 1544.

ΑΡΧΙΜΗΔΟΥΣ

ΤΟΥ ΣΥΡΑΚΟΥΣΙΟΥ, ΤΑ ΜΕΧΡΙ

νῦν σωζόμενα, ἅπαντα.

ARCHIMEDIS SYRACUSANI
 PHILOSOPHI AC GEOMETRÆ EX-
 cellentissimi Opera, quæ quidem extant, omnia, multis iam seculis defi-
 derata, atq; à quàm paucissimis hæctenus uisa, nuncq;
 primùm & Græcè & Latinè in lu-
 cem edita.

Quorum Catalogum uerfa pagina reperies.

Adiecta quoq; sunt

EUTOCHII ASCALONITÆ
 IN EOSDEM ARCHIMEDIS LI-
 bros Commentaria, item Græcè & Latinè,
 nunquam antea excusa.

*Cum Cæs. Maiest. gratia & priuilegio
 ad quinquennium.*

Ioannes Bapt. Grillinjonij

B A S I L E Æ.

Ioannes Heruagius excudi fecit.

An. M D XLIIII.

FIG. 110. TITLE PAGE OF THE 1544 ARCHIMEDES

Editions. This seems to be the first edition of the works of Archimedes to contain the 'De arenæ numero.' This chapter also appears in the 1558 edition (below), and separately in Paris in 1557, 8° (the Hamellius edition, below). It was not in the Tartaglia edition of 1543. It appeared in the elaborate editions of Barrow (1675), Torelli (1792), Peyrard (1807-8), and Heiberg (1880). Riccardi says that it 'fu illustrato dal Clavio ne' suoi commenti alla sfera del Sacrobosco.'

There are several works of Archimedes extant. The 'De arenæ numero,' included in this edition, is not an arithmetic, but it treats of the numeration of large numbers. It is addressed to Gelon, King of Syracuse, and proposes to show, 'by geometric proofs which you can follow, that the numbers which have been named by us and are included in my letter to Zeuxippus are sufficient to exceed not only the number of a sand-heap as large as the whole earth, but one as large as the universe.' Archimedes then proceeds to develop a system of numeration by octads. In this work he incidentally refers to a fact which would now be expressed by the symbols $x^m \cdot x^n = x^{m+n}$.

ARCHIMEDES. Ed. pr. 1544.

Paris, 1557.

See p. 226.

Title. 'Paschasii // Hamellii Regii // Mathematici // Commentarius // in // Archimedis // Syracufani præclari Mathematici librū // de numero arenæ, multis locis per // eundem Hamellium // emendatum. // Lvtetiae // Apud Gulielmum Cauellat, fub pingui Gallina, // ex aduerfo collegij Cameracensis. // 1557.' (F. 1, r.)

Description. 8°, 11 × 17.1 cm., the text being 7.1 × 12.6 cm. 48 ff. numb., 23-30 ll. Paris, 1557.

Editions. See above.

This commentary of Hamellius is quite as satisfactory as any of the earlier ones.

ARCHIMEDES. Ed. pr. 1544.

Venice, 1558.

See p. 226.

Title. 'Archimedis // opera non nulla // à Federico Commandino // Vrbinatè // nyper in Latinvm conversa, // et commentariis // illvstrata. // Quorum nomina in fequenti pagina leguntur.'

// Cvm privilegio in annos X. // Venetiis, // apud Paulum Manutium, Aldi F. // M D LVIII.' (F. 2, r.)

Description. Fol., 21.1 × 30 cm., the text being 13.2 × 22.8 cm. 128 ff. (2 blank, 8 unnumb.), 39 ll. Venice, 1558. With this is bound the 'Commentarii // in opera non Nvlla // Archimedis. // Venetiis, // apud Paulum Manutium, Aldi F. // M D LVIII.' (F. 60, r.) It contains the book entitled 'Archimedis // Liber de Arenæ // nvmero.'

See p. 228.

JUAN SARAVIA, de la calle Beronese.

Ed. pr. 1544.

Medina, 1544.

A Spanish arithmetician, of Medina, of the middle of the sixteenth century.

Title. See Fig. 111.

Colophon. '¶ Fue impreffa la presente: // obrallamada Infrució de mercaderes enla muy // noble villa de medina d'l campo por Pedro de // Castro ipreffor. Acofta d'Antoño de vrueña // mercader d'libros. Acabofe atreynta días // del mes de Julio. Anō de mil ⁊ quiniē-//tos ⁊ quarenta ⁊ quatro anōs.' (F. cvij, 1.)

Description. 8°, 14 × 20.1 cm., the text being 12.1 × 16.9 cm. 2 ff. unnumb. + 105 numb. (Roman numerals) = 107 ff., 30 ll. Medina, 1544.

Editions. Medina, 1544, 4° (here described); ib., 1547, 4°; Venice, 1561, 8° (p. 231.)

This rare work was evidently written about 1542 (see f. xcviij, r.). It is not a textbook on arithmetic, but it relates to commercial problems, the topics being curiously interspersed with biblical illustrations to show the justice of the customs involved.

Other works of 1544. Apianus, p. 155, 1527; Bæda, p. 131, 1521; Finaeus, p. 163, 1530-32; Gemma, p. 200, 1540; Grammateus, p. 123, 1518; Köbel, p. 102, 1514; Noviomagus, p. 195, 1539; Peurbach, p. 53, 1492; Riese, p. 139, 1522; Sfortunati, p. 177, 1534; Tonstall, p. 136, 1522; Vander Hoecke, p. 183, 1537; H. Bock, 'Ein new Rechenbuchlein,' Nürnberg, 8°; Johannes Bogardus, a work on finger reckoning based on Aventinus (p. 136), Paris; Leonard Hegelin, 'Ein künstlich Rechenbüchlin auff Zyffer vnnd andern hüpschen Regeln,' Ulm(?);



Instrucion de mercaderes
muy provechosa. En la qual se enseña como deuen los
mercaderes tractar. y de que manera se han de eui-
tar las vsuras de todos los tractos de ventas y com-
pras. Assi alo contado como alo adelantado. y alo fia-
do. y delas compras del censo al quitar y tractos de
compañia: y otros muchos contratos. Particular-
mente se habla del tracto delas lanas. Tambien ay
otro tractado de cambios. En el qual se tracta de los
cambios licitos y repronados. Aueniente com-
piesto por el doctor Saravia dela calle Heronése.
Año. M. D. xliiij M D XL AD J N U S

FIG. III. TITLE PAGE OF SARAVIA

Antonio Martín, 'Tractado de Arithmética y Geometría,' Alcalá, 4°; H. Vuelpius, 'De minutiis phyfics et practicis afronomicae arithmeticae regulis,' Cologne, 4°, and 'Libellus de communibus et ufítatis arithmeticae practicae regulis,' ib., 4°.

JUAN SARAVIA. Ed. pr. 1544.

Venice, 1561.

See p. 229.

Title. 'Institvtione//de' Mercanti//che tratta del comparare // et vendere, // et della vsvra chepvò // occorrere nella Mercantia // insieme con vn trattato // de' Cambi. // Et in somma fi ragiona di // tutto quello che al Mercante Christiano // fi conuiene. // Composta per il Dottor Sarava, // & nuoamente tradotta di lingua spagnuola // dal S. Alfonso D'Vlloa. // Cvm Privilegio. // In Venetia // Apreffo Bolognino Zaltieri. // M D LXI.' (F. 1, r.)

Colophon. 'In Venetia apreffo Bolognino Zaltieri // 1561.' (F. 135, v.)

Description. 8°, 10.2 × 15.1 cm., the text being 7.6 × 12.2 cm. 135 ff. (3 unnumb.), 29 ll. Venice, 1561.

Editions. See p. 229.

This is an Italian translation of the Spanish edition of 1544 (p. 229). The book was evidently written in 1542 as already stated, for the author speaks (f. 109) 'del cāpo quefto anno M D XLII.'

MICHAEL STIFEL. Ed. pr. 1545.

Nürnberg, 1545.

See p. 223.

Title. See Fig. 112.

Colophon. 'Zu Nürnberg Truckts Johan Petreius. // 1545.' (F. 96, r.)

Description. 4°, 15.5 × 20.7 cm., the text being 10.8 × 15.5 cm. 4 ff. unnumb. + 92 numb. = 96 ff., 32-34 ll. Nürnberg, 1545.

Editions. See p. 226.

The 'Deutsche Arithmetica' is divided into three parts. In the 'Hausrechnung' there are 12 chapters, all relating to the arithmetic of the common people, there being 'no household so narrow and poor that common arithmetic is not both serviceable and necessary to its welfare.' ('Es ift kein Haufzhaltung/niendart fo gering vnnd fchlecht/

Deutsche Arithmetica.

Inhaltend.

Die } Hausrechnung.
 Deutsche Coss.
 Kirchrechnung.

Mein lieber Leser/ Nach dem die Coss (welche ist ein Kunst-
 rechnung der gansen Arithmetick) bissher den Deutschen/ mit vil
 frembden worten/ vermengt vnd verblend/ schwer ist gewesen/ So
 wirt sie hie mit new erfundnem vorthail vnd Regeln / sehr leicht
 vnd kurz herfür bracht vnd gelehrt/ vnd mit guten Deutschen be-
 kanntlichen worten vñ Exempeln erweyset. Das ander so hierin
 gelert wirt von der Hausrechnung vnd Kirchenrechnung/ bringe
 seinen bericht gnugsam mit sich. Alles durch Herr Michael Sti-
 fel/ auff ein besondere newe vnd leichte weis gestellet.

Zu Nürnberg truckts Johan Petreius.

1 5 4 5.

Cum Priuslegio ad Quinquennium,

das jr die Haufrrechnung oder gemeine rechnung/ nicht nützlich vnd dieftlich sey.') Stifel first treats 'Vom Algorithmo der Rechenpfenning,' recommending the operations as being 'wunderleichtlich durch die Rechenpfenning gelernet vnd gelehret.' The coss (algebra) relates largely to arithmetic, although touching upon the most common algebraic operations (Fig. 113). In it Stifel gives the rule for dividing one fraction by another by using the inverted divisor as a multiplier. The third part relates to the ecclesiastical calendar ('Von der Kirchenrechnung/die man nennet Computum Ecclesiasticum'), a subject in which he acknowledges his indebtedness to 'Johannes de Sacro bufto.' With his usual commendable but effusive piety Stifel closes with praise not only to the Prince but to 'vnferm Vater im Hymel vnd feinem eynigen naturlichen Son/vnferm Herren Iefu Chrifto.'

JOHANN SCHEUBEL. Ed. pr. 1545. Leipzig, 1545.

SCHÉUBL, SCHEUBELIUS. Born at Kirchheim, Württemberg, August 18, 1494; died February 20, 1570. Professor of Mathematics in the University of Tübingen, to which institution he bequeathed most of his manuscripts. He wrote on arithmetic and algebra, and edited part of Euclid.

Title. See Fig. 114.

Colophon. 'Lipfiæ ex Officina Michaëlis // Blum, a reftituta falute.// Anno M. D. XLV.// Idib: Maij.' (F. 255, r.)

Description. 8°, 10 × 15.9 cm., the text being 6.9 × 12 cm. 255 ff. unnumb. + 1 blank = 256 ff., 20–26 ll. Leipzig, 1545.

Editions. It is sometimes stated that this work appeared at Strasburg in 1540, but I cannot verify the statement. I know of no edition other than this of 1545. Scheubel also wrote a 'Compendium arithmeticae' (p. 246, 1549). Murhard mentions an 'Arithmetica sive de Arte supputandi Liber,' Lipsiae, 1545, 8°, but he may refer to the 'De Numeris.' Scheubel also published an algebra (Paris, 1551), and the seventh, eighth, and ninth books of Euclid (1558).

This work is the production of a scholar rather than a man conversant with the demands of business. While Scheubel tried to write a mercantile arithmetic, the result was far removed from the needs of the common people. It carries the work in subjects like the roots so far that the ordinary Rechenmeister could not have used it. Moreover, it is written in Latin and is much more extended than the work of Gemma Frisius, so that it appealed neither to the business school nor

Der Ander theyl
Von disen zweyen Zeichen/

+ vnd —. VII.



Wich von Zeichen reden werde/soltu mich verstehn von disen Zeichen + vnd —/Den sollliche verzeichnis/ Sum: oder Sum: A. oder ff. r̄. Werde ich nicht Zeichen nennen/sondern/namen/oder benennung der zalen. Wa ich nu rede von gleichen Zeichen/soltu es verstehn von + vnd — / oder von — vnd —. Also auch/wa ich von ungleichen Zeichen rede / so verstehē es/von + vnd —.

So haben nu dise zwey Zeichen + vnd — / ein sonderlichen Algorithmum/welchē ich hie stellen will auff 4 Regeln. Denn er gehöret zum Algorithmus der ungeredneten zalen wie du woll sehen wirst/vnd alles was vorhin gesagt ist von disen namen sum: sum: A. r̄. das gehöret alles hie her / als vnter ein einigen Algorithmum.

Die erst Regel von dem Addiren
vnd Subtrahiren. VIII.



Wey gleiche Zeichen / machen eben das selbig Zeichen/ im Addiren vñ Subtrahiren/ ohn allein so du im subtrahiren die zal / die du soltest subtrahirē/nicht kanst subtrahirē.

Exempla vom Addiren.

8	Sum: + 7.	8	Sum: — 18.
12	Sum: + 11.	3	Sum: — 6.
20	Sum: + 18.	11	Sum: — 24.

Hie siehest nu vor augen/wie + vnd — mache im ersten exemplo

to the ordinary classical school. A great deal of attention is given to exchange, the rule of three, and the extracting of roots of high order. Attention is also given to problems which would now form part of algebra, and there is a little treatment of geometry from the standpoint of mensuration. The nature of the work can be somewhat understood

DE NVME

RIS ET DIVERSIS RATIONIBVS
seu regulis computationum opusculum,
a Ioanne Scheubelio compositum.

Non solum ad usum quendam vul
garem, sed etiam cognitionem
& scientiam exquisitiorem
arithmeticae accom
modatum.

Philos. Leopoldinus Lipsiæ.



M. D. XLV.

FIG. 114. TITLE PAGE OF SCHEUBEL.

from the titles of the five 'tractati': 1. 'De numeris integris'; 2. 'De proportionibus, proportionalitatibus & alijs'; 3. 'De minutijs vulgari-
bus'; 4. 'De minutijs physicalibus'; 5. 'Aliquot regulæ.'

While Scheubel is not much appreciated to-day, he was really ahead of his time. He tried to banish the expression 'rule of three' and to substitute 'rule of proportion.' His explanation of square root is in

some respects the best of the century, and he dismisses with mere mention the 'duplatio' and 'mediatio' of his contemporaries. He extracts various roots as far as the 24th, finding the binomial coefficients by means of the Pascal triangle a century before Pascal made the device famous.

SACROBOSCO. Ed. pr. 1545.

Wittenberg, 1550.

See p. 31.

Title. 'Ioannis // de Sacrobvsto // Libellus de Sphæra.// Accessit eivsdem // avctoris Compvtvs // Ecclesiaficus, Et alia quædam // in ftudioforum gra-//tiam edita.// Cum Præfatione Philippi // Melanthonis.' On f. 67, r., begins 'Libellvs // Ioannis de Sacro//bvsto, de Anni Ratione, // sev vt vocatvr vvl-//go Compvtvs Ec-//clesiasti-//cvs.// Cvm Præfatione // Philippi Melan-//thonis.// Anno M. D. XLV.'

Colophon. 'Impreffum Vuitebergæ apud // Iohannem Cratonem.// Anno // M. D. L.' (F. 134, r.)

Description. 8°, 10.1 × 15.5 cm., the text being 6.5 × 10.8 cm. 134 ff. unnumb. + 2 blank (2 plans) = 136 ff., 26 ll. Wittenberg, 1550.

Editions. The preface by Melanchthon is dated 'Menfe Auguf- to.// Anno // M. D. XXXVIII,' so that his edition of the book could not have appeared earlier than that year. The fact that this volume was printed in 1550, as shown by the colophon, makes it probable that the date 1545 on the title page is that of the first edition. There are several editions of the 'Sphæra' in Mr. Plimpton's library, but this is the only one containing the Computus.

This is less properly included in a list of arithmetics than many of the other computi. Since several others have been included, this, which is one of the most celebrated, is given place; but the arithmetical work is practically nil.

EUCLID. Ed. pr. (arith. books) 1545.

Rome, 1545.

See p. 11.

Title. See Fig. 115.

Colophon. 'Stampata in Roma per Antonio Blado Afolano.// M D XLV.' (P. 12.)

Description. 8°, 9.8 × 15.1 cm., the text being 6.7 × 10.9 cm. 112 pp. (3 blank, 6 unnumb.), 24–26 ll. Rome, 1545.

Editions. There were several editions of one or more of those books of Euclid that relate to some part of the theory of arith-

I Q V I N D I C I
 LIBRI DEGLI ELEMEN
 TI DI EVCLIDE, DI GRE
 CO TRADOTTI IN
 LINGVA THO.
 SCANA.



IN ROMA. M D XXXXV.

*Con gratia & privilegio del S. N. S. Paulo Terzo,
 & della Serenissima republica Venetiana
 per cinque anni.*

FIG. 115. TITLE PAGE OF THE 1545 EUCLID

metic. Of these separate books, this is the rare first Italian edition. Among others may be mentioned those of Wittenberg, 1546; 1549; Paris, 1551, 4° (p. 238); ib., 1554, 4° (p. 238); 1555 (by Scheubel); Paris, 1557, 8° (p. 240); Wittenberg, 1564,

8° (p. 240). There were very many editions of Euclid's work published before 1600, practically all including Book V, on proportion, and some including the other arithmetical books.

Euclid's treatment of arithmetic was purely theoretical, no work on computation being included. This copy has the following note by De Morgan, who once owned it: "This book was also printed in Greek — same year, place, size, printer, and dedication. There is a Greek copy in the British Museum. A. De Morgan, Feb. 29, 1852."

Other works of 1545. Bæda, p. 131, 1521; Feliciano, p. 149, 1526; Psellus, p. 168, 1532; Stifel, p. 226, 1544; Sfortunati, p. 177, 1534; Willichius, p. 197, 1540; Antonius de Barres, 'Arithmeticae practicae libri IV,' Louvain, 4°; Johann Obers, 'Newgestelt Rechenpüchlin,' Augsburg; Pedro Espinosa, 'Tractatus proportionum,' Salamanca, fol.

EUCLID. Ed. pr. (arith. books) 1545. Paris, 1551.

See p. 11.

Title. See Fig. 116. (Note the signature of Giuliano de Medici.)

Description. 4°, 16.3 × 23.4 cm., the text being 9.5 × 17.3 cm. 162 ff. (2 blank, 20 unnumb.), 29 ll. Paris, 1551.

Editions. See p. 237.

This is not the same as the 1545 edition already described, but, like it, this relates to the numerical side of mathematics.

EUCLID. Ed. pr. (arith. books) 1545. Paris, 1554.

See p. 11.

Title. 'Euclidis // Elementa quædam // Arithmetica. // Lvte-tiæ, // Apud Vafcofanum, uia Iacobæa, ad infigne Fontis. // M. D. LIIII. // Cvm privilegio regis.' (F. 1, r.)

Description. 4°, 15.4 × 19.4 cm., the text being 11.2 × 17.8 cm. 18 ff. numb., 29 ll. Paris, 1554

Editions. See p. 237.

This work is made up of certain extracts from the various books of Euclid relating to Arithmetic. It is in Greek with a Latin translation following each definition or theorem. It consists of such standard old definitions as 'Numerus autem, ex unitatibus composita multitudo,' and such theorems as 'Omnis primus numerus, ad omnem numerum quem non metitur, primus est.' There are no discussions, illustrations, or proofs of the propositions.

Euclidiselementorum

LIBER DECIMVS, PETRO

Montaureo interprete.

Ad Ioannem Bellaïum Cardinalem.

L V T E T I A E,

Apud Vascofanum, uia Iacobæa ad insigne Fontis.

M. D. LI.

CVM PRIVILEGIO.

Di Giuhano de Medici.

FIG. 116. TITLE PAGE OF THE 1551 EUCLID

EUCLID. Ed. pr. (arith. books) 1545.

Paris, 1557.

See p. 11.

Title. 'Euclidis // Elementorum // Libri XV. Graec//icè & Latinè, // Quibus, cum ad omnem Mathematicæ scientiæ // partem, tum ad quamlibet Geometriæ tra-//ctationem, facilis comparatur aditus. // *Επίγραμμα παλαιόν.* // *Σχήματα πέντε Πλάτωνος, à Πυθαγόρας σο-//φὸς εὔρε.* // *Πυθαγόρας σοφὸς εὔρε, Πλάτων δ' ἀρίδην ἐδί-//δαξεν* // *Εὐκλείδης ἐπὶ τοῖσι κλέος περικαλλῆς ἔτευξεν.* Lvtetiae, // Apud Gulielmum Cauellat, in pingui Gallina, // ex aduerfo collegij Cameracensis. // 1557.' (F. 1, r.)

Description. 8°, 10.5 × 16.9 cm., the text being 7 × 12.8 cm. 16 ff. unnumb. + 130 numb. = 146 ff., 25 ll. Paris, 1557.

See p. 238.

EUCLID. Ed. pr. (arith. books) 1545.

Wittenberg, 1564.

See p. 11.

Title. 'Arithmetices // Evclideae // Liber Primvs. // Aliàs in ordine reliquorum // Septimvs: Qui citra // præcedentium Sex librorum // Geometricorum opem eruditè // perfequitur, cum reliquis duobus // fequentibus, mera principia ac // solidiora fundamenta Logi-//ftices, id est, ut uocant, // Arithmetices Pra-//cticae. // Per // Ioan. Sthen. Luneb. // In scholarvm vsvm κατὰ τὸ ὄτι tractatus ἐρωτηματικῶς, difquisitione nimi-//rum Dialectica quæ Dialogorum // est propria. // 1564.' (F. 1, r.)

Colophon. 'Wittenbergæ. // Anno // 1564.' (F. 106, v.)

Description. 8°, 9.2 × 14.8 cm., the text being 6.3 × 11.5 cm. 107 ff. unnumb., 22-24 ll. Wittenberg, 1564.

Editions. See p. 237.

GASPARD DE TEXEDA. Ed. pr. 1546. Valladolid, 1546.

A Valladolid arithmetician of the first half of the sixteenth century.

Title. See Fig. 117.

Colophon. '¶ Fue impreßala prefente // obra d'Arithmetica En la muy noble // y felice villa de Valladolid (Pincia // otro tiempollamada) En la officii-//na de Francisco Fernandez // de



FIG. 117. TITLE PAGE OF TEXEDA

cordoua/ junto alas // escuelas ma//yores // Acabofe a quatro dias del mes // de Henero deste año del // feñor de mill 2 quini- //entos 2 quaren//ta 2 feys // Años.' (F. lxiii, r.)

Description. 8°, 13.5 × 19.5 cm., the text being 10.3 × 16.5 cm. 64 ff., numb. in Roman, 32-34 ll. Title page engraved on wood. Valladolid, 1546.

Editions. There was no other edition. De Mōrgan (p. 103) gives the date as 1545, which is that of the privilege, the colophon of his copy having been torn out.

This rare Spanish arithmetic gives the fundamental processes with integers, fractions, and denominate numbers, introduces some practical mensuration under the title 'De Geometria,' and gives a rather extended treatment of the business rules. It is interesting because of the treatment of Spanish and Arab (algoristic) notation, or, as the author says, 'de numerar en castellano y en guarifimo.' For example, his two methods of writing 160,462,009,621, are :

c. lx. U462 q̄s. . ix U621
160 U462 q̄s 009 U 621. (F. liii, r.)

PIETRO CATANEO. Ed. pr. 1546.

Venice, 1546.

A sixteenth-century arithmetician, of Siena.

Title. See Fig. 118.

Colophon. 'Stampato in Venetia per Niccolo Bafcarini.// M D XLVI.' (F. 64, r.)

Description. 4°, 15.3 × 20.8 cm., the text being 12 × 16 cm. 1 f. unnumb. + 63 numb. = 64 ff., 32-35 ll. Venice, 1546.

Editions. A very rare edition, and probably the first in spite of the words 'nvovamente stampate,' for the dedication is dated M. D. XLVI. (F. 1, v.) There were two later editions, Venice, 1559, 4° (p. 244), and Venice, 1567, 4° (p. 244).

The work is fairly practical, and in many respects is in advance of its time. Unlike most Venetian books it uses the Florentine name 'bircvocolo' for the common form of multiplication, and gives the 'a danda' division before the galley form, recommending it as 'molto neccessario.' The applications, while not numerous, are practical, and throw some light upon the business customs of Siena and Venice. Cataneo was not, however, an original writer. His arithmetic is composed quite largely

of didactic statements to be found in the works of his predecessors, and the fact that he gives four methods of multiplication shows that he could not escape the influence of writers like Paciolo.

**LE PRATICHE DELLE DVE
PRIME
MATHEMATICHE
DI PIETRO DE CATANI
DA SIENA**



**LIBRO D'ALBA CO
E GEOMETRIA**

**NOVAMENTE STAMPATE,
IN VENETIA M D XLVI**

FIG. 118. TITLE PAGE OF THE 1546 CATANEO

Other works of 1546. Anonymous, p. 213, 1542; Boethius, p. 27, 1488; Euclid, p. 237, 1545; Glareanus, p. 192, 1539; Helmreich, p. 303, 1561; Manzoni, p. 257, 1553; Misrachi, p. 180, 1534;

Rudolff, p. 152, 1526; Sole, p. 143, 1526; Stifel, p. 226, 1544; Anonymous, 'An introduction for to lerne to reckon with the pen, or with the counters accordyng to the trewe cast of Algorisme, in hole numbers, or in broken, newly corrected. And certayne notable and goodly rules of false positions thereunto added, not before sene in our Englysche Tonge,' London, 8°, with another edition at London in 1574, sm. 8°; Anonymous, 'Ein new kurtz Rechenbüchlein auff der Linien und Federn,' Frankfort, 8°, possibly by Güllfferich (p. 269, 1555); Alfonso López de Corella, 'Secretos de las quatro mathematicas ciencias,' Valladolid.

Works of 1547. Gemma, p. 200, 1540; Saravia, p. 229, 1544; Tagliente, p. 114, 1515.

Works of 1548. Gemma, p. 200, 1540; Ghaligai, p. 132, 1521; Riese, p. 139, 1522; Stifel, p. 226, 1544; Tagliente, p. 114, 1515; Uberti, see Tagliente, p. 114, 1515; Wolphius, p. 154, 1527; Anonymous, 'Specie principali, et primi principii del' Arithmetica di C. de C. P.,' Bologna.

PIETRO CATANEO. Ed. pr. 1546.

Venice, 1559.

See p. 242.

Title. 'Le // pratiche // delle dve prime // Matematiche // di Pietro Cataneo // con la aggiunta, // libro d'Albaco e Geometria con il // pratico e uero modo di mifurar la Terra. // Non piv mostra da altri. // (Woodcut of griffin with motto: 'Virtute dvce // comite Fortvna.') In Venetia, apresso Giouanni Griffio, MD LIX.' (F. 1, r.)

Colophon. 'In Venetia, apresso Giouan Griffio, ad infantia // di M. Pietro Cataneo, M D LIX.' (F. 83, v.)

Description. 4°, 15.3 × 20.3 cm., the text being 11.4 × 15.1 cm. 1 f. unnumb. + 82 numb. + 1 blank = 84 ff., 32-35 ll. Venice, 1559.

See p. 242.

PIETRO CATANEO. Ed. pr. 1546.

Venice, 1567.

See p. 242.

Title. 'Le // pratiche // delle dve prime // Matematiche // di Pietro Cataneo Senese, // ricorrette, & meglio ordinate, con alcune ag- // giontioni de lo steffo Autore. // Diuife in libri quattro. //

(Woodcut of griffin, with motto: 'Virtvte dvce, // comite Fortvna.') In Venetia, apreffo Giouanni Griffio, // M D LXVII.' (F. 1, r.)

Colophon. 'In Venetia, apreffo Giouan Griffio, ad instantia di // M. Pietro Cataneo, M D LXVII.' (F. 88, r.)

Description. 4°, 15.5 × 20.7 cm., the text being 11.7 × 15.7 cm. 88 ff. numb., 32–35 ll. Venice, 1567.

Editions. See p. 242. This differs from the first (1546) edition only in the fact that the part relating to geometry contains considerable additional matter.

See p. 242.

JACQUES PELETIER. Ed. pr. 1549.

S. l., 1607.

Born at Mans in 1517; died at Paris in July, 1582. He became principal of a college, traveled extensively, and contributed both to literature and to elementary mathematics.

Title. 'L'Arithmeti-//qve de Iacques // Peletier dv // Mans, // Departie en quatre liures.// Troisieme edition, reucuë et augmentee.// Par Iean de Tovrnes.// M. DC. VII.' (P. 3.)

Description. 8°, 10.3 × 16 cm., the text being 7.7 × 13 cm. 297 pp. (6 blank, 1 unnumb.), 26 ll. S. l., 1607.

Editions. Poitiers, 1549, 4° (Graesse, Sup.); ib., 1552, 8° (Graesse says 1551); Lyons, 1554, 8°. Graesse mentions all of these, but the above title shows this edition of 1607 to be the third, possibly the third revision. I have also seen mentioned an edition of 1567, 4°, a Lyons edition of 1570, and a Latin edition at Paris in 1563 and 1578.

The work is quite practical, although it contains a considerable amount of mediæval matter. The first book treats of the fundamental operations with integers, the second of fractions, the third of roots and proportion, and the fourth of the applications of arithmetic. It contains a number of such traditional problems as the hare and hound. Peletier also wrote a chapter 'De fractionibus astronomicis compendium de cognoscendis per memoriam calendis,' that was published in his editions of Gemma Frisius. Graesse mentions an 'Arithmeticae modus,' Paris, 1563, 8°, probably the Paris edition referred to above. Peletier also wrote one of the first practical textbooks on algebra.

JOHANN SCHEUBEL. Ed. pr. 1549.

Basel, 1549.

See p. 233.

Title. The title page is missing in this copy, but the running headline is 'Compendium Arithmeticae.' (See the 1560 edition.)

Colophon. 'Basileae, per Iacobvm // Parcvm, expensis // Ioannis Oporini, // Anno 1549.' (F. 87, r.)

Description. Sm. 8°, 8.7 × 13.7 cm., the text being 6.3 × 11.8 cm. 87 ff. unnumb., 27 ll. Basel, 1549.

Editions. Basel, 1549, sm. 8° (here described); ib., 1560, 8° (below). That this is the first edition is seen in the 'Epistola Dedicatoria,' which bears date 'Tubingæ, idibus Martij // anni fefqui millefimi // quadragesimi noni.' (P. 7.)

While open to some of the criticism mentioned in connection with Scheubel's 'De numeris' (p. 233, 1545), this book is more practical than his earlier one, and was enough in demand to warrant two editions. It is not, however, a commercial textbook.

JOHANN SCHEUBEL. Ed. pr. 1549.

Basel, 1560.

See p. 233.

Title. 'Compen//divm Arithme//ticae Artis, vt bre//uifsum ita longè utilifsimum eru//diendis tyronibus, non folùm pro//pter ordinem, quo paucis perftrin//guntur omnia huius artis capita: fed // etiam caufa perfpicuitatis, quæ plu//rimùm delectat & iuvat difcentes, // fummoperè expetèdum: per Ioan//nem Scheubeliū adornatum // & confcriptum. // Iam denuò ab ipfo autore recognitum // & emandatum. // Continent autem utrunq; hoc Compendiū, // numerorum fcilicet & calculorum, feu // proiectilium (ut uocant) ra//tiocinationem. // Bafilæ, anno 1560.' (P. 1.)

Colophon. 'Basilæ // excudebat Iacobus Parcus, // expenfis Ioannis Opo//rini, anno M.D.LX. // menfe Martio.' (P. 205.)

Description. 8°, 9.5 × 15 cm., the text being 6.1 × 12 cm. 14 pp. unnumb. + 191 numb. (3-193) + 1 blank = 206 pp., 23-24 ll. Basel, 1560.

See above.

JOHANN FISCHER (Piscator).

Ed. pr. 1549.

Stettin, s. a. (1565?).

A German Rechenmeister of the second half of the sixteenth century.

Title. 'Ein kurtz Rechenbüchlein für die anfahende Schüler gemacht // Durch Johann Fifer. Gedruckt zu Alten Stettin // in Johan Eichorns Druckerey.' (F. 1, r.)

Description. 8°, 9.8 × 15.4 cm., the text being 6.7 × 11.2 cm. 16 ff. unnumb., Stettin, s. a. (1565?).

Editions. This work appeared first in Latin under the title 'Arithmeticae Compendium, pro Studiosis hujus artis tyronibus recognitum,' Leipzig, 1549, with subsequent Latin editions, ib., 1554, 1559, 1582, 1592, 1598, and Wittenberg, 1592, all 8°. Of the German translation there were editions as follows: Stettin, s. a. (1565?), 8° (here described); Frankfort an der Oder, 1566; Leipzig, 1581, 8°; 1592, 8°. Fischer also published a work, said to be different from the 'Compendium,' entitled 'Ein künstlich Rechenbüchlein,' Wittenberg, 1559, with four editions from 1559 to 1592.

As the title suggests, this is merely a compendium, designed to serve as an introduction to practical arithmetic. It has no more merit than any brief primer.

JUAN DE YCIAR, Vizcayno.

Ed. pr. 1549.

Saragossa, 1549.

ICIAR. A Basque arithmetician, born at Durango in 1525. On f. 3, r., is a large portrait with the inscription 'Ioannes de Yciar ætatis sve anno xxv.' He lived in Saragossa, and was well known as a calligrapher.

Title. See Fig. 119.

Colophon. '¶ Fue impreffo el prefente libro en la muy noble // y leal ciudad // d'çaragoça en cafe de Pedro Bernuz/a cofta // del auctor y de Miguel de çapila mercader d'libros, // Acabo fe a .xvj. de Febrero del año de mil y // quinientos y quarenta y // nueue.' (F. 61, v.)

Description. Fol., 19 × 28.9 cm., the text being 14.3 × 21.5 cm. 4 ff. unnumb. + 56 numb. + 3 blank = 63 ff., 27-38 ll. Saragossa, 1549.

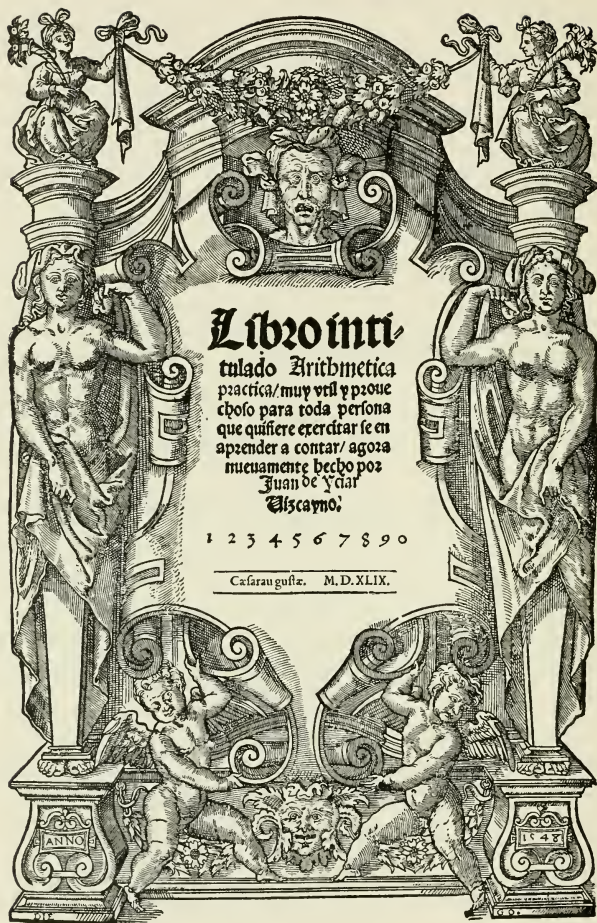


FIG. 119. TITLE PAGE OF YCIAR

Editions. Saragossa, 1549, fol. (here described); ib. 1555, 4°; ib., 1564, 4°. The book probably had several other editions, for Heredia (I, 154) says that this is 'une des plus anciennes éditions de ce traité.'

There are numerous interesting features in this book. Among these is Yciar's fanciful explanation of the origin of the Roman numerals, part of it traditional, as that V stands for five because it was the fifth Latin vowel, and part more recent, as that L was half of the old form for C. U is used instead of M, as with several Spanish writers, and *cuento* is used for million as was their general custom. (See p. 60, Ciruelo.) The treatment of the fundamental operations is followed by progressions, compound numbers, roots, mensuration, and such common applications as 'las compañías fin tiempo' and 'con tiempo,' and 'las reglas de testamentos.'

Other works of 1549. Anianus, p. 32, 1488; Anonymous, p. 213, 1542; Boethius, p. 27, 1488; Euclid, p. 237, 1545; Gemma, p. 202, 1540; Glareanus, p. 192, 1539; Köbel, p. 102, 1514; Recorde, p. 214, c. 1542; Hans Bock, 'Ein new Rechenbüchlein auff der Linien und Federn,' Nürnberg (probably a second edition of the 1544 book, p. 229); Joannes Stigelius, 'Arithmetica,' Leipzig, 8°, with a second edition, s. l., 1554 (Victorinus Strigelius of 1563? see p. 311); Juan Vejar, 'Arithmetica practica,' Saragossa, 4°. (Yciar's work?)

VALENTIN MENCHER de Kempten.

Ed. pr. 1550.

Antwerp, 1565.

MENCHER. A German-Dutch arithmetician of the sixteenth century. See also p. 281, 1556.

Title. 'Practicque // pour brievement // apprendre à Ciffrer, & tenir Liure // de Comptes, avec la Regle de // Cofs, & Geometrie. // Par M. V. Menher Alleman. // (Woodcut of counting house.) A Anvers, l'an M. D. LXV. // Avec priuilege du Roy pour 4 ans.' (F. 1, r.) Bound with this in the third part is 'La Regle d'Algebra,' or 'Cofs.' Also the 'Practicque // des Triangles // Spheriqves. // . . . Anvers . . . M. D. LXVIII.'

Colophon. 'Imprimé en Anuers par Ægidius Dieft, // l'An de nostre Seigneur Iefu Chrift. // M. D. LXV. // 19. Ianuarij.' (F. 113, v.)

Description. 8°, 9.6 × 15.6 cm., the text being 7.3 × 12.6 cm. 113 ff., 26 ll. The algebra contains 120 ff. unnumb. (part 3); the geometry, 102 ff. (part 4), besides the 'Practique des triangles sphériques.' Antwerp, 1565.

Editions. Menher wrote three or four arithmetics, as follows :

1. 'Practique briesve pour cyfrer et tenir Livres de compte,' Antwerp, 1550, 8°; 1556 (probably the one mentioned on p. 281); Antwerp, 1565, 8° (here described). Unlike the De Morgan copy this does not have 1564 for 1565 in the colophon. Indeed I think De Morgan probably looked at the colophon of the geometry instead of the arithmetic.

2. 'Arithmetique seconde,' Antwerp, 1556 (p. 281). A comparison of this with the 'Practique' shows it to be substantially the same work. In his epistle to the reader, Menher speaks of the 1565 edition of the 'Practique' as merely a revision of 'nostre feconde Arithmetique de l'an M. D. LVI.'

3. 'Livre d'Arithmetique,' Antwerp, 8°, 1573 (p. 347). I know of no other sixteenth-century edition of this work, although there was a Rotterdam edition in 1609, 8°. The work is entirely different from the 'Practique.'

4. 'Arithmetica Practice,' Autorff, 1560, 8°. I know nothing of this work.

The 'Practique' and the 'Arithmetique seconde,' essentially the same work, are mercantile textbooks, possessed of the spirit of the 'Livre d'Arithmetique' (p. 347), but not as successfully written. Menher was one of the pioneers among the Dutch arithmeticians, and his successors, particularly in the period from 1600 to 1650, produced some very practical textbooks.

ADAM RIESE. Ed. pr. 1550.

Leipzig, 1550.

See p. 138.

Title. See Fig. 120.

Colophon. 'Gedruckt zu Leipzig durch // Jacobum Berwalt.' (F. 196, r.)

Description. 4°, 15.5 × 17.8 cm., the text being 10.6 × 14.4 cm. 4 ff. unnumb. + 196 numb. = 200 ff., 29-31 ll. Leipzig, 1550.

Rechenung nach der Lenge/ auff den Linien vnd Feder.

Darzu forteil vnd behendigkeit durch die Proportio-
nes/ Practica genant/ Mit grüntlichem
vnterrichte des visierens.

Durch Adam Riesen.
im 1550. Jar.

Eylin.



Cum gratia & priuilegio
Cæsareo.

FIG. 120. TITLE PAGE OF THE 1550 RIESE

Editions. See p. 140. This is the fourth of Riese's books (p. 139). Bound with it is Isaac Riese's arithmetic of 1580 (p. 365). The date is also given in the dedicatory epistle, 'im 1550 jhar.'

The first forty-six folios contain the treatise 'auff den Linihen,' the counter reckoning. This is followed (ff. 47-105) by that 'auff der Feder,' the common algorism. The third part is the 'Practica,' and the fourth the 'Vifieren' or gauging. The book represents the culmination of Riese's work, and is the best exponent of the practical arithmetic of the middle of the century in Germany.

Other works of 1550. Agricola, p. 171, 1533; Agrippa, p. 167, 1531; Anianus, p. 32, 1488; Borghi, p. 22, 1484; Cassiodorus, p. 211, 1540; Feliciano, p. 149, 1526; Gemma, p. 200, 1540; Glareanus, p. 192, 1539; Lonicerus, p. 253, 1551; Medlerus, p. 223, 1543; Regius, p. 181, 1536; Riese, p. 139, 1522; Tagliente, p. 114, 1515; Torrentini, p. 76, 1501. There was also an edition of Sfortunati, c. 1550 (p. 174, 1534). Two other works published c. 1550 should be mentioned: Anonymous, 'Opera che insegna a tener conto de libro secondo lo cōsuetudo di tutti li lochi della Italia al modo mercantile,' s. l. a., with some mercantile arithmetic; William Buckley, 'Arithmetica memorativa sive compendaria Arithmetice tractatio,' 8°, s. l. a., but later in Seton's Logic, London, 1572, 1574, 1577, 1584, 8°.

JOHANN SCHEUBEL. Ed. pr. 1551. Paris, 1551.

See p. 223.

Title. 'Algebrae//compendiosa//facilisqve descri-//ptio, qua depromuntur magna // Arithmetices miracula.// Authore Ioanne Scheubelio Mathematicarum//professore in academia Tubingensi. // Parisiis, // Apud Gulielmum Cauellat, in Pingui Gallina, // ex aduerfo Collegii Cameracensis. // 1551. // Cvm privilegio.' (F. 1, r.)

Colophon. 'Excudebat Lutetiæ Parisiorum, Benedictus Preuotius Typo-//graphus, in vico Frementello, sub insigni ftellæ aureæ. // 1551.' (F. numb. 52, v.)

Description. 4°, 13.2 × 18.5 cm., the text being 9.4 × 15.2 cm. 52 ff. numb., 32-37 ll. Paris, 1551.

Editions. There was no other edition.

I have included this algebra because it contains some work in the extracting of roots by the galley method, and therefore shows the persistence of this mediæval plan.

ROBERT RECORDE. Ed. pr. 1551. London, 1596.

See p. 213.

Title. 'The Castle // of // Knowledge. // To Knowledge is this Castle fet, // All Learnings friends wil it fupport, // So fhall their name great honour get, // And gaine great fame with good report. // Though fpitefull Fortune turn'd her wheele, // To ftay the Sphere of Vranie, // Yet doth the fphere refit that wheele, // And flee'th all Fortunes villanic // Though earth do honour Fortunes ball, // And beetles blinde her wheele aduance, // The heauens to Fortune are not thrall, // The fpheres furmount all Fortunes chance. // London // printed by Valentine Sims, afigned // by Bonham Norton. // 1596.' (P. 1.)

Colophon. 'Imprinted at London by Valentine // Simmes. 1596.' (P. 236.)

Description. 4°, 14.4 × 19.2 cm., the text being 12.5 × 17.5 cm. 3 pp. unnumb. + 1 blank + 232 numb. = 236 pp., 41 ll. London, 1596.

Editions. London, 1551; ib., 1556, fol.; ib., 1596, 4° (here described).

Recorde's name does not appear on the title page, but he signs the letter of dedication to 'Princesse Marie,' 'Robert Record Phyficion.' The work is on astronomy, and is of interest in the history of arithmetic only in the operations involving sexagesimal fractions. Division is performed by the galley method, and there are no symbols for degrees, minutes, and seconds. The arithmetical part includes the rule of three. Like the author's other works (pp. 213, 286), this is in the catechism form.

Other works of 1551. Borghi, p. 16, 1484; Euclid, p. 238, 1545; Gemma, p. 200, 1540; Glareanus, p. 193, 1539; Noviomagus, p. 197, 1539; Peletier, p. 245, 1549; Recorde, p. 214, c. 1542; Tonstall, p. 134, 1522; Adam Lonicerus, 'Arithmeticae brevis Introductio,' Frankfort, 8°, with subsequent editions, ib., 1568, 8°; 1570, 12°; 1581; 1585; 1600, 8° (Tropfke puts the first edition as 1550); Andrés García de Lovas, 'Tratado del cómputo,' Salamanca, 8°; Innocenzo Ringhieri, 'Centi givochi liberali . . . in dieci libri descritti,' Bologna, 4°, with subsequent editions, Venice, 1553, 4°; Bologna, 1580; Lyons (French translation), 1555, 4° (contains some number games).

MARCO AUREL. Ed. pr. 1552. Valencia, 1552.

Aurel was, as he states, a German. He lived, however, for several years in Valencia, and published a work there in 1541.

Title. See Fig. 121.

Description. 4°, 14.5 × 19.3 cm., the text being 9.9 × 16.6 cm. 4 ff. unnumb. + 140 numb. = 144 ff., 31–36 ll. Valencia, 1552.

Editions. There was no other edition.

Aurel, in his letter to the reader, dwells upon the unfortunate state of mathematics in Spain, and says that he feels called upon to assist in making known a science so necessary to humanity. Of the twenty-four chapters in the book, the first six may be said to relate to arithmetic as we ordinarily consider it, the rest referring entirely to algebra. The arithmetical chapters present the subject in a fairly practical way, but are deficient in genuine problems. To subtract is called 'Restar,' as at present in Spanish, the same root appearing occasionally in other languages, and our word 'rest' (for remainder) being a relic of this name. Division is performed entirely by the galley method, but the figures are not canceled as is generally the case. 'Proporcion' is used for ratio, and 'proporcionalidad' for proportion, as was generally the custom in the early arithmetics of all Latin countries, a custom derived from the Boethian books. The 'proporciones' (ratios) are treated at considerable length after the fashion set by the mediæval writers. The applications are almost entirely under the 'Regla de tres' (rule of three).

In the part devoted to algebra, surd numbers are first treated, the root symbols showing the German influence. The plus and minus signs are also used as extensively as in the works of writers like Stifel and Scheubel, and the symbols for the various powers of the unknown quantity are such as are found in the works of contemporary writers in other countries.

LILIUS GREGORIUS GYRALDUS.

Ed. pr. 1552. Venice, 1553.

A philosopher of Ferrara, of the middle of the sixteenth century.

Title. See Fig. 122.

Description. 8°, 9.3 × 15.5 cm., the text being 6.1 × 12.4 cm. 184 pp. (2 blank, 16 unnumb.), 29 ll. Venice, 1553.

Editions. Venice, 1552, 8°; ib., 1553, 8° (here described). This treatise also appeared in his 'Opera,' Basel, 1580, sm. fol., and Leyden, 1696.

LIBRO PRIMER

MERO, DE ARITHMETICA

Algebratica, enel qual se contiene el arte Mercantiuol, con otras muchas Reglas del arte menor, y la Regla del Algebra, vulgarmente llamada Arte mayor, o Regla de la cosa: sin la qual no se podra entender el decimo de Euclides, ni otros muchos primores, assi en Arithmetica como en Geometria: compuesto, ordenado, y hecho Imprimir por Marco Aurel, natural Aleman: Intitulado, Decapertador de ingenios. Va dirigido al muy magnifico señor mossen Bernardo Cimon, Ciudadano dela muy insigne y coronada Ciudad de Valencia.

de Hieronymo de Rogeras *Franc. gilberte.*



Con Priuilegio de su Magestad,
por tiempo de diez años.

EN VALENCIA,

En casa de Ioan de Mey, Flandro;

Año. 1552.

LILII GREGORII
 GYRALDI FERRARIEN. SVA
 RVM QVARVNDAM ANNO
 tationum Dialogismi XXX. ad Am-
 pliff. Card. Saluiatum.

Item Laurentij Frizzolij Solianensis Dialogismus unicus
 de ipsius Lilij uita & operibus.



99 30
 VENETIIS, Apud Gualterum Scottum.

M D L I I I .

01

FIG. 122. TITLE PAGE OF THE 1553 GYRALDUS

This set of dialogues is of interest in the history of mathematics in that the second and third parts deal with notation and finger symbolism. 'Dialogismvs secvndvs de manus & digitorum nominibus déq; numerandi per eos antiquorum ratione' (p. 10) is an almost unknown sketch of finger symbolism. 'Dialogismvs tertivs ad Baptistam Lucarinum FR. filium optimæ spei ac indolis puerum, de notis & figuris numerorum, quibus Latini ac Græci utebantur' (p. 20) is an equally interesting sketch of the Greek and Latin numerals. Gyraldus also published a 'Brevis instructio de Grecorꝝ numerali supputatione' in 1513, fol.

Other works of 1552. Agricola, p. 171, 1533; Gemma, p. 203, 1540; Ghaligai, p. 132, 1521; Herman Gölfferich, 'Ein new kurtz Rechenbüchlein,' Frankfort, 8°, with editions ib., 1555, 12°, 1568, 8° (see also p. 244, 1546, and p. 292, 1559); Ortega, p. 94, 1512; Peletier, p. 245, 1549; Recorde, p. 214, c. 1542; Riese, p. 139, 1522; Joachim Camerarius, 'Arithmologia,' 12° (there was also an edition at Basel, s. a., 16°); Dunkel, 'Arithmetica,' Leipzig, 8°; Christopher Falconius, 'Rechenbuch,' Königsberg in Preußen, 4° (Murhard cites as a different work of the same date 'Rechenbuch auff die Preusche münzt mass und Gewicht,' ib., 4°).

DOMENICO MANZONI. Ed. pr. 1553. S. l. (Venice), 1553.

A sixteenth-century arithmetician, born at Oderzo.

Title. See Fig. 123.

Description. 8°, 10.5 × 15.8 cm., the text being 8.1 × 13.4 cm. 16 ff. unnumb., 26 ll. except where arranged in sections. S. l. (Venice), 1553.

Editions. There was no other edition of this work. Manzoni had already published a textbook entitled 'Libretto molto utile per imparar a leggere, scrivere et Abaco, con alcuni Fondamenti della Dottrina Christiana,' Venice, 1546, 8°, 31 pp. of which are devoted to arithmetic. He also published in 1553 a more elaborate treatise, 'La Brieve Risoltione di Aritmetica universale in quasi voglia negotio, doue interuenga numero, peso, & misura,' Venice, 1553, 8°, 246 ff.

A beautifully printed little manual of the fundamental operations of arithmetic. The 'Abbreviatvre delle monete, Pesi, & misure, chi fi ufano in Vinetia' (f. 2) is helpful to students of the history of sixteenth-century arithmetic and to all who are interested in the metrology of the countries with which Venice traded.



FIG. 123. TITLE PAGE OF MANZONI

MICHAEL STIFEL. Ed. pr. 1553. Königsberg i. Pr., 1553.

See p. 223.

Title. See Fig. 124.

Colophon. 'Gedrückt zu Königs-//berg in Preußē durch Alex-
 andrum // Behm von Luthomisl/ Voll // endet am dritten tag

deſs Herbt-//monats/ Als man zalt nach // der geburt vnſers
lieben // herrn Jefu Chriſti.// 1554.' (P. 505.)

Die Coſſ
Chriſtoffs Rudolffs
Die ſchönen Exempel der Coſſ

Durch

Michael Stifel

G. beſſert vnd ſehr gemehret.

Den Inhalt des gantzen Buchs
ſuch nach der Vorrede.

Zu Königsberg in Preußen

Gedruckt/ durch Alexandrum
Lutomyſkiem im jar .

1 5 5 3.

FIG. 124. TITLE PAGE OF STIFEL'S RUDOLFF

Description. 4°, 14.7 × 19.6 cm., the text being 9.9 × 16 cm.
507 pp. (4 blank, 12 unnumb.), 21–26 ll. Königsberg in Preußen,
1553.

Editions. Königsberg in Preußen, 1553, 4° (here described); 1571. See also p. 226.

Although the book is nominally an algebra (the word 'cofs' coming from the Italian *cosa*, 'thing,' meaning the unknown quantity), the first part of the book is devoted entirely to arithmetic. This part is intended as an introduction to the algebra that comes later, and gives the fundamental operations as treated by Rudolff, with Stifel's commentary. It is entirely theoretical, and it naturally leads into the theory of irrational numbers, which constitutes the first part of the algebra.

Other works of 1553. Albert, p. 180, 1534; Boethius, p. 27, 1488; Gemma, p. 204, 1540; Gyraldus, p. 254, 1552; Mariani, p. 181, 1535; Morsianus, p. 182, 1536; Ringhieri, p. 253, 1551; Rudolff, p. 152, 1526; Bernardu Wojewódki, 'Algorithm, to jest nauka liczby, po polsku na linijoch uczyniony,' Cracow.

CLAUDE DE BOISSIÈRE. Ed. pr. 1554. Paris, 1554.

CLAUDIUS BUXERIUS. Born in the diocese of Grenoble, probably c. 1500.

He also wrote on poetry, music, and astronomy. For his *Rythmochia* see p. 271.

Title. See Fig. 125.

Colophon. 'Acheué d'Imprimer le xiiij. // iour d'Octobre, // 1554.' (F. 74, 1.)

Description. 4°, 10 × 14.8 cm., the text being 7.2 × 12.9 cm. 2 ff. unnumb. + 73 numb. = 75 ff., 32 ll. Paris, 1554.

Editions. Paris, 1554, 8° (here described); ib., 1563, 8° (p. 262).

This is a theoretical work in two 'livres,' probably written for students in the University of Paris. It is the second printed work which I have noticed that carries the system of numeration as high as thousands of quintillions, 'Mille de Quintillions,' although Chuquet, in his manuscript of 1484, carries it to 'nonyllions.' De la Roche (p. 128) followed Chuquet in this as in other respects. Boissière's plan starts with the names of millions, bimillions (for million millions), trimillions, etc. He then says that to avoid ambiguity, as of bimillions for two millions, these names are abridged to billion, trillion, etc. He moreover numerates in periods of six figures each, as in England at present, and not in periods of three figures as is now the custom in France and America.

He first treats of the classes of number according to the old plan, distinguishing between digits (1-9), articles (multiples of 10), and composites (articles + digits), of which names we still use the digit. Instead of extending the fundamental operations to six, or even nine, as his

contemporaries so often did, he limits them to four, as we do. His work in addition and multiplication is substantially like ours, but his 'subtraction' is as follows (1563 edition):

Reste	$\frac{939973901}{1840006503}$	C.
Debte ou somme		A.
Paye ou à Subtraire	900032602	B.

L'ART
D'ARYTHME-
TIQUE CONTENANT
TOVTE DIMENTION, TRES-
SINGVLIER ET COMMODE,
tant pour l'art militaire que
autres calculations.



Avec priuilege
du Roy.

*Imprimé à Paris, par Annet Briere, à l'enseigne saint
sebastian, rue des Porées.*

1 5 5 4.

FIG. 125. TITLE PAGE OF BOISSIÈRE

In division he uses the galley method only. Boissière is one of the first writers, I believe the first in France, to invert the divisor in the division of fractions, as Stifel had done a few years before in Germany. Book I closes with a somewhat extended treatment of the rule of three.

The second book relates largely to mensuration, figurate numbers, roots, and the mediæval proportions.

Some of the rules are in verse. Of military matters, referred to in the title page, there is little mention.

CLAUDE DE BOISSIÈRE. Ed. pr. 1554. Paris, 1563.

See p. 260.

Title. This is practically identical with that of the 1554 edition, except for the following: 'Reueu & augmenté par Lucas Trembley Parisien, // professeur des Mathematiques. // A Paris, // Pour Guillaume Cauellat, à l'enfeigne de la Poulle // graffe, deuant le college de Cambray. // 1563.' (F. 1, r.)

Description. 8°, 10.2 × 16.8 cm., the text being 6.8 × 13 cm. 3 ff. blank + 1 unnumb. + 71 numb. = 75 ff., 25–30 ll. Paris, 1563.

See p. 260. Two other books are bound with this: 'La Declara// tion et Vsage de // L'instrument nommé Canometre, // Par G. des Bordes, Gentilhō // me bordelais, professeur ez // Mathematiques. // . . . 1570.' and 'Vsage // Dv // Compas // de // Proportion. // Par D. Henrion, Mathem. // . . . M. DC. XVIII.'

JOACHIM CAMERARIUS. Ed. pr. 1554. Deventer, 1667.

Born at Bamberg, April 12, 1500; died at Leipzig, April 17, 1574. The office of chamberlain (Kammermeister) to the Prince-Bishop of Bamberg being hereditary in the family of Liebhard, he took the Latin name of Camerarius. He was a distinguished classicist, a friend of Melancthon, and a professor at Tübingen and Leipzig. Of the various commentaries on Nicomachus, his was the most important of the Renaissance.

Title. 'Explicatio // Ioachimi Camerarii // Papebergenfis // in dvos libros // Nicomachi Geraseni // Pythagorei // Deductionis // Ad Scientiam Numerorum. // Et Notæ // Samuelis Tennulii // in // Arithmetica // Jamblichi Chalcidensis. // Daventriæ. // Typis Wilhelmi Wier, CIO IOCLXVII.' (P. 1.)

Description. 4°, 14.7 × 19.8 cm., the text being 10.3 × 14 cm. 2 pp. unnumb. + 239 numb. = 241 pp., 34 ll. Bound with

the commentary of Iamblichus on Nicomachus (p. 188, 1538). Deventer, 1667.

Editions. The first edition was Augsburg, 1554, 8°. There was also an edition published in 1569.

Camerarius also wrote a work entitled 'De logistica,' published at Augsburg in 1554; *ib.*, 1557, 8°; Leipzig (?), 1569, 8°. See also p. 257, 1552.

A commentary on the theoretical work of Nicomachus (p. 186).

Other works of 1554. Albert, p. 180, 1534; Bæda, p. 131, 1521; Buteo, p. 292, 1559; Euclid, p. 238, 1545; Finaeus, p. 160, 1530-32; Fischer (Piscator) p. 247, 1549; Glareanus, p. 192, 1539; Huswirt, p. 74, 1501; Nicomachus, p. 186, 1538; Peletier, p. 245, 1549; Psellus, p. 168, 1532; Riese, p. 139, 1522; Stigelius, p. 249, 1549; Tagliente, p. 114, 1515; Barth. Barchi, 'Tariffe della valuta di tutte le monete,' Mantua, 4° (hardly an arithmetic); Claudio Bertholio, 'De numerandi ratione aphorismi,' Paris, 8°; Ian Gentil (Vander Schuere, in his 1634 edition, f. 201 — see p. 424 — refers to his arithmetic as published at Paris, 1554); Caspar Hützler, 'Eyn behende und Kunstrik Rekensoeck op. der Linien und Tziferen,' Lübeck, 8°.

PETRUS RAMUS. Ed. pr. 1555.

Paris, 1555.

PIERRE DE LA RAMÉE. Born at Cuth, Vermandois, 1515; killed at Paris the night of August 24-25, 1572, in the Massacre of St. Bartholomew. He lectured on philosophy at Paris, and for a short time at Heidelberg. He wrote on arithmetic, geometry, optics, and mathematics in general.

Title. See Fig. 126.

Colophon. 'P. Rami Eloquentiæ et Phi-//losophiæ professoris //Regij Arithmeticiæ, //Finis.' (P. 111.)

Description. 4°, 13.8 × 19.1 cm., the text being 9.5 × 17.2 cm. 128 pp. (2 blank, 16 unnumb.), 26-27 ll. Paris, 1555.

Editions. Paris, 1555, 4° (here described); *ib.*, 1557, 8°; Basel, 1567; Paris, 1584. See also Gleitsman, 1600 (p. 427), and the 'Libri Duo' of Ramus, 1569 (p. 330).

This arithmetic was popular in the Latin schools for half a century. It is theoretical, consisting largely of definitions, extracts from the Greek writers, a little work on the fundamental operations, and the mediæval theory of ratios. Ramus had not the faculty of putting together a text-book that should be a rival to that of Gemma Frisius.

P. Rami, eloquentiæ
 ET PHILOSOPHIÆ PROFES-
 SORIS REGII, ARITH-
 meticæ libri tres,

Ad
Carolus Lotharingum Cardinalem.



PARISIIS,
 Apud Andream Wechelum, sub Pegaso, in
 vico Bellouaco, *Anno Salutis,*

1555.

Cum priuilegio Regis.

FIG. 126. TITLE PAGE OF RAMUS

JACOBUS MICYLLUS. Ed. pr. 1555.

Basel, 1555.

MOLTZER. Born at Strasburg, April 6, 1503; died at Heidelberg (?), January 28, 1558. He was a well-known classical scholar.

Title. See Fig. 127.

Arithmeticae

LOGISTICAE LIBRI
duo, ex diuersis eius artis scri-
ptoribus collecti, & exemplis
plurimis, h̄isdemq̄ utilis.
nuper illustrati:

PER IACOBVM MI-
cyllum.

Cum gratia & priuilegio Imperiali
ad decennium.

BASILEAE, PER IOAN-
nem Oporinum.

FIG. 127. TITLE PAGE OF MICYLLUS

Colophon. 'Basileæ, ex officina // Ioannis Oporini, Anno Salutis humanæ // M. D. LV. Menfe Martio.' (P. 319.)

Description. 8°, 9.3 × 15.2 cm., the text being 7.8 × 11.3 cm. 320 pp. (3 blank, 23 unnumb.), 25-27 ll. Basel, 1555.

Editions. There was no other edition. Treutlein's statement (*Abhandlungen*, I, 15) that the book was published in Heidelberg is incorrect. It probably came from the fact that the 'Epistola Nvncvptoria' is dated 'Heidelbergæ, 10 Calend. Nouemb. Anno Domini 1553.'

The book was written for the classical schools. Although Micyllus gives the fundamental operations in a practical manner, the latter part of his book is theoretical, presenting some of the ancient arithmetic in the Greek language. The work includes an unusually complete treatment of sexagesimals, 'De partibvs Afronomicis, & earum supputatione' (p. 201), and a chapter on the computus (see p. 7), 'De Temporvm svppvttatione, qva Ecclesiastici utuntur.' The latter shows that the name 'Computus' had become unpopular, for it begins with the following statement: 'Est & temporum supputatio quædam, quem Computum Ecclesiasticum, barbaro nomine, uocant.' (P. 269.) The following is an example of his applied problems: 'Scribit Plinius, Alexandriam à Rhodo distare 583000 passuum. Cupio autem scire, quot stadia ijdem passus efficiant. Diuido igitur 583000 per 125.'

MICHAEL NEANDER. Ed. pr. 1555.

Basel, 1555.

Born in the Joachimsthal, April 3, 1529; died at Jena, October 23, 1581. He was professor of mathematics, Greek, and medicine, in the university of Jena. He wrote on physics and cosmography.

Title. See Fig. 128.

Colophon. 'Basileæ, ex Officina // Ioannis Oporini, Anno // Salutis humanæ M. D. LV. Men-//fe Ianuario.' (P. 119.)

Description. 4°, 13.9 × 19.5 cm., the text being 9.1 × 15.7 cm. 104 pp. numb. + 15 unnumb. + 1 blank = 120 pp., 25-29 ll. Basel, 1555.

Editions. There was no other edition. The 'Epistola Nvncvptoria' is dated 'Die Paschalis, Anno LIIII,' but the book was printed, as the colophon shows, in 1555.

This is a historical treatise on Greek, Egyptian, Roman, Arabic, and mediæval European weights and measures, and is particularly interesting because of the symbolism which it contains. The origin of our present apothecary's symbols of measure is seen in the ancient Roman abbreviations. The text is mostly in Latin, but eight pages of 'Γαληνου περι Μετρων και Σταθμων' are in Greek.

ΣΥΝΟΨΙΣ
MENSVRARVM ET PON-
DERVM, PONDERATIONIS,
que mensurabilium secundum Romanos,
Athenienses, *γωργίου, καὶ ἰπποκράτους*, ex
præstantissimis authoribus huius generis
cōtracta, opera MICHAELIS NEAN-
DRI ex Valle Ioachimica,
Anno M D LIII.

ACCESSERVNT ETIAM, QVAE APVD
Galenum hætenus extabant de ponderum & mensurarum ratione uec-
hementer deprauata, nunc Græcè & Latine multo correctiora,
eiusdem MICHAELIS NEAN-
DRI opera.

Item rerum & uerborum in his omnibus
memorabilium Index.

LEVITICI XIX.
*Μέτρα δίκαια, καὶ χοῦς δίκαιη
ἔστω γὰρ ὑμῖν.*

BASILEAE, PER IOAN-
nem Oporinum.

FIG. 128. TITLE PAGE OF NEANDER

ANTOINE CATHALAN (?). Ed. pr. 1555. Paris, 1556.

A French arithmetician. The author's name does not appear in this edition. A work with the same title is assigned to Cathalan, Lyons, 1555.

Title. See Fig. 129.



L'ARITHMETIQUE

ET MANIERE DE APPRENDRE

*a Chiffrer & compter par la plume & par
les gests en nombre entier & rom-
pu, facile a apprendre, & tres-
utile a toutes gens.*

De nouveau reueue
& corrigee.

*A laquelle sont adionstees plusieurs questions
& exemples pour faire la science plus
facile, & plus legiere a com-
prendre.*

A P A R I S.

Par Jehan Ruelle, demourant en la Rue
sainct Iacques, a l'enseigne de
la queue de Regard.

1 5 5 6.

FIG. 129. TITLE PAGE OF THE 1556 CATHALAN

Description. Small 8°, 7.3 × 11.4 cm., the text being 5.3 × 9.5 cm. 79 ff. numb. + 1 unnumb. = 80 ff., 27 ll. Paris, 1556.

Editions. Lyons, 1555, 16°; Paris, 1556, sm. 8° (here described).

This is a very good little primer of algorism for the time. Concerning this work the author says: 'Lequel art trouua premierement vn philosophe d'Arabie, nommé Alqus. Dont ceste science prent son nom d'Algorisme' (f. 3). In multiplication the gelosia arrangement is given as a third method, under the name 'Mvltiplication per quarreaux.' In division only the galley form appears. The 'premier liure' covers the four fundamental operations with integers, and a brief treatment of progressions. The 'second liure' relates to the use of counters ('gectz'), which the author esteems so highly as to say: 'Et note que ceste espee de addition est plus vtile & facile aux gectz que aux chiffres;' 'il est facile par les gectz, & difficile par les chiffres.' The last part of the book is devoted to such standard problems as the testament, the pipes filling the cistern, and the broken eggs, and to applications like exchange and pasturage.

LODOICO BAËZA. Ed. pr. 1555.

Paris, 1555.

A Spanish scholar of the sixteenth century.

Title. See Fig. 130.

Colophon. 'Excudebat Benedictus Preuotius, via // Frementella, ad insigne stellæ aureæ.' (F. 68, r.)

Description. 8°, 10.3 × 15.6 cm., the text being 7.8 × 13 cm. 2 ff. unnumb. + 66 numb. = 68 ff., 26–27 ll. Paris, 1555.

Editions. This rare first edition of Baëza's arithmetic is seldom found in libraries. The second edition (1556), 8°, is, however, the same impression with the title page changed.

The book is entirely theoretical, making much of the classification of numbers and of the ancient ratio systems. It is in Latin with numerous Greek quotations.

Other works of 1555. Euclid, p. 237, 1545; Finaeus, p. 163, 1530–32; Gemma, p. 200, 1540; Glareanus, p. 192, 1539; Herman Güllferich, p. 257, 1552; Mariani, p. 181, 1535; Ringhieri, p. 253, 1551; Valturius, p. 10, 1472; Yciar, p. 249, 1549; Jacob Cuno, 'Arithmetica,' Wittenberg, 8°; Taddeo Duni, 'Liber de arithmetica,' Basel, 4°; Melchior Goldammer, 'Arithmetica Pratica,' Wittenberg, 8°; Jerónimo de Valencia, 'Arte de computo,' in Santaella's 'Vocabularium ecclesiasticum,' a separate edition appearing at Saragossa in 1601. (See also p. 140, 1523.)

N V M E R A N - D I D O C T R I N A

P R A E C L A R A M E T H O D O
*exposita, in qua breuiter continentur, &
 exponuntur apertè ea, quæ ex vniuersa A-
 rithmetica sunt ad vsum potiora.*

Authore Lodoico Bæza.



L V T E T I A F,
*Apud Gulielmum Cauellat, sub pingui Galli-
 na, ex aduerso collegij Cameracensis.*

I 5 5 5.

FIG. 130. TITLE PAGE OF BÆZA

CLAUDE DE BOISSIÈRE. Ed. pr. 1556. Paris, 1556.

See p. 260.

Title. See Fig. 131.

Description. 8°, 10.4 × 16.6 cm., the text being 6.7 × 13.1 cm. 1 f. unnumb. + 52 numb. + 1 blank = 54 ff., 26–27 ll. Paris, 1556.

Editions. Paris, 1556, 8° (here described); French edition, ib., 1556, 8°.

Of the three standard treatises on the ancient number game of Rythmomachia mentioned in this list, the others being the one of 1496 of uncertain authorship and Barozzi's work of 1572, this is the clearest. It describes very carefully the checkerboard on which the game is played, the nature of the *calculi* used, and the general mode of procedure. Moreover, it is profusely illustrated (Fig. 132), which adds much to the value of the book. The game was connected with the mediæval number classifications and ratios, and could never have been understood by any save those who were well educated in the ancient theoretical arithmetic.

GALLUS SPÄNLIN. Ed. pr. 1556 (?). Nürnberg, 1566.

An Ulm Rechenmeister, as he describes himself on the title page.

Title. See Fig. 133.

Colophon. 'Gedruckt zu Nürnberg // durch Chriftoff // Heufzler.' (P. 382.)

Description. 8°, 9.2 × 14.7 cm., the text being 7.1 × 11.5 cm. 15 pp. unnumb. + 4 blank + 365 numb. = 384 pp., 21–25 ll. Nürnberg, 1566.

Editions. The dedication to 'Den Edlen Ehrnvesten/ Fürsichtigen/ Erfamen vnd Weyfen Herren/ Eltern Burgermeistern vnd Rath/ des heyligen Reichs Stadt Ulm' is dated '3 Julij/ Anno Christfi/ 1556,' so that this is possibly the date of the first edition. I know of no other edition except this of 1566.

The author devotes twenty-one pages to 'Rechnung auff der Linien,' this counter reckoning being still the popular method at the time he wrote. He then (p. 24) takes up the processes with Arabic numerals, at first using a few abstract numbers, but soon, as was the custom, introducing many practical applications. On the whole the book may be said to be a rather good exponent of Riese's school.

NOBILISSI-

MVS ET ANTIQVISSIMUS ludus Pythagoreus (qui Rythmo machia nominatur) in vtilitatem & relaxationem studiosorum comparatus ad veram & facilem proprietatem & rationem numerorum assequendam, nunc tãdem per Claudium Buxerium Delphinatrem illustratus.



LVTETIAE,

Apud Gulielmum Cauellat, sub pingui Gallina, ex aduerso collegij Cameracensis.

Abacus & calculi videntur in Palatio, apud Ioannem Gentil.

1556

CVM PRIVILEGIO REGIS.

FIG. 131. TITLE PAGE OF THE 1556 BOISSIÈRE

Arithmetica

Künstlicher Rechnung / Zu
 stiger Exempeln / mancherley
 schöner Regeln auff Linien
 vnd Differn / vormaln
 nie gesehen.

Monasterij Weingarten 1600
 Durch
Callum Spänlin Rechen-
 meyster inn Olm / zudrus
 cken beschriben.

Syrach am 10 Capitel.
 Das weret lobet den Meister
 vnd einen weysen Fürsten /
 seine händel.



1 5 0 0.

FIG. 133. TITLE PAGE OF SPÄNLIN

DOMENICO DELFINO. Ed. pr. 1556. Venice, 1565.

A sixteenth-century Venetian. He was born of a noble family, which had produced a doge, a general of the Camaldoli, and other men of prominence, and which was later to produce a cardinal and a captain-general of the Venetian fleet.

Title. See Fig. 134.

Description. 8°, 9.8 × 14.4 cm., the text being 8.5 × 12.7 cm. 416 pp. (56 unnumb.), 26 ll. Venice, 1565.

Editions. Venice, 1556, 4°; ib., 1565, 8° (here described); ib., 1568, 8°; ib., 1584, 8°, and later. The title page bears the date 1565 as stated, and the dedicatory letter 'Al Mag.^{co} et Ecc.^{mo} Sig. Nicolò Crasso,' signed by Ludouico Dolce, is dated 'In Venegia a VII. di Febraio. M D LXIII,' 1565 new style. The author's preface, 'Intentione dell' avtore,' which follows, bears no date, but succeeding this there is a letter 'All' Illvstrissimo et Reverendissimo Signor, Il S. Cristoforo Madrvccio, Cardinal di Trento, Governator Meritissimo di Milano,' signed by F. Nicolo Croce, and dated 'Di Vinetia il dì primo di Settembre. M D L VI.' There is no colophon to fix the date more accurately, unless it appeared on some page after 360, with which this copy terminates.

The book, a 'summary of all the sciences,' devotes a brief chapter to the Boethian arithmetic (pp. 43-48): 'Dell' Aritmetica, de' svio // inuentori, utilità, modo, & altri fecre // ti Cap. III.' The author is highly lauded in Croce's letter as of noble family, 'Illustre per lo splendor del fangue, non dimeno uia piu per l'ornamento e per la gloria della dottrina.' The Delfino family was at that period very prominent in Venice.

NICOLÒ TARTAGLIA. Ed. pr. 1556. Venice, 1556.

TARALEA. Born at Brescia, c. 1506; died at Venice in 1559. He was one of the best mathematicians of his time, and was the first to give a general solution of the cubic equation.

Title. See Fig. 135.

Description. Fol., 21.1 × 29.1 cm., the text being 13.8 × 23.6 cm. 285 ff. (3 blank, 6 unnumb.), 52-56 ll. Venice, 1556.

Editions. Tartaglia's works include the 'Nova Scientia,' chiefly algebraic, editions of Euclid, Archimedes, and Jordanus,



1564

DI TUTTE LE
SCIENZE,

DEL MAGNIFICO MESSER
Domenico Delfino, nobile Vinitiano,
DAL QUALE SI POSSONO IMPARAR
molte cose appartenenti al uiuere humano,
& alla cognition di Dio.

Con la Tanola, & le Postille delle cose piu notabili.



CON PRIVILEGIO.

D. Alessandro Morici



*Anton
Francesco
Dellegoio
Autore del Collegio
dei Nobili*

IN VINEGIA APPRESSO GABRIEL
GIOLITO DE' FERRARI.
M D I X V

FIG. 134. TITLE PAGE OF DELFINO

LA PRIMA PARTE DEL
 GENERAL TRATTATO DI NV-
 MERI, ET MISVRE DI NICOLO TARTAGLIA,
 NELLAQVALE IN DIECISETTE
 LIBRI SI DICHIARA TVTTIGLI ATTI OPERATIVI,
 PRATICHE, ET REGOLE NECESSARIE NON SOLA-
 mente in tutta l'arte negotiaria, & mercantile, ma anchor in ogni altra
 arte, scientia, ouer disciplina, doue interuenghi il calcolo.



MALIGNITA'

NOIAR NON PVO



A FORTEZZA

CON LI SVOI PRIVILEGII.

In Vinegia per Curtio Troiano de i Nauo.
 M D LVI.

FIG. 135. TITLE PAGE OF TARTAGLIA

the 'Quesiti et inventioni' and 'Regola generale,' chiefly physical, and the 'General Trattato' containing the arithmetic. Of the arithmetic there were editions in Venice, 1556 and 1560, 4° (?); ib., 1592-93, 4° (p. 279); Paris, 1578, 8° (below); Antwerp, 1578, 8°. There was also a 'Scelta di Abbaco ridotto dal famosissimo Nicolò Tartaglia,' published at Venice in 1596.

The entire work consists of six volumes, bound usually in three, and the publication extended over a period of five years, from 1556 to 1560 inclusive. This volume contains the arithmetic, the most scholarly contribution to the subject that appeared in the sixteenth century. It is more elaborate than the treatise of Paciolo (p. 54, 1494), and like that work it enters into the various minute details of the operations and commercial rules of the Italian arithmeticians. For example, Tartaglia gives seven methods for the multiplication of integers, and four for division; he enters very fully into the discussion of denominate numbers and exchange; and his treatment of such rules as 'Regula de tri' is unusually elaborate. Indeed, there is no other treatise that gives as much information concerning the arithmetic of the sixteenth century, either as to theory or application. The life of the people, the customs of the merchants, the struggles to improve arithmetic, are all set forth by Tartaglia in an extended but interesting fashion.

NICOLÒ TARTAGLIA. Ed. pr. 1556. Paris, 1578.

See p. 275.

Title. 'L'Arithmetique // de Nicolas // Tartaglia Brescian, // grand mathematicien, // et prince des praticiens. // Diuifée en deux parties. // La declaration fe verra en la page fuyuante. // Recueillie, & traduite d'Italien en François, par // Gvillavme Gosselin de Cæn. // Auec toutes les demonsttrations Mathematiques : & plufieurs in- // uentions dudit Gosselin, efparfes chacune // en fon lieu. // A tres-Illustre & Vertueufe Princeffe Marguerite de France, Roynne de Nauarre. // Premiere Partie. // A Paris, // Chez Gilles Beys, rue S. Jacques, au Lis blanc. // 1578. // Avec Privilege dv Roy.' (F. 1, r.)

Description. 8°, 10.6 × 16.6 cm., the text being 7.5 × 13.4 cm. 286 ff. (152 in part I, 134 in part II, 28 being unnumb.), 27-32 ll. Paris, 1578.

See p. 278. The 'Seconde Partie' follows f. numb. 136 of the first part, and is of the same date. The Privilege follows f. numb. 122 of the second part, and is dated 'Paris le 17. Septembre. 1577.'

This is merely a French translation of the work already described with notes by Gosselin. These notes are, rather naively, printed in more prominent type than the original text, but are generally of little value. They cover such points as multiplying by or dividing numbers ending in zero, they amplify certain demonstrations (as in the division of fractions), and they adapt the commercial chapters to French usage.

NICOLÒ TARTAGLIA. Ed. pr. 1556. Venice, 1592.

See p. 275.

Title. 'Tvtte l'opere // d'arithmeticca // del famosissimo // Nicolò Tartaglia.// Nelle qvale in XVII. libri con varie prove, // & ragioni, mostrafi ogni prattica naturale, & artificiale; i modo, & le regole da // gli Antichi, & Moderni vfate nell' arte mercantile; & oue interuiene calcolo, // pefi, denari, tariffe, calmeri, baratti, cambi di banchieri, e di fiere, faldi, fconti, // giuochi, traffico di compagnie, compre, vendite, portar mercantie da un paeſe // all'altro, conuertir monete, congiungimento di metalli, & opere de' zecchieri. // Sopra le qual cofe tutte, formanfi belliffimi queſiti, & ſi ſciolgono le diffi- // coltà, con vqual chiarezza, & diligenza, per vtile rileuato de i mercanti, & te- // forieri, à Capitani, e Matematici, & Aſtrogli, &c. // Parte Prima. // Con Privilegio. // In Venetia, // All' Infegna del Leone. M. D. XCII.' (F. I, r.)

Description. 4°, 13.6 × 18.8 cm., the text being 11.5 × 18 cm. 479 ff. (204 in part I, 275 in part II, 8 unnumb.), 40 ll. Venice, 1592. Riccardi says that it was not completed until 1593.

Editions. See p. 278.

This is substantially the same as the first volume of the 'General Trattato' of 1556 (p. 275), except that it is in quarto instead of folio.

ORONTIUS FINAEUS. Ed. pr. 1556. Paris, 1556.

See p. 160.

Title. See Fig. 136.

Description. Fol., 19.6 × 28.5 cm., the text being 13 × 21.4 cm. 6 ff. unnumb. + 136 numb. = 142 ff., 15-34 ll. Paris, 1556.

ORONTII FINAEI,
DELPHINATIS. RE-
GII MATHEMATI-
CARVM PRO-
FESSORIS,

De rebus mathematicis,
hactenus desideratis,
Libri IIII.

¶ Quibus inter cætera, Circuli quadratura Centum
modis, & suprâ, per eundem Orontium
recenter excogitatis, demonstratur.

LVTETIAE PARISIORVM,
Anno Christi Seruatoris,
M. D. LVI.

Ex officina Michaëlis Vascosani, uia Iacobæa
ad insigne Fontis.

Cum Priuilegio Regis.

FIG. 136. TITLE PAGE OF THE 1556 FINAEUS

Editions. There was no other edition. For his arithmetic, see p. 160.

Although chiefly on geometry, this work is included in the list of arithmetics because its treatment of proportion is more arithmetical than that of Euclid and his followers. (Ff. 25-29.) There was, however, nothing original in the work of Finaeus.

VALENTIN NABOD. Ed. pr. 1556. Cologne, 1556.

NABOD, NABODA. Born at Cologne; died at Padua, March 3, 1593. He was for a time professor of mathematics at Cologne. He wrote on astronomy as well as arithmetic.

Title. See Fig. 137.

Colophon. 'Coloniae, Typis Iohannis//Bathenij.' (F. 100, r.)

Description. 8°, 9.5 × 14.9 cm., the text being 6.3 × 11.9 cm. 8 ff. unnumb. + 92 numb. = 100 ff., 28 ll. Cologne, 1556.

Editions. There was no other edition.

This is a Latin work, with occasional Greek passages, and was written for the classical schools of Germany. Although assuming to be a practical treatise on calculating, it so lacks the merit of brevity as to be unfitted for use as a textbook. It has few problems, and these are of no commercial value. In his desire to exalt the classical learning, Nabod, like other Latin writers of his time, assigns the Arab-Hindu numerals to the Pythagoreans.

VALENTIN MENHER de Kempten.

Ed. pr. 1556.

Antwerp, 1556.

See p. 249.

Title. See Fig. 138.

Colophon. 'Imprimé en Anuers par Ian Loë //l'An de nostre Seigneur 1556 //le 20 iour d'Auril.' (F. 184, v.)

Description. 8°, 9.8 × 14.9 cm., the text being 7.8 × 13.2 cm. 184 ff. unnumb., 27-28 ll. Antwerp, 1556.

Editions. See p. 250.

This is usually mentioned as the second of Menher's arithmetics. It is, however, the same as the work described on p. 249, 1550, save for a few minor changes.

VALENTI-
NI NABODI DE
CALCVLATORIA NV-
merorumque natura Sectio-
nes quatuor.

^{A D}
CLARISSIMVM VIRVM
GASPARVM DOVCIVM
FLORENTINVM, CAESAREAE
Maieftatis Confiliarium.



COLONIAE AGRIPPINAE,
Apud hæredes Arnoldi Birck-
manni. 1556.

FIG. 137. TITLE PAGE OF NABOD

ARITHMETI-
 QUE SECONDE PAR
 M. VALENTIN MENCHER
 de Kempten.



Avec grace & priuilege de l'Em-
 pereur pour quatre ans.

FIG. 138. TITLE PAGE OF MENCHER

PIERRE FORCADEL. Ed. pr. 1556-57. Paris, 1556-57.

Born at Béziers; died at Paris in 1574. He was (1560) professor of mathematics in the Collège Royale, Paris. He also wrote on astronomy, and translated the works of several Greek mathematicians.

Title. The title page of this copy of Book I is missing. The title page of Book II reads as follows:

‘Le // Second Livre de // l’Arithmetique de P. For//cadel de Beziers.// Av quel seront declarees les //fractions vulgaires, avec leurs demonstrations, par les // quantitez continues, & premieres caufes des egaliffemens // de l’Algebre.// Le tout nouvellement inuenté par l’auteur.// (Woodcut with motto: In Pingvi Gallina.) A Paris.// Chez Guillaume Cauellat, à l’enfeigne de la // poulle graffe, deuant le college de Cambray.// 1556.// Avec Privilege.’ (F. 94.)

The title page of Book III reads as follows:

‘Le // Troysieme Li//vre de l’Arithmetique // de P. Forcadel de Beziers.// Avquel sont traictees les de//monstrations de toutes fortes de racines, avecques l’entiere pra//ctique de l’extraction d’icelles, ensemble plusieurs questions, reigles, // & demonstrations Mathematiques, avecques le propre subiect de l’Algebre.// Le tout de l’invention de l’Autheur.// A Paris, // Chez Guillaume Cauellat, a l’enfeigne de la // Poulle graffe, deuant le college de Cambray.// 1557.// Avec Privilege.’ (F. 1, r., of Part III.)

Description. 4°, 13.2 × 19.2 cm., the text being 10.1 × 16 cm. 323 ff. (5 + 93, 110, 4 + 111, in the above three books); 25-31 ll. Paris 1556-57.

Editions. Forcadel wrote four arithmetics, as follows:

1. ‘L’arithmetique,’ Paris, 1556-57, here described.
2. ‘L’Arithmétique par les gects,’ Paris, 1558, 8°.
3. ‘Arithmetique entiere et abregee,’ Paris, 1565 (p. 316).
4. ‘Arithmétique demonstree,’ Paris, 1570, 4°.

This is perhaps the most elaborate French treatise on arithmetic published in the sixteenth century. Its three books of about one hundred pages each form a work of the nature of the great contemporary Italian arithmetic of Tartaglia, or rather of Tonstall’s Latin treatise. Of



L'ARITHMETICQVE DE P.

Forcadel de Beziars. (1556. voir de Rome 2)

De la cognoissance & disposition des figures, autrement des nombres simples.



OUTE l'Arithmetique consiste à sçavoir cognoistre dix figures, ou caracteres, propres guidons de toute computation Mathematicque: qui font cy del' sous rengez selon leur propre nature.

vn.	deux.	trois.	quatre.	cing.	six.	sept.	huit.	neuf.	zero ou nulle.
•ua 1.	2.	3.	4.	5.	6.	7.	8.	9.	0. zero.
•xna 2.	3.	4.	5.	6.	7.	8.	9.	0. 1.	premieres.
•iio 3.	4.	5.	6.	7.	8.	9.	0. 1. 2.		secondes.
•enb 4.	5.	6.	7.	8.	9.	0. 1. 2. 3.			tierces.
•bu 5.	6.	7.	8.	9.	0. 1. 2. 3. 4.				quartes.
•xij 6.	7.	8.	9.	0. 1. 2. 3. 4. 5.					quintes.
•cpj 7.	8.	9.	0. 1. 2. 3. 4. 5. 6.						sixiesmes.
•huit 8.	9.	0. 1. 2. 3. 4. 5. 6. 7.							septiesmes.
•xvij 9.	0. 1. 2. 3. 4. 5. 6. 7. 8.								huitiesmes.
•xx 0.	1. 2. 3. 4. 5. 6. 7. 8. 9.								neufiesmes.
•no zero.	1. 2. 3. 4. 5. 6. 7. 8. 9.								zero.
	premieres.	secondes.	tierces.	quartes.	cingiesmes.	septiesmes.	huitiesmes.	neufiesmes.	&c.

FIG. 139. FIRST PAGE OF TEXT OF THE 1556-57 FORCADEL

practical problems it has very few, and it is equally deficient in the theories of the ancient arithmeticians. It is simply a ponderous work on the theory of arithmetical calculations and rules, valuable for a scholar but useless as a practical textbook.

For a biographical study of Forcadel see Boncompagni's *Bulletino*, II, 424.

Other works of 1556. Bæza, p. 269, 1555; Cathalan (Anonymous), p. 269, 1555; Gemma, p. 200, 1540; Medlerus, p. 223, 1543; Medicus, p. 290, 1557; Psellus, p. 168, 1532; Recorde, p. 214, c. 1542; Riese, p. 139, 1522; Ringelbergius, p. 168, 1531; Xylander, p. 356, 1577; Anonymous, 'Arithmetices Epitome,' Freiburg, 12°; A. Lottini, 'Calcoli e conti per quelli che hanno denari,' Lyons, 8°; Casp. Pauerus, 'Logistica astronomica,' Wittenberg, 8°; Joannes Pierius Valerianus, 'Hieroglyphica sive de Sacris Aegyptiorvm literis Commentarii' (ancient finger reckoning), Basel, fol., with editions ib., 1567, fol.; ib., 1575, fol.; Lugduni, 1579, fol.; Juan Díaz Freyle, 'Sumario compendioso . . . con algunas reglas tocantes al Aritmética,' Mexico (the first arithmetic printed in America).

ROBERT RECORDE. Ed. pr. 1557.

London, 1557.

See p. 213.

Title. See Fig. 140.

Colophon. 'Imprinted at London, // by Jhon Kyngfton. // Anno domini. 1557.' (F. 164, v.)

Description. 4°, 13 × 18 cm., the text being 8.1 × 14.7 cm. 164 ff. unnumb., 36 ll. London, 1557.

Editions. There was no other edition.

Recorde speaks of this work as 'The seconde parte of Arithmetike, containyng the extraction of Rootes in diuerse kindes, with the Arte of Coffike numbers, and of Surdes numbers also, in fondrie fortes.' It is not, however, purely algebraic, for the first half of the book is a treatise on Boethian arithmetic. For example, the following is one of the definitions: 'A Diametralle number, is fuche a number as hath two partes of that nature: that if thei bee multiplied together, thei will make the faied diametralle number.' The treatise on 'Cossike numbers' begins on f. S 1, and 'The rule of equation, commonly called Algebers Rule' on f. Gg 4. The sign of equality, 'a paire of paraleles, or Gemowe lines of one lengthe, thus: =, bicaufe noe .2. thynges, can be moare equalle,' is found for the first time in print on f. Ff 1 (see Fig. 141).

The whetstone of witte,

whiche is the seconde parte of
Arithmetike: containyng the trac-
tion of Rootes: The Cosike practise,
with the rule of Equation: and
the woorkes of Surde
Numbers.

*Though many stones doe beare greate price,
The whetstone is for exercise
As needfull, and in woork as straunge:
Dulle thinges and harde it will so chaunge,
And make them sharpe, to right good vse:
All artesmen knowe, thei can not chuse,
But vse his helpe: yet as men see,
Noe sharpenesse semeth in it to bee.*

*The grounde of artes did brede this stone:
His vse is greate, and moare then one.
Here if you list your wittes to wette,
Muche sharpenesse therby shall you gette.
Dulle wittes hereby doe greatly mende,
Sharpe wittes are fined to their fulle ende,
No to proue, and praise, as you doe finde,
And to your self be not unkinde.*

These Bookes are to bee solde, at
the Weste doore of Poules,
by Iohn Kyngstone.

FIG. 140. TITLE PAGE OF RECORDER'S *Whetstone of witte*

The Arte

as their woorkes doe extende) to distinge it onely into two partes. Wherof the firste is, when one number is equalle vnto one other. And the seconde is, when one number is compared as equalle vnto 2. other numbers.

Alwaies willyng you to remēber, that you reduce your numbers, to their leasse denominations, and smalleste formes, befoze you procede any farther.

And again, if your equation be soche, that the greatestte denomination *Cossike*, be ioined to any parte of a compounde number, you shall tourne it so, that the number of the greatestte signe alone, maie stande as equalle to the reste.

And this is all that needeth to be taughte, concerning this woork.

Howbeit, for easie alteration of equations. I will prouide a fewe crâples, because the extraction of their rootes, maie the more aptly bee wroughte. And to auoide the tedious repetition of these woordes: is equalle to: I will sette as I doe often in woorkes vsc, a paire of paraleles, or Remoue lines of one lengthe, thus: =====, because noc. 2. thynges, can be moare equalle. And now marke these numbers.

1. 14.ze.—|—15.ſ=====71.ſ.
 2. 20.ze.——|18.ſ=====102.ſ.
 3. 26.ſ.—|—10ze=====9.ſ——|10ze——|—213.ſ.
 4. 19.ze——|—192.ſ=====10ſ——|—108ſ——|—19ze
 5. 18.ze——|—24.ſ.=====8.ſ.——|—2.ze.
 6. 34ſ.——|—12ze=====40ze——|—480ſ——|—9.ſ.
1. In the firste there appeareth, 2. numbers, that is
14.ze.

FIG. 141. FROM RECORDE'S *Whetstone of wytte*

LUCAS LOSSIUS. Ed. pr. 1557. Frankfort a. d. Oder, 1557.

A German arithmetician of the sixteenth century, born at Lüneberg.

Title. See Fig. 142.

ARITHMETICÆ
EROTEMATA
PVE
RILIA.

IN QVIBVS SEX SPECIES
huius vtilissimæ artis, & Regula, quam
vocant, Detri, breuiter & per-
spicue traduntur.

IN GRATIAM ET VSVM SCHOLA-
rum puerilium Latinarum collecta, & in
lucem iam recens edita.

A
LVCA LOSSIO
Lunenburgensi.



FRANCOFORDIÆ AD ODERAM
IN OFFICINA IOHANNIS
EICHORNI.

FIG. 142. TITLE PAGE OF LOSSIUS

Description. 8°, 9.2 × 14 cm., the text being 6.8 × 11.9 cm.
4 ff. unnumb. + 27 numb. = 31 ff., 22–24 ll. Frankfort. For
date see f. 4, v.: ‘Datæ Lunebar, Anno 1557.// 7. Februarij.’

Editions. Frankfort an der Oder, 1557, 8° (here described); s. l., 1562, 8°; Leipzig, 1568, 8°; Frankfort, 1569; Magdeburg, 1585, 8°.

A small book, intended, as the title states, for beginners in the Latin schools. It is arranged on the catechism plan, a feature not common with arithmetics printed in Germany at this time, although extensively used by Recorde in England (see p. 210). It begins: 'Quid est Arithmetica? Est benè & artificiosè numerandi & computandi scientia.' (F. 5.) The 'species' are treated in a practical way, but the problems are all traditional, part of them being based upon biblical incidents.

Other works of 1557. Archimedes, p. 228, 1544; Camerarius, p. 263, 1554; Gemma, p. 200, 1540; Gutiérrez de Gualda, p. 167, 1531; Jacob, p. 298, 1560; Paxi, p. 80, 1503; Psellus, p. 170, 1532; Ramus, p. 263, 1555; Rudolff, p. 153, 1526; Tagliente, p. 115, 1515; Martinus Carolus Cressfelt, 'Arithmetica, Reeckeninge op den Linien end Cyfferen na allerley Hantieringe,' Deventer (second edition 1577); Sixtus Medicus, 'De Latinis numerorum notis,' Venice, 4° (colophon date, 1556; hardly an arithmetic).

GIOVANNI FRANCESCO PEVERONE.

Ed. pr. 1558.

Lyons, 1581.

An Italian arithmetician of the sixteenth century, born at Cuneo, in Piedmont.

Title. See Fig. 143.

Description. 4°, 15.3 × 21.7 cm., the text being 10.2 × 17.6 cm. 136 pp. (60 on arithmetic), 35–37 ll. The dedicatory epistle is dated 1556. Bound with this is 'Il breve Trattato// di Geometria.' Lyons, 1581.

Editions. Although the dedicatory epistle is dated 1556, and the portrait of the author bears the date 1550, I know of no edition before 1558, Lyons, 8°. This edition of 1581 seems to have been the second.

The first part of the work treats of the operations with integers. It is not a particularly progressive textbook, as is seen in the fact that it includes the 'gelosia' multiplication of the early Venetian writers. The second book relates to fractions, the third to business operations, and the fourth to roots. The work is in no sense a scholarly production.

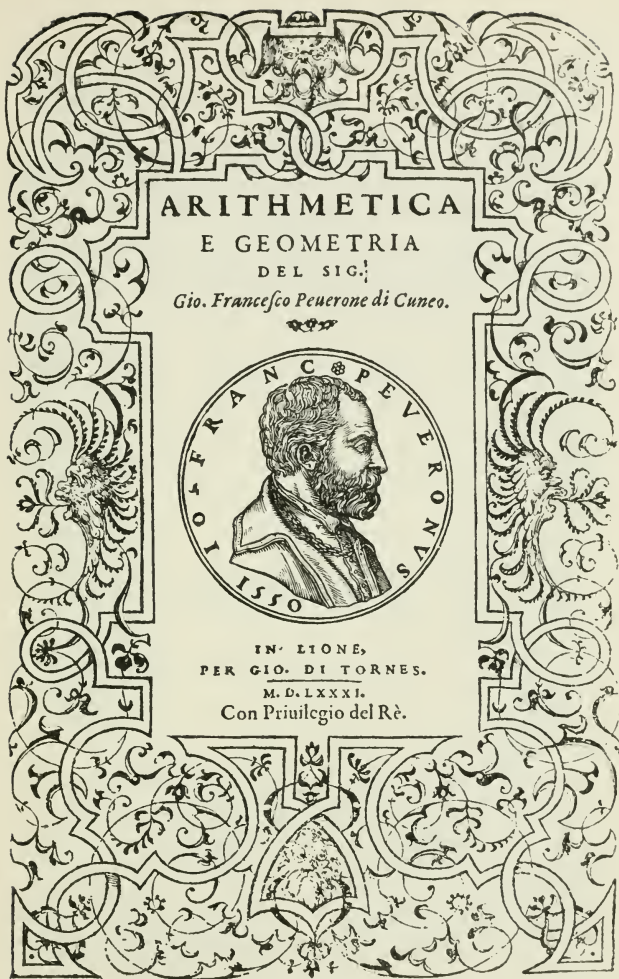


FIG. 143. TITLE PAGE OF PEVERONE

ALVISE CASANOVA. Ed. pr. 1558. Venice, 1558.

A Venetian teacher of the sixteenth century.

Title. See Fig. 144.

Description. 4°, 15.5 × 20.8 cm., the text being 12.5 × 16.1 cm. 136 ff. (partly numbered), 33–38 ll. Venice, 1558.

Editions. There was no other edition.

Although this rare work is usually classed as a commercial arithmetic, it is rather a collection of bookkeeping problems. As such it was one of the most prominent of the century, and it gives an idea of the business questions of the Venetian merchants of its time.

Other works of 1558. Anianus, p. 32, 1488; Archimedes, p. 228, 1544; Forcadel, p. 284, 1556–57; Gemma, p. 204, 1540; Glareanus, p. 192, 1539; Mariani, p. 181, 1535; Medlerus, p. 223, 1543; Recorde, p. 213, c. 1542; Riese, p. 141, 1522; Andreas Clatovenus, 'Arithmetica Bohemice,' Prag, 8° (Wydra, in his *Historia Matheseos in Bohemia*, p. 18, mentions it as printed in Nürnberg, 1530). There were also two arithmetics published s. a., but c. 1558, viz.: Benese, p. 182, c. 1536; Gemma, p. 200, 1540.

JOHANNES BUTEO. Ed. pr. 1559. Lyons, 1559.

BOTEO, BUTÉON, BATEON. Born in Dauphiné, c. 1485–1489; died in a cloister in 1560 or 1564. He belonged to the order of St. Anthony, and wrote chiefly on geometry, exposing the pretenses of Finæus.

Title. See Fig. 145.

Description. 8°, 10.4 × 16.9 cm., the text being 7.2 × 13.2 cm. 400 pp., 23–27 ll. Lyons, 1559.

Editions. Lyons, 1559, 8° (here described); ib., 1560, 8°. An edition of his 'Opera' appeared in 1554.

The work is divided into five books, the first treating of the fundamental operations with integers, the second of fractions and the rule of position, the third of algebra, the fourth of arithmetical problems, and the fifth of algebraic problems. The problems are not of practical value, and hence the arithmetic never attained any popularity.

Other works of 1559. Albert, p. 180, 1534; Anianus, p. 32, 1488; Cataneo, p. 244, 1546; Gemma, p. 200, 1540; Mariani, p. 181, 1535; Johann Fischer (Piscator), p. 247, 1549; Herman Gülfferich, 'Ein new Rechenbüchlin auff der Linien und Federn' (perhaps the work mentioned on p. 257, 1552); Pedro Juan Monzó (Monzoni), 'Elementa Arithmeticae,' Valencia, 8°, and s. l., 1566, 1569.



FIG. 144. TITLE PAGE OF CASANOVA

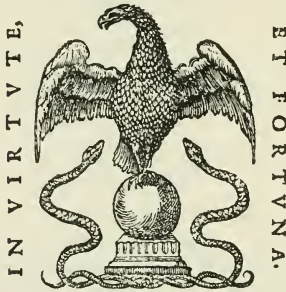
Q. Rota Profitor. In loca cat. in unip. I O A N. Biblioth. a. 1618.

BUTEONIS LOGISTICA, QUÆ

& Arithmetica vulgò dicitur in li-
bros quinque digesta: quo-
rum index summatim
habetur in tergo.

EIVSDEM,

*Ad locum Vtruuij corruptum Festitatio, qui est
de proportioe lapidum mittendorum ad baliste
foramen, Libro Decimo,*



LVGDVNI,

APVD GVLIELMVM ROVILLIVM,

SVB SCVTO VENETO.

M. D. LIX.

Cum privilegio Regis.

FIG. 145. TITLE PAGE OF BUTEO

FRANCISCUS BAROCIUS. Ed. pr. 1560. Pavia, 1560.

FRANCESCO BAROZZI. Born at Venice, c. 1538; died after 1587. He wrote on cosmography, and edited Proclus.

Title. 'Francisci Barocii // patritii Veneti // opvscvlvm, // in quo vna Oratio, & duæ Queſtiones: // altera de certitudine, & altera // de medietate // Mathematicarum continentur. // Ad Reuerendisſimum Danielem Barbarum Patriarcham // Aquileienſem deſignatum Virum Clariff. // Patavii, E. G. P. // M. D. LX.' (F. 1, r.)

Description. 4°, 14.1 × 19.6 cm., the text being 10.1 × 15.3 cm. 40 ff. numb., 26 ll. Pavia, 1560.

Editions. There was no other edition.

This philosophical discussion has been mentioned because it includes some reference to the old Boethian arithmetic. No arithmetical processes are discussed.

OLIVIERO FONDULI. Ed. pr. 1560. Bologna, 1560.

A Bolognese teacher of the middle of the sixteenth century.

Title. See Fig. 146.

Description. 8°, 9.9 × 14.6 cm., the text being 6.9 × 11.1 cm. 23 ff. unnumb. (possibly one missing at the end), 24 ll. The date is given on f. 1, v.: 'Dat. Bonoïæ . die xxv. Septemb. 1560.' Bologna, 1560.

Editions. There was no other edition.

This rare little handbook of commercial customs, from the press of Pellegrino Bonardo of Bologna, is hardly an arithmetic, although it explains certain arithmetical processes, and gives a considerable number of business problems.

SIMON JACOB. Ed. pr. 1560. Frankfort, 1565.

Born at Coburg; died at Frankfort am Main, June 24, 1564. He was one of the best-known Rechenmeisters of his time.

Title. See Fig. 147.

Colophon. 'Getruckt zu Franck-//furt am Main/ bey Georg Raben/ //in verlegung Sigmund Feyerabends/ //vnd Simon Hütters. Sigmund Feyerabent // Simon Hütter // M. D. LXV.' (F. 363, v.)

PRATICHE DE FIORETTI MERCHANTILI.

utilissime a ciascheduna persona, di mandare a memoria le breue Inuentioni fabbricate sopra il Valutar de pesi, & misure, & altre instructioni necessarie da sapere.

Et anchora a quadrare Muraglie, Taffelli, & Coperti Tuade, Fieno, & Legne: Con la decchiaratione, & Exempli loro come legendo intenderai.



FIG. 146. TITLE PAGE OF FONDULI

Ein Newvnd Wol.

gegründt Rechenbuch / auff den Linien vñ Ziffern /
 sampt der Welschen Practic vnd allerley vorthellen / neben der
 extraction Radicum, vñ von den Proportionen / mit vilen lustigen Fragen vñ
 Aufgaben. c. Desgleichen ein vollkommener Bericht der Regel falsi mit neuen Inuentio-
 nibus / Demonstrationibus / vnd vorthellen / so biß anher für vnmöglich gehalten / gebessert / ver-
 gleichen noch nie an tag kommen. Vnd dann von der Geometria / wie man mancherley Fel-
 der vnd ebne / auch allerley Corpora / Regularia vnd Irregularia / messen / Aream finden vñ rech-
 nen sol. Alles durch Simon Jacob von Coburg / Bürger vnd Rechenmeister zu
 Franckfurt am Mayn / mit fleiß zusammen getragen / vnd jetzt
 erstmals getruckt.



Mit Rom. Keyser. Mt. Gnab vnd Freiheit nicht nachzutrucken.
 Getruckt zu Franckfurt am Mayn / 1565.

FIG. 147. TITLE PAGE OF JACOB

Description. 4°, 15.2 × 18.6 cm., the text being 10.3 × 15 cm. 354 ff. (349 numb.), 30 ll. Frankfurt, 1565.

Editions. Jacob published two works, as follows:

1. 'Rechenbüchlein auf den Linien und mit Ziffern,' Frankfurt, 1557, 12°; 1574, 12°; 1589; 1590; 1599.

2. 'Ein new vnd wolgegründt Rechenbuch,' 1560; Frankfurt, 1565, 4° (here described); 1569; 1600, 4° (below), and in the seventeenth century.

Jacob's arithmetics followed the general plan of the popular books of Riese, and were deservedly well received in the second half of the century. They were commercial textbooks, and although they do not show any mathematical advance they are historically valuable for their applied problems. The title page (fig. 147) is interesting because of the variety of mathematical instruments illustrated.

Other works of 1560. Borghi, p. 16, 1484; Buteo, p. 292, 1559; Feliciano, p. 149, 1526; Psellus, p. 168, 1532; Scheubel, p. 246, 1549; Tartaglia, p. 278, 1556; Gasparo Rizzo, 'Abbaco nvovo molto copioso et artificiosamente ordinato,' Venice, 8°; Juan Ventallol, 'Aritmética,' a rare work, s. l. a., which appeared in Spain about this time.

SIMON JACOB. Ed. pr. 1560.

Frankfurt, 1600.

See p. 295.

Title. This is practically the same as in the 1565 edition described above.

Colophon. 'Getruckt zu Franckfurt am Mayn/bey // Matthes Beckern/ In Verlegung Chris-//ftian Egenolphs Erben.// Anno 1600.' (F. 360, v.)

Description. 4°, 15.5 × 19.2 cm., the text being 10.5 × 14.8 cm. 11 ff. unnumb. + 349 numb. = 360 ff., 28 ll. Frankfurt, 1600.

See above.

JOSEPHUS UNICORNUS. Ed. pr. 1561. Venice, 1561.

GIUSEPPE UNICORNO. A Bergomese arithmetician, born in 1523; died in 1610.

Title. See Fig. 148.

Description. 8°, 9.4 × 13.9 cm., the text being 7.4 × 12.7 cm. 1 f. unnumb. + 78 numb. = 79 ff., 30 ll. Venice, 1561.

IOSEPHI VNICORNI
BERGOMATIS
LIBER

DE VTILITATE MATHEMATICARVM
ARTIVM.

*In quo candide Lector multa quidem scitu periucunda,
admiratione digna, & humano usui
necessaria passim reperies.*



VENETIIS, Apud Dominicum de Nicolinis,
Anno Domini, M D L X I.

FIG. 148. TITLE PAGE OF UNICORNUS

Editions. There was no other edition.

This work is not an arithmetic, Unicorn's textbook on this subject appearing much later (p. 412, 1598). It is a prolix dissertation on the uses of mathematics, and of arithmetic in particular, with extracts from the ancient and mediæval writers. Like Agrippa's 'De vanitate scientiarum,' it is interesting but profitless.

NICOLAUS WERNER. Ed. pr. 1561. Nürnberg, 1561.

A Nürnberg Rechenmeister, born c. 1520.

Title. See Fig. 149.

Colophon. 'Gedrückt zu Nürnberg///durch Johann vom Berg/
//vnd Ulrich Newber.' (F. 156, r.)

Description. 4°, 14.2 × 19.3 cm., the text being 10.1 × 15.5 cm. 156 ff. unnumb., 23-31 ll. Nürnberg, 1561.

Editions. There was no other edition.

This is a purely mercantile arithmetic, and like many of the Italian textbooks it assumes some preliminary knowledge of the fundamental operations. It begins with a treatment of Welsch (Italian) practice, and is composed almost entirely of practical problems of the day, solved by this method. Welsch practice differs from the rule of three only in having, ordinarily, unity for the first term, as in the following example: If 1 book cost \$2, how much will 7 books cost? This method was very popular with all German arithmeticians of the sixteenth century, and survived in the chapter on Practice still to be found in English arithmetics. It appeared also in the early American textbooks. The book gives a very good idea of the business requirements of the second half of the sixteenth century. The value placed upon exchange and 'profit and loss' may be seen in the fact that twenty-six pages are devoted to the former and forty-seven to the latter, while partnership also has twenty-six pages for its share.

JOHANNES MONHEMIUS.

Ed. pr. 1561.

Düsseldorf, 1561.

A German teacher of the second half of the sixteenth century.

Title. See Fig. 150.

Description. 8°, 9.4 × 15 cm., the text being 6.5 × 12 cm. 22 ff. unnumb., 25-27 ll. Düsseldorf, 1561.

Editions. There was no other edition.



Rechenbuch

Vonder welschen practick auff allerley Kauffmans hendel/ vnd sonderlich soniel der Nürnbergischen Lands art/ vnd gebrauch belangt/ mit sonderem vorteyl/ vnd behendigkeit auff mancherley art practice

*Johannes/ Durch Keller Anno 1590
Vom Drucken ist mein Vaterlandt*

Nicolaum Werner
Rechenmeyster / vnd Burger zu
Nürnberg/ Seinen Discipeln/ Schülern
vnd sonst meniglichen zu nutz in
Druck verfertigt.

Nürnberg M. D. LXI.

Druck

FIG. 149. TITLE PAGE OF WERNER

This work is almost unknown to students of arithmetic. It seems to be the only edition, although the introduction bears the date 1542. It is a small work and is based somewhat on the mediæval texts. It gives

M E T H O
DVS ARITHMETICES
COMPVTATORIAE, OMNEM SVP
putandi artem tradens: tam illam, quæ notis
numerorum, quàm quæ olim calculis,
nunc nummis super æquè distan
tes lineas sursum ac de
orsum positis,
perficitur.

Auctore Io. Monhemio.



DVSSELDORPII
Anno 1561.

FIG. 150. TITLE PAGE OF MONHEMIUS

the fundamental operations with integers and a brief treatment of the rules of three, partnership, and false. There is also a brief explanation of counter reckoning.

BENEDICTUS HERBESTUS. Ed. pr. 1561. Cracow, 1577.

Born at Novomiasti, Poland, in 1531; died at Jaroslaw, March 4, 1593. He was a Jesuit priest at Cracow.

Title. See Fig. 151.

Description. 8°, 9.5 × 15.3 cm., the text being 8 × 11.5 cm. 42 ff. unnumb., 27–28 ll. Cracow, 1577.

Editions. 1561; Cracow, 1564, 8°; ib., 1566; ib., 1569; ib., 1577, 8° (here described).

A Latin book intended for the Church schools, and revised, as the 'Proæmivm auctoris' states, 'Mariæburgi in Prufsia, sub finem Anni Domini 1576.' It consists of two parts, the first being devoted to the arithmetical operations, chiefly with counters (and this as late as 1577), and the second to the calendar. Besides the operations, the first part also includes a chapter on progressions ('De Progressione. Capvt VII. '), and one on the rule of three ('De tribvs nvmeris integris. Capvt VIII.').

ANDREAS HELMREICH. Ed. pr. 1561. Eisleben, 1561.

A Halle Rechenmeister of the latter half of the sixteenth century. The dedication of the 1561 edition is signed by 'Andreas Helmreich Rechenmeister vnd Visierer zu Halle,' and the 1588 edition by 'Andreas Helmreich von Eifzfeldt/ Notarius publicus/ Rechenmeister vnd Visierer zu Halle.'

Title. See Fig. 152.

Colophon 'Gedruckt zu Eisleben/ bey // Vrban Ganbifch.' (F. 111, r.)

Description. 4°, 14.2 × 19.3 cm., the text being 9.3 × 14.9 cm. 111 ff. unnumb. + 1 blank = 112 ff., 27–33 ll. Eisleben, 1561.

Editions. This is probably the first edition of Helmreich's arithmetic, the dedicatory epistle being dated 'zu Halle in Sachffen den Sontag Oculi/ welcher war der 9. tag des Monats Marcij/ nach Christi Ihefu vnfers lieben Herrn vnd Seligmachers Geburt 1561.' Murhard (I, 155) mentions, however, an edition appearing at Halle in 1546, 4°. The book was republished at Leipzig in 1588 (p. 306), and again in 1595, 4° (p. 306), and possibly ib., 1596, 4°.

The work is an unsuccessful attempt to combine the old and new arithmetics. The author begins with a semi-Boethian treatment of ratios, assuming a knowledge of the fundamental operations with integers, and then introduces a course in mercantile arithmetic. He closes with a considerable amount of work on mensuration, including

ARITHME=
TICA LINEA=
RIS,

eiq; adiuncta
FIGVRATA,
cum quibusdam ex
COMPVTO

necessarijs;

auctore BENEDICTO
HERBESTO, Societatis
IESU Presbytero,
cum facultate Superiorum.

CRACOVIAE,

CVM GRATIA ET PRIVILEGIO S. R. M.

In Officina Matthæi Siebeny-
cher: Anno DOMINI

J 5 7 7.

Inscr. Catalogo librorum
~~Herbestus~~

FIG. 151. TITLE PAGE OF THE 1577 HERBESTUS

Rechenbüch

Von vorteil vnd behendigkeit nach der Welschen Practica / mit iren eigentlichen / deutlichen vnd vnterschiedlichen Proporzten / sampt gewisser vnd behender art / mancherley Dissertuthen vnd Schnüre / auff alle Dyme vnd Lich zu machen / zusamen bracht durch



Andream Helmreich Rechenmeister
vnd Dissertor zu Walle in Sachsen.

FIG. 152. TITLE PAGE OF THE 1561 HELMREICH



gauging (Visierrechnung). It is somewhat surprising that such a wearisome treatise ever went through three editions.

Other works of 1561. Albert, p. 178, 1534; Borghi, p. 16, 1484; Feliciano, p. 148, 1526; Gemma, p. 204, 1540; Recorde, p. 214, c. 1542; Rudolff, p. 152, 1526; Sfortunati, p. 177, 1534; Tagliente, p. 115, 1515; Wolphius, p. 154, 1527; A. Citolini, 'Tipocosmia,' Venice, 8° (a synopsis of science, including arithmetic); Ognibene de Castellano, 'Opera,' Venice, 4° (principally on geometry, but including some arithmetic; see also p. 375, 1582); Antonio Maria Venusti, 'Compendio utilissimo,' Milan, 8° (includes some treatment of exchange).

ANDREAS HELMREICH. Ed. pr. 1561. Leipzig, 1588.

See p. 303.

Title. 'Rechenbüch // Von vorthail vnd behendig-//keit/ nach der Welfchen Practica/ mit // jhren vnterschiedlichen Proportionen.// Grund vnd vrfach der Regel Detri/ // Sampt gewisser vnd behender art/ mancherley Vi-//fier Ruthen vnd Schnüre/ nach dem Quadrat vnd // Cubo, auff alle Ohme vnd Eiche zu machen/ alles mit war-//hafftigen perfectiuischen/ Geometrischen vnd Arithmetischen demon-//strationen, aufz den Büchern Euclidis fundirt/ mit fleiß // zusammen gebracht vnd in Druck aufzgangen/// Durch // Andream Helmreich/ Rechenmeister vnd Vifierer // zu Hall in Sachffen.// (Cut showing dimensions of a cask.) Im Jahr 1588.' (P. 3.)

Colophon. 'Gedruckt zu Leipzig/ // Durch Abraham Lamberg // Anno // M. D. LXXXVIII.' (P. 336.)

Description. 4°, 15.5 × 19.2 cm., the text being 10.1 × 14.5 cm. 9 pp. blank + 16 unnumb. + 317 numb. = 342 pp., 31 ll. Leipzig, 1588.

See p. 303.

ANDREAS HELMREICH. Ed. pr. 1561. Leipzig, 1595.

See p. 303.

Title. 'Rechenbuch // Erflich/ Von // Vortheil vmd Behendigkeit/ nach der Welfchen Practica/ mit ih-//ren vnterschiedlichen Proportionibus, Grund vnd vr-//fach der Regel Detri oder proportionum.// II. Von zubereitung mancherley Vifier Ruthen/

// vnd Schnüren/ damit alle Vähffer vnd andere Corpora nach dem // Quadrat vnd Cubo auff alle Ohme vnd Eiche-Vifiere werden. // III. Wie man künstlich das Feld vnd Erdreich/ auff man- // cherley art/ mit gewiffer Meßruthen vnd Schnuren/ nach eines jeden Landes // oder Stadt gebrauch/ Geometrischer vnd Jdiotischer weiß/ vnd was hier-//innen der Vnterscheid sey/ recht messen sol. // IIII. De Distantijs Locorum, das ist/ Wie man wunderbar-//licher Geographischer vnd Cosmographischer/ nach Geometrischer weise/ durch // Arithmeticom, in der gantzen Welt/ zweyer Stedte oder Wohnung Distantiam, oder // wie weit die von einander gelegen/ nach ihren Longitudinibus, vnd Latitudinibus, // sol Rechnen vnd finden/ Sampt einer Landtaffel daraus zu // machen vnd zu beschreiben. // V. Vnd wie man die Fünff Horologia communia, oder ge-//meine Sonnen Vhrn/ als Horizontale, Meridionale, Septentrionale, Ori-//entale, vnd Occidentale, auff einen Cubum, aufzwendig/ oder sonst an die Wen- // de/ Mauer vnd ebenen/ Vnd das Fundamentum Horologiorum abreiffen. Item/ // der Sonnen vnd des Monchs am Himmel geschwinden Lauff rechnen. Vnd auch eine sonderliche gar künst- // liche Sonnen Vhr/ der Cylinder genandt/ darinne alle Stunde nach der Sonnen schein deß Tages gründ-//lich zu erfuchen vnd zu befinden/ machen/ vnd sampt andern mehr schönen Künsten vnd Vbun-//gen/ nützlich gebrauchen sol. // Alles mit warhafftigen Demonstrationibus vnd Figuren/ aus den Büchern Euclidis vnd andern fundirt. Durch // Andream Helmreich von Eißfeldt/ Rechenmeister vnd // Vifierer zu Halle in Sachsen an der Sahl. // Cum Priuilegio.' (P. 1.)

Colophon. 'Gedruckt zu Leipzig/durch Zacha-//riam Berwald. // Im Jahr/ // M. D. XCV.' (P. 645.)

Description. 4°, 14.5 × 18.7 cm., the text being 10.9 × 15.4 cm. 17 pp. unnumb. + 3 blank + 627 numb. = 647 pp., 26-34 ll. Leipzig, 1595.

Editions. See p. 303.

This edition contains the Rechenbuch of 1561, together with much additional matter as summarized on the title page, viz. books III, IV

(pp. 306-631). This includes a considerable amount of work on gauging, surveying, cosmography, and the 'Sphere.' The first 304 pages are practically identical with the first edition, except for the addition of numerous woodcuts.

GUGLIELMO PAGNINI. Ed. pr. 1562. Lucca, 1562.

A Lucca mathematician of the sixteenth century.

Title. 'Practica // Mercantile // Moderna. // Di Guglielmo Pagnini // Lucchefe. // In Lucca per il Bus-//dragho. MDLXII.' (P. 5.)

Description. 4°, 14.5 × 20.6 cm., the text being 9.1 × 15.3 cm. 14 pp. unnumb. + 161 numb. = 175 pp., 19-28 ll. Lucca, 1562.

Editions. There was no other edition.

This is a commercial arithmetic, the only one I have seen that appeared in Lucca in the sixteenth century. The author begins with the operations on denominate numbers, but places division immediately after addition. The galley method of dividing is not given at all, in which Pagnini shows a more advanced spirit than most of his contemporaries. There is first the 'Modo di partire ditti partiri piccoli,' or short division; then the 'Modo di partir per ripiegho,' 'Modo di partire per colonna,' and finally the 'Modo di partire, à danda per altro nome partire grande.' Following division is the work in multiplication, including 'regoletto,' 'biricuocholo,' 'crocetta,' 'per colonna,' and 'per ripiegho.' Subtraction or 'traction' ('Modo di trare, o fottrare') follows multiplication. The author then takes up fractions in the same order. This work in the fundamental operations is followed by chapters on exchange and mercantile problems, the 'Regola del tre,' profit and loss ('Gvadagni e perdite'), partnership ('Compagnie'), barter, interest and discount ('Meriti e sconti semplici e capo d'anno'), and a further treatment of exchange. Altogether the arithmetic is one of the most interesting of the smaller books of the time issued under Florentine influence.

JUAN PEREZ DE MOYA. Ed. pr. 1562. Salamanca, 1562.

Born in San Stefano (Santisteban del Puerto), in the Sierra Morena, in the first third of the sixteenth century. He studied at Alcalá and Salamanca. He was canon at Granada in the latter half of the century.

Title. See Fig. 153.

Colophon. 'En Salamanca. // Por Mathias Gaf. // Año de 1562.' (P. 765.)

ARITHMETICA
 PRACTICA, Y SPECV-
 latiuua del Bachiller Iuan
 Perez de Moya.



Agora nueuamente corregida, y añadidas
 por el mismo author muchas cosas, con
 otros dos libros, y vna Tabla muy copio-
 sa de las cosas mas notables de todo lo
 que en este libro se contiene.

*Va dirigida al muy alto y muy podero-
 so señor don Carlos Principe
 de España nuestro
 señor.*

Con licencia y priuilegio Real.

EN SALAMANCA,
 Por Mathias Gass.

1562

Esta rassado à cinco blancas el pliego,

FIG. 153. TITLE PAGE OF THE 1562 MOYA

Description. 8°, 9.3 × 14.9 cm., the text being 7 × 12.1 cm. 811 pp. (765 numb.), 29 ll. Salamanca, 1562.

Editions. This is the first edition of this work that I have been able to find, in spite of the words 'agora nueuamente corregida' in the title. It appeared again at Alcalá in 1573, and at Madrid in 1598, 8°, and there were at least thirteen editions between 1609 and 1706. For the 1703 edition see below.

Moya also published three other works: 'Reglas para cõtar sin pluma y de reduzir unas monedas castellananas en otras,' in 1563, 4°; 'Manval de contadores,' Alcalá, 1582, 8°, and Madrid, 1589, 8°; and 'Tratado de matemáticas,' Alcalá, 1573, fol., containing a section on arithmetic less complete than the 'Arithmetica practica.'

This is an elaborate treatise of 765 pages of text, covering the ordinary calculating by algorism, the use of counters, business arithmetic, the elements of algebra (of which word he gives the etymological meaning, adding the rest of the ancient title, 'almucabala'), practical geometry ('Trata algvnas reglas de Geometria pratica necessãrias para el medir de las heredades,' p. 304), and the calendar. Besides all this, Moya gives a large amount of information concerning matters of historical interest. For example, he treats the subject of notation very fully, giving the Greek, Roman, Hebrew, digital, and astrological systems, together with a brief mention of other systems. Altogether it is the most noteworthy book on mathematics published in Spain in the sixteenth century.

JUAN PEREZ DE MOYA.

Ed. pr. 1562.

Barcelona, 1703.

See p. 308.

Title. 'Arithmetica // Practica, // y Espevciativa, // del Bachiller // Jvan Perez // de Moya. // Aora nvevamente corregida, // y añadidas por el mismo Autor mu-//chas cofas. // Con otros dos Libros, // y vna Tabla muy copiofa de las cofas mas // notables de todo lo que en este Libro // fe contiene. // Año 1703. Con Licencia: En Barcelona, en la Imprenta // de Rafael Figuerò.' (F. I, r.)

Description. 8°, 15 × 20 cm., the text being 10.7 × 17.9 cm. 396 pp. (380 numb.), 39–41 ll. Barcelona, 1703.

Editions. See p. 310.

See p. 310. It shows the popularity of this Spanish treatise that this edition should appear 141 years after the first one, and that another edition was published as late as 1761.

ANONYMOUS. Ed. pr. 1562.

Paris, 1562.

Title. See Fig. 154.

Description. 8°, 10.5 × 15.9 cm., the text being 6.9 × 12.5 cm. 98 pp. numb., 24–30 ll. Paris, 1562.

Editions. There was no other edition.

The work is largely theoretical, but it contains a few applied problems. It was without merit.

Other works of 1562. Benese, p. 182, 1536; Budaeus, p. 99, 1514; Euclid, p. 11, 1482; Gemma, p. 200, 1540; Ghaligai, p. 132, 1521; Lossius, p. 290, 1557; Ramus, p. 330, 1569; Riese, p. 139, 1522; Xylander, p. 356, 1577; Francesco Spinola, 'De Intercalandi ratione corrigenda, & tabellis quadratorum numerorum, à Pythagoreis dispositum,' Venice, 8°.

VICTORINUS STRIGELIUS.

Ed. pr. 1563.

Leipzig, 1563.

STRIGEL. Born at Kaufbeurn, December 26, 1524; died at Heidelberg, June 26, 1569. He was professor of theology at Jena, Leipzig, and Heidelberg, and, aside from the work here mentioned, wrote entirely on that subject.

Title. See Fig. 155.

Description. 8°, 9.1 × 14.9 cm., the text being 6.3 × 11.8 cm. 83 ff. unnumb. + 1 blank = 84 ff., 21–27 ll. Leipzig, 1563.

Editions. There was no other edition. It seems by the preface that the work was written in 1551. See p. 249, 1549. For the date of the printing of this work, 1563, see f. 6, v., of the preface. F. 10, v., gives the year in which it was written, MDLI.

This comparatively unknown work presents the subject of arithmetic from the classical standpoint. The author speaks of the dignity of arithmetic ('De dignitate arithmeticae'), and follows this discussion by

ARITHMETICA.



PARISIIS,
Apud Andream Wechelum.

1562.

Cum privilegio Regis.

J. M. Thomasi Δ

FIG. 154. TITLE PAGE OF THE ANONYMOUS 1562 ARITHMETIC

7126 286

108

Arithmeticus
LIBELLVS
CONTINENS

NON MODO PRÆCEPTA
NOTA ET VSITATA, SED
etiam demonstrationes
præceptorum,

EDITVS A

Victorino Strigelio.

7126.



Lipsiæ, 1563

IN OFFICINA
VOEGELIANA.

FIG. 155. TITLE PAGE OF STRIGELIUS

a series of definitions from Euclid, a brief treatment of the operations, the theory of proportion, the operations with fractions, and some of the Greek theory of numbers. One curious feature of the book is the notation of Greek fractions after the Arabic manner.

PIERRE SAVONNE. Ed. pr. 1563.

Lyons, 1571.

A French arithmetician, born at Avignon c. 1525.

Title. 'L'Arithmetique // de Pierre Savonne, // dict Talon, natif d'Auignon // comté de Veniffe. // En laquelle font contenues plusieurs reigles briefues & subtiles, pour les traffiques de plusieurs pays, mentionnez // en la table dudit liure : avec la difference des poids, aunages // & monnoyes de chacun dedits lieux, alliage de metaux : // neceffaire pour tous Maistres de monnoyes, Orfeures & // Changeurs, avec le fait & maniemment des Changes & Ban-//ques qui fe font iournellement à Lyon, & par les places ac-//coustumees : comme Flandres, Angleterre, Hefpaigne, // Italie, & autres lieux. // A Lyon, par Benoist Rigavd. // M. D. LXXI.' (F. 1, r.)

Colophon. 'A Lyon, de l'Imprimerie de // Pierre Roufsin. // 1571.' (F. 148, r.)

Description. 8°, 10.8 × 17 cm., the text being 7.4 × 13.6 cm. 156 ff. (147 numb.), 28–30 ll. Lyons, 1571.

Editions. Paris, 1563, 4°; ib., 1565, 4°; Lyons, 1571, 8° (here described); ib., 1585; ib., 1588, 8°.

This is one of the early French commercial arithmetics, well arranged but with no marked peculiarities. It was so popular that an edition appeared as late as 1672. Like all arithmetics appearing in Lyons it devotes much attention to banking and exchange, this city being at that time the commercial center of France, and the seat of one of the great international fairs.

Other works of 1563. Bæda, p. 131, 1521; Boissière, p. 262, 1554; Feliciano, p. 148, 1526; Gemma, p. 205, 1540; Moya, p. 310, 1562; Ortega, p. 93, 1512; Peletier, p. 245, 1549; Wolfgang Hobel, 'Ein nützlich Rechenbüchlein mit viel schönen Regeln und Fragstücken,' Nürnberg, with editions s. l. (Nürnberg?), 1565 and 1577, 8°; Simon Schweder, 'Rechenbuch von alles kauffmanschaft der Landt auff der Feder und Linien,' Königsberg, 8°.

COSIMO BARTOLI. Ed. pr. 1564. Venice, 1589.

A Florentine geometer, born in 1503; died in 1572. He also translated the works of Finæus (see pp. 160, 164).

Title. 'Cosimo Bartoli // gentil' hvomo, et // Accademico Fiorentino, // Del Modo di Misurare // le distantie, le superficie, i corpi, le // piante, le prouincie, le prospettiue, & // tutte le altre cose terrene, che posso // no occorrere a gli huomini, // Secondo le vere regole d' Euclide, & de gli altri // piu lodato scrittori. // (Elaborate woodcut.) In Venetia, Per Francesco Franceschi Sanese. 1589.' (F. 1, r.)

Colophon. 'In Venetia, // Per Francesco Franceschi Sanese. // M. D. LXXXIX.' (F. 148, r.)

Description. 4°, 15.5 × 21.6 cm., the text being 11.2 × 15.5 cm. 148 ff. (6 unnumb.), 29 ll. Venice, 1589.

Editions. Venice, 1564, 4°; ib., 1589, 4° (here described), and one edition after 1601. The dedicatory epistle is dated 'il di 10. di Agosto del 1559,' so there may have been an earlier edition than that of 1564.

Although the book is on practical mensuration, the 'libro sesto' (f. 130, r.) is upon square and cube root. The galley method is used, and the common sixteenth-century device of annexing 2 *n* ciphers in square root and dividing the root by 10ⁿ (and similarly for cube root) is employed. Bartoli also gives a table of squares to 662². The chapter on roots is followed by one on the 'Regola delle tre cose, ouero quattro proportionali.'

Works of 1564. Albert, p. 180, 1534; Apianus, p. 155, 1527; Benese, p. 182, 1536; Euclid, p. 240, 1545; Gutiérrez de Gualda, p. 167, 1531; Herbestus, p. 303, 1561; Köbel, p. 111, 1514; Mariani, p. 181, 1535; Medlerus, p. 223, 1543; Riese, p. 139, 1522; Sole, p. 146, 1526; Tagliente, p. 115, 1515; Thierfelder, p. 391, 1587; Ulman, p. 391, 1587 (Thierfelder); Yciar, p. 249, 1549; Barlaamo, 'Arithmetica demonstratio eorum quæ in secundo libro Elementorum (Euclidis) sunt,' Strasburg (see also p. 343, 1572); Giovanni Camilla, 'Enthosiasmo,' Venice, 8° (containing a little work on arithmetic); Manuel Fernández Lagasa, 'Libro de quantas,' Salamanca, 4°, with a little work on arithmetic; Petrus Nonius (Nuñez), 'Libro de Algebra en Arithmética y Geometría,' with two editions at Antwerp in 1567, 8°; the 'Opera' of Nonius appeared at Basel in 1592.

PIERRE FORCADEL. Ed. pr. 1565. Paris, 1565.

See p. 284.

Title. See Fig. 156.

Description. 4°, 14.8 × 20 cm., the text being 9.9 × 15.9 cm. 192 pp. numb., 32–39 ll. Paris, 1565.

Editions. See p. 284. This is the third work on arithmetic published by Forcadel. The dedicatory epistle is dated 'De Paris, ce 19. de May. 1565.' There was only one edition, and this is not often found in dealers' catalogues.

In this book Forcadel does not, as in his other works, take up the subject of counter reckoning, but he gives a very satisfactory treatment of the fundamental operations, the rule of three, partnership, alligation, and the common applications of the day. It is not, however, as practical as the arithmetics of Savonne and Trenchant.

ANTICH ROCHA de Gerona.

Ed. pr. 1565.

Barcelona, 1565.

A Spanish arithmetician of the second half of the sixteenth century, born in Gerona, lecturer at Barcelona.

Title. See Fig. 157.

Description. 8°, 9.7 × 14.7 cm., the text being 7.5 × 12 cm. 314 ff. (267 numb.), 28 ll. The dedication by Rocha bears the date 'Hecha en Barcelona, a. 23. de Nouiembre. 1564.' Barcelona, 1565.

Editions. There was no other edition.

This rare compilation is based upon several Italian books, and the writer claims to have consulted a large number of authors. His list includes the names of Feliciano, Faber Stapulensis, Buteo, Scheubel, Finaeus, Ramus, Gemma, and various other writers of the time. Rocha has, however, omitted some of the best textbook-makers who preceded him. The book is a fairly complete elementary treatise, the writer having taken up the fundamental operations with various kinds of numbers, and treated each rule in a rather scientific way. Although a considerable number of practical problems relating to mercantile affairs appear in the last half of the work, the style of the writer is so prolix that the book could never have been well received by the mercantile classes. Bound with this work is another with the following title: 'Compendio

ARITHMETIQUE

ENTIERE ET ABREGEE

DE PIERRE FORCADEL,

LECTEUR DV ROYES

MATHEMATIQUES.



A PARIS.

Chez Charles Perier, rue S. Jean de Beauvais,
au Bellerophon.

1565.

FIG. 156. TITLE PAGE OF THE 1565 FORCADEL

y breue // inſtruction por tener Libros de Cuen//ta, Deudas, y de Mercaduria : muy prouechoſo // para Mercaderes, y toda gente de negocio. //traduzido de Frances en Caſtellano. En Barcelona.// En caſe de

ARITHMETI-
ca por Antich Rocha
 de Gerona compueſta, y de varios
 Auſtores recopilada : prouechoſa
 para todos eſtados de gentes.

Va anadido vn Compendio, para tener y re-
 gir los libros de Cuenta:traduzido de len-
 gua Franceſa en Romance Caſtellano.



EN BARCELONA
 En caſa de Claudio Bornat, a la Aguila fuerte.

1 5 6 5.

Con priuilegio por diez años.

FIG. 157. TITLE PAGE OF ROCHA

Claudio Bornat // al Aguila fuerte. 1565.// Con priuilegio por diez años.' (F. 286.) This relates, as the title ſuggeſts, entirely to bookkeeping, and is one of the earlieſt treatiſes upon the ſubject in the Spaniſh

language. In the fourth book of this second part is a treatise on algebra, one of the first to appear in Spain.

Rocha speaks of an *Aritmética* by Juan Ventallol, of which we do not know the date, but which must have appeared before 1565 (p. 298).

ERHART HELM. Ed. pr. 1565. Frankfort, 1592.

A Frankfort arithmetician and gauger of the middle of the sixteenth century.

Title. '1592. Erhart Helm/// Mathematicus // zu Franckfurt am Mayn/// von // Geometrischer Abmessung der Erden.// Item :// Künftliche Vifier vnnd // Wechselruthen/ auß dem Quadrat/ // durch die Arithmetiam vnnd Geometri-//am/ gerecht zumachen/ sampt einer lustigen behen-//digkeit in Weinrechnung/ // alles durch obgedachten // Authorem beschriben/ vnd jetzt von neuem // widerumb fleißig ersehen vnd cor-//rigiert.// Franckf. bey Chrif. Egen. Erben. 1592.' (F.1, r.)

Description. 8°, 9.5 × 15.4 cm., the text being 6.5 × 12.2 cm. 23 ff., 26–27 ll. Bound with Adam Riese's arithmetic of 1592 (p. 143). Frankfort, 1592.

Editions. The work appears in the 1565 edition of Adam Riese (p. 142), but not with a separate title page. I have seen no separate edition before this one of 1592.

This is a brief treatise on mensuration, and in particular on gauging, but it contains some explanation of arithmetical processes, including the extraction of roots, and a table of square roots to the equivalent of three decimal places.

Other works of 1565. Agrippa, p. 167, 1531; Apianus, p. 62, 1496 (Jordanus); Belli, p. 343, 1573; Cusa, p. 43, c. 1490; Delfino, p. 275, 1556; Fischer (Piscator), p. 247, 1549; Gemma, p. 200, 1540; Hobel, p. 314, 1563; Jacob, p. 295, 1560; Jordanus, p. 62, 1496; Menher, p. 249, 1550; Padovanius, p. 389, 1587; Riese, p. 142, 1522; Savonne, p. 314, 1563; Priscian, Rhemnius, Fanius, Bæda, Metianus, 'Liber de nummis, ponderibus, mensuris, numeris, eorumque notis, et de vetere computandi ratione, ab Elia Vineto emendati,' Paris, 8°. (Priscian's 'De figuris et nominibus numerorum' had already appeared in his works published at Venice in 1470, fol., with later editions in 1488, 1492, 1495, 1496, 1519, 1525. Such books, of which Mr. Plimpton has several, are not generally included in this list.)

HIERONYMUS MUNYOS. Ed. pr. 1566. Valencia, 1566.

Born at Valencia; died in 1584. He was professor of mathematics and Hebrew at Ancona, and later at Valencia. He also wrote an astronomical work. The family name is more strictly Muñoz.

Title. See Fig. 158.

Description. 4°, 15 × 20.4 cm., the text being 9.3 × 14.6 cm. 4 ff. unnumb. + 77 numb. + 1 blank = 82 ff., 27–31 ll. Valencia, 1566.

Editions. There was no other edition. The 'epistola' is dated 'Calendis Aprilis, anni M. D. Lxvj.'

The work consists of three books. The first treats of the fundamental operations, including proportion and some work in the Greek theory of numbers. The second book treats of fractions, including sexagesimals, these being needed by the astronomers for whom Munyos was writing. The third book relates to ratio and proportion. Altogether the work is too theoretical to have much influence upon the development of arithmetic.

IAN TRENCHANT. Ed. pr. 1566. Lyons, 1578.

A Lyons arithmetician, born c. 1525.

Title. 'L'Arithme-//tique de Ian //Trenchant, //Departie en trois //liures. //Ensemble vn petit discours des Changes. // Avec // L'art de calculer aux Getons. // Reueüe & augmentée pour la quatrième edition, //de plusieurs regles & articles, //par l'Autheur. // A Lyon, // par Michel Ioue, // et Iean Pillehotte. // à l'enfeigne du Iefus. // 1578. // Avec priuilege du Roy.' (P. 1.)

Description. 8°, 10.4 × 15.5 cm., the text being 7 × 13.7 cm. 375 pp. numb. + 5 unnumb. = 380 pp., 30–31 ll. Lyons, 1578.

Editions. Lyons, 1566; ib., 1571; ib., 1578, 8° (here described). The dedication of the 1578 edition bears the date 'De Lyon ce 9. de Iuillet 1571,' and this is often given as the date of the first edition. Although this is described on the title page as the fourth edition, I know of only two earlier. Cantor says that not less than six editions were published at Lyons from 1588 to 1602, and I have seen mentioned editions of 1608, 1610, 1632, and 1643.

Trenchant was one of the best of the sixteenth-century textbook-makers of commercial arithmetic in France. His work is divided into

INSTITVTIONES
ARITHMETICAE AD PER-
CIPENDAM ASTROLOGIAM ET
Mathematicas facultates necessarias.

AUCTORE

Hieronymo Munyos Valentino Hebraica lin-
gua pariter atq; Mathematicum in Gy-
mnasio Valentino publico
professore.



Supra Ma
V. H.
~~_____~~
~~_____~~
~~_____~~
de Mathē
maticā
nativā
de S. B.
Ⓜ

VALENTIAE.
Ex typographia Ioannis Mey.
Anno 1566.

Ex Libris Antonij Pelagii S. J. D. S. J.
et ad eius Iurum

FIG. 158. TITLE PAGE OF MUNYOS

three books, the first dealing with the fundamental operations with integers and fractions, and containing a considerable number of applied problems. The second book treats of the rule of three in its various forms together with such applications as barter, partnership, commision, and alloys. The third book treats of the properties of numbers, including figurate numbers, roots, and progressions, and has some work on discount, together with a few recreations. In the 1578 edition the third book is followed by a chapter on exchange, and an explanation of the method of calculating with counters.

GEORGIO LAPAZZAIA. Ed. pr. 1566. Naples, 1569.

LAPAZZAIA, LAPAZZAIA. Probably a resident of Naples, but born at Monopoli, a town in the province of Bari, on the Adriatic. He was a priest, and wrote only the work here described.

Title. See Fig. 159.

Colophon. 'In Napoli // Apreffo Mattio Cancer. M.D.LXIX. // Con Priuilegio per anni diece. // Marius Carrafa Archiepiscopus Neapolitanus.' (P. 262.)

Description. 4°, 14.1 × 21 cm., the text being 10.8 × 16.9 cm. 13 pp. unnumb. + 250 numb. = 263 pp., 29 ll. Naples, 1569.

Editions. Naples, 1566, Latin edition with the title 'De familiarite arithmeticae et geometriae,' this date appearing also in the privilege, 'Datum Neapoli die vltimo Iulii M.D.LXVI;' ib., 1566, Italian edition; ib., 1569, 4° (here described); 1575; Naples, 1590, 4° (p. 324). There were several editions after 1600, one appearing as late as 1784. For the 1601 edition see p. 324.

The book has nothing to commend it except its popular style. Lapazzaia begins with the fundamental operations with integers, and then treats of ratio, fractions, and progressions. He considers also the rule of three, the rule of five, interest, exchange, partnership, alligation, rule of false, and the extraction of roots. The last part of the work is on mensuration.

Other works of 1566. Belli, p. 343, 1573; Fischer (Piscator), p. 247, 1549; Gemma, p. 200, 1540; Herbestus, p. 303, 1561; Monzó, p. 292, 1559; Georg Meyer, 'Rechenbüchlein defs Silberkauffs und gemachter Arbeit,' Augsburg, 16°; Mathäus Nessen (Nesse), 'Zwei neue Rechenbücher,' Breslau, 8°; Johannes de Segura, 'Mathematicae quaedam selectae propositiones,' Alcalá, 4°, and 'Compendium Arithmeticae et Geographiae partis,' Alcalá, 4°.

DARITMETICA E GEO-
METRIA DELL'ABBATE GEOR.
GIO LAPAZZAIA MONOPOLITANO.

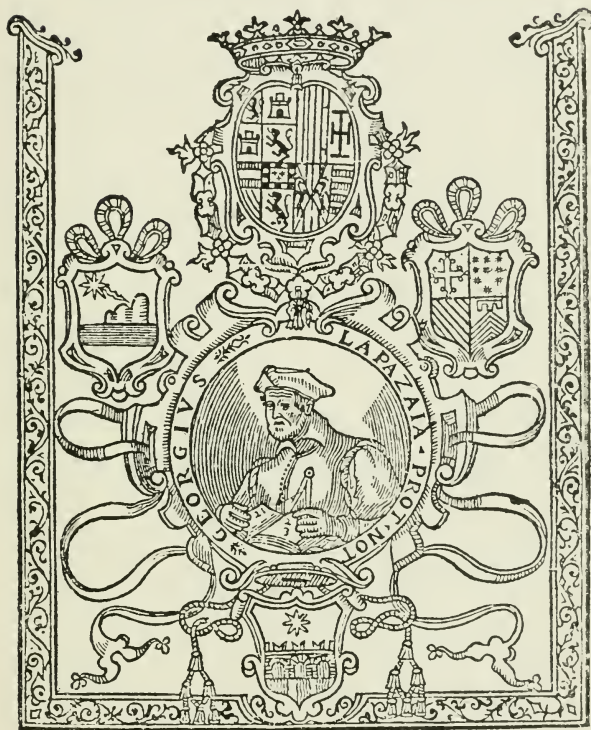


FIG. 159. TITLE PAGE OF THE 1569 LAPAZZAIA

GEORGIO LAPAZZAIA. Ed. pr. 1566. Naples, 1590.

See p. 322.

Title. 'Opera // terza // de Aritmetica // et Geometria. // Dell'abbate Georgio Lapazaia // da Monopoli. // Intitolata il Ramaglietto. // In Napoli, // Apreffo gli Eredi di Mattio Cancer. // M. D. LXXXX.' (P. 1.)

Colophon. 'In Napoli // Apreffo gl'Eredi di Mattio Cancer. // M. D. LXXXX.' (P. 176.)

Description. 4°, 13.9 × 18.7 cm., the text being 10.8 × 16.5 cm. 1 p. unnumb. + 1 blank + 174 numb. = 176 pp., 29 ll. Naples, 1590.

Editions. See p. 322.

Although bearing a different title, this is merely a revision of the 1566 work, with a slight variation in the problems. The preface is dated 1569, when the second edition of the Italian version appeared, but it is not found in that edition. The title 'Opera terza' means simply the second revision, or the third writing of the book. Lapazzaia's work shows the increasing attention given by the Church schools to the business needs of the people.

GEORGIO LAPAZZAIA. Ed. pr. 1566. Naples, 1601.

See p. 322.

Title. 'Libro // d'Aritmetica // e Geometria, // dell'Abbate Giorgio Lapazzaia // Canonico Monopolitano, e Protonotario Apoftolico. // Nouamente in quest'ultima imprefione espurgato da molti errori, & arric-//chite d'vna Prattica d'Abbaco, non meno vtilifsima, che neceffaria. // Al Signor Diego d'Aldana, // Prefidente della Regia Camera della Summ. per Sua Maieftà. // (Large woodcut, coat of arms.) In Napoli, // Apreffo Tarquinio Longo. MDCI.' (P. 1.)

Colophon. 'In Napoli, // Apreffo Tarquinio Longo. MDCI.' (P. 215.)

Description. 4°, 14.9 × 20 cm., the text being 10.7 × 15.8 cm. 216 pp. (3 blank, 8 unnumb.), 30-38 ll. Naples, 1601.

See p. 322.

NICOLAUS PETRI. Ed. pr. 1567. Amsterdam, 1635.

Born at Deventer. He taught at Amsterdam from 1567 to 1588. He also wrote on algebra and astronomy.

Title. 'Practicque // Om te leeren // Reecken / Cypheren // ende Boeckhouwen / met die regel Cofs // ende Geometrie / feer profijtelycken voor allen // koop-luyden. Van nieu gecorrigeert // ende vermeerdert // Deur Nicolaum Petri Daventrienfem. // L'homme propofe, Et dieu difpofe. A° 1603. // (Woodcut of author.) t'Amstelredam, // Voor Hendrick Laurentfz. Boeckvercooper op het // water int Schrijf-boeck, Anno 1635.' (F. 1, r.)

Description. 8°, 10.3 × 16.3 cm., the text being 8.9 × 14.4 cm. 6 ff. unnumb. + 281 numb. = 287 ff., 23–32 ll. Bound with this is '1596. // Iournael-Boeck // gheteekent met die // Letter // Anno M. DC. XXXV.,' 10 ff. Amsterdam, 1635.

Editions. From the preface it appears that the work was first published in 1567. The other sixteenth-century editions were Amsterdam, 1576, 8°; 1583; 1591; and Alkmaar, 1596, 8°.

The arithmetic is of the ordinary Dutch type. It uses only the galley form of division, and its chief value to the student of history lies in its business problems.

Other works of 1567. Agrippa, p. 167, 1531; Borghi, p. 16, 1484; Cataneo, p. 244, 1546; Gemma, p. 205, 1540; Mariani, p. 181, 1567; Nonius (Nuñez), p. 315, 1564; Ramus, p. 263, 1555; Tagliente, p. 115, 1515; Conradus Dasypodius, 'Logistica,' Strasburg, 8°; Guill. de la Toissonière, 'Compost arithmétique,' Lyons.

STEFANO GHEBELINO. Ed. pr. 1568. Brescia, 1568.

An arithmetician of Brescia, of the second half of the sixteenth century.

Title. See Fig. 160.

Colophon. 'In Brescia, // Apresso Vincenzo // di Sabbio. // M. D. LXVIII.' (F. 34, r.)

Description. 4°, 13.5 × 19.5 cm., the text being 10.1 × 16.5 cm. 11 ff. unnumb. + 33 numb. = 44 ff., 37 ll. Brescia, 1568.

Editions. There was no other edition.

The dedicatory epistle shows that this work was written at Brescia in October, 1568. It is composed almost entirely of tables for the use

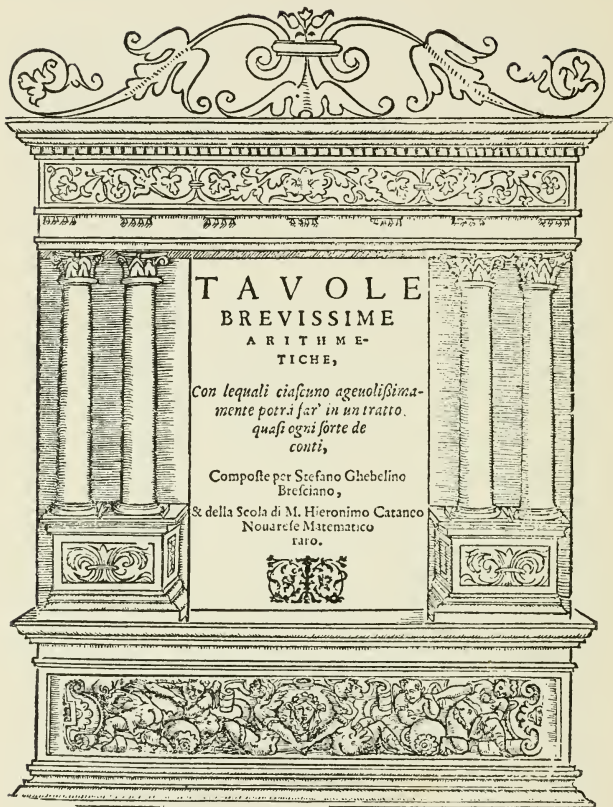


FIG. 160. TITLE PAGE OF GHEBELINO

of merchants and bankers in the north of Italy. There is some explanatory matter in the beginning relating to the arithmetic of exchange, but the work can hardly be called a school textbook. Riccardi speaks of it as 'uno dei primi esempi di tavole di conti fatti.'

HUMPHREY BAKER. Ed. pr. 1568. London, 1580.

Born at London; died after 1587.

Title. 'The Well spring of // Sciences.// Which teacheth the perfect // worke and practife of Arith-//meticke, both in whole Num-//bers and Fractions: fet // forthe by // Humfrey Baker // Londoner, 1562.// And nowe once agayne perused // augmented and amended in all // the three partes, by the sayde // Authour: where unto he // hath also added certein // tables of the agree-//ment of measures // and waights // of diuers places in Europe, // the one with the other, as // by the table following // it may appeare.// 1580.' (F. 1, r.)

Description. 8°, 9.9 × 14 cm., the text being 5.6 × 11.2 cm. 227 ff. (28 unnumb., last folio missing), 24–26 ll. London, 1580.

Editions. London, 1568, 8° (written in 1562, which explains the date on the title page); ib., 1574, 8°; ib., 1580, 8° (here described); ib., 1583, 8°; ib., 1591, 8°. There were several editions after 1601 (see pp. 328, 329).

For a long time Baker's arithmetic was the only English rival to Recorde's 'Ground of Artes' (see p. 213), and it was in many respects better than that popular work. This edition is more complete than that of 1568, the book having, as the author states, been rewritten. In 'The Prologue to the gentle Rerder' he says: 'Hauing fometime now twelue yeres sithence (gentle Reader) published in print one Englifhe boke of Arithmetick, conteyning as I suppose, fundry necfsarie and profitable documentes for such as are vvilling to attayne any knowlege therein. I have bene often since that time, and of very late also, requested by fundry of my friendes to peruse the fame vvorke, and as I fhold nowe iudge it expedient, to adde something more therevnto, and to amplifye the fame.' He complains of the criticism of foreigners that English arithmetic is not as advanced as that on the continent: 'For vvhen I perceyued the importunitie of certayne fraungers not borne within this lande, at this present, and of late dayes fo farre proceeding, that they aduanced and extolied them felues in open talke and writings,

that they had attained such knowledge and perfection in Arithmetike, as no English man the like: Truly me thought that the same reporte not only tended to the (dispraise) dispraise our Countrey men in general: But touched especially some others & me, that had traueiled & written publicly in the same facultie. For vnto this same effecte they haue of late paynted the corners and postes in euery place within this citie with their peeuishe billes, making promise and bearinge men in hande that they coulde teache the summe of that Science in breefe Methode and compendious rules such as before their arriual hath not bene taughte within this Realme.' These words, and others in the same strain, give an interesting picture of English arithmetic in 1580, and of the work of the teacher at that time. The criticism was a just one, for the Dutch, French, Germans, Spanish, and Italians were much ahead of the English at that period in the matter of arithmetic.

Baker follows the continental models, giving the usual operations and the applications to 'Marchandise,' 'Fellowship,' barter, alligation, false position, and the like. He closes his text with 'Questions of Pastime.' He still uses duplation, generally uses the form 'subtraction' (following the Dutch books of the time), and makes relatively little of 'Deuision,' which he treats by the usual galley method, but he succeeds in producing a fairly practical mercantile book.

Other works of 1568. Anianus, p. 32, 1488; Delfino, p. 275, 1556; Gemma, p. 200, 1540; Gülfferich, p. 257, 1552; Lonicerus, p. 253, 1551; Lossius, p. 290, 1557; Riese, p. 139, 1522; Sfortunati, p. 174, 1534; Mauritius Steinmetz, 'Aritmeticae praecepta in quaestiones redacta,' Leipzig, sm. 8°.

HUMPHREY BAKER. Ed. pr. 1568. London, 1659.

See p. 327.

Title. 'The // Wel-spring // of // Sciences : // teaching The perfect Work and Practice of // Arithmetick, // both in Numbers and Fractions. // Set forth by // Humphrey Baker // Londoner. // And now again Perused, Augmented, and // Amended in all three Parts, by // the said Authour. // Whereunto are added certain Tables of // the agreement of Measures & Weights // of diuers places in Europe, // the one with the other, as by the Table appeareth. // London, // Printed for A. Kemb, at St. Margarets Hill in // Southwark, to bee sold by Tho. Brewfster, // at the three Bibles in Pauls Church-yard : 1659.' (P. 1.)

Description. 8°, 8.4 × 13.6 cm., the text being 6.3 × 11.2 cm. 366 pp. (54 unnumb.), 26–27 ll. London, 1659.

Editions. See p. 327.

This is not materially different from the 1580 edition (p. 327). The publisher says that 'The friendly Reader may please to take notice that in this Impression of 1659, the whole Book hath been revised, every Question therein examined, the Faults that were committed in former Impressions, Corrected, the whole restored to its first integrity.' In spite of this statement, there is little improvement in the book either in methods of operating or in symbolism. It is interesting to read that 'The Fractions [in the tables at the end of the book] which before were in the common way (and so the figure being small in many not discerned) are put into the decimal parts, and so the same with the integral, but farre more true than the Common Fractions can expresse it in one figure, and if in the common it be exprest in many, (as it must be, if true) then the decimal is far more easie, because the Denominator is one and the same to all, whereas the other is differing.' In fact, very slight knowledge of decimals is shown, and when they are employed the bar is generally used instead of the point.

HUMPHREY BAKER. Ed. pr. 1568. London, 1687.

See p. 327.

Title. 'Licenfed, // Feb. 28, 168^q. // Rob. Midgley.' (P. 4, first page of print.) 'Baker's // Arithmetick : // Teaching // The perfect Work and Practice of // Arithmetick both in // Whole Numbers & Fractions. // Whereunto are Added // Many Rules and Tables of // Intereft, Rebate, and Purchafes, & c. // Also // The Art of Decimal Fractions, // intermixed with Common Fractions, for the // better Underftanding thereof. // Newly Corrected and Contracted, and // made more plain and easie // By Henry Phillippes. // London. // Printed by J. Richardfon for William Thackery at the // Angel in Duck-Lane, and Matthew Wotton at the Three // Dagggers in Fleet ftreet, and George Conyers at the // Ring without Ludgate, 1687.' (P. 5.)

Description. 12°, 8.3 × 14.3 cm., the text being 6.8 × 12.8 cm. 8 pp. blank + 10 unnumb. + 228 numb. = 246 pp., 32–39 ll. London, 1687.

Editions. See p. 327.

Phillippes, the editor, pays a deserved tribute to Baker in his letter 'To the Reader.' He begins as follows: 'This little Book, as it was one of the first, so it is one of the best of this Subject, and hath had as good Acceptance, as any other; which may appear by the often Imprefions of it. Indeed as long as the Author lived, he was careful to be still adding and correcting it: and though he be dead, yet his Book is thought worthy to live, and not only to live, but to flourish.' It certainly speaks well of the book that this edition should have been published 121 years after the first one appeared. The treatment of decimal fractions is very satisfactory, and, of course, is not found in the original edition. These fractions, the necessity for which became apparent in the sixteenth century, were first scientifically treated at any length in a work by Stevin, published in 1585. (See p. 386.)

PETRUS RAMUS. Ed. pr. 1569.

Basel, 1569.

See p. 263.

Title. 'P. Rami Arith//meticae libri // dvo: Geometriae // septem et viginti.// (Woodcut.) Basiliae, per Evsebivm // Episcopium, & Nicolai fratris haeredes.// Anno M. D. LXIX.' (P. 1.)

Description. 4°, 17.5 × 23.3 cm., the text being 12.3 × 18.2 cm. 198 pp. (2 blank, 6 unnumb.), 42 ll. Basel, 1569.

Editions. Basel, 1569, 4° (here described); Paris, 1577, 8° (p. 331); Basel, 1580, 4° (p. 331); Paris (Stadius edition), 1581, 12°; Frankfort (Schonerus edition), 1586, 8° (p. 331); ib., 1591, 8° (Stegerus edition); ib., 1592, 8° (Schonerus); ib., 1596, 8° (the Snellius and Schonerus 'Explicationes,' p. 333); ib., 1599, fol. (Schonerus, p. 333); Lemgo, 1599, 4°. There was also published at Paris in 1562, and in two editions the same year, an 'Arithmetica,' in two books, without the author's name, attributed to Ramus, but I do not know whether it is the same as this work. There was also an English edition of 'The Art of Arithmeticke in whole numbers and fractions . . . by P. Ramus . . . translated . . . by William Kempe,' London, 1592, 8°.

This is a better book than the 'Libri Tres' of 1555. Although it is too theoretical to have met the commercial needs, it is a nearer approach to a practical work than its predecessor.

PETRUS RAMUS. Ed. pr. 1569.

Paris, 1577.

See p. 263.

Title. 'Petri Rami // Professoris Regii, // Arithmeticae // libri dvo. // Parisiis, // Apud Dionysium Vallensem, sub // Pegaso, in vico Bellouaco. // 1577.' (F. 1, r.)

Description. 8°, 10.3 × 16 cm., the text being 7.1 × 13.1 cm. 97 ff. (2 blank, 1 unnumb.) with chart; 32 ll. Paris, 1577.

See p. 330.

PETRUS RAMUS. Ed. pr. 1569.

Basel, 1580.

See p. 263.

Title. 'P. Rami // Arithmeticae // libro dvo // Geometriae // septem et viginti. // (Woodcut.) Basileae, per Evsebivm // Episcopium, & Nicolai fratris hæredes. // M D LXXX.' (P. 1.)

Colophon. 'Basileae, per Evsebivm Episcopi, & Nicolai fratris hæredes. Anno // M. D. LXXX.' (P. 192.)

Description. 4°, 15.9 × 21.2 cm., the text being 11.1 × 17 cm. 200 pp. (9 unnumb.), 28–35 ll. Basel, 1580.

See p. 330.

PETRUS RAMUS and LAZARUS SCHONERUS.

Ed. pr. 1569.

Frankfort, 1586.

See p. 263.

Title. See Fig. 161.

Description. 8°, 10.5 × 17.3 cm., the text being 7 × 13.1 cm. 16 pp. unnumb. + 406 numb. = 422 pp., 26–32 ll. Frankfort, 1586.

Bound with this is 'P. Rami, Regii // Eloquentiae et // Philosophiae Pro-//fefforis, liber de moribus // veterum Gallorum, // ad // Carolum Lotharingum // Cardinalem. // Parisiis, // Apud Andream Wechelum. // 1562. // Cum privilegio Regis.'

Editions. See p. 330. The commentary of Schonerus also appeared with that of Snellius in 1596 (p. 333), and without the latter in 1599 (p. 333). There were also editions by Steger published at Leipzig in 1591 and at Frankfort in 1592.

PETRI RAMI
 ARITHMETICES LI-
 BRI DVO, ET ALGEBRÆ
 totidem: à LAZARO SCHONERO
 emendati & explicati.

*Eiusdem SCHONERI libri duo: alter, De
 Numeris figuratis; alter, De Logistica
 sexagenaria.*



FRANCOFURDI
 Apud heredes Andreæ Wecheli,

MDLXXXVI.

Cum S. Ces. Maiestatis priuilegio ad sexennium.

FIG. 161. TITLE PAGE OF THE 1586 RAMUS

The first of these works is one of several commentaries on the theoretical arithmetic of Ramus (p. 263). It is more practical than that of Snellius (mentioned below), giving the various operations and making an attempt at introducing some commercial problems.

In the first part are included two works by Schonerus, 'De numeris figuratis Lazari Schoneri liber' and 'Lazari Schoneri De logistica sexagenaria liber.' The former is, as the title suggests, a treatise on the Greek theory of numbers, and the second is on the sexagesimal fractions used by the astronomers. Schonerus writes his sexagesimals thus:

$$\begin{array}{cccccc} \text{II} \text{æ} & \text{I} \text{æ} & \text{o} & \text{I} & \text{II} & \\ 3. & 39. & 40. & 20. & 40., & \end{array}$$
 for $3'60^2 + 39'60 + 40 + \frac{20}{60} + \frac{40}{60^2}$.
 This is one of the early approaches to our symbols $^{\circ}$, $'$, $''$.

PETRUS RAMUS and RUDOLPHUS SNELLIUS.

Ed. pr. 1569.

Frankfort, 1596.

See p. 263. SNELLIUS, born at Oudewater, October 8, 1546; died at Leyden, March 2, 1613.

Title. See Fig. 162.

Description. 8°, 9.6 × 16 cm., the text being 6.6 × 12.8 cm. 3 pp. unnumb. + 154 numb. = 157 pp., 29-30 ll. Frankfort, 1596. Bound with this are 'Rvdolphi // Snellii in // P. Rami Geome-//triam Præle-//ctiones,' and 'Rudolphi // Snellii in Sphæram Cor-//nelii Valerii // prælectiones,' both of 1596.

Editions. See p. 330. The first edition of Snell's commentary.

Like the arithmetic of Ramus, this work is theoretical rather than practical. Only the prominence of Ramus could have justified such efforts as these of Snellius, Salignacus, and Urstisius.

PETRUS RAMUS. Ed. pr. 1569.

Frankfort, 1599.

See p. 263.

Title. 'Petri Rami // Arithmeticae // libri dvo: Geometriae // septem et viginti. // A Lazaro Schonero recogniti & aucti. // Francofvrti, // Apud Andreæ Wecheli heredes, // Claudium Marnium, & Ioannem Aubrium. // M. D. XCIX.' (P. 3.)

Description. Fol., 17 × 22.5 cm., the text being 11.9 × 17.6 cm. 244 pp. in the arithmetic, 184 pp. in the geometry, 39 ll. Frankfort, 1599. Bound with this is the geometry of Ramus.

IN P. RAMI ARITH-
METICAM

RVDOLPHI
SNELLI

Explicationes lectissimæ:

LAZARI SCHONERI, BERNH.
*Salignaci, & Christiani Vrstisii, com-
mentationibus passim lo-
cupletatæ.*



FRANCOVRTI

Ex Officina Typographica Ioannis Saurii,
impensis hæredum Petri Fischeri.

M. D. XCVI.

FIG. 162. TITLE PAGE OF THE 1596 RAMUS AND SNELLIUS

PETRUS RAMUS. Ed. pr. 1569.

Basel, 1569.

See p. 263.

Title. See Fig. 163.

Colophon. 'Basileæ, per Evsebivm Episco//pium, & Nicolai fratris hæredes. Anno Salutis humanæ//M. D. L. XIX.' (P. 190 of the geometry, bound with the above, or 534 of the entire book.)

Description. 4°, 17.5 × 23.3 cm., the text being 12.3 × 18.2 cm. 16 pp. unnumb. + 320 numb. = 336 pp. of the above (not including the rest of the work), 42 ll. Basel, 1569.

Editions. Basel, 1569, 4° (here described); ib., 1578 (Schonerus edition); Frankfort (also Schonerus edition), 1599, 4°. The first three books also appeared at Paris in 1567, 8°, under the title 'Præmium Mathematicarum.'

An extensive and tiresome treatise on the philosophy of elementary mathematics in general.

THOMAS DE MERCADO.

Ed. pr. 1569.

Salamanca, 1569.

A Spanish priest of the middle of the sixteenth century.

Title. See Fig. 164.

Description. 8°, 13.5 × 19.4 cm., the text being 11.5 × 16 cm. 277 ff. (29 unnumb.), 32 ll. Salamanca, 1569.

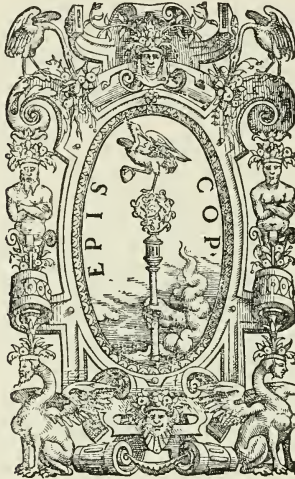
Editions. There was no other edition.

This is not a textbook on arithmetic, but a treatise on the applications of the subject to mercantile affairs. It is so prolix and theoretical that it was never republished. That it is the first edition appears from 'La Tassa' and from the dedication to the king, the former being dated October 6, 1569, and the latter May 6 of the same year. The license is, however, dated August 13, 1568, and one of the decrees May 9, 1568. Although the work professes to be of a mercantile character, it is too ponderous in style for the purpose for which it was intended. It is interesting historically because in several chapters the author has considered the development of arithmetic and of mercantile customs. It is also interesting because of its reference to the recently awakened commerce. For example, chapter 13 has the title 'De los ratos de Indias, y tratantes en ellos.' Chapter 16 is also suggestive of the methods of trade of the period, the title being 'De los baratas y

*Nobilissimo uicem Nicolao Burckhu/w.
hunc librum Ioannes Sturmijus Mropeon
vop domis hro confectum d. d.*

*D. 15 Ap
1581*

P. RAMI SCHOLARVM MATHEMATICARVM LIBRI VNVS ET TRIGINTA.



**BASILEAE, PER EVSEBIVM EPISCOPIVM,
& Nicolai Fratris heredes.**

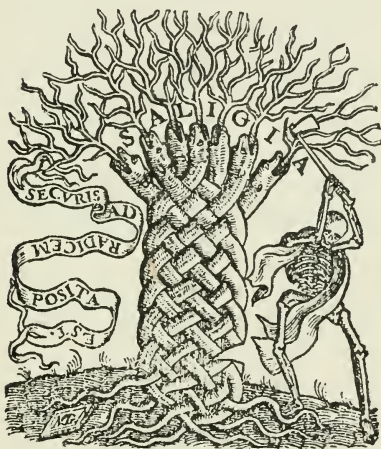
ANNO M. D. LXIX.

*L. X. mmy Jo. Sturmijus Mropeon
Academia vrbis dono dedit*

3

FIG. 163. TITLE PAGE OF THE *Libri vnus et triginta* OF RAMUS

TRATOS Y CON-
TRATOS DE MERCADERES
y tratantes discidos y determinados, por
el Padre Presentado Fray Thomas
de Mercado, de la orden de los
Predicadores.



Conlicenciay priuilegio real.

EN SALAMANCA.
Por Mathias Gast. Año de
1569.

Esta tassado en cinco reales.

FIG. 164. TITLE PAGE OF MERCADO

de la nauegacion de las Indias.' The treatment of interest and exchange is more extensive than usual, the former having been by no means popular in Spain. The last part of the book is devoted entirely to legal questions.

Other works of 1569. Belli, p. 343, 1573; Camerarius, p. 263, 1554; Gemma, p. 200, 1540; Herbestus, p. 303, 1561; Jacob, p. 298, 1560; Lapazzaia, p. 322, 1566; Lossius, p. 290, 1557; Mariani, p. 181, 1535; Monzó, p. 292, 1559; Urstisius, p. 361, 1579; Jacob Frey, 'Exempelbüchlein allerley Kaufmannshändel,' Nürnberg (there was also an Augsburg edition of 1603, 16°); Adriaen van der Gucht, 'Cyferbouck,' Bruges, 4°; James Peele, 'The pathwaye to perfectnes in th' accomptes of debitour and creditour,' London, fol. (second edition).

HIERONYMUS CARDANUS.

Ed. pr. 1570.

Basel, 1570.

See p. 193.

Title. See Fig. 165.

Colophon. 'Basileæ, // ex officina Henricpetrina, Anno // Salv-
tis M. D. LXX. Mense // Martio.' (P. 111 of the third part.)

Description. Fol., 20.4 × 30 cm., the text being 13.2 × 24 cm. 291 pp. (4 blank, 16 unnumb.) in this book. Bound with this is the 'Ars Magna' (second edition), 163 pp. numb., and the 'De aliza regvla liber, hoc est, algebraicæ logifticæ fuæ . . .,' 120 pp. (111 numb.), 41 ll. Basel, 1570.

Editions. There was no other separate edition of the 'Opus Novum.'

This work is particularly interesting in its application to physical problems, these being well illustrated. The only reason for including it in a list of arithmetics is that it contains some work on proportion less geometric than that given in Euclid. See also p. 193, 1539.

Other works of 1570. Belli, p. 343, 1573; Boethius, p. 27, 1488; Feliciano, p. 148, 1526; Forcadel, p. 284, 1556-57; Gemma, p. 200, 1540; Glarcanus, p. 192, 1539; Lonicerus, p. 253, 1551; Recorde, p. 214, c. 1542; Riese, p. 139, 1522; Tagliente, p. 115, 1515; Anonymous, 'Briefue arithmétique fort facile à comprendre'; Johann Weber, 'Gerechnet Rechenbüchlein auf Erfurtischen Wein- und Tranks-Kauff,' Erfurt, with a second edition in 1583.

Works of 1571. Digges, p. 343, 1572; Gemma, p. 206, 1540; Riese, p. 139, 1522; Savonne, p. 314, 1563; Stifel, p. 260, 1553;

HIERONYMI CARDANI MEDIO

LANENSIS, CIVISQV'E BONO-

NIENSIS, PHILOSOPHI, MEDICI ET

Mathematici clarissimi,

OPVS NOVVM DE
PROPORTIONIBVS NVMERORVM, MO-
TVVM, PONDERVM, SONORVM, ALIARVMQV'E RERVM
mensurandarum, non solum Geometrico more stabilitum, sed etiam
uarijs experimentis & obseruationibus rerum in natura, solerti
demonstratione illustratum, ad multiplices usus ac-
commodatum, & in V libros digestum.

P R A E T E R E A.

ARTIS MAGNÆ, SIVE DE REGVLIS

ALGEBRAICIS, LIBER VNVS, ABSTRVSIVSSIMVS

& inexhaustus plane totius Arithmeticæ thesaurus, ab

autore recens multis in locis recogni-
tus & auctus.

I T E M.

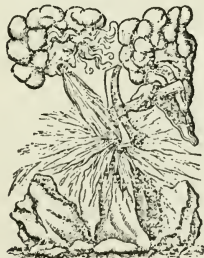
DE ALIZA REGVLA LIBER, HOC EST, ALGEBRAICAE

logisticae suae, numeros recondita numerandi subtilitate, secundum Geo-

metricas quantitates inquirentis, necessaria Coronis,

nunc demum in lucem edita.

*Opus Physicis & Mathematicis imprimis
utile & necessarium.*



Cum Cæs. Maiest. Gratia & Priuilegio.

B A S I L E Æ.

FIG. 165. TITLE PAGE OF THE 1570 CARDAN

Trenchant, p. 320, 1566; Anonymous, 'Les principaux fondemens d'arithmétique'; Nicolaus Eschenburg, 'Arithmetica logistica,' Frankfurt; Alex. Vandenbussche, 'Arithmétique militaire,' Paris, 4°.

FRANCISCUS BAROCIUS. Ed. pr. 1572. Venice, 1572.

See p. 295.

Title. See Fig. 166.

Description. 4°, 13.9 × 19.3 cm., the text being 10.3 × 17 cm. 3 ff. unnumb. + 23 numb. = 26 ff., 17–36 ll. Venice, 1572.

Edition. There was no other edition. A German translation was published in Leipzig in 1616.

This is an attempt to popularize the mediæval number game of Rithmomachia (Rithmimachia, Rythmomachia), set forth in Latin possibly by Shirwode or by Faber Stapulensis, in an edition of Boethius in 1496 (see p. 63), and afterwards amplified by Claude Boissière (see p. 271, 1556). The game was often, with no authority, attributed to Pythagoras. Barocius (or Barozzi) amplified the treatment attributed to Faber Stapulensis, and his discussion of the subject is clearer than that of the latter, although hardly equal to that of Boissière already described. He had already published a philosophical discussion of arithmetic as stated on p. 295.

LEONARD AND THOMAS DIGGES.

Ed. pr. 1572.

London, 1579.

LEONARD DIGGES came of an ancient family whose seat was Digges Court, Barham, Kent. He studied at Oxford, and was an expert mathematician for the time. He died c. 1571.

THOMAS was a son of Leonard, and was born in Kent. He was educated at Oxford, and died in London, August 24, 1595.

Title. See Fig. 167.

Colophon. 'Imprinted at Lon//don, by Henrie Bynneman, dwel//ling in Thames Street, neere vnto // Baynardes Caftle.// Anno 1579.' (P. 192.)

Description. 4°, 12.8 × 18 cm., the text being 8.9 × 14.7 cm. 16 pp. unnumb. + 191 numb. = 207 pp., and one plan (p. 176), 35 ll. London, 1579.

Editions. London, 1572, 4°; ib., 1579, 4° (here described); ib., 1585, 4°; ib., 1590, 4°. The 1579 edition was a revision,

IL NOBILISSIMO
ET ANTIQVISSIMO
GIVOCO PYTHAGOREO
NOMINATO
Rythmomachia
CIOE BATTAGLIA
DE CONSONANTIE
DE NVMERI.

Ritrouato per utilità, & solazzo delli Studiosi.

Et al presente per Francesco Barozzi Gentil'huomo
Venetiano in lingua volgare in modo di
Paraphrasi composto.



IN VENETIA.

Appresso Gratiofo Perchacino. 1572:

FIG. 166. TITLE PAGE OF BAROZZI

¶ An Arithmeticall Militare Treatise, named
STRATIOTICOS:

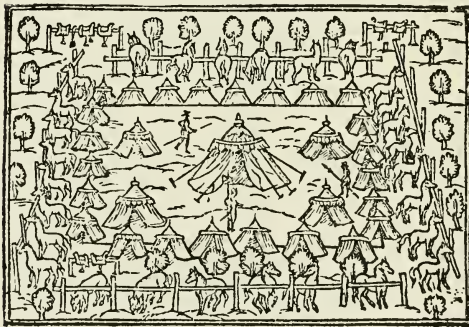
Compendiously teaching the Science of Nūbers,
 as vvell in Fractions as Integers, and so much of the Ru-
 les and Æquations Algebraicall and Arte of Numbers
 Colsicall, as are requisite for the Profesion of a Soldiour.

Together with the Moderne Militare Discipline, Offices, Lawes and
 Duties in eucry wel governed Campe and Arme to be obserued:

Long since attēpted by LEONARD DIGGES Gentleman,
 Augmented, digested, and lately finished, by
 THOMAS DIGGES, his Sonne.

Whereto he hath also adioyned certaine Questions of great Ordinaunce,
resolved in his other Treatise of Pyrotechny and great
Artillerie, hereafter to bee published.

VIVET POST FVNERA VIRTVS.



AT LONDON:
 Printed by Henrie Bynneman.
 ANNO Domini. 1579.

FIG. 167. TITLE PAGE OF THE 1579 DIGGES

for the preface 'To the Reader' (f. a 2) states that it was 'finished the 13. of October. 1579.'

Considering its date, this work is a very good introduction to the study of arithmetic. The arithmetic proper extends, however, only to page 32. Then follows a brief treatment of algebra (pp. 33-51), after which are certain problems (to p. 70) relating to military matters. Pp. 81-191 are devoted entirely to military affairs.

The father and son wrote several mathematical treatises, but none directly on arithmetic. One was the 'Pantometria' of 1571, which De Morgan includes, and which is in Mr. Plimpton's library, but which I have omitted because it is in no sense an arithmetic.

Other works of 1572. Buckley, p. 252, 1550; Gemma, p. 200, 1540; Grammateus, p. 123, 1518; Mariani, p. 181, 1535; Barlaamo, 'Λογιστικη, sive arithmeticae, algebraicae libri VI' (in a work on spherics), Strasburg, with later editions at Paris, 1594, 4°; 1599, 4°; 1600, 4° (see also p. 315, 1564); John Seton (see Buckley, p. 252, c. 1550).

SILVIO BELLI. Ed. pr. 1573. Venice, 1573.

Born at Vincenza. He died in 1575. He was an architect at Rome and Ferrara, and wrote on practical geometry.

Title. See Fig. 168.

Description. 4°, 15 × 20.6 cm., the text being 9 × 15.1 cm. 46 ff. (40 numb.), 19-21 ll. Venice, 1573.

Editions. This is the only separate edition of this semi-geometric work. Belli published a 'Libro del misurar con la vista,' which passed through the following editions: Venice, 1565, 4°; ib., 1566, 4°; 1569, 4°; Venice, 1570, 4°; ib., 1573, 4°; ib., 1595, 4°. This was united with the 'Della Proportione' in 1595 (Venice) to form the 'Quattro libri geometrici.'

This work is included in this list because of the treatment of mediæval proportion which it contains.

LUCAS PAETUS. Ed. pr. 1573. Venice, 1573.

A Venetian jurist of the sixteenth century.

Title. See Fig. 169.

Description. Fol., 20.5 × 29.5 cm., the text being 15 × 24.5 cm. 8 pp. unnumb. + 93 numb. + 1 blank = 102 pp., 50 ll. Venice, 1573.

SILVIO BELLI
VICENTINO

DELLA
PROPORTIONE, ET PROPORZIONALITA'
Comuni Passioni del Quanto.

LIBRI TRE.

*Utiles, & necessarij alla vera, & facile intelligentia
dell' Arithmetica, della Geometria, & di
tutte le scientie & arti.*

Al Magnanimo Alessandro Farnese Card.^{le}



CON PRIVILEGIO.

IN VENETIA, Appresso Francesco de' Franceschi Sanese. 1573.

LVCAE PAETI

IVRISCONSVL.

DE MENSVRIS, ET

PONDERIBVS ROMANIS,

ET GRAECIS,

CVM HIS QVAE HODIE ROMAE SVNT COLLATIS

LIBRI QVINQVE.

RIVSDEM VARIARVM LECTIONVM LIBER VNVS

AD SANCTISSIMVM OPTIMVMQVE PRINCIPEM

PIVM QVINCTVM PONT. MAX.

MAXIMILIANI.II

EX. PRIVILEGIO



IMP. CAES. AVG.

174

VENETIIS MDLXXIII.

FIG. 169. TITLE PAGE OF PAETUS

Editions. There were two editions of this work published at Venice in 1573. (See next title.)

Although not an arithmetic, this work is a scholarly and interesting contribution to the history of the weights and measures of Greece and Rome, and the symbols inherited by the Middle Ages. It also contains several illustrations of ancient measures.

LUCAS PAETUS. Ed. pr. 1573. Venice, 1573.

See p. 343.

This is a different edition from that just described. The title page is, however, substantially the same.

Description. Fol., 17.5×23.2 cm., the text being 11.6×18.5 cm. 144 pp. (127 numb.), 38 ll. Venice, 1573.

See above.

VALENTIN MENHER. Ed. pr. 1573. Antwerp, 1573.

See p. 249.

Edited by Michiel Cognet, born c. 1549 at Antwerp; died at Antwerp.

Title. See Fig. 170.

Colophon. 'Antverpiæ // Typis Ant. Dieft. 1573.'

Description. 8°, 9.3×13.6 cm., the text being 6.7×11.8 cm. 141 ff. unnumb., 24 ll. Antwerp, 1573.

Editions. I have no doubt there was an earlier edition, although Cognet may have edited this from a manuscript left by Menher.

This is one of the best of the purely business arithmetics of its time. It shows, better than most works of the kind, the state of commerce in the second half of the sixteenth century in Antwerp, then the most progressive of the mercantile cities of the North. In it may be studied the merchandise, the trade routes, the customs of merchants and bankers, and the prices prevailing in that period. It was to the Netherlands what Riese's book had been to Germany and Borghi's to Italy. As the title page shows, it also took a progressive attitude with reference to practical geometry. (On Cognet see p. 365.)

Other works of 1573. Köbel, p. 102, 1514; Moya, p. 310, 1562; Recorde, p. 214, c. 1542; Peter Beausard, 'Arithmetices praxis,' Louvain, 8°; Simon Köpfer, 'Grundbüchlein der Regel Detri,' Nürnberg; Bartolomeo Piccini, 'Trattato de' Cambi,' Florence, 4°.

Works of 1574. Anonymous, p. 244, 1546; Baker, p. 327, 1568; Buckley, p. 252, c. 1550; Jacob, p. 298, 1560; Riese, p. 139, 1522; Rudolff, p. 152, 1526; Seton (see Buckley, p. 252, c. 1550); Lorenzo

L I V R E

D'ARITHMETIQUE,

contenant plusieurs belles questions & demandes, propres & utiles à tous ceux qui hantent la Trafique de Marchandise.

*Composé par feu Valentin Menner Allemand :
reueu, corrigé, & augmenté en plusieurs endroits
par Michiel Cognet.*

E N S E M B L E

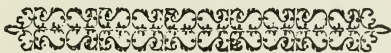
Vne ample déclaration sur le fait des Changes.

I T E M

*Vn petit discours de bien & deuément disconter, avec
la Solution sur diuerses opinions y proposées.*

A V E C

La Solution des questions Mathematiques par la supputation de Sinus, illustrées & amplifiées par les demonstrations Geometriques nécessaires à icelles.



A A N V E R S

Chéz Jean waesberghe, à l'escu de Flandres.

A V E C P R I V I L E G E .

1573.

FIG. 170. TITLE PAGE OF THE 1573 MENNER

Bonocchio, 'Breve et universale risolutione d'aritmética,' Brescia (Venice ?), 4°; ib., 1597; Milles de Norry, 'Arithmétique,' Paris, 4°; Johann Sekgerwitz, 'Rechenbüchlein auff allerley Handthierung,' Breslau.

DIOPHANTUS. Ed. pr. 1575.

Toulouse, 1670.

A Greek mathematician, c. 300 A.D. He was the first great writer upon algebra.

Title. 'Diophanti // Alexandrini // Arithmeticorum // libri sex, // et de numeris multangulis // liber vnus. // Cvm commentariis C. G. Bacheti V.C. // & obseruationibus D. P. de Fermat senatoris Tolofani // Accessit Doctrinæ Analyticæ inuentum nouum, collectum // ex varijs eiusdem D. de Fermat Epistolis. // (Engraving 'Rabault Facit,' with motto: 'Obloquitur numeris septem discrimina vocum.') Tolosæ, // Excudebat Bernardus Bosc, ã Regione Collegij Societatis Iesu. // M. DC. LXX.' (P. 1.)

Description. Fol., 23.4 × 36.3 cm., the text being 15.1 × 23.9 cm. 5 pp. blank + 6 unnumb. + 341 numb. + 48 of notes = 400 pp., 50-55 ll. Toulouse, 1670.

Editions. Basel, 1575. There was no other sixteenth-century edition.

Although entitled an arithmetic this is really a treatise on algebra, the first systematic one ever written. It contains, however, a good deal of matter upon the Greek theory of numbers, notably the 'Clavdii Gasparis Bacheti Sebusiani, in Diophantum Porismatum, Liber Primus,' 'Liber Secundus,' and 'Liber Tertius.' A certain amount of this work also enters into the treatise itself, but this is generally algebraic in character, the standard problem requiring the finding of a number satisfying given conditions. This leads to numerous indeterminate (Diophantine) equations. This edition, by Bachet and Fermat, is one of the best that has been published.

FRANCISCUS MAUROLICUS.

Ed. pr. 1575.

Venice, 1575.

FRANCESCO MAUROLICO. Born at Messina, September 16, 1494; died near there, July 21, 1575. He entered the priesthood and later became professor of mathematics at Messina. He wrote chiefly on astronomy, and edited several works of the Greek mathematicians.

Title. See Fig. 171.

Colophon. 'In monasterio S. Maria // à parte 19. Iulij die, // 8. 11. Indictionis, // 1553.' (P. 305.)

Description. 8°, 15.7 × 20.9 cm., the text being 10.6 × 17.5 cm. 20 pp. unnumb. + 285 numb. + 1 blank = 306 pp., 39-40 ll. Venice, 1575.

D. FRANCISCI
MAVROLYCI,
 ABBATIS MESSANENSIS,
 Opuscula Mathematica ;

*Nunc primum in lucem edita, cum rerum omnium
 notatu dignarum.*

INDICE LOCYPLETISSIMO.

PAGELLA HVIC PROXIME CONTIGVA,
 eorum Catalogus est.

PER ME QUI SI RIPOSA,



EN CIEL SI GODE.

CVM PRIVILEGIO.

Venetijs, Apud Franciscum Franciscum Senensem.

M D L X X V.

FIG. 171. TITLE PAGE OF THE *Opuscula* OF MAUROLYCUS

Editions. There was no other edition. (See below.)

It appears from the colophon that this work was composed in 1553, although it was not published until 1575. It includes (pp. 26-47) a 'Compvvtvs ecclesiasticvs in svmmam collectvs.' The rest of the treatise is chiefly astronomical. It forms the first of two volumes on mathematics, the second being the 'ArithmetiCorum libro duo' (see below).

FRANCISCUS MAUROLYCUS.

Ed. pr. 1575.

Venice, 1575.

See p. 348.

Title. See Fig. 172.

Colophon. 'Libri fecundi ArithmetiCorum Maurolyci finis: hora //decimaOctaua, diei Sabbati, qui fuit Iulij 24^o. Cùm // Meffanæ cum multo pontis & arcus // apparatu expectaretur Io. Cerda, // Methynenfium Dux, // Prorex. Indict. 15. // M. D. LVII. // Venetiis, M D LXXV. // Apud Francifcum Francifcium Senenfem.' (P. 183.)

Description. 4°, 15.9 × 20.9 cm., the text being 13.3 × 17.2 cm. 200 pp. (175 numb.), 40 ll. Venice, 1575.

Editions. This is the first edition, and from the colophon it appears that it lay in manuscript from 1557 to 1575. A second edition appeared in Venice in 1580. The 'ArithmetiCorum libri duo' formed the second volume of the 'Opuscula Mathematica' (Venice, 1575; p. 348).

The work is mediæval, dealing solely with the Boethian theory of numbers. It was one of the last of the extensive sixteenth-century Italian works of this nature, and shows considerable originality in the treatment of figurate numbers. Maurolycus was by no means a mere compiler, but a man of creative power.

HENRICUS BRUCÆUS. Ed. pr. 1575. Rostock, 1575.

Born at Alost, Flanders, c. 1531; died at Rostock, December 31, 1593. He was professor of mathematics at Rome, and later professor of medicine at Rostock.

Title. See Fig. 173.

Description. 8°, 9.5 × 15.1 cm., the text being 6.5 × 11.6 cm. 76 ff. (1 blank), 25 ll. Rostock, 1575.

D. FRANCISCI
MAUROLYCI,
ABBATIS MESSANENSIS,
Mathematici celeberrimi,
ARITHMETICORVM LIBRI DVO,

NVNC PRIMVM IN LVCEM EDITI,
Cum rerum omnium notabilium.

INDICE COPIOSISSIMO.



CVM PRIVILEGIO.

Venetijs, Apud Franciscum Franciscium Senensem.

M D LX X V.

Leonhardus

FIG. 172. TITLE PAGE OF THE *Libri duo* OF MAUROLYCUS

Editions. There was no other edition.

This is a Latin-school manual, in two 'books.' The first book treats of arithmetic, and chiefly of mediæval ratios. The second treats of algebra, the equations being considered from the standpoint of geometry,

HENRICI
BRUCÆI
BELGÆ,
MATHEMATICARVM
EXERCITATIONVM
LIBRI DVO.



ROSTOCHII

EXCVDEBAT IACOBVS LVCIVS
TRANSYLVANVS.

Anno M. D. LXXV,

FIG. 173. TITLE PAGE OF BRUCEUS

and some attention being given to surd numbers, roots, and the rule of false.

Other works of 1575. Gemma, p. 206, 1540; Köbel, p. 102, 1514; Lapazzaia, p. 322, 1566; Mariani, p. 181, 1535; Salignac, p. 359,

1577: Xylander, p. 356, 1577: Mauricius Steinmetz Gersbach, 'Arithmetices praecepta,' Leipzig, 8°.

Works of 1576. Gemma, p. 200, 1540; Petri, p. 325, 1567; Tagliente, p. 115, 1515; Joseph Lange, 'Arithmetica,' Copenhagen, 8°.

GIRJKA GÓRLA Z GÓRLSSTEYNA.

Ed. pr. 1577.

Czerny, 1577.

A Polish Rechenmeister of the latter half of the sixteenth century.

Title. See Fig. 174.

Colophon. 'Wytiffitēnow // Starém Héfté Praš kém // v Girijka Czerneho. // Letha Páně // M. D. LXXVII.' (F. XC, r.)

Description. 8°, 9.5 × 15.9 cm., the text being 7.2 × 11.7 cm. 9 ff. unnumb. + 89 numb. (Roman) = 98 ff., 21 ll. Czerny, 1577.

Editions. There was no other edition.

This is one of the few arithmetics in the Polish language published in the sixteenth century, and is very rare. There was a copy in the Boncompagni sale, but the book is seldom mentioned by bibliographers. It consists of five parts, the first dealing chiefly with the fundamental operations with counters, the second with written operations, the third with fractions, the fourth with business arithmetic, and the fifth with the rule of false and allied topics.

DIONIS GRAY. Ed. pr. 1577.

London, 1577.

A London goldsmith of the second half of the sixteenth century.

Title. See Fig. 175.

Description. Sm. 8°, 8.8 × 13.8 cm., the text being 6.5 × 12 cm. 126 ff. (8 unnumb.). London, 1577.

Editions. London, 1577, 8° (here described); ib., 1586, 8°.

This is a practical arithmetic, consisting of four parts. 'The first containeth foundrie partes of Arithmetique, that is to say,' the fundamental operations with integers, including progressions. 'The seconde parte, containeth the faid partes feruyng for practife of broken numbers or fraccions.' 'The third part containeth the fondrie Rules of proportion, furthered by vse of the foresaid partes,' and includes alligation and the rule of false. 'The fourth parte containeth fondrie Rules of breuetie,' or short processes. It is one of the earliest English arithmetics to contain rules and definitions in rhyme. For example, in

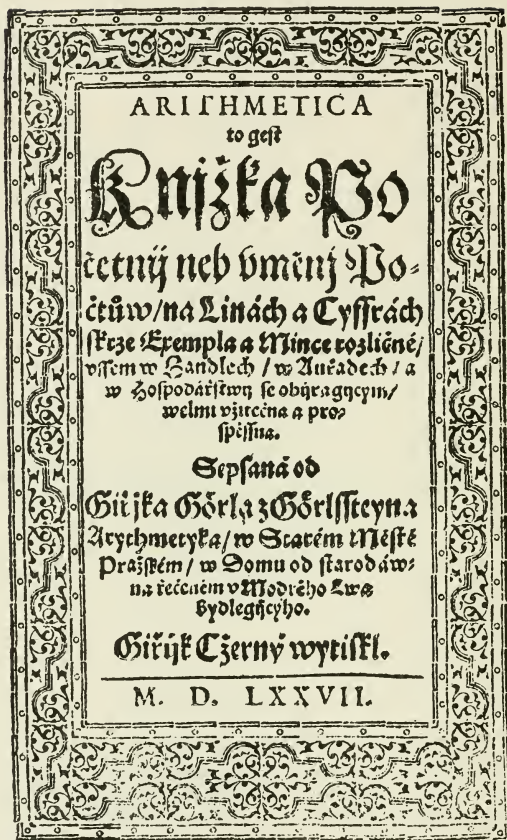


FIG. 174. TITLE PAGE OF JIŘKA GÓRLA Z GÓRLSSTEYNA

speaking of addition Gray says: 'And for to amplifie the effecte, take here a fewe lines in verse :

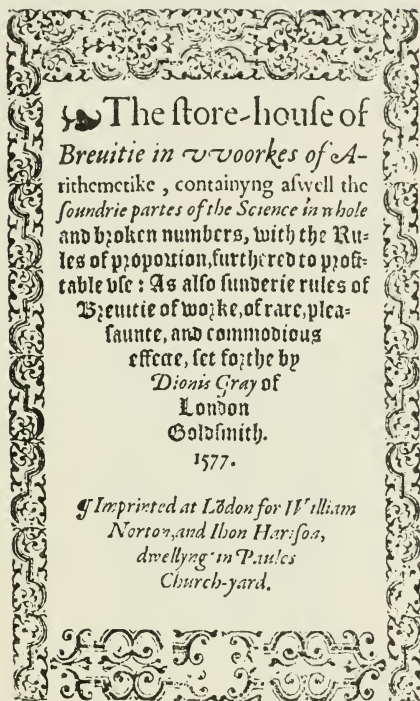


FIG. 175. TITLE PAGE OF GRAY

¶ Of fondrie formes perticulars, one totall for to frame,
 Set them doune right orderly, as worke doeth best require :
 What place ye giue to any one, the rest let haue the fame,
 So maie you well performe the 'ffecte, of what you doe desire.'

The rule is then continued in a series of verses.

GUILIELMUS XYLANDER.

Ed. pr. 1577.

Heidelberg, 1577.

WILHELM HOLTZMANN. Born at Augsburg, December 26, 1532; died at Heidelberg, February 10, 1576. He was professor of Greek at Heidelberg.

Title. See Fig. 176.

Colophon. 'Excudebat Iacobus Mylius, impensis // Matthæj Harnifch.// M. D. LXXVII.' (F. 52, v.)

Description. 4°, 14.9 × 19.2 cm., the text being 10.5 × 16.1 cm. 2 ff. unnumb. + 50 numb. = 52 ff., 31 ll. Heidelberg, 1577.

Editions. There was no other edition of this work. Xylander translated several Greek works into Latin, among them Euclid (Basel, 1562) and Diophantus (Basel, 1575, fol.). The 'Opuscula' appeared a year after his death. Xylander also edited Psellus (Basel, 1556).

As the title states, this work is divided into four parts. The first and most extensive (ff. 1-22) relates to astronomy. The second is purely arithmetical (ff. 22-36), and treats of common fractions, giving the usual operations and the rule of three. The arrangement of this part is peculiar, addition and subtraction being treated together, after which division is explained, multiplication coming last. This order would be justified if Xylander had reduced his fractions to fractions having a common denominator, but he merely follows the usual rule of cross multiplication (f. 29, v.). The third section is 'De syrdis, quos vocant, numeris iis, qui a quadratis primò nascuntur, Infitutio docendo explicanda,' a chapter now conventionally placed in our algebras. The fourth section relates to the celestial globe and the astrolabe (ff. 46-50).

PIETRO ANTONIO CATTALDI.

Ed. pr. 1577.

Bologna, 1577.

CATALDI, CATALDO. Born at Bologna in 1548; died at Bologna, February 11, 1626. Professor of mathematics and astronomy at Florence (1563), Perugia (1572), and Bologna (1584). He wrote several mathematical works, and to him is due the beginning of the theory of continued fractions (1613).

Title. See Fig. 177.

Description. 4°, 14.3 × 19.6 cm., the text being 10.9 × 16.7 cm. 8 ff. unnumb., 40 ll. Bologna, 1577.

OPVSCVLA MATHEMATICA

DOMINI
GVILIELMI XYLANDRI
AVGVSTANI

Aphorismi Cosmographici liber I.

De Minutiis liber I.

De Surdorum Numerorum natura & tractatione liber.

De vsu Globi & Planispharij tractatus.



HEIDELBERGÆ

Excudebat Iacobus Mylius, impensis
Matthæj Harnisch.

M. D. LXXVII.

DVE LETTIONI
DI PIETR'ANTONIO
CATTALDI BOLOGNESE

FATTE NELL'ACADEMIA
del Dissegno di Perugia,

ALLI GENEROSI, ET VIRTUOSISSIMI
 Signori Academici, il Signor Cauallier Paciotto,
 & il Signor Caualliero Analtagi.



IN BOLOGNA.

Per Giouanni Rosi MDLXXVII.

Con licentia de' Superiori.

FIG. 177. TITLE PAGE OF CATTALDI

Editions. There was no other edition. Cattaldi wrote, under the pseudonym Perito Annotio, a 'Prima Parte della Pratica Aritmetica' (Bologna, 1602) and a 'Trattato dei numeri perfetti' (Bologna, 1603), but like all of his strictly mathematical works they appeared after 1600. The second part of the 'Pratica' appeared under his own name in 1606.

This book hardly deserves to be ranked in a list of arithmetics. I have included it, however, because in his first address Cattaldi treats somewhat of numbers, and in the second address he applies arithmetic to mensuration. The treatment is mediæval, and the chief interest in the book is a typographical one; for, the printer not being able to set such numbers, all of the fractions have been written in by hand.

Other works of 1577. Borghi, p. 16, 1484; Buckley, p. 252, c. 1550; Capella, p. 68, 1499; Cressfelt, p. 290, 1557; Herbestus, p. 303, 1561; Hobel, p. 314, 1563; Ramus, p. 331, 1569; Seton, p. 252 (see Buckley, c. 1552); Anonymous, 'Arithmetica,' Debreczin; Miguel Berenguer, 'De numerorum antiquorum notis,' Saragossa; Georg Gehrl, 'Ein nutzlich und künstlich Rechenbuch auff der Federn,' Prag, 8°; Johann Jung, an arithmetic, Lübeck, c. 1557 (no copy extant?); Bernhard Salignacus, 'Tractatus de Arithmetica Partium et Alligationis,' Frankfort (Peacock says 1575); also 'Regula veri,' Heidelberg, 1578, and 'Arithmeticae Libri II, et Algebrae totidem,' Frankfort, 1580, 4°; *ib.*, 1593, 4°.

JACQUES CHAUVET CHAMPENOIS.

Ed. pr. 1578.

Paris, 1578.

Professor of mathematics in the University of Paris, in the second half of the sixteenth century.

Title. See Fig. 178.

Description. 8°, 10.1 × 17 cm., the text being 7.5 × 14 cm. 9 pp. unnumb. + 383 numb. = 392 pp., 28–29 ll. Paris, 1578.

Editions. There was no other edition. The privilege is dated 'a Paris le huictiefme iour de Septembre, M. D. LXXVII.', and the dedicatory epistle 'De Paris ce 28. de Nouembre 1577.'

The chief interest in the book lies in the fact that it was written by a man who was so interested in military matters as to take a large number of his applied problems from army life. The arrangement of the book is not peculiar, but the great array of military problems is unique, and, having been prepared especially for this work, would form an

LES
INSTITUTIONS
 DE L'ARITHMETIQUE DE
 IACQUES CHAVVET CHAMPENOIS, Professeur és Mathematiques en
 l'Vniuersité de Paris, diuisees en
 quatre parties: avec vn petit
 Traicté des fractions
 Astronomiques.



A PARIS,

Chez Hierosme de Marnef, au mont
 S. Hilaire, à l'enseigne du Pelican.

1578.

AVEC PRIVILEGE DV ROY.

Ad. Th. f. Verneley Corsini?

FIG. 178. TITLE PAGE OF CHAVVET CHAMPENOIS

interesting source for the study of army conditions in France in the sixteenth century.

Other works of 1578. Capella, p. 66, 1499; Gemma, p. 200, 1540; Ramus, p. 355, 1569; Salignacus, p. 359, 1577; Tartaglia, p. 278, 1556; Trenchant, p. 320, 1566.

JOHANN OTTO. Ed. pr. 1579. Leipzig, 1579.

A Freiburg Rechenmeister, born c. 1529. The dedicatory epistle is dated 1579, and is signed 'Johan Otto. Ætatis suæ 50,' which approximately fixes the date of Otto's birth.

Title. See Fig. 179.

Colophon. 'Getruckt zu Leipzig/ bey Johan // Rhambawes Seligers hinderlaf-//nen Erben/ 1579.' (P. 423.)

Description. 4°, 14.5 × 19.1 cm., the text being 11.7 × 17.5 cm. 424 pp. (381 numb.), 28–38 ll. Leipzig, 1579.

Editions. There was no other edition.

The book is composed almost entirely of tables, although the first few pages give a brief treatment of counter reckoning.

CHRISTIAN URSTISIUS. Ed. pr. 1579. Basel, 1579.

ALLASSIDERUS, ALLASSISIDERUS, WURSTEISEN, URSTIS. Born at Basel in 1544; died at Basel March 30, 1588. He was educated at Basel and became professor of mathematics (1565) and afterwards (1585) of theology in that university.

Title. See Fig. 180.

Colophon. 'Basileæ Helve-//tiorvm, // per Sebastianvm Hen- //ricpetri, An. hvmanitatis // Filii Dei, CIO. IO. LXXIX. // Menfe Augufto.' (P. 192.)

Description. 8°, 10.3 × 16.6 cm., the text being 6.4 × 11.2 cm. 192 pp., 25–28 ll. Basel, 1579.

Editions. On p. 192 is a woodcut with the date 1569, evidently used from some earlier work of the printer's. Murhard (vol. I, p. 173) mentions a work by Urstisius, 'Zwey Bücher von der Rechenkunft, defsgleichen in der deutſchen Sprache nie ausgegangen,' Basel, 1569, 4°, in which this woodcut may have been used. He also mentions an edition at Basel in 1595. An English translation by T. Hood appeared in 1596.

Calculator.

Lin newes / liebliches /
vnd nütliches ausgerechnetes Rechen=
buch für alle / so Arithmetiam lieb haben /
Insonderheit aber für Kauffleut / Amptspersonen /
Händler / Krämer vnd allesampt (sie seien hie oder ausländische
Personen) so sich des Einkaufens vnd verkauffens zu Leipzig gebrauchen /
auff die Wag vnd Gewicht obgedachter löblichen handel Stadt Leipzig ge=
stelt : Auch andern Stedten gleichofals dienstlich / als zu Franckfort an der
Oder / zu Freiberg / Dresden / Kempnis vnd Amberg / etc. vnd in summa
allenthalben / wo der Centner auff 110. pfund ausgeteilet ist. Darinnen alle
keuff auff Centner gut / vnd anderer farnembsten wharen austragende Sum=
ma gar behend one Multipliciren vnd Diuidiren , allein durch die allerleichteste
species der Addition oder Summirens / vnd auch an einem blat egllich hundert
tausent Exempla vnd Fragen zu finden / vnd auffzulösen sein. Was
aber mehrers zu diesem Tittel gehörig / ist auff der
andern seiten dieses blats vermeldet

Durch

Johan Otthhen Notarien, der Rechen=
kunste Studiosum, zu Freiberg in der alten
berühmbten Churfürstlichen Sächsischen
Bergstadt / Mitbüraer.

℞

Pfalm. 90.

*Mandauit DOMINVS angelis suis de te, vt custodiant
te in omnibus vijs tuis.*

Leipzig/

1 5 7 9.

FIG. 179. TITLE PAGE OF OTTO

This is a book written by a gymnasium teacher, who was filled with a love of the classical learning, and yet who recognized that the old Boethian arithmetic must give way to the practical treatment demanded

ELEMENTA
A·R·I·T·H·
M·E·T·I·C·Æ, LOGI-
CIS. LEGIBVS.
 DEDVCTA,

In usum Academiae Basil.

Opera & studio

CHRISTIANI VRSTISII,
Mathematicarum profes-
oris.



BASILEÆ,
 PER SEBASTIANVM HEN-
 RICPETRI.

FIG. 180. TITLE PAGE OF URSTISIUS

by modern conditions. As a result it is a somewhat heavy treatment of part of the old theory of numbers, together with the fundamental operations, roots, and certain commercial applications of the rule of three, of partnership, and of alligation. Urstisius expresses his indebtedness

chiefly to Euclid, Ramus, Salignacus, Gemma Frisius, and Scheubel, not a very extensive list for 1579.

Other works of 1579. Digges, p. 340, 1572; Gemma, p. 200, 1540; Mariani, p. 181, 1535; Riese, p. 139, 1522; Tagliente, p. 115, 1515; Anonymous, 'Nouvelle et facile méthode d'arithmétique,' Lyons, 16°; Miguel de Eleyzalde, 'Guia de contadores,' Madrid, 4°.

GIAMBATTISTA BENEDETTI.

Ed. pr. 1580.

Turin, 1585.

JOHANNES BAPTISTA BENEDICTUS. Born at Venice, August 14, 1530; died at Turin, January 20, 1590. Philosopher and mathematician of the Duke of Savoy.

Title. 'Io. Baptistae // Benedicti // Patritij Veneti Philofophi. // Diversarvm Specvlationvm // Mathematicarum, & Phycicarum // Liber.// Quarum feriem sequens pagina indicabit.// Ad Srenissimvm Carolvm Emanvelem // Allobrogvm, et Svbalpinorvm // Dvcem Invictissimvm.// (Large woodcut.) Tavrini, Apud Hæredem Nicolai Beuilaquæ, MDLXXXV.// Superioribus permiffum.' (F. 3.)

Description. Fol., 20.7 × 30 cm., the text being 14.5 × 23 cm. 425 pp. numb. + 10 unnumb. + 1 blank = 436 pp. (118 in the part devoted to arithmetic), 42-46 ll. Turin, 1585.

Editions. Turin, 1580, fol.; ib., 1585, fol. (here described); Venice, 1599, fol.

This work is composed of six parts, of which the first is entitled 'Theoremata Arithmetica.' The other five parts relate respectively to perspective, mechanics, Aristotle, Euclid's book on proportion, and physics. The arithmetic is a scientific consideration of various matters of theory, and is best illustrated by the following theorems, which, as is usually the case, are stated in the form of questions: 'Theorema IIII. Cvr multiplicaturi fractos cum integris, rectè multiplicent numerantem fracti per numerum integrorum, partianturque productum per denominantē fracti, ex quo numerus quæsitus colligitur?' 'Theorema XXIX. Quid caufe est, cur subtrahcto duplo producti duorum numerorum ad inuicem multiplicatorū ex summa fuorum quadratorum, femper quod fuper est duorum numerorum quadratum differentie fit?' All such questions are answered by the aid of diagrams, quite as Euclid would have done. The graphic treatment is even applied to such problems as that of the couriers ('Theorema CXIII'). There is an interesting

'Appendix de specvlatione regvlæ falsi,' which closes the arithmetic, and sets forth an elaborate explanation, with graphic aids, of the rule of false which was then so common.

As a specimen of graphic arithmetic, combining the Euclidean theory with the Renaissance practice, Benedetti's book is worthy of more attention than it has received. It may be inferred from some of his statements that, although purely a theorist himself, he recognized the obsolete nature of much that the practical arithmetics had to offer. It is possible that the common partnership problems were already considered too traditional, for he says: 'Svpponunt *antiqui* aliquot mercatores dantes pecunias lucro in diuerfis vnus anni temporibus,' etc.

ISAAC RIESE. Ed. pr. 1580.

Leipzig, 1580.

One of the five sons of Adam Riese (p. 138).

Title. See Fig. 181.

Colophon. 'Gedruckt zu Leipzig // ben Hans Rhambaw // im Jar // M. D. LXXX.' (P. 402.)

Description. 4°, 14.1 × 17.9 cm., the text being 11 × 16.5 cm. 36 pp. unnumb. + 366 numb. = 402 pp. Leipzig, 1580.

Editions. There was no other sixteenth-century edition.

Although this book contains a brief treatment of the operations, it is largely made up of tables for the use of merchants. It is therefore not a textbook, and I believe it went through only one other edition (Leipzig, 1619).

WILLEM RAETS. Ed. pr. 1580.

Antwerp, 1580.

A Dutch arithmetician of Maastricht. The privilege is dated May 22, 1576, and mentions only the name of Raets. Coignet (Cognet) in his preface, however, speaks of his particular friend ('mijn zōderlinge goet vrient') Raets as dead ('meynen ouerledē vrient'), so that he very likely died between 1576 and 1580. Coignet was also the editor of Menher's arithmetic (see p. 346).

Title. See Fig. 182.

Description. 8°, 9.8 × 14.7 cm., the text being 7.4 × 11.9 cm. 88 ff. unnumb., 27-31 ll. Antwerp, 1580.

Editions. There was no other edition.

This work is one of several elementary business arithmetics appearing in the Low Countries about this time. It is a small book of no special merit save as it shows the style of commercial problems of the period. The similarity of the title page to that of Menher's 'Arithmetique seconde' of 1556 (p. 283) is interesting.

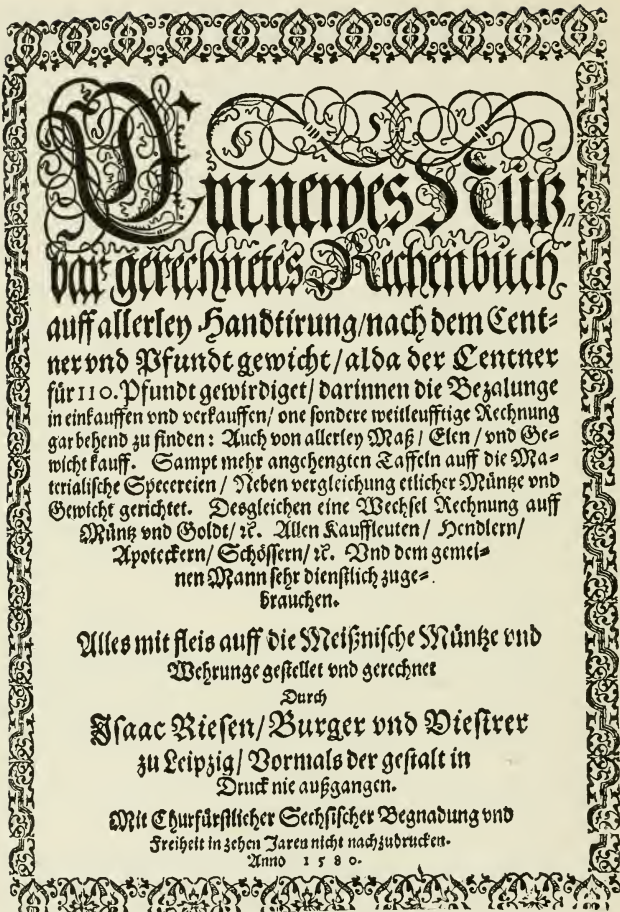


FIG. 181. TITLE PAGE OF ISAAC RIESE

Other works of 1580. Apianus, p. 155, 1527; Baker, p. 327, 1568; Cassiodorus, p. 211, 1540; Gemma, p. 200, 1540; Gyraldus, p. 254, 1552; Mariani, p. 180, 1535; Maurolycus, p. 350, 1575; Ramus, p. 331, 1569; Ringhieri, p. 253, 1551; Salignacus, p. 359, 1577; J. Ammo-

ARITHMETICA

Oft

**Een nieuw Cijfferboeck/ van
Willelm Raets / Maastrichter.**

VVaer in die Fondamenten seer grondelijck verclaert
en met veel schoone questien gheillustreert vor-
den, tot nut ende oorbær van alle Cooplidē
ende lief hebbers der seluer Consten.

Met noch een Tractaet vande VVisselroede, met Anno-
taten verciert, dogh Michiel Coignes.

de v. Raet



T'hantwerpen,
**Ten huysse van Hendrick Hendriksen/ inde
Tschelieboecme. 1580.**
Met Priuilegie van thien Jaeren.

FIG. 182. TITLE PAGE OF RAETS

nius, 'Isagoge Arithmetica,' Wittenberg, 8°; H. Flicker, 'Arithmetices introductio,' Cologne, 8°, and 'Compendium calculorum, seu projectili-ratiocinationis,' ib., 8°; C. Zuccantini, 'Libro d'Albaco,' Siena, 12°.

ANTONIO MARIA VISCONTI.

Ed. pr. 1581.

Brescia, 1581.

A mathematician of Piacenza, of the latter part of the sixteenth century.

Title. See Fig. 183.*Colophon.* 'Brixiae.// apud Iacob. & Policretum de Turlinis.// M D L XXXI.// Svpriorvm Premissv.' (P. 301.)*Description.* 4°, 14.8 × 20.2 cm., the text being 9.4 × 15.6 cm. 304 pp. (289 numb.), 37 ll. Brescia, 1581.*Editions.* There was no other edition. Riccardi believes the date 1551 in Murhard is a misprint. I find no such edition.

This rare and curious book is a combination of algebra, advanced arithmetic, geometry, and the mensuration of river lands. The arithmetic is designed to be an application of the algebra, and includes roots, equation of payments, proportion, and a little bookkeeping.

Other works of 1581. Anonymous, p. 195, 1539; Fischer (Piscator), p. 247, 1549; Gemma, p. 200, 1540; Lonicerus, p. 253, 1551; Peverone, p. 290, 1558; Ramus, p. 330, 1569; Riese, p. 139, 1522; Johann Kandleon, 'Arithmetica,' Regensburg (referred to in the carelessly prepared Boncompagni sale catalogue, but probably the Kaudler book of 1591). There was also 'A short Introduction to Arithmetic' published anonymously in London c. 1581-90, 8°.

JULIUS CAESAR of Padua.

Ed. pr. 1582.

Frankfort, 1678.

A German-Italian teacher of the sixteenth century.

Title. 'Julii Cæsaris // von Padua // Arithmetifche // Practick // Welche in allen Ländern // fehr nützlich kan gebraucht // werden/ bey Kauff- und Ver-//kauffung allerley Wahren/ auch // die groffen Müntz-Sorten in // kleine/ und die kleine in groffe // zu verwandeln:// Samt der Erklärung/ wor-//inn ein Jedweder/ der nur die // Ziffern keñet/ alfo bald fehen kan// wie diß Büchlein zu verftehen ift.// Nebenft Morgen- und Abend-//Gebehten und Gefängen/ den // reyfenden Perfonen gar bequem // bey fich zu führen.// Und dann letztlich/ eine kurtze Be-//fchreibung/ der denckwürdigften // Sachen/ fo von Anfang der Welt/ biß // zu diefer Zeit/ vorgangen.// Franckfurt am Mayn/ // Druckts Blafius Jlbner/ im Jahr 1678.' (P. 1.)

ANTONII MARIAE
VICECOMITIS
CIVIS PLACENTINI,

*Practica Numerorum, & Mensurarum, ac Alluionis partitionem,
inuestigandi, & vt in Indice sequenti.*



B R I X I A E .

APVD IACOBVM, ET POLYCRETVM
de Turlinis Fratres. 1581.

FIG. 183. TITLE PAGE OF VISCONTI

Description. 12°, 4.7 × 11 cm., the text being 3.9 × 9.8 cm. 504 pp. (239 and 258 numb.); tables 28 ll., other pages 22 ll. Frankfort, 1678.

Editions. Strasburg, 1582, 16°; ib., 1583; ib., 1585; ib., 1592, and after 1600 as late as 1679.

The first part of the work is devoted to multiplication tables. This is followed by a chapter on chronology. The last part of this edition is a separate book of prayer, 'Christliche Morgen- Und Abend Gebeht,' of the same date (1678). There is nothing arithmetical in the work except the tables.

GASPARO SCARUFFI. Ed. pr. 1582. Reggio, 1582.

An Italian jurist of the sixteenth century.

Title. See Fig. 184.

Colophon. 'In Reggio, // Per Hercoliano Bartoli. // M.D. LXXXII.' (F. 65, v.)

Description. Fol., 21 × 30.2 cm., the text being 12.7 × 19.5 cm. 65 ff., 32 ll. Reggio, 1582.

Editions. This is the only sixteenth-century edition of Scaruffi's work, the privilege being dated July 15, 1582. The dedicatory epistle is, however, dated at Reggio, May 16, 1579.

The work is called in the running headlines a 'Discorso sopra le monete,' and is a historical treatise on money and coinage, touching slightly on exchange.

GASPARO SCARUFFI. Ed. pr. 1582. Reggio, 1582.

See above.

Title. 'Breve Instrvttione // sopra il discorso // fatto dal Mag. M. // Gasparo Scarvffi, // per regolare le cose delli // danari. // (Woodcut representing a bishop, surrounded by these words: S. Prosper // Episcopvs // Regii //.) In Reggio, // per Hercoliano Bartoli. // M. D. LXXXII.' (F. 1, r.)

Colophon. 'Di Reggio il xvij. Aprile. M.D.LXXXI.' (F. 9, r.) The colophon and title page do not agree as to date.

Description. Fol., 21 × 30.2 cm., the text being 12.8 × 20 cm. 9 ff., 27-30 ll. Bound with the preceding work. Reggio, 1582.

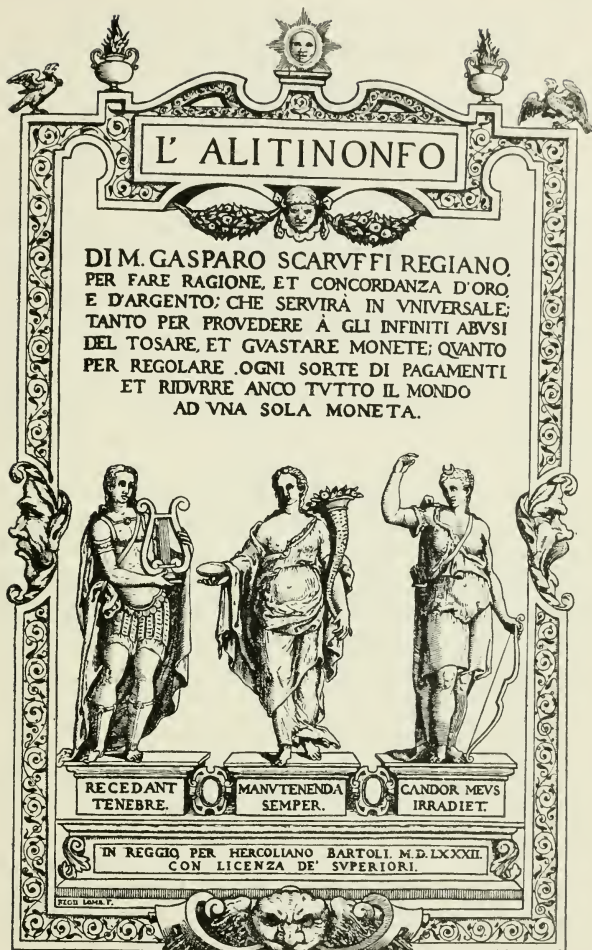


FIG. 184. TITLE PAGE OF SCARUFFI

Editions. There was no other edition.

A verbose commentary on certain parts of Scaruffi's work. See p. 370.

JOANNES THOMAS FREIGIUS.

Ed. pr. 1582.

Basel, 1582.

A Swiss educator of the sixteenth century.

Title. 'Ioan. Thomæ // Freigii I. V. D. // Pædagogvs. // Hoc est, libellvs // ostendens, qva ratio // ne prima artivm ini // tia pueris quàm facilli // mè tradi pof // fint. // Basileæ, // per Sebastianvm // Henricipetri.' (P. 1.)

Colophon. 'Basileæ, // per Sebastianvm Hen // ricipetri, anno salvtis // nostræ instauratæ CIO. IO. XXCII. // Menfe Septembri.' (P. 383.)

Description. 8°, 10.1 × 15.8 cm., the text being 6.8 × 12.4 cm. 17 pp. unnumb. + 1 blank + 366 numb. = 384 pp., 30-31 ll. Basel, 1582.

Editions. There was no other edition.

This is a general summary of the subject-matter of education, published, after the author's death, by his two sons John Thomas and John Oswald (Joannes Osualdus) Freigius. The section devoted to arithmetic begins on p. 144 and ends on p. 156, and p. 145 is reproduced in Fig. 185. Only the fundamental operations with integers, fractions, and compound numbers are given, save for nine lines on the 'Aurea Regula . . . uulgô uocatur regula Detri.'

MATTHEW HOSTUS. Ed. pr. 1582.

Antwerp, 1582.

A German educator of the sixteenth century.

Title. See Fig. 186.

Colophon. 'Matthæus Hoftus Francofordiæ ad Oderam hæc obferuata congerebat & edebat elegantioris literaturæ // ftudiofis gratificaturus, Anno Chrifto nato CIO. IO. LXXXI.' (On map at end.)

Description. 8°, 10 × 14.6 cm., the text being 7.6 × 13.3 cm. 61 pp. numb. + 3 blank = 64 pp., 20-32 ll. Antwerp, 1582 (colophon 1581).

Editions. There was no other edition.

DE ARITHMETICA. 145

Quid est Arithmetica?

Est ars bene numerandi. Subiectum igitur Arithmetice est numerus.

Quot sunt considerata in numero?

Duo: Notatio & numeratio.

Quanam est Notatio?

Numeri in abaco scribendi & notandi decem notæ sunt, 1. 2. 3. 4. 5. 6. 7. 8. 9. 0. Circulus per se nihil significat, ualeat tamen ad alias notas amplificandam pro uarijs gradibus. M. 10. 100. 1000. 10000.

Quanam fuerunt notæ Romanorum?

- I. 1.
- V. 5.
- X. 10.
- L. 50.
- C. 100.

D. 1000. Quingenta.

CD. 500. Mille.

CD. 5000. Quinque millia.

CM. CCCI. 10000. Decem millia.

CDL. 50000. Quinquaginta millia.

CCCL. 100000. Centum millia.

CDL. 500000. Quingenta millia.

CCCCD. 1000000. Decies cetera millia.

Romani numeri non progrediuntur ultra decies centena millia illa et cum plura significare uolunt, duplicant rotas: ut,

II. 2000.

CCD. CCD. CCD. 3000.

DD. DD. 1500. III. D.

k 100

FIG. 185. FROM THE *Pedagogus* OF FREIGIUS

DE
 NUMERATIONE
 EMENDATA,
 VETERIBVS LATINIS
 ET GRÆCIS VSITATA,

Matthæo Hosto auctore.



ANTVERPIÆ,
 Ex officina Christophori Plantinai.

M. D. LXXXII. 0

Fig. 186. TITLE PAGE OF HOSTUS

This is a semi-historical treatise on the various numeral systems found in Renaissance literature. It includes the Arabic system, and the Greek, Latin, and Hebrew ('gens Iudaica,' as Hostus speaks of it) systems, and a chapter 'De notis Numerorum Afronomicis quibusdam vfitatis,' a set of mediæval astrological numerals also fully described by Noviomagus.

MAFFEO POVEIANO. Ed. pr. 1582. Bergamo, 1582.

A Veronese arithmetician of the sixteenth century.

Title. See Fig. 187.

Description. 4°, 15.1 × 16.5 cm., the text being 10.3 × 15.6 cm. 92 ff. (83 numb.), 22–26 ll. Bergamo, 1582.

Editions. There was no other edition.

An ordinary treatment of the fundamental operations, with a few applications to mercantile affairs. The book had not enough merit to warrant a second edition. The second part of the work treats of elementary mensuration. The book is little known, and, like many others in this list, is not mentioned by De Morgan.

Other works of 1582. Gemma, p. 200, 1540; Moya, p. 310, 1562; Sacrobosco, p. 32, 1488; Stevin, p. 386, 1585; Clement, 'Summa del arte arithmetica, de Fr. de Sant Clement,' Barcelona, 4°; Ognibene de Castellano, 'Il lineamento pertinente all' intendere facilmente quello, che Euclide & altri Eccellentiss. Mathematici hà trattato oscuramente,' Vincenza, 8° (contains some theory of numbers; see also p. 306, 1561); Mellema, 'Arithmétique composée de plusieurs inventions et problèmes nouveaux,' Antwerp, 2 vol., 1582 and 1586.

CHRISTOPHER CLAVIUS. Ed. pr. 1583. Rome, 1583.

CHRISTOPH KLAU. Born at Bamberg in 1537; died at Rome, February 6, 1612. He was a Jesuit priest, and taught mathematics in the Jesuit college at Rome. He wrote a number of treatises on mathematics.

Title. See Fig. 188.

Description. 8°, 10.5 × 16.6 cm., the text being 8 × 13.3 cm. 219 pp. numb. + 13 unnumb. = 232 pp., 38 ll. Rome, 1583.

Editions. Rome, 1583, 8° (here described); Cologne, 1584; Rome, 1585, 8° (p. 378); Cologne, 1592. There were also editions after 1600 (see p. 378 for the 1602 edition). The Italian translation of 1586 is mentioned on p. 378. The collected works of Clavius in five volumes appeared at Basel in 1612, fol.



FATTORE

LIBRO D'ARITHMETICA,
ET GEOMETRIA PRATTICALE.

DI M. MAFFEO POVEIANO
VERONESE.

Opera noua, & vtillissima

*Delle più breui, & generali prattiche, che usar si possono,
necessarie ad ogn'uno.*



Con licenza de' Superiori.

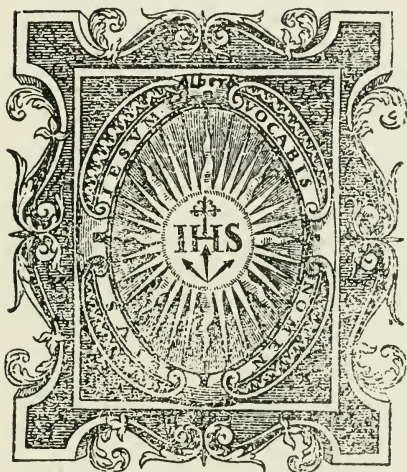
IN BERGAMO L'ANNO DI N. SIG.
M D LXXXII.

Per Comin Ventura, Stampatore in essa Città.

FIG. 187. TITLE PAGE OF POVEIANO

CHRISTOPHORI
CLAVII
BAMBERGENSIS
E SOCIETATE
IESV

EPITOME ARITHMETICÆ
Practicæ.



PERMISSV SUPERIORVM.
ROMÆ Ex Typographia Dominici B.ise. 1583.

FIG. 188. TITLE PAGE OF CLAVIUS

Clavius was an excellent teacher of mathematics, and his textbooks were models of good arrangement. This work is an attempt at a practical arithmetic. It is conservative in treatment, the applications being confined, as was the custom, largely to the rule of three. It was too scholarly to be popular in schools under the mercantile influence, but it was influential in the classical schools.

CHRISTOPHER CLAVIUS. Ed. pr. 1583. Rome, 1585.

See p. 375.

Title. 'Christophori // Clavii // Bambergensis // e Societate // Iesv // Epitome Arithmeticae // Practicae nunc denuo ab ipso auctore // recognita. // (Woodcut with I. H. S. in center.) Permissu Superiorum // Romae Ex Typographia Domini Bafæ. 1585.' (P. 1.)

Description. 8°, 10.3 × 16 cm., the text being 8 × 13 cm. 337 pp. (321 numb.), 31 ll. Rome, 1585.

See above.

CHRISTOPHER CLAVIUS. Ed. pr. 1583. Rome, 1586.

See p. 375.

Title. 'Aritmetica // Prattica // composta dal Molto // Reuer. Padre Chriftoforo Clauio // Bambergense della Com-//pagnia di I E S V. // Et tradotta da Latino in Italiano dal Signor // Lorenzo Castellano Patritio // Romano. // Con Licentia dei Superiori. // (Woodcut with I H S in center.) In Roma, // Nella Stamperia di Domenico Bafa. // M. D. LXXXVI.' (P. 1.)

Description. 8°, 10.3 × 15.6 cm., the text being 8.2 × 13.3 cm. 302 pp. (275 numb.), 39 ll. Rome, 1586.

Editions. See p. 375.

This is merely an Italian translation of the 1583 edition (see p. 375). Clavius was unable, however, to popularize the book in the mercantile schools of Italy, although several editions appeared after 1600.

CHRISTOPHER CLAVIUS. Ed. pr. 1583. Rome, 1602.

See p. 375.

Title. 'Arithmetica // Prattica // composta dal Molto // Reuer. Padre Chriftoforo Clauio // Bambergense della Com-//pagnia di

IESV.// Et tradotta da Latino in Italiano dal Signor Lorenzo // Castellano Patritio Romano.// Reuifta dal medemo Padre Clauio // con alcune aggiunte.// Con Licentia de i Ssuperiori.// In Roma, // (woodcut with I. H. S. in center.) Per li Heredi di Nicolò Mutij // M. DC. II.' (P. 1.)

Colophon. 'In Roma, // Per li Heredi di Nicolò Mutij M D C II.' (P. 312.)

Description. 4°, 10.4 × 15.7 cm., the text being 8.3 × 13.3 cm. 312 pp. (281 numb.), 39 ll. Rome, 1602.

Editions. This is the second Italian edition (p. 375).

See p. 378.

NICOLAUS REYMERS. Ed. pr. 1583. Leipzig, 1583.

A German surveyor, born at 'Henstede in Dietmarschen.' The 'Bechluss' is dated 'zu Hattfede in Diethmarchen,' September 14, 1583.

Title. 'Geodæsia // Ranzoviana. // Landt Rechnen // vnd Feldmessen / sampt messen aller // hand gröffe. Alles auff eine leichte / behende // vnd vormals vnbeandte neue art / künft // lich / gründlich vnd deutlich // beschriben // Zu Ehren // Dem Edlen / Bestrengen // vnd Ehrnuehften Herrn / Heinrichen // Rantzouen / Herrn Johans feligen Sohne / der // Kôn. Mayft. zu Dennemarcken / etc. In den // Fürftenthumben Schlefewick / Holftein / vnd Diethmar // fchen / Stadthaltern / Rhat vnd Ambtman auff // Segeberge / Erbgefessen zum // Breitenberge / etc. // Durch // Nicolaum Reymers / von Henstede // in Dietmarschen. // Cvm Privilegio.' (F. 1, r.)

Colophon. 'Gedruckt zu Leipzig bey // Georg Defner // Im Jahr // M. D. LXXXIII.' (F. 44, v.)

Description. 4°, 15.1 × 18.6 cm., the text being 9.7 × 14.5 cm. 44 ff. unnumb., 25 ll. Leipzig, 1583.

Editions. There was no other edition.

Although nominally a book on surveying, this work may properly rank as an arithmetic, the 'Erste Buch' being entirely devoted to that subject. Of this book the first chapter is entitled 'von zahlen'; the second, 'von brüchen'; the third, 'von summieren'; the fourth, 'von vielfeltigen,' multiplication thus directly following addition; the fifth, 'von

abziehen'; the sixth, 'von Theilen' (division); the seventh, 'von den Wurtzel'; the eighth, 'von der gevierten Wurtzel.' The rest of the work is devoted to mensuration, and in particular to surveying. The chief interest in the first book is in the use made of the compound numbers then needed in surveying. Like most such manuals, it shows no insight into educational problems, and the treatment is very unsatisfactory.

Other works of 1583. Baker, p. 327, 1568; Caesar, p. 370, 1582; Gemma, p. 200, 1540; Petri, p. 325, 1567; Reisch, p. 82, 1503; Anonymous, 'Rechenbüchlein auf Erfurtische weifs,' Erfurt, 8°; Johann Weber, 'Ein new Kunstlich Rechenbuch auff den linien und ziffern,' Leipzig, 4° (see also p. 338, 1570).

PETRUS BUNGUS. Ed. pr. 1583-84. Bergamo, 1584-85.

Born at Bergamo; died September 24, 1601, at Bergamo. He was a canon of the cathedral in that city. He wrote only on the mystery of numbers.

Title. See Fig. 189, which gives the title page of the first part. Bound with this is the second part with the title: 'Mysticae // nvmerorum // significationis // pars altera, // Io. Petro Bongo Canonico Bergomate // avctore, // In qua de Numeris in Sacris libris potiffimum repertis, ex Theo-//logorum maxime fententia, & probatorum aliorum cuiufuis // facultatis Scriptorum, ita exacte, dilucide, & accurate differi-//tur, vt ferme nil addi, aut detrahi posse videatur: // Opus varia fane, et multiiuga adeo refertum doctrina, vt non Theo-//logis solum; sed etiam Philosophis, Mathematicis, atque alijs ftu-//diosis omnibus, tam vtile, quam iucundum fit futurum. // De Svperiorvm licentia. // Bergomi CIO IO XXCIV. // Typis Communi Venturæ, eiusdem Urbis typographi.'

Description. Fol., 20.6 × 30.4 cm., the text being 17 × 28.9 cm. 276 pp. (245 numb.) in the first part; 198 pp. (177 numb.) in the second part; 36 ll. Bergamo, first part 1585, second part 1584.

Editions. The first edition appeared in 1583-84, 'Bergomi, typis Comini Venturæ.' The second part of this work, as the title page shows, is therefore of the first edition. The first edition of the first part was evidently exhausted before that of the

M Y S T I C A E
N V M E R O R V M
S I G N I F I C A T I O N I S

L I B E R

I N D V A S D I V I S V S P A R T E S ,

R . D . P E T R O B O N G O

C A N O N I C O B E R G O M A T E

A V C T O R E :

Opus maximarum rerum , & plurimarum doctrina , sua-
uitate , copia , & uarietate refertum ,

*Theologis , Philosophis , Mathematicis , atque alijs studiosis
omnibus , tam utilitatem , quam iucunditatem
allaturum .*

D E S V P E R I O R V M L I C E N T I A .



B E R G O M I C I O I O X X C V .

Typis Comini Venturæ , & Socij .

FIG. 189. TITLE PAGE OF THE 1585 BUNGUS

second part was sold, and hence the first part of the present work is the second edition.

There were also editions as follows: Venice, 1585, 8°; Bergamo, 1590; *ib.*, 1591, 4° (which De Morgan incorrectly calls the second edition); *ib.*, 1614 (p. 384). It appeared under the

Romanorum		
CIC	CIC	CIC
∞	∞	∞
III		3000.
IIIM		
CIC	ICC	
∞	ICC	4000.
V		
V̄		
I,CC		5000.
ICC		
V CIC		
V M		
ICC	CIC	
ICC	∞	6000.
VII CIC		7000.
ICC	CIC CIC	
ICC	∞ ∞	
CIC	CIC CCIC	
∞	∞ CCIC	8000.

FIG. 190. FROM THE 1614 EDITION OF BUNGÛS

title 'Numerorum mysteria,' Bergamo, 1599, 4° (p. 384). I have an edition under this title, published at Paris in 1618 (1617 in the colophon), 4°. For the 'Praecipuae numerorum notae et earum valor,' Parma, 1689, see p. 384.

This is a mass of erudition, prolix and unscientific, relating to the mystery of numbers. It was written by a priest for the use of preachers,

and it includes all of the allusions to such matters as the mystic three that Bungus could find in ancient literature. He takes up the various numbers from one to ten in the same way, together with a few of the more interesting larger numbers. For students interested in popular number mysticism the book still remains the classic in its way. It is also of much value in showing the nature of the Roman numerals in use in the sixteenth century. (See Figs. 190, 191.)

Numeratio.	
$\overline{\text{CIC}} \text{ CCIC}$ $\infty \text{ CCIC}$	9000.
$\overline{\text{CCIC}} \text{ IC}$ C.C.IC.C	
$\overline{\text{X}}$ $\overline{\text{X}}$	10000.
CC.ICC CMC CMI IMI	
$\overline{\text{CCIC}} \text{ IC}$ $\text{CC.ICC} \infty$	11000.
$\overline{\text{CCIC}} \text{ IC IC}$ $\text{CC.ICC} \infty \infty$	12000.
$\overline{\text{CCIC}} \text{ IC IC IC}$ $\text{CCIC} \infty \infty \infty$	13000.
$\overline{\text{CCIC}} \text{ IC IC}$ $\text{CCIC} \infty \text{ IC}$	14000.
$\overline{\text{CCIC}} \text{ IC}$	15000..

FIG. 191. FROM THE 1614 EDITION OF BUNGUS

Other works of 1584. Buckley, p. 252, 1550; Cassiodorus, p. 211, 1540; Clavius, p. 375, 1583; Delfino, p. 275, 1556; Köbel, p. 102, 1514; Ramus, p. 263, 1555; Anton Schulze, 'Arithmetica oder Rechenbüchlein,' ('Arithmetica oder Rechenbuch neben einer dienlichen Anleitung zum Buchhalten?') s. l., with subsequent editions at Liegnitz, 1600, 4°, and Frankfort, 1600, 4°.

PETRUS BUNGUS. Ed. pr. 1583-84. Bergamo, 1599.

See p. 380.

Title. 'Petri Bongii // Bergomatis // Numerorum myſteria. // Opvs maximarvm rervm // Doctrina, et copia refertvm, // In quo mirus in primis, idemq̄ perpetuus Arithmeticae Pythagoricae cum // Diuinæ Paginæ Nvmeris confenfis, multiplici ratione probatur. // Poſtrema hac editione ab Auctore ipſo copioſo Indice, & ingenti // Appendice avctvm. // Cum Superiorum approbatione. // Bergomi, Typis Comini Venturæ, eiufdem vrbis Typographi. // ∞ IO XCIX.' (P. 1.)

Description. 4°, 17.5 × 24.3 cm., the text being 12.6 × 18.8 cm. 770 pp. (676 numb.), 32 ll. Bergamo, 1599.

See p. 382. Although the title is slightly changed, this is the work already described.

PETRUS BUNGUS. Ed. pr. 1583-84. Bergamo, 1614.

See p. 380.

Title. 'Petri Bvngii // Bergomatis // Nvmerorvm myſteria // Ex abditis plurimarum difciplinarũ fontibus hauſta: // Opvs maximarvm rervm // Doctrina, & copia refertum: In quomirus in primis, idemq̄; perpe- // tuus Arithmeticae Pythagorice cum Diuinæ Paginæ Nu- // meris confenfus, multiplici ratione probatur. // Poſtrema hac editione ab Auctore ipſo copioſo Indice, & ingenti // Appendice avctvm. // Illuſtriſſimo viro, Virtutum omnium, ac difciplinarum // genere ornatiffimo // Ranvtio Gambaræ // Comiti Virolæ. & c. // Bergomi, Typis Comini Venturæ. 1614.' (P. 1.)

Description. 4°, 17.5 × 23.4 cm., the text being 12.6 × 18.8 cm. 970 pp. (753 numb.), 32 ll. Bergamo, 1614.

See p. 382.

PETRUS BUNGUS. Ed. pr. 1583-84. Parma, 1689.

See p. 386.

Title. 'Præcipuæ // Numerorum // Notæ, // Et earum valor, // Secundum // Petrum // Bungum. // Parmæ, Ex Typographia Du- cali. // CLD. IOC. LXXXIX.' (P. 1.)

Description. 4°, 11.1 × 17.7 cm., the text being 7.9 × 12.6 cm. 16 pp. (12 numb.), 13–19 ll. Parma, 1689.

Editions. See p. 380. This is simply an extract from the later editions of the 'Numerorum Mysteria.'

The treatment of Roman numerals by Bungus is the most elaborate and interesting to be found in any of the works of Renaissance writers.

MONTE REGAL PIEDMONTAIS.

Ed. pr. 1585.

Lyons, 1585.

The title states that he was professor of mathematics in the University of Paris; evidently in the second half of the sixteenth century.

Title. See Fig. 192.

Description. 32°, 5.3 × 9.8 cm., printed on vellum in double columns, each 1.8 × 9.5 cm. 144 pp. (100 numb.), 27–28 ll. Lyons, 1585.

Editions. There was no other edition. The privilege is dated August 6, 1581, but the work does not seem to have been published until 1585. The book is exceedingly rare, and is unknown to most bibliographers. The author speaks of having published part of the tables in Venice in 1575.

This is a collection of tables, largely for multiplication, beautifully printed on split vellum. These tables give the products of numbers to 100 times 1000. The last ten pages contain a table of arrangement of soldiers in order of battle: 'Le moyen et ordre qui se doit tenir pour mettre en ordonnance les batailles de dix soldats iufques au nôbre de quarante mille.' This is dedicated 'A pviſſant et illustre Seigneur le Baron de Mont-clar.'

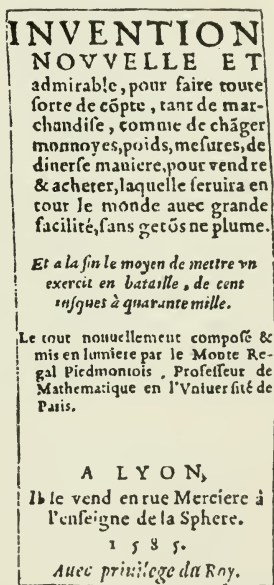


FIG. 192. TITLE PAGE OF MONTE REGAL PIEDMONTAIS

SIMON STEVIN. Ed. pr. 1585.

Leyden, 1585.

Born at Bruges in 1548; died at the Hague in 1620. He was a merchant, a soldier, and an officer in the civil service.

Title. See Fig. 193.

Description. 8°, 10.5 × 16 cm., the text being 7.6 × 12.7 cm. 31 pp. unnumb. + 1 blank + 642 numb. + (203 numb. + 12 unnumb. + 1 blank in 'La Pratique d'Arithmetique') = 890 pp., 29 ll. Leyden, 1585.

Editions. Stevin's first work was an interest table, Antwerp, 1582. His arithmetic first appeared in Flemish, at Leyden, 1585, and was reprinted in that language at Gouda in 1626 and in 1630. The French translation, which is here described, appeared at Leyden in 1585 and again in 1586. The first edition under the editorship of Girard appeared at Leyden in 1625. For the edition of 1634 see below.

This work consists of three distinct parts: (1) 'L'Arithmetique,' in two books, the first treating of powers and roots, and particularly of surds, and the second of operations on numerical and algebraic expressions and of the solution of equations; (2) 'Les quatre premiers Livres d'Algebre de Diophante d'Alexandrie,' translated by Stevin, apparently from Xylander's text; (3) 'La Pratique d'Arithmetique,' an attempt at a practical textbook, but too scholarly for its purposes. The Pratique contains 'La Regle d'Interest avec ses tables,' the 1582 work above mentioned, 'La Disme. Enseignant facilement expedier par nombres entiers fans rompuz, tous comptes se rencontrent aux affaires des Hommes. Premierement descrite en Flameng, & maintenant conuertie en François,' and a 'Traicte des incommensvrables Grandevrs.' The interest centers in 'La Disme,' in which decimal fractions are for the first time treated in any elaborate way (see Fig. 194).

SIMON STEVIN.

Ed. pr. of the arithmetic, 1585.

Leyden, 1634.

See above.

Title. 'Les // Œuvres // Mathematiques // de // Simon Stevin, // Augmentées // Par Albert Girard.' (P. 1.)

Page 3 reads: Les // Œuvres // Mathematiques // de Simon Stevin de Bruges. // Ou font inferées les // Memoires Mathematiques, // Esquelles s'est exercé le Tres-haut & Tres-illustre Prince

L'ARITHMETIQUE
DE SIMON STEVIN
DE BRUGES:

Contenant les computations des nombres
Arithmetiques ou vulgaires :

Aussi l'Algebre, avec les equations de cinc quantitez.

Ensemble les quatre premiers liures d'Algebre
de Diophante d'Alexandrie, maintenant pre-
mierement traduits en François.

*Encore vn liure particulier de la Pratique d'Arithmetique,
contenant entre autres, Les Tables d'Interest, La Disme;
Et vn traicté des Incommensurables grandeurs :
Aucc l'Explication du Dixiesme Liure d'Euclide.*



A LEYDE,
De l'Imprimerie de Christophle Plantin.
c1o. 1o. lxxxv.

FIG. 193. TITLE PAGE OF THE 1585 STEVIN

SECONDE PARTIE DE LA DISME DE L'ŒPE.

R A T I O N .

PROPOSITION I, DE L'ADDITION.

Estant donnez nombres de Disme à ajoûter : Trouver leur somme :

Explication du donné. Il y a trois ordres de nombres de Disme, desquels le premier 27 ① 8 ① 4 ② 7 ③, le deuxiesme 37 ① 8 ① 7 ② 5 ③, le troisieme 875 ① 7 ① 8 ② 2 ③.

Explication du requis. Il nous faut trouver leur somme. *Construction.*

	① ① ② ③
On mettra les nombres donnez	2 7 8 4 7
en ordre comme ci joignant, les	3 7 6 7 5
ajoûtant selon la vulgaire maniere	8 7 5 7 8 2
d'ajoûter nombres entiers; en ceste	<hr style="width: 100%; border: 0.5px solid black;"/>
sorte:	9 4 1 3 0 4

Donne somme (par le 1^{er} probleme de l'Arithmetique) 941304, qui sont (ce que demonstrent les signes dessus les nombres) 941 ② 3 ① 0 ② 4 ③. Je di, que les mesmes sont la somme requise. *Demonstration.* Les 27 ① 8 ① 4 ② 7 ③ donnez, sont (par la 3^e definition) $27 \frac{8}{10}, \frac{4}{100}, \frac{7}{1000}$, ensemble $27 \frac{847}{1000}$, & par mesme raison les 37 ① 8 ① 7 ② 5 ③ valent $37 \frac{675}{1000}$, & les 875 ① 7 ① 8 ② 2 ③ feront $875 \frac{782}{1000}$, lesquels trois nombres, comme $27 \frac{847}{1000}, 37 \frac{675}{1000}, 875 \frac{782}{1000}$, sont ensemble (par le 10^e probleme de l'Arith.) 941 $\frac{304}{1000}$, mais autant vaut aussi la somme 941 ② 3 ① 0 ② 4 ③, c'est

FIG. 194. FROM THE 1634 EDITION OF STEVIN

Maurice // de Nassau, Prince d'Aurenge, Gouverneur des Provinces des // Païs-bas unis, General par Mer & par Terre, &c.// Le tout reveu, corrigé, & augmenté // Par Albert Girard Samicois, Mathematicien.// A Leyde // Chez Bonaventure & Abraham Elfevier, Imprimeurs ordinaires // de l'Univerfité, Anno c1610 c xxxiv.'

Description. Fol., 21.7 × 34 cm., printed in double columns, each being 8.1 × 28 cm. 910 pp. (232 on arithmetic, 10 unnumb.), 63 ll. Leyden, 1634.

Editions. See p. 386.

Other works of 1585. Benedetti, p. 364, 1580; Bungus, p. 382, 1583; Caesar, p. 370, 1582; Clavius, p. 378, 1583; Digges, p. 340, 1572; Gemma, p. 200, 1540; Lonicerus, p. 253, 1551; Lossius, p. 289, 1557; Psellus, p. 168, 1532; Riese, p. 139, 1522; Savonne, p. 314, 1563; Io. Frans. Fulconis, 'Cisterna Fulconica, libro d'abaco in lingua provenzale,' s. l. (Lyons?), 8°; Thilman Ofenlach, 'Rechenbüchlein mit der Ziffer und auf den Linien mit Zahlpfennigen,' Basel, 8°; Johann Schreckenberger, 'Rechenbuchlein auff den Linien und der Federn,' Strasburg, 8°; Samuel Eisenmenger (pseud. Siderocrates), 'Cyclopaedia Paracelsica Christiana,' s. l., with a section on arithmetic.

Works of 1586. Clavius, p. 378, 1583; Gray, p. 353, 1577; Mellema, p. 375, 1582; Ramus, p. 331, 1569; Riese, p. 139, 1522; Schonerus, p. 331 (Ramus, 1569); Stevin, p. 386, 1585; Stifel, p. 226, 1544; Tagliente, p. 115, 1515; Anonymous (Sternier mentions a Rechenbüchlein without title page, Magdeburg); Georg Höflein, 'Rechenbüchlein mit der Ziffer und mit den Zahlpfennigen auf der Linie,' Strasburg, 8°; Paulus Alexandrinus, 'Rudimenta,' Greek and Latin, Wittenberg, 4° (with some notes on Jewish arithmetic).

JOHANNES PADOVANIUS. Ed. pr. 1587. Verona, 1587.

GIOVANNI PADOVANI. A Veronese mathematician of the second half of the sixteenth century.

Title. See Fig. 195.

Description. 4°, 14.4 × 20.4 cm., the text being 9.6 × 15.7 cm. 7 pp. unnumb. + 73 numb. = 80 pp., 29–32 ll. Verona, 1587.

Editions. Padovani published a work in Venice in 1565 consisting of six parts, the fourth of which was 'De Arithmetica.'

IOANNIS PADOVANI
VERONENSIS,

DE ARITHMETICA OPVS, IN QVO NON
solum omnis generis numerandi ars tam Latino
sermone, quàm Græco perdiscitur: uerum
etiam quicquid ad quascunque ra-
tiorinationes pertinet, facili
doctrina aperitur,

Omnibus, & in primis reipublica literariae studiosis perneceffarium.



VERONAE,

Ex Typographia Sebastiani à Donnis. 1587.

Delicentia Superiorum.

That work is probably the same as this. This seems to be the first and only separate edition, and is very rare.

This is in no sense a practical treatise, but it discusses the subject of arithmetic in a learned way, at first rather on the Greek plan. It then considers the Arabic arithmetic, taking up the four processes, roots, proportion, partnership, and two or three other applications. The style in which it is written is such that it would hardly have appealed to the practical merchant even if it had not been in Latin. For Padovani's other works see Riccardi, I, 1, 251.

CASPAR THIERFELDER.

Ed. pr. 1587.

Nürnberg, 1587.

A German Rechenmeister of Steyer, born c. 1525.

Title. See Fig. 196.

Colophon. 'Gedruckt zu Nürnberg/ // durch Leonhardt // Heufzler.' (P. 369.)

Description. 8°, 9.4 × 15.2 cm., the text being 7 × 13.3 cm. 30 pp. unnumb. + 369 numb. = 399 pp., 25-26 ll. Nürnberg, 1587.

Editions. There was no other edition. Thierfelder also published a book with Ulman at Freiburg in 1564, 8°, entitled 'Neues Kunft-Rechenbuch auf der Linie und Feder; dergleichen weder in lateinifchen noch deutfcher Sprache ausgegangen.'

This is a commercial arithmetic, based on Rudolff and other German writers, and with no particular individuality. It contains eighteen chapters, the last one being upon mathematical recreations, 'Von der Schimpff Rechnung/vnd Erfindung derselben Regeln,' a subject that began to come into prominence about this time.

Other works of 1587. Finaeus, p. 160, 1530-32; Riese, p. 139, 1522; Michael Gempelius, 'Arithmetik,' s. l., 8°; Aurelio Marinati, 'Della prima parte della somma di tutte le scienze,' Rome, 4° (with a brief treatment of arithmetic); Conr. Poeppingius, 'Neues Rechenbüchlein auf Linien und Federn,' Braunschweig, 8° (four editions after 1600).

Works of 1588. Gemma, p. 208, 1540; Helmreich, p. 306, 1561; Rudolff, p. 152, 1526; John Mellis, 'A brief instruction and maner hovv to keepe bookes of Accompts,' London, 8° (containing a short chapter on arithmetic); Heinrich Strübe, 'Arithmetica oder new künstliches Rechenbüchlein,' Zürich, 8°, with an edition *ib.*, 1599, 12°.

Arithmetica
Bibliothecae Collegii Nobil. Odenburgici 1780
Rechenbuch /
 Auff den Linien vnd Ziffern/
 mit Vortheil vnd Behendigkeit / auf
 allerley gebräuchliche Haus / vnd Kauff-
 manns Rechnung / Wänsschlag / Beschi-
 ckung des Thigels / Kunstrechnung / gründ-
 lich beschriben / inn Frag vnd
 Antwort gestellet:
Joseph Durch Heigl
 Caspar Thierfeldern / Schul vnd
 Rechenmeister zu Seener.
 Gedruckt zu Nürnberg / durch
 Leonhard Heubler.
 M. D. LXXXVII.




FIG. 196. TITLE PAGE OF THIERFELDER

BERNAERT STOCKMANS.

Ed. pr. 1589.

Dordrecht, 1609

A French schoolmaster at Dordrecht (Dort), in the second half of the sixteenth century.

Title. 'Een corte ende een-//vuldige Instructie/ om lichtelij-
 ckē // en by hemselfē/ fonder eenige meester oft onderwij-//fer

te leeren cijfferen. Seer nut en profijtelijcken // alle menschen/
die in de Conste van Arith//metica heel stecht/onervaren //
ende eenvuldich zijn.// Gestelt ende by een vergadert, door
Bernaert // Stockmans Ianz. Françoysche Schoolmeester // inde
vermaerde Coop-stadt Dordrecht.// Hier zijn ooc bygevoecht de
Differentien van de co//ren-Matē der voornaēfte stedē in Hol-
lant/ t'Sticht/ // Zeelant/ Brabant/ Vlaenderen/ Gelderlant/
En//gelant/ Vrancrijck/ en Ooftlant/ tot dienft // van allen
Graen-coopers.// Van nieus overfien ende verbeterd door C. P.
Boeye.// Item/ noch van nieus bygevoecht een clare onder-//
wyfinge om de tafelen van Intereft te leeren maken/ //alles tot
dienft vanden onervarenen.// Sapiente 11. verf. 22.// Maer ghy
hebbet alles in Mate/ Tellen/ // ende Ghewichte gheordineert.//
Tot Dordrecht // By my Pieter Verhagen/ woonende inde Druc
// kerije/ teghen over de Wijnbrugge. 1609.' (F. 1, r.)

Colophon. 'Tot Dordrecht.// By Adrien Ianz Bot.// Anno
1609.' (F. 214, v.)

Description. 8°, 9.1 × 14 cm., the text being 7.4 × 11.9 cm.
4 ff. blank + 211 unnumb. = 215 ff., 31-33 ll. Dordrecht, 1609.

Editions. This book was first printed in 1589, and the dedi-
catory epistle is dated 'den 20. defer Maent Julij/ 1589.' There
was no other edition in the sixteenth century.

This is one of the noteworthy arithmetics of Holland, and it went
through a number of editions after 1601 (see p. 394). It is a commer-
cial work, and like Vander Schuere's book it gives an excellent view of
the mercantile life of Holland in this period.

Other works of 1589. Jacob, p. 298, 1560; Moya, p. 310, 1562;
Fabio Paolini (Paulinus), 'Hebdomades, sive septem de septenario
libri,' Venice, 4°, containing a little arithmetic, and ib., 1598 (?).

Works of 1590. Bungus, p. 382, 1583; Digges, p. 340, 1572;
Jacob, p. 298, 1560; Lapazzaia, p. 324, 1566; Psellus, p. 170, 1532;
Recorde, p. 214, c. 1542; Heizo Buscher (Boscherus), 'Arithmetice
libri duo,' Helmstadt, sm. 8°, with editions, ib., 1591, 8°; Hamburg,
1592, 8°; ib., 1597, 8°; Frankfort, 1600, 8°, and later; Franciscus
Brasser, an arithmetic, Lübeck, with later editions; Cyprian Lucar, 'A
treatise named Lucarsolace,' London, 4°; Bartolomé Solorzano, 'Libro de
caxa y Manual de cuentas de Mercaderes,' Madrid.



BERNAERT STOCKMANS. Ed. pr. 1589. Gouda, 1644.

See p. 392.

Title. 'Aritmetica, // Door Bernardus Stockmã // eertyts Franfoysche school-//meeſter inde vermaerde coopftadt // Dordrecht nu van nieu^s curicus // gecorigert ende verbeteret noch is // hier bȳ gevoecht een tafelken om te // rabatteeren op fulcken tyt ofte intereft // men begeert door // Abel. W. Waesenaer // Rekenmeeſter tot Vtrecht // (Portrait of author.) Gedruckt tot Vtrecht by // Efdras Willemfen Snellaert. // boeckvercooper // Anno. 1637.' (P. 1.)

Colophon. 'Ter Govde, // Gedruckt by Pieter Rammazeyn, Boeck-// drucker in't vergulde A B C. // Door Efdras Willemfz Snellaert, Boeck-//vercooper tot Vtrecht by de waert-poort 1644.' (P. 421.)

Description. 8°, 9.3 × 13.9 cm., the text being 7.5 × 12.4 cm. 429 pp. (410 numb.), 32–33 ll. Gouda, 1644.

Editions. See p. 393. The engraved title page of the 1637 edition has been used with this edition, which, as the colophon shows, was printed in 1644.

See p. 393.

FRANCESCO PAGANI. Ed. pr. 1591. Ferrara, 1591.

An Italian arithmetician of the sixteenth century, born at Bagnacavallo.

Title. See Fig. 197.

Description. 4°, 14.2 × 17.9 cm., the text being 10.1 × 15.9 cm. 210 pp. (200 numb.), 38 ll. Ferrara, 1591.

Editions. There was no other edition.

This rare and almost unknown work is based upon the Borghi model (see p. 16) which served for so many of the best Italian writers. It was written, as the dedicatory epistle states, at Bagnacavallo, and is one of the few books on mathematics published in the sixteenth century at Ferrara. It has no merit save as its applied problems give a view of the business life of the time. In its numerical work it is reactionary, making, for example, a strong plea for the galley as opposed to the 'a danda' or modern method of division.

ARITHMETICA

PRATTICA VTISSIMA,

ARTIFICIOSAMENTE ORDINATA

Da M. FRANCESCO PAGANI da Bagnacavallo,

*Nella quale si contiene il vero, & facile
modo di conteggiare.*

Con molti Quesiti importanti, & necessarij
à Ragionieri, à Mercanti, & ad ogni
persona, in tutti i Paesi.

AL MOLTO ILLUSTRE SIGNOR
RAFFAELE RASPONI, &c.



Nicolaus

Carolina

IN FERRARA,

Appresso Vittorio Baldini.

Con licenza de' Superiori. M. D. XCI.

RENÉ BUDEL, et al. Ed. pr. 1591.

Cologne, 1591.

For biographies, see below.

Title. See Fig. 198.

Description. 4°, 18.2 × 23.6 cm., printed in double columns, each being 6.4 × 18.6 cm. 38 pp. unnumb. + 798 numb. = 836 pp. (PP. 271–350 are not in the volume, and if they were ever bound in any copies they must have constituted a section by themselves.) 46–49 ll. Cologne, 1591.

Editions. There was no other edition.

This rather massive treatise on the history of monetary measures consists of two books by Budel (Budelius), director of the Bavarian mint, and several appended chapters by the following writers: Albertus Brunus (1461–1541), counselor to Louis of France, and ambassador; Johannes Aquila, friend of the astrologer Stöffler who died in 1531; Bilibaldus Pirkheymer (1470–1530), a celebrated humanist; Martinus Garatus Laudensis, who writes a chapter 'De monetis'; Franciscus Curtius, and Joannes Regnaudus of Avignon, who write on the same topic; Carolus Molinæus (1500–1566); Didacus Covarrubias (1512–1577), bishop of Ciudad Rodrigo; Henricus Mameranus, a Belgian printer; Henricus Hornmannus; Franciscus de Aretio (1418–1483), a celebrated lawyer of Arezzo; Nicolas Everardus (1473–1532), a celebrated Dutch lawyer, of Middelburg; Jacobus Menochius (1531–1607), an Italian lawyer, and various others. It is a monumental work, and is helpful in the investigation of the history of monetary tables.

Other works of 1591. Baker, p. 327, 1568; Bungus, p. 382, 1583; Buscher, p. 393, 1590; Gemma, p. 200, 1540; Mariani, p. 181, 1535; Petri, p. 325, 1567; Psellus, p. 168, 1532; Ramus, p. 331, 1569; Vincent de Beauvais, p. 10, 1473; Jordanus Bruno, 'De Monade numero et Figura liber,' Frankfort, 8°; Johann Kaudler, 'Arithmetica oder Rechnung auf der Linien und mit Ziffern,' Regensburg, 8°; Hans Jacob Mewrer, 'Bericht von dem Rechnen mit den Zahlpfennigen oder auf der Linien,' Zürich, 8°.

THOMAS HYLLES. Ed. pr. 1592.

London, 1600.

An English mathematician of the latter part of the sixteenth century.

Title. See Fig. 199.

Description. 4°, 14.2 × 19.6 cm., the text being 10.8 × 16.9 cm. 15 ff. unnumb. + 270 numb. = 285 ff., with 2 charts at the end; 40 ll. London, 1600.

DE
MONETIS,
 ET RE NUMMA-
 RIA, LIBRI DVO:

QUORVM PRIMVS ARTEM CVDENDAE MO-
 NETAE: SECVNDVS VERO QVAESTIONVM MO-
 NETARIARVM DECISIONES CONTINET.

HIS ACCESSERVNT TRACTATVS VARIJ ATQVE
 VTILES, NECNON CONSILIA, SINGVLARESQVE ADDI-
 tione tam veterum, quàm Neotericorum Authorum, qui
 de Monetis, earundemque valore, liga, pondere,
 potestate, mutatione, variatione, fallitate,
 ac similibus scripserunt.

Quorum omnium Catalogum pagina duodecima indicat.

AVTHORE ET COLLECTORE CLARISS.
 VIRO RENERO BVDELIO RVREMVNDANO, IC. NECNON REVE-
 rendis. atque Illustris. Principis ac D. Domini Ernesti Electoris
 Colonien Bauariæ Duc. &c. Monetarum, tam Rhe-
 nensium, quàm Vvestphalicarum Archie-
 piscopalium Præfeto.

CVM SVMMARIIS ET INDICE COPIOSO.



COLONIAE AGRIPPINAE,
 APVD IOANNEM GYMNICVM,
 SVB MONOCEROTE.
 ANNO M. D. LXXXXI.

CVM PRIVILEG. CAES. MAIEST. AD SEXENNIVM.

FIG. 198. TITLE PAGE OF BUDEL ET AL.

The Arte of vulgar arith-
meticke, both in Integers and Fractions,
deuided into two Bookes: whereof the first is called
Nomodidactus Numerorum, and the second *Portus Proportionum.* with
 certeine Demonstrations, reduced into so plaine and perfect Me-
 thod, as the like hath not hetherro bene published in English. Wherevnto
 is added a third Booke, entituled *Musa Mercatorum*: Com-
 prehending all the most necessarie and profitiable Rules
used in the trade of Merchandise.

In all which three Bookes: the Rules, Precepts, and Maxims, are not
onely composed in meeter for the better retaining of them in memorie,
 but also the operations, examples, demonstrations, and questions,
are in most easie wise expounded and explained, in the forme
of a Dialogue, for the Readers more cleere vnderstanding.

A knowledge pleasant for Gentlemen, commendable for Capteines
and Soldiers, profitable for Merchants, and generally
necessary for all estates and degrees.

Newly collected, digested, and in some part deuised by
a Welwiller to the Mathematicals.

Ecclesiasticus, cap. 19.

Learning vnto fooles is as fetters on their feete and Manicles vpon
 their right hand: but to the wise it is a Iewell of golde, and like
 a Braclet vpon his right arme.

Boetius libr. 1. Arith, cap. 2.

Omnia quaecunque a prima natura constructa sunt, Numerorum videntur
ratione formata, Hoc enim fuit principale in animo conditoris exemplar.



Imprinted at London by *Gabriel Simson*, dwelling
 in Fleet-street. 1600.

FIG. 199. TITLE PAGE OF THE 1600 HYLLES

Editions. London, 1592; ib., 1600, 4° (here described).

This rather ponderous work of 570 pages is written in the form of a dialogue, following the popular textbooks of Recorde. Hylles introduces his rules and definitions in verse, presumably with the idea that they can be more easily memorized in this form. An illustration of this feature is seen in the following description of the first case of 'Barters or Trucques,' a chapter now obsolete, but one of which we have a reminder in the words 'barter' and 'truck':

Of Barters or trucques, there are diuers kindes,
VVhereof the firft, is when the Trucquers take,
But ware for ware, by agreement of mindes,
No partie grating, greater gaines to make,
Thequalitie of which exchange of wares,
The compound rule afcending fole declares.' (F. 255.)

The author seems to take up every rule known to the English arithmeticians of the time, and his book is a good source of information concerning British commerce of the period. It was not a popular work, probably because it elaborated its rules too much to be usable.

JOANNES ANTONIUS MAGINUS.

Ed. pr. 1592.

Venice, 1592.

GIOVANNI ANTONIO MAGINI. Born at Padua, June 13, 1555; died at Bologna, February 11, 1617. He was professor of astronomy and mathematics at Bologna, and wrote numerous works on these subjects.

Title. 'Io.// Antonii // Magini Patavini // Mathematicarvm in almo // Bononienfi Gymnafio profefforis.// De Planis Triangv-
lis // Liber Vnicus.// Eiuſdem // de Dimetiendi ratione // per
Quadrantem, & Geometricum Quadratum, // Libri Qvinque.//
Opus valdè vtile Geometris, Aftronomis, Geographis, Mechanicis,
Ar-//chitectis, Militibus, Agrorum menforibus, & denique // om-
nibus Mathematicarum profefforibus.// Cvm Privilegio.// Vene-
tiis, apvd Robertvm Meietvm.// M. D. XCII.' (F. 1, r.)

Colophon. 'Bononiæ, // apud Iannem Baptiftam Ciottum, //
Typis Victorij Benacij, // Anno Domini, M. D. XCII. // Superi-
orum permiffu.' (F. 114, v., and 132, v.)

Description. 4°, 16 × 21.6 cm., the text being 11.8 × 18.2 cm.
4 ff. unnumb. + 110 numb. (in the first book) + 124 numb. + 4

unnumb. (in the second book) = 242 ff., 34-38 ll. Venice (but printed in Bologna, as the colophon states), 1592.

Editions. There was no other edition.

Following some other bibliographers, I have included this treatise on plane triangles, because of the 'Expositio, ac vsvs tabvlæ tetragonice, feu Quadratorum numerorum cum suis radicibus iuxta sequentes octo Canones' (f. 5, r.) which it contains. The 'Tabvla nymerorum quadratorum' begins on f. 41 and extends to f. 64, inclusive. It is the most extensive table of squares and roots that had appeared up to 1592.

THOMAS MASTERSON.

Ed. pr. 1592-95.

London, 1592-95.

An English mathematician of the latter part of the sixteenth century.

Title. See Fig. 200.

Description. 4°, 12.8 × 18.1 cm., the text being 10.1 × 15.6 cm. 255 pp. (230 numb.), 34-35 ll. London, 1592-95. Book II (148 pp.) bears the date 1592; Book III (78 pp.) bears the date 1595.

Editions. There was no other edition. There was, however, an addition to the 'First Booke' published at London in 1594.

The author says in his dedicatory epistle, dated 'London this 20 August Anno. 1592,' that he has 'vnder taken to write and publishe fixe bookes of the Art of Arithmeticke: with this order and methode, that the first, third, and fift bookes, shalbe as a summarie and ground, teaching, the true ingenious, inuentions, and the perfect figuratiue and caractericall operations of the fame Art . . . Then the seconde, fourth, and sixt bookes, shalbe of Arithmeticall questions and demaundes, with the application of the definitions, common sentēces and instructions of the first, third, and fift bookes.' The plan was not carried out beyond the publication of the three books and the supplement mentioned above.

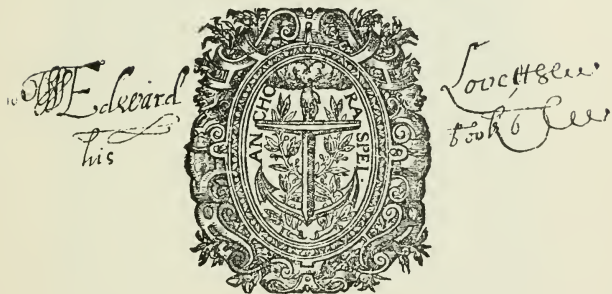
Book I is on the fundamental operations with integers and fractions, and makes no advance in the ordinary textbooks of the period. Book II is a collection of practical problems representing the mercantile activities of London at the close of the sixteenth century (see Fig. 201). Book III would now be classed as part of algebra (see Fig. 202), since it refers chiefly to irrational numbers.

Other works of 1592. Buscher, p. 393, 1590; Capella, p. 68, 1499; Clavius, p. 375, 1583; Fischer (Piscator), p. 247, 1549; Gemma,

THOMAS
 MASTERSON HIS
 FIRST BOOKE
 OF ARITHMETICKE.

Shewing the ingenious inuentions, and figuratiue opera-
 tions, by which to calculate the true solution or answeres
 of Arithmeticall questions: after a more perfect, plaine,
 brieve, well ordered Arithmeticall way, then any
 other heretofore published: verie
 necessarie for all men.

*Nothing without labour.
 All things with reason.*



Imprinted at London by Richard Field, dwelling in
 the Blacke friers neare Ludgate.

1592.

1626
 1592.
 ———
 0034.

FIG. 200. TITLE PAGE OF MASTERSON

p. 200, 1540; Nonius, p. 315, 1564; Psellus, p. 168, 1532; Ramus, p. 331, 1569; Riese, p. 139, 1522; Tartaglia, p. 279, 1556; Rutilio Cosentino Benicansa, 'Corona di tutte le scientie de Abaco,' Naples,

122 THOMAS MASTERSON HIS

$$\begin{array}{r}
 5 \dots 200 \dots 3 \text{ Facit } 120 \\
 200 \dots 4 \dots 800 \\
 \hline
 100 \\
 300 \dots 4 \dots 1200 \\
 \hline
 150 \\
 150 \dots 4 \dots 600 \\
 80 \dots 2600 \dots 120 \\
 \hline
 \text{Facit } 3900. \\
 400 \dots 5 \dots 2000 \\
 \hline
 1900 \\
 \hline
 271\frac{2}{7}
 \end{array}$$

Facit B tooke out $128\frac{2}{7}$ pound.

538 Two marchants made a companie, A put in 300 pound for 2 monethes, and then putteth yet in 100 pound, and 6 monethes after that taketh out 200 pouñd, and with the rest remaineth vntill the yeares end. B put in 100 pound for one moneth, and then putteth yet in 700 pound, and 6 monethes after that taketh out a certaine summe of money, and with the rest remaineth vntill the yeares end. and then finde to haue gained together 400 pouñd, whereof B must haue 80 pound more then A, the question is how much money B tooke out of the companie, without reckoning interest vpon interest.

$$\begin{array}{r}
 300 \dots 2 \dots 600 \qquad 400 \\
 100 \qquad \qquad \qquad 80 \\
 \hline
 400 \dots 6 \dots 2400 \qquad 320 \\
 200 \qquad \qquad \qquad 160 \\
 \hline
 200 \dots 4 \dots 800 \\
 160 \dots 3800 \dots 240 \\
 \hline
 19 \\
 5700 \\
 100 \dots 1 \dots 100 \\
 700 \\
 \hline
 800 \dots 6 \dots 4800 \text{ Facit B tooke out } 640 \text{ pound.} \\
 4900 \\
 800 \\
 160
 \end{array}$$

If

FIG. 201. FROM MASTERSON

8°; Julius Caesar of Padua, 'Gewiffe Erinnerung einer allgemeinen arithmetischen Practic,' Cologne, 16° (see also p. 368, 1582); Johann Krafft, 'Ein neues vnd wohlgegründtes Rechenbuch,' Ulm.

6 THOMAS MASTERSON HIS

hauing here their number written ouer them.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.
 \mathcal{Z} . \mathcal{Z} . \mathcal{C} . $\mathcal{Z}\mathcal{Z}$. $\mathcal{f}\mathcal{f}$. $\mathcal{Z}\mathcal{C}$. $\mathcal{b}\mathcal{f}\mathcal{f}$. $\mathcal{Z}\mathcal{Z}\mathcal{Z}$. $\mathcal{C}\mathcal{C}$. $\mathcal{Z}\mathcal{f}\mathcal{f}$. $\mathcal{c}\mathcal{f}\mathcal{f}$. $\mathcal{Z}\mathcal{Z}\mathcal{C}$.
 13. 14. 15.
 $\mathcal{d}\mathcal{f}\mathcal{f}$. $\mathcal{Z}\mathcal{b}\mathcal{f}\mathcal{f}$. $\mathcal{C}\mathcal{f}\mathcal{f}$. &c.

The first character written thus \mathcal{Z} , doeth signifie any number before which it is written, to be the first number giuen, taken, or imagined; and is called *radix*, or roote, for that all the other characters haue their originall or of-spring of it. The second written thus \mathcal{Z} , is called *zense* or square, and doth signifie any number before which it is written, to be the product of the first multiplication of the roote by it selfe: that is of the roote two times taken and multiplied. The third written thus \mathcal{C} , is called *cube*, and doth signifie the number following the same to be the product of the second multiplication of the roote, three times taked and multiplied, that is of the \mathcal{Z} multiplied by the \mathcal{Z} . The fourth is called *zensezense*, and doth signifie the number following the same, to be the product of the third multiplication, that is the product of the \mathcal{Z} foure times taken and multiplied. The fift is called *surfolide*, and doth signifie the number following the same, to be the product of the fourth multiplication. The sixt is called *zensecube*, and doth signifie the number following the same, to be the product of the fift multiplication. The seuenth is called *bsurfolide*, or second surfolide, and doeth signifie the number following the same, to be the product of the sixt multiplication. The eight is called *zensezensezense*, & doth signifie the number following the same, to be the product of the seuenth multiplication. The ninth is called *cubecube*, and doth signifie, the number following the same, to be the product of the eight multiplication. The tenth is called *zense surfolide*, & doth signifie the number following the same, to be the product &c. The eleuenth, is callèd *csurfolide*, or third surfolide. The twelfth is called *zensezensecube*. The thirteenth is called *dsurfolide*, or fourth surfolide. You may proceede further at your pleasure, if you marke that the fift character is the first surfolide, the seuenth the second surfolide, and the next vncompound number following, the next surfolide, & so infinitely euer the next vncompound

FIG. 202. FROM MASTERSON, SHOWING ALGEBRAIC SYMBOLS

SIGISMUNDUS SUEVUS. Ed. pr. 1593. Breslau, 1593.

A German priest, living at Breslau. Born c. 1550.

Title. See Fig. 203.

Colophon. 'Gedruckt zu Brefsław/ durch // Georgium Bawmann/J. Jn Mitvorle-//gung Andreæ Wolcken. Jm Jahre:// M. D. XCIII.' (P. 523.)

Description. 4°, 14.8 × 19.5 cm., the text being 11.2 × 15.8 cm. 524 pp. (455 numb.), 28–31 ll. Breslau, 1593.

Editions. There was no other edition.

This work was probably intended to be a practical arithmetic, but the author's theological interests unfitted him for the task of writing such a book. Although the fundamental operations and the common rules of the day are treated in somewhat the usual way, the problems are largely biblical, or mystical. The size of Goliath's armor and Gematria used to foretell the famine of Poland represent the applications.

ALESSANDRO ALAMAGNI.

Ed. pr. 1593.

Venice, 1593.

A Venetian arithmetician of the sixteenth century.

Title. See Fig. 204.

Description. 12°, 8.7 × 15.4 cm., the text being 6.3 × 13.2 cm. 1 f. unnumb. + 96 numb. = 97 ff., printed in double columns, 30 ll. Venice, 1593.

Editions. There was no other edition.

The word 'tariffa' in these early books means a table used by merchants to assist in their computations involving the measures and awkward monetary systems of the time. See Paxi, p. 77; Mariani, p. 180.

Other works of 1593. Gemma, p. 200, 1540; Tartaglia, p. 279, 1556; Horatio Galasso, 'Giochi di Carte,' Venice, 8°, with an edition at Verona in 1597, 12°, and a French translation in 1603 (containing several 'giochi d'abbaco').

MIGUEL GERONIMO SANTA CRUZ.

Ed. pr. 1594

Madrid, 1643.

A Spanish merchant and arithmetician of the second half of the sixteenth century, born at Valencia. He lived at Seville.

Title. 'Libro de // Arithmetica // especvlativa, y pra-//tica, intitvlado, el Dorado // Contador, contiene la fineza y reglas de



ARITHMETICA
HISTORICA.

Die Lößliche Rechenkunst.

Durch alle Species vnd fürnembste Regeln/
mit schönen gedentckwürdigen Historien vnd Exempeln /
Auch mit Hebraischer / Griechischer / vnd Römischer Münze / Ge-
wichte vnd Maß / deren in Heiliger Schrifft vnd guten Geschichts-
Büchern gedacht wird / Der lieben Jugend zu gutte erkleret.

Auch denen die nicht rechnen können / wegen vieler
schönen Historien vnd derselbigen bedeutuna-
gen lustig vnd lieblich zu lesen.

Aus viel guten Büchern vnd Schrifften mit fleis
zusammen getragen.

Durch

Sigismundum Sueuum Freystadiensem,
Diener des H. Göttlichen Worts der Kirchen Chri-
sti zu Breslaw / Probst zum H. Geiste / vnd
pfarrherr zu S. Bernardin in der Newstadt.

Gott hat alles geordnet mit Maß / Zal
vnd Gewichte. *Sapient. 11.*

Gedruckt zu Breslaw / durch Georgium Hawman /
Im Jahre

M. D. XCiiij.

CVM GRATIA ET PRIVILEGIO.

FIG. 203. TITLE PAGE OF SUEVUS

T A R I F F A
N V O V A,

DELLA VALUTA
delli Cecchini, da Lire
dieci, e soldi vno,

Fino à $\text{L } 12 \text{ s } 8$. Laqual serve
anco per ogni sorte di
Mercantie;

F A T T A D A M.
Alessandro Alamagni.
Con Privilegio



I N V E N E T I A,

Appresso Gio. Ant. Rampazetto. 1593.

FIG. 204. TITLE PAGE OF ALAMAGNI

contar // oro y plata, y los Aneages de // Flandes. // Por moderno y com-//pendiofo cftilo. // Compvesto por Migvel Gero-//nimo de Santa-Cruz, natural de la Ciudad, y // Reino de Valencia, y vezino de // Seuilla. // Al L^{do} Don Pero de Baraiz. // Teniencie mayor de Corregidor de la infigne Villa de // Madrid, Corte del Rei nueftro Señor. // Año 1643 // Con licencia. // En Madrid, Por Francisco Martinez. // A cofta de Iuan Bautifta Tabàno, Mercader de libros, vendefe al // lado del Colegio de Atocha.' (F. 1, r.)

Description. 4°, 13.8 × 20 cm., the text being 9.9 × 16.8 cm. 6 ff. unnumb. + 238 numb. = 244 ff., 32-34 ll. Madrid, 1643.

Editions. I know of no sixteenth-century edition, but the original privilege is dated May 8, 1594. This edition of 1643 seems by the dedication of Tabàno to have been published after the author's death. There was an edition as late as 1794.

The work follows the general plan of the Spanish and Italian mercantile arithmetics of the sixteenth century. It is not, however, a very practical book, the author having been too much influenced by the theoretical side of works like Tartaglia's.

Other works of 1594. Barlaamo, p. 343, 1572; Masterson, p. 400, 1592; Recorde, p. 217, c. 1542; Reisch, p. 82, 1503; Wenceslaus, p. 421, 1599; Thomas Blundevile, 'His Exercises, containing sixe Treatises,' London, 4° (the first being on arithmetic; there was an edition ib., 1597, 4°, and others appeared after 1601); Smiraldo Borghetti, 'Opera d'abbaco,' Venice, 8°; Jerónimo Cortés, 'Arithmetica practica,' Valencia.

Works of 1595. Belli, p. 343, 1573; Helmreich, p. 306, 1561; Masterson, p. 400, 1592; Urstisius, p. 361, 1579.

JOANNES BILSTENIUS. Ed. pr. 1596. Basel, 1596.

A sixteenth-century German educator.

Title. Syntagma // Philippo-//rameum // Artium Li-//beralium, Methodo brevi ac per-//fpicua concinnatum // per // Ioan. Bilstenium // Marfbergianum. // In // Gratiam Tyronum partim difficilibus // vocibus Germanica adiecta // est explicatio. // Basileæ. // Typis Conr. Waldkirch. // CIO IO XCVI.' (F. 1, r.)

Description. 8°, 10 × 16.1 cm., the text being 6.8 × 12 cm. 16 pp. unnumb. + 586 numb. = 602 pp., 26-28 ll. Basel, 1596.

Editions. There was no other edition.

This work consists of twenty parts, treating respectively of the leading branches of knowledge as considered in the sixteenth century. Of these the eleventh is 'De Arithmetica,' and gives in 43 pages a succinct account of algorism. It begins with the catechism form: 'Quid est Arithmetica? Arithmetica, die Rechenküft/est ars benē numerandi. Subjectum Arithmeticae est Numerus.' There is nothing progressive in the treatment, division, for example, being performed by the galley method only, and the applications being confined largely to the 'Aurea Regula' (the 'Golden Rule' of three).

Other works of 1596. Helmreich, p. 303, 1561; Hood (translator; see Urstisius), p. 361, 1579; Petri, p. 325, 1567; Ramus, p. 330, 1569; Recorde, p. 219, c. 1542; Snellius (see Ramus), p. 333, 1569; Tartaglia, p. 278, 1556; Urstisius, p. 361, 1579; Anonymous (William Parley (?), translator), 'The Pathway to Knowledge,' London, 4° (containing 'Thirty days hath September,' see p. 33); Anonymous, 'Arithmetica,' Frankfort, 8°; Sebastian Brandt, 'Plenaria artis Arithmeticae resolutio,' Frankfort, 8°; C. M. Glysonius, 'Arithmetica practica,' Venice, 4°, with editions as late as 1783; Giacomo Trevisano, 'Memoriale di abbaco,' Venice, 8° (title page 1597, colophon 1596); Bernardo Vila, 'Reglas breves de Arithmetica,' Barcelona, sm. 8°; Antonio Rodríguez, 'Aritmetica practica y theoretica,' Salamanca, 8°.

ANONYMOUS. Ed. pr. 1597.

Luyck, 1597.

Title. 'Cleynen//Catholyken//Catechismvs.//...Tot Luyck by Jan Voes.//M.D.XCVII.//Met priuilegie van fes Iaren.' (F. 1, r.)

Colophon. 'Tot Luyck by Ian Voes, 1597.' (F. 12, v.)

Description. 4°, 9 × 14 cm., the text being 6.2 × 11.8 cm. 12 ff. unnumb., 16–21 ll. Luyck, 1597.

This is one of many similar children's books in Mr. Plimpton's library. It is introduced here merely as a type of those primers that taught some work in number in connection with grammar or the catechism. In this book the child learns the Roman and Arabic numerals to 84. There are also in the library numerous Latin and Greek grammars of the sixteenth century in which numeration is taught, but these have been omitted from this bibliography.

Other works of 1597. Blundevile, p. 407, 1594; Bonocchio, p. 346, 1574; Buscher, p. 393, 1590; Galasso, p. 404, 1593; Gemma, p. 200, 1540; Trevisano, above, 1596; Francis Meres, 'God's Arithmetique,' London, 8°.

HENRY DE SUBERVILLE. Ed. pr. 1598. Paris, 1598.

A French scholar of the close of the sixteenth century. He describes himself as canon of the cathedral at 'Xaintes,' and 'Aduocat en la Cour de Parlement de Bourdeaux,' and signs his name with the birthplace 'Breton-Bearnois.' The dedicatory epistle is dated at 'Kimpercorentin.'

Title. 'L'Henry-metre, // instrvment royal, et // vniversel, avec sa theorique, // vsage, et pratique demonstree par // les Propositions Elementaires d'Euclide, & regles familiares // d'Arithmetique: & aussi fans Arithmetique: Lequel prend toutes mesures Geometriques, & Astronomiques, qui luy // font circulairement opposées tant au Ciel, qu'en la Terre, // svr vne sevlé station, par vn // feul triangle Orthogone, fans le bouger de fa place, ny aller // mesurer aucune distance de ftation, ainsi qu'on est con-//trainct de faire avec les autres Instrumens Geometriques. // De l'inuention // D'Henry de Suberville Breton, Chanoine en l'Eglise Cathedrale S. Pierre // de Xaintes: & Aduocat en la Cour de Parlement de Bourdeaux. // Item, // Vn petit traicté sur la Theorique, & Pratique que de l'Extraction des racines quarrées, // pour dressez les Scadrons, & Bataillons quarrés. // Dediés au Roy. // Dieu a disposé toutes choses en Poids, Nombre, & // Mesvre. Sap. 11. 21. // A Paris, // Chez, Adrien Perier, rue faint Iaques en la // boutique de Plantin au Compas. // 1598. // Avec Priuilege du Roy.' (F. 1, r.)

Description. 4°, 17 × 22.1 cm., the text being 11.8 × 17.8 cm. 39 pp. unnumb. + 225 numb. = 264 pp., 39-42 ll. Paris, 1598.

Editions. There was no other edition.

Although this is primarily a treatise on mensuration by the use of a trigonometric instrument somewhat resembling a quadrans, it is properly included in this list because it contains several chapters on fractions and denominate numbers. These are of no special merit, and are introduced as a preliminary to the calculations involved in the use of the 'Henry-metre' which the author invented. The book is an interesting effort to perpetuate an inventor's name by a work of no special scholarship describing an instrument of no particular value. There is, however, a value in the general study of all of these early instruments. Many of them are easily constructed, the quadrans for example, and their more extensive use in the teaching of trigonometry would be very helpful.

JOHANN FRIDOLIN LAUTENSCHLAGER.

Ed. pr. 1598.


Freiburg in Uchtland, 1598.

A Freiburg Rechenmeister of the latter half of the sixteenth century.

Title. See Fig. 205.

Ein Neues
Volgegründtes Kunst-
und Nuzliches Rechbüchlein!
 den ansehenden *Arithmeticiis* zugebrau-
 chen sehr Diestlich / mit gar kurzen Preceptē /
 Regeln vnd Exempeln / Keimens weiß
 begriffen / gestellt / vñ verfaßt /
 desgleichen vormals nie
 außgangen.

Durch **Johannem Fridolinum Lauten-**
 schlager Lateinisch vñnd Teutschen Schulo-
 meister zu Freiburg in
 Uchtland.



Getruckt zu Freiburg in Uchtland / bey
Magistro VVilhelmo Mafz. Anno

1 5 9 8.

FIG. 205. TITLE PAGE OF LAUTENSCHLAGER

Description. 8°, 9.4 × 14.7 cm., the text being 6.9 × 12.3 cm.
4 pp. unnumb. + 58 numb. = 62 pp., 21–30 ll. Freiburg in
Uechtland, 1598.

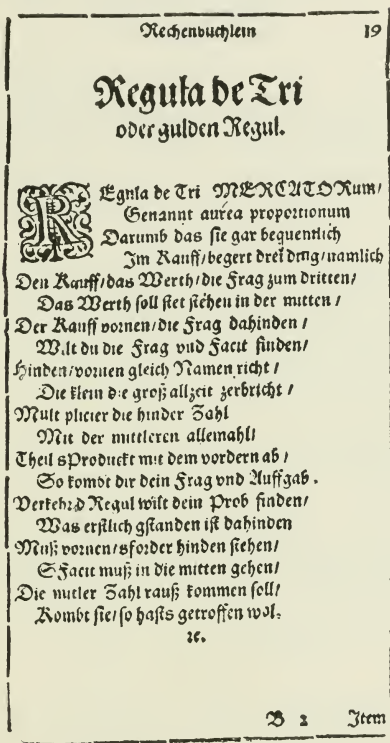


FIG. 206. FROM LAUTENSCHLAGER

Editions. There was no other edition.

This is the first arithmetic that I have seen composed entirely in rhyme. Various others had already contained verses, but this is

substantially all in meter. Like all such educational vagaries, it is weak in subject matter, the most difficult example in division being that of 65443 by 6. The illustration (Fig. 206) shows the rule of three in verse.

CASPAR SCHLEUPNER. Ed. pr. 1598 Leipzig, 1598.

A Breslau Rechenmeister, born at Nürnberg c. 1535.

Title. See Fig. 207.

Colophon. 'Gedruckt zu // Leipzig / bey Frantz // Schnellboltz. // Typis hæredum Beyerii. // (Woodcut.) Im Iahr // M. D. XCviii.' (F. 99, v.)

Description. 8°, 9.3 × 14.7 cm., the text being 6.9 × 12.2 cm. 99 ff. unnumb., 22–26 ll. Leipzig, 1598.

Editions. Leipzig, 1598, 8° (here described); Breslau, 1599, 8°.

Schleupner was one of the last serious advocates of the old 'line reckoning' with counters. He was a disciple of the Newdorffer school of Nürnberg Rechenmeisters, as he states in his preface, and had himself taught at 'Neyfe' and 'Brefzlaw' for many years when he decided to write this book. He makes an attempt at an easy method of presenting the fundamental operations, hoping, as he says, to set forth the doctrines of Adam Riese and Johan Seckerwitz (another Nürnberg Rechenmeister) in simple fashion. The work is made up of a series of impossible questions and answers between a father and his son. The latter always begins with 'Geliebter Vater,' and the father's replies, while always clear, are often very extended, the entire 99 pages covering little more than the four operations, together with a few insignificant problems. As a simple presentation of line reckoning, however, the book has few equals.

JOSEPHUS UNICORNUS. Ed. pr. 1598. Venice, 1598.

See p. 298.

Title. See Fig. 208.

'Parte Seconda,' of the same date, follows f. 204, the two being bound in one, and the pages being numbered consecutively.

Colophon. 'In Venetia, // Apreffo Francesco de' Franceschi Senefe. // M D XCVIII.' (F. 413, v.)

Description. 4°, 15.5 × 21.6 cm., the text being 10.4 × 17.6 cm. 12 ff. unnumb. + 395 numb. = 407 ff., 29–39 ll. Venice, 1598.

Rechenbüchlein/

Auff der Linien,

Inn

Allen dreyen

Ständen/ als im Wehr/ Lehr
vnd Wehr stande/ sehr nütlichen zu
gebrauchen.

Daraus ein fleissiger Leser/ wel-
cher alleine sein Ein mal Eins bis auff vier mal
Neune/ aufwendig kan/ ohne einigen Müdsichen be-
richt/ für sich selbst/ die Linien Rechnung lernen kan/
Wil geschweigen der/ welcher zuu. or schon
seine Species auff der Federn ge-
lernet hat.

Der gleichen hienor/ in Deutscher
Sprach/ nicht außgange n.

Gesprech weis gestellt/

Durch Caspar Schleupner/
von Nürnberg/ Deudsehen Schulmeis-
ter zu Breslaw. Weniglichen/ vnd
beuor der lieben Jugend/ zu nutz
verfertiget.

Mit Röm. Key. May. Freyheit.

In vorlegung Andres Wolcken Erben/ vnd
Dauid Albrechts. Anno 1598.

D E
L'ARITHMETICA
VNIVERSALE
DEL SIG.
IOSEPPO VNICORNO,
M A T H E M A T I C O
ECCELLENTISSIMO,
Parte Prima:

Nellaquale si contiene non solo la Theorica di tutti i Numeri,
ma ancora la Prattica appartenente a
tutti i negotij humani.

*Trattata, & amplificata con somma eruditione, e con
noui, & squisiti modi di chiarezza.*

CON PRIVILEGIO.



*In Venetia, appresso Francesco de' Franceschi 1598.
Con licenza de Superiori.*

FIG. 208. TITLE PAGE OF UNICORNUS

Editions. There was no other edition.

This is one of the most elaborate treatises on arithmetic published in Italy in the sixteenth century. It consists of six books, the first four making up Part I. The first book treats in a detailed fashion of the fundamental operations. Unicornus, for example, gives six methods of multiplication, a treatment that recalls those of Paciolo and Tartaglia. There is a good discussion of the two general methods of dividing, the downward ('a danda') method having as much attention as the galley plan. Fractions are also treated in Book I. Book II deals with the theory of numbers after the Boethian method. Book III treats of roots, surds, and proportion; Book IV, of the rules of three and false; and Book V, of business arithmetic, including exchange, interest, and alligation.

The work was too theoretical to be popular, but it is an excellent source for the study of the development of elementary mathematics. Unicornus gives a number of interesting historical references.

Other works of 1598. Cassiodorus, p. 211, 1540; Fischer (Piscator), p. 247, 1549; Moya, p. 310, 1562; Paolini, p. 393, 1589; Raymundus Lullius, 'Opera ea quae ad adinventam ab ipso artem universalem . . . pertinent cum diversorum commentariis,' Strasburg, 1598, 8° (see also p. 457); Fabricio Mordente, 'Le propositioni di Mordenti,' Rome, 4° (geometric, but with a little arithmetic).

ANTHON NEWDÖRFFER. Ed. pr. 1599. Nürnberg, 1599.

One of the famous Newdörffer family of Nürnberg Rechenmeisters.

Title. 'Künftliche vnd Ordentliche An//weyfung der ganzen Practic vff // den Jetzigen schlag vnd derselbenn // herlichen geschwinden Exempel // vffs kürtzt zůfammen getzogen &c.// Meinen lieben Discipeln zu fon-//derlichem Nützen gestelt. Durch // mich Anthonium Newdörffer // Rechenmaifter vnd Modift der // Statt Nürnberg // Anno .M.D.IC.' (F. 2, r.) On f. 1, r., is an engraved frontispiece with figures of Euclid and Pythagoras, and a triangular multiplication table. On f. 1, v., are 14 ll. of verse 'Ad Stvdiosos Artis Nvmerandi.'

Colophon. 'Gedruckt zu Nürnberg/ // durch Paulum Kauffmann.// M. D. XCIX.' (F. 65, r.)

Description. 4°, 15 × 19.3 cm., the text being 11.4 × 15.5 cm. 65 ff. unnumb., 22-32 ll. Nürnberg, 1599.

Editions. There was no other edition.

This is an excellent illustration of the work of the celebrated Nürnberg Rechenmeisters. It is divided into twelve books, of which 'Das erste Büchlein handelt von der Venetianischen oder Kauffmennischen Practic,' usually called Welsch practice by the German writers. It is composed chiefly of problems, the rules and explanations being left for the master. Directions are given, however, in the case of fractions. Book II relates to denominate numbers and the 'Regula de Tribus.' Book III treats of the weighing of commercial products. Book IV 'Handelt von der Rechnung eines Cassierers,' including exchange. Book V is entitled 'Iornates, Das ist/ Rechnung von allerley Handtierung,' and consists of practical problems relating to the purchase of goods. Book VI 'Tractiert von der Regel Conversa vnd Quinque,' inverse and compound proportion. The rest of the twelve books are devoted to practical business questions of the day.

OBERTO CANTONE. Ed. pr. 1599. Naples, 1599.

A Genoese arithmetician of the sixteenth century, residing in Naples.

Title. See Fig. 209.

Description. Fol., 14.5 × 20.1 cm., the text being 10.4 × 15.7 cm. 304 pp. (292 numb.), 34–37 ll. Naples, 1599.

Editions. This is the first edition of this work, three other editions appearing in the seventeenth century.

Arithmetics written by Genoese masters in the sixteenth century are rare, even in manuscript form, and this is probably the only such work printed in Naples. Genoa was a mercantile center, but its dialect was not conducive to the success of a textbook, as is seen in the case of Zucchetti's treatise (p. 425). Naples was too far from the path of international commerce to produce many mercantile works. But although Oberto Cantone was a Genoese, he was a 'professor delle discipline matematiche' in Naples, and he dates his dedicatory epistle 'Di Napoli li 15. Iuglio 1599.' Naples, however, had a commerce of its own, even if not as extensive as that of Venice or Florence, and by the close of the century it was natural to expect works of this kind.

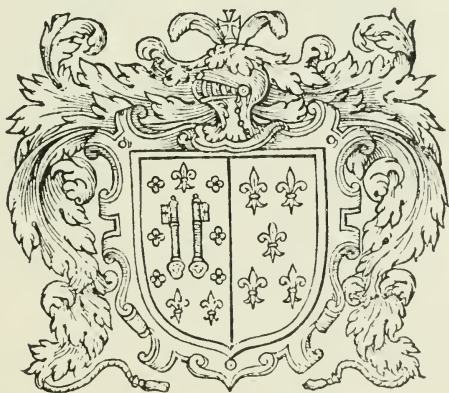
The book is mercantile and is based upon Borghi and similar writers of the North. It gives our present method of multiplication, but makes no use of the Venetian or Florentine names, with the exception of 'per colonna.' Two or three short methods are given, but no such extended treatment of varied forms appears as in Tartaglia, or his great predecessor Paciolo. Division, except in simple cases, is postponed to p. 142,

L'VSO PRATTICO
DELL'ARITMETICA
DI
OBERTO CANTONE
DA GENOVA,
PROFESSOR DELLE DISCIPLINE
Matematiche.

NEL QUALE CON NUOVA INVENTIONE
*s'insegna in materia di conti, l'uso tanto della Regia Camera della
Sommaria, quanto di Negotianti, Mercadanti, & Artegiani.
e come Napoli cambij, e recambij in ciascuna piazza.*

CON PRIVILEGIO.

INSIGNA



DE QUIROS-

IN NAPOLI,
Appresso TARQUINIO LONGHO. M. D. IC.

Si vendono dal medesimo Autore à Banchi nuoui.

and is there treated in the modern form, 'a danda.' Most of the applied problems are in exchange, although a few other types are given. The book is poorly constructed, being too prolix in the treatment of the operations, and too narrow in its applications.

JOANNES MARIANA. Ed. pr. 1599. Toledo, 1599.

Born at Talavera de la Reina, in 1536; died at Toledo, February 17, 1624. He was a Spanish Jesuit and a famous historian.

Title. See Fig. 210.

Colophon. 'Toleti, Apud Thomam Guf-//manium, Anno. 1599.' (P. 206.)

Description. 4°, 14 × 18.6 cm., the text being 9.3 × 15.6 cm. 6 pp. blank + 8 unnumb. + 192 numb. = 206 pp., 26 ll. Toledo, 1599.

Editions. There was no other edition.

The author is not the same as the Giovanni Mariani mentioned on p. 180, but a Spanish Jesuit of some fifty years later. The work is on the history of the weights and measures used in Spain in the sixteenth century. It traces these measures from the Roman, Greek, and Hebrew sources, and is valuable for the study of the history of the subject. It closes with a table of comparative measures.

MARTIN WENCESLAUS. Ed. pr. 1599. Middelburg, 1599.

A Dutch arithmetician of the sixteenth century.

Title. See Fig. 211.

Colophon. 'Eynde defes onfes eerften Vo-//lumens: Ghedruct int Jaer ons Hee-//ren 1599. In defe vermaerde Coop-//ftadt van Middleburgh in //Zeelandt.'// Also in French: 'Fin de ce noftre premier Volu-//men: Imprimé l'An de noftre Seig-//neur 1599. A la tref-renommée // ville Marchande de Middel-//bourg en Zeelande.' (F. 157, r.)

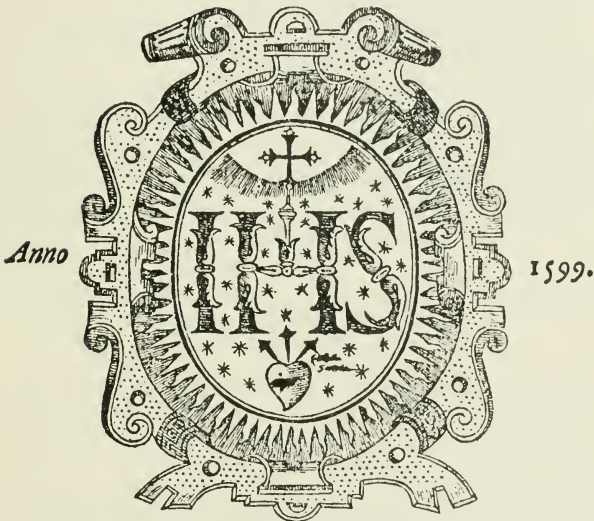
Description. 4°, 15.2 × 20.1 cm., printed in double columns, one in Dutch and the other in French, the Dutch being 6.7 × 15.7 cm., the French 5 × 15 cm. 4 ff. blank + 18 unnumb. + 137 numb. = 159 ff. Dutch: 30-41 ll.; French: 16-26 ll. Middelburg, 1599.

Editions. This is evidently the first edition, since the dedication is dated 'Den 10. dach van Decem. ftijlo nouo. Anno Chrifiti.

10 ANNIS

MARIANAE

Hispani,
E SOCIE. IESV,
DE PONDERIBVS ET
mensuris.



CVM PRIVILEGIO.

Toleti, Apud Thomam Gusmanium.

FIG. 210. TITLE PAGE OF MARIANA

T' FONDAMENT
Van Arithmetica: mette Ita-
 liaensche Practijck / midtsgaders d'aller
 nootwendichste stukken van den Reghel van
 Interest.

Bevdes in Nederduyts ende in Franchois/
 met redelicke ouereenstemminghe ofte
 Concozdantien.

Alles
 Deoz MARTINVM VENCESLAVM,
 A QVIS GRANENSEM.

LE FONDAMENT
DE L'ARITHMETIQUE AVEC
 LA PRACTICQUE ITALIENNE ENSEM-

ble les pieces, les plus necessaires de la Regle
 d'Interest.

ENSEMBLE EN BAS ALLEMAN ET EN
 François, avec raisonnable Harmonie ou
 Concordance.

LE TOVT

Par *MARTHINVM WENCESLAVM.*
Aquisgranensis.

MIDDELVRGH.

By Symon Moulert, woonende inde Druckerije. 1599.

Ende men vintse te coope/ by Adriaen van de Vivere, Boekvercooper/
 woonende by de meulwe Burse/ inden vergulden Wybel.

1598,' 'le 10. Iour de Decembre ftylo nouo. Anno. Christi- 1598.' The long and stupid preface is dated November 30 of the same year. Wenceslaus had already published two works before this one, the 'Proportionale ghesolveerde Tafelen van Interest,' 1594, 8°, and the 'Boukhoudens Instruction,' 1595.

The book is interesting, both because of its arrangement of the Dutch and French texts in parallel columns, thus serving a purpose in language teaching in a bilingual country, and because of the mercantile problems which reveal, as is particularly true of the Dutch books, the contemporary life of the people.

Other works of 1599. St. Augustine (see Reisch), p. 82, 1503; Barlaamo, p. 343, 1572; Benedetti, p. 364, 1580; Boethius (see Reisch), p. 82, 1503; Bungus, p. 384, 1583-84; Capella, p. 66, 1499; Clichtoveus (see Reisch), p. 82, 1503; Faber Stapulensis (see Reisch), p. 82, 1503; Finaeus (see Reisch), p. 82, 1503; Gallucci (see Reisch), p. 82, 1503; Jacob, p. 298, 1560; Jordanus (see Reisch), p. 82, 1503; Ramus, p. 330, 1569; Reisch, p. 82, 1503; Schleupner, p. 412, 1598; Strübe, p. 391, 1588; Johann Heere, 'Rechenbüchlein von allerhand gebräuchlichen Fragen,' Nürnberg, 8°; Andreas Reinhard, 'Drey Register Arithmetischer Anfang zur Practik,' Leipzig, 8°, with a second edition in 1600.

JACOB VANDER SCHUERE.

Ed. pr. 1600.

Haarlem, 1600.

A Dutch arithmetician of Meenen, c. 1550-1620.

Title. See Fig. 212.

Description. 8°, 9.4 × 14.4 cm., the text being 7.2 × 12.6 cm. 2 ff. unnumb. + 202 numb. = 204 ff., 22-23 ll. Haarlem, 1600.

Editions. That the date of the first edition is 1600 appears in the Voor-Reden of the 1625 edition, where his son, Denys, says that the book was published by the father 'eerst in't Iaer 1600. ende dit is al de vierde mael dat het gedrukt is.' There were various editions in the seventeenth century, including the following: Haarlem, 1611; Rotterdam-Schiedam, 1624, 8° (p. 423); Haarlem, 1625; c. 1630, 8° (p. 423); Gouda, 1634, 8° (p. 424); Amsterdam, 1643, 8° (p. 424); Rotterdam, 1653, 8° (p. 425); Amsterdam, 1675.

ARITHMETICA,
Oft Reken-const/
Verchiert met veel schoone
Exempelen/seer nut vooz alle Coop-
lieden / Facteurs / Cassiers / Ontfan-
ghers/etc. Ghemaect / Vooz
IAQVES VAN DER SCHVERE
VAN MEENEN.
 Nuter tijdt Francoysche School-meeester
 tot HAERLEM.



TOT HAERLEM,
 Vp Gillis Grooman Boeckdrucker/in de Jaco-
 bjine-strate/in de bergulde Parffe, 1600.

FIG. 212. TITLE PAGE OF VANDER SCHUERE

Vander Schuere's work on bookkeeping is mentioned under the later editions (p. 424), although it was not published in the sixteenth century. No effort has here been made to complete the list of seventeenth-century editions.

This is one of the many practical arithmetics that appeared in Holland about this time. It takes up the fundamental processes, rule of three, fractions, the rule of practice, partnership, commissions, inheritance problems, profit and loss, interest, exchange, barter, alligation, and the various other rules in use at that time. It was one of the most successful Dutch textbooks.

JACOB VANDER SCHUERE.

Ed. pr. 1600.

Rotterdam-Schiedam, 1624.

See p. 421.

Title. 'Arithmetica//Oft//Reken-konft;//Verciert met veel fchoone // Exempelen/ zeer nut voor alle vlijtighe // Oeffenaers ende leer-ghierighe Aenvanghers // defer Konft/ etc. Ghemaect door // Iacob Vander Schuere, Meenenaer, // Nu ter tijdt Franfoyfche. School-meeftter // tot Haerlem. // Ende nu int herdrucken overfien ende ghebetert. // (Woodcut of Vander Schuere with motto: Door siet den Grond.) // Tot Rotterdam, // Voor Pieter van Waefberghe/ // Anno 1642.' (F. 1, r.)

Colophon. 'Tot Schiedam, // Ghedruckt by Adriaen van Delf. // Anno 1624.' (F. 208, r.)

Description. 8°, 8.7 × 14.7 cm., the text being 7.6 × 12.9 cm. 2 ff. unnumb. + 206 numb. = 208 ff., 22-27 ll. Rotterdam-Schiedam, 1624.

See above.

JACOB VANDER SCHUERE.

Ed. pr. 1600.

S. l. a. (?), c. 1630.

See p. 421.

Title. 'Arithmetica oft Reken-konst.'

This edition is without date, the title page being missing, but is probably c. 1630. F. 1 is missing. 9 × 15.6 cm., the text being 7.3 × 12.2 cm. 5 ff. unnumb. + 252 numb. = 257 ff., 35 ll.

JACOB VANDER SCHUERE. Ed. pr. 1600. Gouda, 1634.

See p. 421.

Title. 'Arithmetica // oft // Reken-konft. // Door Iakob vander Schuere, Meenenaer // Eertyts Françoysche Schoolmeester // tot Haerlem, // En in't herdrukken by hem ouerfien // verbeterd en vermeerderd, en noch by // geuoecht een kort onderricht van // 'tItaliaens Boeck-houden // ter Goude // By Pieter Rammefeyn, Boeck-vérkooper // inde Korte Groenen-dal, in't Vergult A, B, C. // a^o 1634. W Akerfl: fec.' (The title page is elaborately engraved, with a portrait of the author surrounded by the following: 'Doorseit den Grond Iakob Vander Schvere æt 50.')

Description. 8°, 8.8 × 14.2 cm., the text being 7 × 12.7 cm. 8 ff. unnumb. + 208 numb. = 216 ff. Bound with this is 'Kort onderricht // over het // Italiaens // Boeck-houden; // Nu int licht ghebracht // Door Iakob vander Schvere,' etc., with 1 f. unnumb. + 37 numb. = 38 ff., making a total of 254 ff. in the book, 28-33 ll. Gouda, 1634.

See p. 423.

JACOB VANDER SCHUERE.

Ed. pr. 1600.

Amsterdam, 1643.

See p. 421.

Title. 'Arithmetica // oft // Reken-konft. // Eene kort onder-richt van't Italiaens Boeckhoudē // Door Iacob vander Schvere Meenenaer. // By den Autheur overfien, verbeetert en vermeerderd. // Tot Amsterdam, // voor Michiel de Groot Boeckverkooper // op de nieuwendyk inde Bieftkens Bybel. 1643.' (Engraving of author with the following wording: 'Iacob vander Schvere Meenenaer. Out 67. Iaer. Doorsiet den Grondt. Anno 1643.')

Description. 8°, 9.5 × 14.7 cm., the text being 7.2 × 12.5 cm. 272 ff. (216 numb + 8 unnumb. in the arithmetic), 26-31 ll. Amsterdam, 1643. Bound with this is 'Kort onder-richt // Over het // Italiaens // Boeck-houden. // In't Licht gebracht // door // Jacob van der Schuere. // t'Amsteldam, // By Michiel de Groot,

Boeckverkooper // op de Nieuwendijck / tuffchen de twee Haer-//
lemmer Sluyfen. A^o. 1675.' (F. 1, r., of the bookkeeping.)

See p. 423.

JACOB VANDER SCHUERE.

Ed. pr. 1600.

Rotterdam, 1653.

See p. 421.

Title. 'Arithmetica // ofte // Reken-konft, // En een kort
onder-richt van't Italiaens // Boeck-houden.// Door // Iacob van
der Schuere Meenenaer.// By den Autheur over-sien, verbeter
en // vermeerdert.// Tot Rotterdam, // Gedruckt by Pieter Waef-
berge, woo-//nende op't Steyger/ in de gekroonde // Leeuw/
Anno 1653.' (F. 1, r.)

Description. 8°, 8.7 × 14.1 cm., the text being 7 × 12.1 cm.
275 pp. (219 numb. + 8 unnumb. in the arithmetic), 26-33 ll.
Rotterdam, 1653. Bound with this is 'Kort onder-richt // over
het // Italiaens Boeck-houden.// In't Licht gebracht // door //
Jacob van der Schuere.// Tot Rotterdam, // Gedruckt by Pieter
van Waefberge, // Ordinaris Drucker/ woonende op't Steyger //
in de gekroonde Leeuw/ Anno 1653.' (F. 1, r., of the book-
keeping.)

See p. 423.

GIOVANNI BATTISTA ZUCHETTA.

Ed. pr. 1600.

Brescia, 1600.

Born April 21, 1550. A Genoese arithmetician.

Title. See Fig. 213. The privilege is dated 'In Genoua nel
di 30. di Genaro. M. CCCCC.'

Description. Fol., 24.2 × 33.4 cm., the text being 17.1 × 26
cm. 444 pp. (412 numb.), 33-37 ll. Brescia, 1600.

Editions. There was no other edition. Brunet says this 'Prima
Parte' is the only one that appeared.

The work has several interesting features, not the least one being the
apology 'Al generoso lettore,' in which the author speaks of the criticism
liable to be directed against a Genoese author on account of his pro-
vincial Italian. The 'Prologo' is a curious dissertation on the 'Arti,

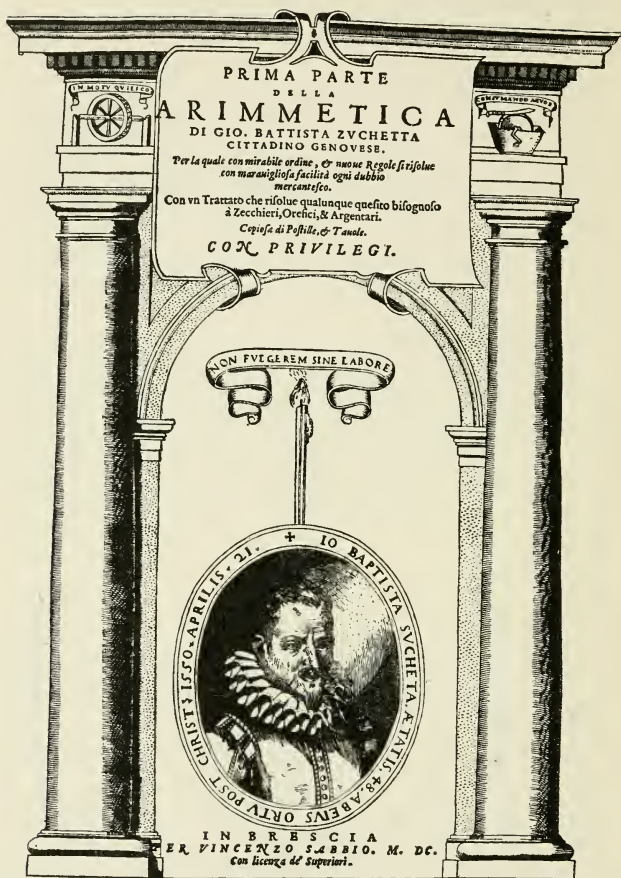


FIG. 213. TITLE PAGE OF ZUCHETTA

Scienze, & altro,' with some ninety-eight arguments to show the need for arithmetic on the part of all classes of humanity. The farmer, the musician, the thief, the cook, the prelate, all are shown to have need of number; and Nature, Intelligence, and even God himself make use of it.

The book presupposes a knowledge of the arithmetic of integers, and opens with a treatment of fractions. The rule of three, in all of its forms, and with most unbusinesslike numbers, is then discussed at great length, and this is followed by various complications of the Regola del Cattaino, 'così detta da gli Arabi inuentori di quello, ch' in lingua nostra significa falsa posizione.' The latter part of the book treats of such topics as partnership, barter, and alligation. The work was not of a nature to have any influence on Italian arithmetic.

WILHELM SCHEY. Ed. pr. 1600.

Basel, 1600.

A German Rechenmeister at Solothurn. Born c. 1560.

Title. See Fig. 214.

Description. 4°, 15.1 × 19.4 cm., the text being 10 × 15 cm. 486 pp. (470 numb.), 36–37 ll. Basel, 1600.

Editions. That this is the first edition appears from the dedication: 'Datum den 12. Septembris. Anno Domini 1600.'

The book is an attempt at a complete commercial arithmetic, but is not well constructed. The author likes to arrange his computations in a bizarre fashion, for effect. He extends his explanations unduly, and for so large a book the mercantile information is not as complete as it should be. There is a curious arrangement of the figures in the proofs by casting out nines, as here shown, although whether this is a typographical matter or a notion of Schey's there is nothing to indicate. In the 'Regula Falsi' there is a rather early use of ÷ for the minus sign. In general the book is reactionary, giving only the galley division (with much attempt at effect), and mentioning, although not treating, 'Duplatio' and 'Mediatio.'



Other works of 1600. Barlaamo, p. 343, 1572; Buscher, p. 393, 1590; Chambers (see Barlaamo), p. 343, 1572; Herodianus, p. 60, 1495; Hylles, p. 396, 1592; Jacob, p. 298, 1560; Lonicerus, p. 253, 1551; Ramus, p. 263, 1555; Reisch, p. 82, 1503; Reinhard, p. 421, 1599; Schulze, p. 383, 1584; M. van den Dycke, 'Chyfer-Boeck' (second edition, I do not know the first), Antwerp, 8°, and 'La vraye reigle d'Arithmétique' (a translation of the other?), ib., 8°; Georg Gleitsmann, 'Künstliches Rechenbuch fowohl auf Linien als mit Ziffern

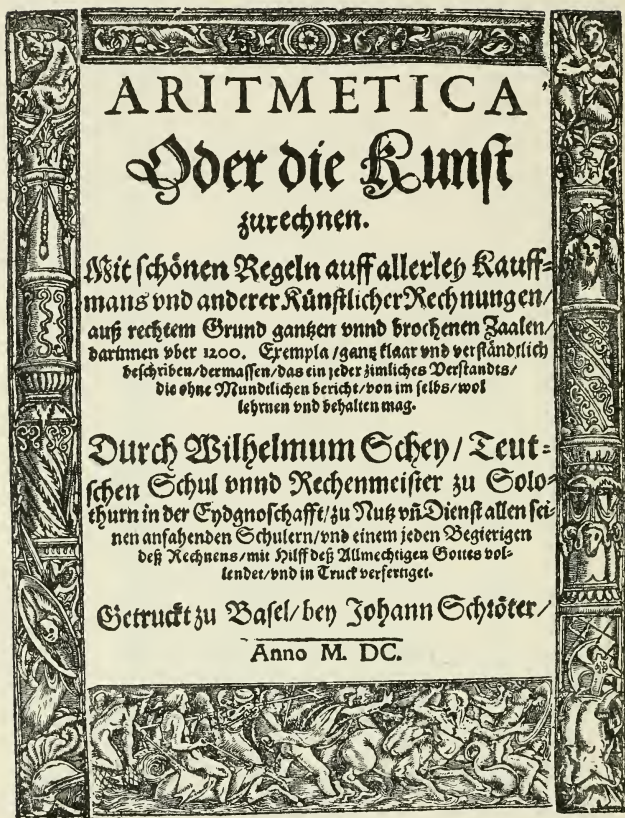
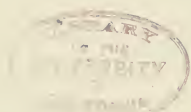


FIG. 214. TITLE PAGE OF SCHEY

nach defs Rami Arithmetica gestellt,' Frankfort, 8°; M. Johann Taf, 'Schönes neues . . . Rechenbuch,' Cologne, 4°. There was also published, s. a., but c. 1600, a work by Vincenzo da Bergamo, 'Arithmetiche instruttioni.'

There were many other arithmetics published in the sixteenth century without date, including the following: Anonymous, 'Art et Science de Arismetique,' Paris, 12°, 96 ff. (Boncompagni sale); Anonymous, 'Livre des gects,' s. l., 4° (see p. 130, 1520); Anonymous, 'Abbaco di succincte dimostrazioni,' s. l. (Milan?) (Brunet); Anonymous, '(Q)ui apresso e ināci col nome di dio intēdo di tractare e scriuere alquātimo di e regole sopra larte del numero altrimēti chiamato alcurismo,' s. l., 33 ff. (Riccardi); Joachim Ammonius, 'Isagoge Arithmetices . . . cum praefatione P. Melanchthoni,' Wittenberg; Angelus Mutinens, p. 140, 1525; Sarafino da Campora, 'Della ragione dell' Abbaco,' and a work on the calendar (Messina, 1559, and Rome, 1560) (Riccardi); Lauro Quirini, 'De mysterio numerorum;,' Matteo Ricci, 'T'ung-wen suan-chih' (Practical arithmetic in 11 books, the work of a Jesuit missionary in China, b. 1552, d. 1610; possibly not published during his lifetime).

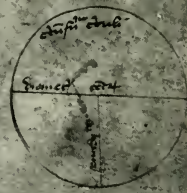
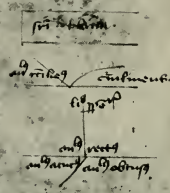
PART II
MANUSCRIPTS





LIBRARY
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OF
CALIFORNIA

463
Divides autem pars non est lineae
 longitudo sed latitudine aut extre-
 mitates sunt et recta lineae recta est ab
 uno puncto ad aliud extendit super exten-
 suas utriusque coram suscipies est quod longitudo
 in eam latitudinem tamen habet aut terminum quod dicitur
 sunt lineae. Superficies plana est ab una linea
 ad aliam extendit in extremitates suas est
 recipies. Angulus pluri est duarum linearum
 alterius terminus quatuor expansio super superficiem
 applicatam non directam. Quandoque angu-
 lum terminet duae lineae rectae sunt rectili-
 neus angulus nominatur. Quando recta linea sit recta
 dicitur duorum angulorum utrobique sunt oppositi
 eorum utique rectus est. Lineae sunt isoclinae
 angulus perpendicularis vocatur. Angulus non
 a recto maior est obtusus dicitur angulus. In
 angulis minoribus recto aequales appellantur. Ter-
 minus est quod angulus terminus est. Figura est quod
 terminus ut terminus dicitur ut terminus. Ter-
 minus est figura plana una quod linea recta
 est a quo omnis linea ad differentiam dicitur



Philippus
 4633

PLATE IV. FROM THE CAMPANUS MANUSCRIPT OF EUCLID, C. 1260

MANUSCRIPTS

EUCLID.

Latin MS., c. 1260.

See p. 11.

Title. 'In hoc libro continet' geomet'a euclidis // cū commento magrī campani.' (F. 1, v.)

Colophon. '¶Explicit geometria euclidis cū cōmen//to magiftri campani.' (F. 165, v.)

Description. Fol., 17.8 × 25.8 cm., the text being 8.5 × 17.2 cm. besides the marginal figures. 165 ff., 23-44 ll. Written on vellum c. 1260.

Editions. This work being primarily a geometry, I have not given a list of the editions. For the arithmetical books, which (except for Book V, on proportion) are not included in this manuscript, see p. 237.

This is a Latin manuscript of Euclid, with the commentary (proofs) of Campanus, written on vellum about 1260. The translation of the theorems is that made by Adelard (Æthelhard) of Bath, c. 1120, but in the early printed editions of the 'Elements' it is generally referred to as that of Campanus.

Of Campanus himself not very much is known. His first name was probably Johannes, and he is known to have prepared a set of planetary tables, and to have been chaplain to Urban IV. (See Boncompagni's *Bulletino*, I, 5, and XIX, 591.)

This manuscript has been studied by Mr. C. S. Peirce (*Science*, n.s., XIII, 809), who believes it to be the copy given by Campanus himself to Jacques Pantaléon when the latter was Patriarch of Jerusalem, hence before August 29, 1261, when he became Pope Urban IV. He bases his belief on a sentence written in a cursive hand just below the colophon, containing the words 'Jacobus Dei gratia Patriarcha Jerusalem-torum.' The complete sentence is: 'In nōīe dñī amē Jacobus dei g'

patriarcha Jerufalemitar om̄ibus xpi fidelibus falutem defiderium,' — 'In the name of the Lord, amen; Jacob by the grace of God patriarch of the Jerusalemites to all the faithful of Christ, greeting and love.' While this seems more of a blessing or quasi imprimatur than a mark of ownership, it is equally valuable in serving to fix the date. On f. 1, r., is the inscription in a fourteenth-century hand, 'mgri adolphi di Werda,' and a statement that the manuscript belonged to the Phillips collection, no. 4633. On f. 165, v., is an inscription in an English hand of c. 1400, 'lib^e ifte fuit Di armachani,' — 'This book belonged to Dominus Armanus.' (For a page of this MS. see Plate IV.)

ANICIUS MANLIUS SEVERINUS BOETHIUS.

Latin MS., c. 1294.

See p. 25.

Title. The manuscript begins: 'Incipit proloḡ in arithmeticā boetii.' (F. 1, v.)

Colophon. 'Explicit arifme^{ca} // boetij ad fymacu⁹ patriciu^e.' (F. 28, r.)

Description. Fol., 19.8 × 27 cm., in double columns, each being 7 × 20.1 cm. 28 ff., 41 ll. Written on vellum c. 1294. Bound with the Euclid described below but in a different hand. It is beautifully written and illuminated. The contemporary pigskin binding has the inscription, 'lib' arifmetice boecij.' The text is practically that followed by the Friedlein edition (Leipzig, 1867). (See Plate I.)

Editions. For printed editions see p. 27.

See p. 27.

EUCLID.

Latin MS., c. 1294.

See p. 11.

Title. The work begins without title: 'Punct⁹ eft cui⁹ ps nē.' (F. 29, v.)

Colophon. 'Explicit geometri euclidis cum comto campani.' (F. 111, v.)

Description. Fol., 19.8 × 27 cm., the text being 17.5 × 19.5 cm. 111 ff. (the first 28 ff. being the arithmetic of Boethius)

described on p. 434), 44 ll. Written on vellum, c. 1294. It has beautifully executed figures and is a fine specimen of the work of the mediæval scribe. It is written in a different hand from that of the Boethius with which it is bound. The cover, which seems contemporary with the manuscript, has the number cclxxxiiiij, possibly for the date 1294, the M being omitted as is often the case. (See Fig. 215 and Plate V.)

ANICIUS MANLIUS SEVERINUS BOETHIUS.

Latin MS., c. 1300.

See p. 25.

Title. The manuscript begins: 'Incipit libr̄ arismetice art . . .'

Description. Fol., 13 × 18.6 cm., the text being 8.9 × 14.1 cm. 37 ff., 32–36 ll. Beautifully written on vellum. The work is complete, and, like the manuscript described on p. 434, this shows a text very similar to that followed by the Friedlein edition. At the end of the manuscript are two folios of commentary, closing with two almost illegible lines containing the words 'Com . . . campani . . .,' referring to the commentary of Campanus. Roman numerals are used throughout the text, which was not always the case in manuscripts of this date. (See Plate VI.) The commentary, which seems to have been added about a century later, has some Hindu-Arabic numerals.

PAOLO DAGOMARI.

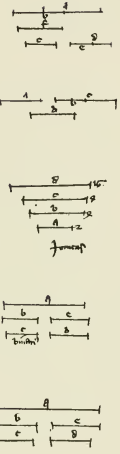
Italian MS., c. 1339.

PAOLO DELL'ABACO, PAOLO ASTROLOGO, PAOLO GEOMETRA, PAOLO ARISMETRA, PAUL OF THE ABACUS. Born in Prato, c. 1281; died at Florence in 1374, or, according to some writers, in 1365. He was a celebrated Florentine arithmetician, 'geometra grandissimo, e peritissimo aritmetico . . . diligentissimo osservatore delle Stelle, e del movimento de' cieli,' as Villani (*Le Vite d'Uomini illustri Fiorentini*) calls him.

Title. 'Trattato d'Abbaco, d'Astrono-//mia, e di segreti naturali // e medicinali.' (F. 1, r.)

Description. Fol., 21.7 × 29.3 cm., the text being 15 × 21.4 cm. 138 ff. (7 blank), 32–35 ll., clearly written on paper, c. 1339 (possibly copied later).

29.
30.
31.
32.
33.
34.
35.
36.
37.
38.
39.
40.
41.
42.
43.



7 nũmp m oñu pareu ducar qui in pduce er par ^{327 mãmfm}
 5 iunãmgen duca impar qui pduce erit impar ^{27 e q d2}
 5 iunãm impat nuim pare ^{27 e q d2}
 nuẽctũo pĩ cã nuĩbuẽ ^{27 e q d2}
 57 impar impare nuĩet ipũ ^{27 e q d2}
 eũ nuĩet ^{27 e q d2}
 57 mĩs par nuim pare incedũ ^{27 e q d2}
 at eĩdem quoqũ dũũduũ ^{27 e q d2}
 qũũ meari nũc est ^{27 e q d2}
 57 mĩs ipar ad alĩque sũũ ^{27 e q d2}
 pũũ idẽ ad eĩde erũ duũ ^{27 e q d2}
 plũ pũũũ ^{27 e q d2}
 57 uũ aduũũ duũũ sũũ pũũ ^{27 e q d2}
 partes cantũũ ^{27 e q d2}
 57 uũũũ cuĩ medĩetas ẽ ipar ^{27 e q d2}
 est pũũ impar ^{27 e q d2}
 57 oũũ uũũ a duũũũ nũ duũũ ^{27 e q d2}
 cuĩ medĩetas est par est ^{27 e q d2}
 pũũ par 7 mĩpũũ ^{27 e q d2}

FIG. 215. FROM THE 1294 MANUSCRIPT OF EUCLID

Bernardino Baldi testifies to the esteem in which the author of this work was held, in the following words: 'Di patria Fiorentino fu Paulo; il quale, per l' eccellenza ch'egli hebbe ne le Matematiche, lasciato il proprio cognome, fu chiamato da tutti il Geometra. Come apunto fra gli antichi auenne ad Apollonio Pergeo.'

This manuscript is primarily a treatise on arithmetic. The writer, however, left a number of blank pages at the end, and these have been filled in from time to time by various owners.

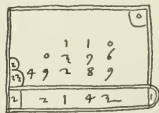
The arithmetic begins (f. 1, r.): 'El nome sia di Dio et a reverentia // della fuo potentia et della fanta trinitade. Et dello fuo madre // uirgino sempre fanta maria Et del beato SCo Giouani batisto // . . . Al chominiciamento del nostro trattato . . .' On f. 1, r., is a table of

ple trezo anno cõp uagliano 147^{dt} c 6^ß c 99^q et gusti/popa 1492^{dt} c 2^ß
et 109^q fauimo 1642^{dt} c 9^ß c 2^q auimo a fano p 7 m^{si} c 1081 pumamem
diuimo lano uerono 164^{dt} c 8^ß c 1/2 clom^q mo uerono 82^{dt} c 2^ß c 68^q equipo
penti q 6^q fano uenit 12^{dt} c 12^ß c 118^q etamo uenit lom^q / Ora facimo
p 10 q c 9^q pono 4^{dt} c 11^ß noc loco qo di quello cõp uale ilm^q / Ora facimo
diuim 7 m^{si} c 1081 equimontano 100^{dt} c 7^ß c 68^q etamo uagliano p 7 m^{si} c 1081
a 100^{dt} p 100 coc 100^{dt} c 7^ß c 68^q equipo noto equipo gusti/popa 1642^{dt}
c 9^ß c 2^q pono pinto 1742^{dt} c 16^ß c 89^q 17^q am^{si} c 7 m^{si} c 1081 Equi com
mo fauo a 11^{dt} c 15^ß p 1000 equidueno gusti/popa 2^ß c 68^q / pono 204^{dt}
c 19^ß c 118^q Equipo gusti/popa 1742^{dt} c 16^ß c 89^q Sono pinto 2047^{dt}
c 16^ß c 79^q cõ fauo fano equitans glia c uenit na c apatulo di
122^{dt} c 17^q am^{si} c 7 m^{si} c 1081 a dt 11^ß p 100 lano ::

Vno a p r e f a t o r e d e d a c e a n n o p r o a n n o q 56^{dt} diqui a 2 m^{si} c 1/2
d u e l a m e q 9 d a n e c g h o f f i v g o n t a n t e m o d a n a r e a s a p e n e d i 10^{dt} p 100 l a n o
D i m m i q u a n t o g l i a d a c e a p a g h a n o i n a m q 12 m^{si} c 1/2 / D u e a 100^{dt}
p 100 l a n o u e n e i l m q 2 9 p 2 m^{si} c 1/2 p o n o 9 q e t a m o n a l e l e t t
i n 2 m^{si} c 1/2 n o c 5 q f a c i a m o p r i m a m e m l e 400^{dt} c 9 c u a g l i o n o 8^{dt}
c 6^ß c 89^q E q u i p o n e l d i 456^{dt} u e p a 447^{dt} c 13^ß c 99^q O r a f a c i a m o

FIG. 216. FROM THE DAGOMARI MANUSCRIPT

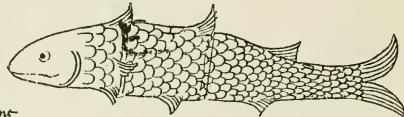
money. F. 2, r., - f. 3, v., is a table of contents: 'Questi sono echapitoli del nostro tractato,' and this states that the work includes the 'Regholvze del Maestro Pagolo Astrologo.' (ff. 121, r., - 131, r.). This part of the volume is an ordinary commercial arithmetic such as the Florentine teachers produced in the fourteenth and fifteenth centuries. The writing and the forms of the numerals indicate this period, and are not unlike that of a fourteenth-century computus (see p. 445) in this library. This may, however, be a fifteenth-century copy. The examples in division are unique, since they follow neither the galley nor the 'a danda' method, as is here shown in the case of $49289 \div 23 = 2143$. The peculiar position of the remainders should be noted. The 0 indicates no remainder, and the 2, 2, and 1 are excesses of 7's in the proof.



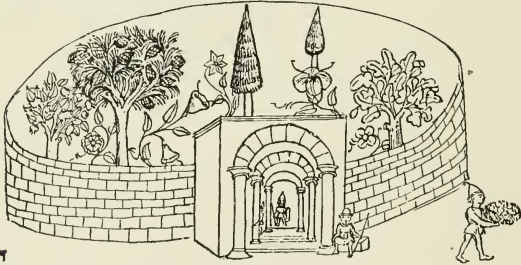
That the author considers this the 'a danda' plan (the forerunner of our present long division) appears in his use of this name immediately after. Another odd feature is the placing of the divisor second in the

19/monpolerij/0/pauli eguueda quello luogo che puo essere naturale m^o emas p^o uolmente . . .

EGLE uno pesce
de quale peso lan
sta il l^o e 3 ditto
peso clagoda
peso il quanto ditto
cto il peso cloufone



ditto peso 9/ onne m^o piu ne meno dim^o quanto peso tutto il peso
quanto peso lan sta p^o quanto peso la gda p^o / Doumo di questa rdi
tutto simiglianti che face du 1/2 e 1/2 simonono in 12: prendi il 1/2 e 1/2 di
12 loquale e 7/1 diu da 7/ infino in 12: fa . 5. e nota Epoco iglietone di
mezo peso 9/ onne / simiglianti che 9/ su 12 fino . 109 : epa ch^o . 5. / 9/ su
onno 21 e 3/7 etanto peso tutto il peso cioe 6n . 21 . e 3/7 donno / Semmo papre
quanto peso lan sta p^o solo prendi il 1/2 di 21 6n 3/7 che 7 6n e 1/2 etanto
peso lan sta p^o solo se moz papre quanto peso la gda prendi simiglianti tutto
il 1/2 di 21 6n e 3/7 loquale e 5 onne e 3/7 di 6n etanto peso la gda cioe 5 6n
e 3/7 Etanto che tutto il peso peso 21 6n e 3/7 Etato peso 7 6n e 1/2 donno
clagoda peso 6n e 3/7 donno cioe prouato . . .



EGLE uno Signoce Eg^o m^o manda anno grandino loquale a . . .

FIG. 217. FROM THE DAGOMARI MANUSCRIPT

division of fractions, it usually appearing first in that period. The problems are of the usual Florentine mercantile character. The first few are followed by a treatise on 'Nvmeri perfetti' (f. 67, r.), and this

(f. 73, r.) by further business problems. The work contains several curious illustrations (Figs. 217, 218).

The most interesting feature of the treatise is, however, the internal evidence as to its date. It is usually possible to determine quite accurately the date of a Florentine manuscript on arithmetic by the examples in equation of payments, a favorite application with the Tuscan arithmeticians, and one requiring the year to be stated. This is the case here, where the dates in these examples are all, save two, 1339. The writer has also used approximately these dates in other examples, in part as follows: 1329-1332 (a problem on the calendar, f. 27, r.); 1310-1404 (an astronomical table, which would naturally extend well into the future, f. 79, r.); 1330 (f. 116, r.), and 1339 frequently. A table of the 19-year cycle (f. 123, v.) begins with 1337, as is easily computed from a marginal note in a different hand bearing the dates 1394 and 1412. This part of the work ends on f. 131, r., and there can be no doubt that it was written about 1339, the date so frequently used in the problems.

F. 121, r., begins 'Regholvzze del Maestro Pagolo Astrologo,' Dagomari being referred to in the table of contents as Paul of the Abacus, 'Regholuzze del Maefstro pagholo delabacho . . .' The 'Regholvzze' was first published in Libri's *Histoire*, vol. III, p. 296.

Dagomari is included in the list of Bernardino Baldi's (1589) biographies, published in the Boncompagni *Bulletino*, XIX, 600.

Ff. 131, v., and 132, r., are in a different hand. These and the following leaves were originally blank, and after ff. 132, v., - 133, v., had been written upon, some owner used these two blank pages. He has also left his dates, viz. 1400, 1402, 1406, 1412, 1435, the 1402 being used several times. This was therefore written about 1400-1435. In this occurs the first per-cent sign I have met, other than p. 100, which is in the earlier part of this volume. This unknown writer of about 1425 uses a symbol which, by natural stages, developed into our present %.



FIG. 218. FROM
THE DAGOMARI
MANUSCRIPT

Instead of writing 'per 100,' 'p 100,' or 'p cento,' as had commonly been done before him, he wrote 'p $\frac{\circ}{\circ}$ ' for 'p $\frac{c}{c}$,' just as the Italians wrote $\frac{1}{1}$, $\frac{2}{2}$, . . . and $\frac{1}{1}$, $\frac{2}{2}$, . . . for primo, secundo, etc. In the manuscripts which I have examined the evolution is easily traced, the $\frac{\circ}{\circ}$ becoming $\frac{1}{1}$ about 1650, the original meaning having even then been

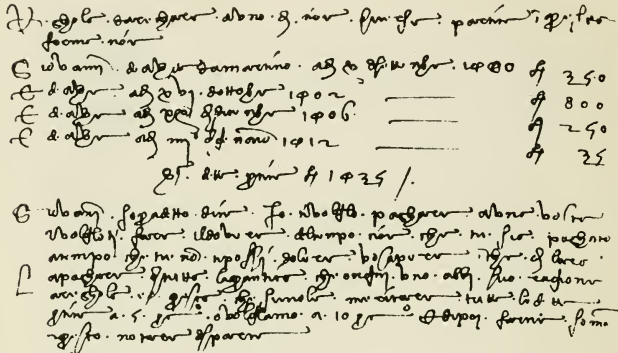


FIG. 219. FROM THE ADDITION (C. 1400-1435) TO DAGOMARI

lost. Of late the 'per' has been dropped, leaving only $\frac{1}{1}$ or $\frac{\circ}{\circ}$. See Figs. 219, 220.

Ff. 132, v., and 132, r., are in a different hand. They refer to the calendar, and contain the dates 1380 and 1382, each twice. F. 133, v., is in a still different hand, although also on the calendar. The date of this part is fixed by the expression, 'et i ifto prefeti año. f. 1447 finit circulf anni.'

EUCLID.

Latin MS., c. 1350.

See p. 11.

Title. None. Fragments of the 'Elements.'

Description. 4°, 16.5 × 21.4 cm., the text being 10.5 × 15.8 cm., with marginal drawings. 6 ff. unnumb., 32-41 ll. A Latin manuscript, written on vellum in a hand of c. 1350.

The manuscript is a fragment of 6 folios, and includes part of Books III and IV, and a list of propositions evidently based upon, but not identical with, Euclid's sequence.

Si Domanda quanto fu comprata la
libbra di quella Mercanzia la quale
vendendosi 75 d' 6 la libbra disse il
Mercante guadagnare $2\frac{1}{10}\%$ - -

| | | | | |
|--|-----|---|---|--|
| $\begin{array}{r} 122 \\ \underline{20} \\ 2440 \\ \underline{12} \\ 40110 \\ \underline{2440} \\ 29200 \\ \underline{4 \cdot 6 \frac{1}{10}} \end{array}$ | 100 | - | 5 | 6 |
| | | | | $\begin{array}{r} 12 \\ \underline{6600} \\ 20 \\ \underline{132000} \\ 14110 \\ \underline{12} \\ 170560 \\ \underline{20110} \\ 29200 \\ \underline{141} \\ 146 \\ \underline{7} \\ 73 \\ \underline{1} \\ 20 \end{array}$ |

FIG. 220. FROM A 1684 MANUSCRIPT, NOT HERE CATALOGUED

ALBERTUS MAGNUS.

Latin MS., c. 1350.

ALBERTUS TEUTONICUS, DE COLONIA, or RATISBONENSIS. Born at Lauingen, Swabia, c. 1193; died at Cologne, November 25, 1280. He was Count of Bollstädt, a Dominican priest, and Bishop of Regensburg. He studied at Padua and taught at Bologna, Strasburg, Freiburg, Cologne, and Paris. He was so prominent as a philosopher that he was known as 'Doctor Universalis.'

Title. 'De Cælo et Mundo.' (F. 1, r.)

Description. 22.4 × 32 cm., the text being 14 × 21.3 cm. without the marginal notes, and arranged in double columns, each 6.5 cm. wide. 90 ff., 50 ll.

This is a beautifully written manuscript, in a fourteenth-century hand, with fine initials in red, black, and blue. The first folio contains part of the calendar, and a few random memoranda, including an old price mark of three ducats. The twenty-ninth folio is blank except for some crude circles, and one folio has been cut out. There is a break here in the manuscript, f. 28, v., closing with these words from the fourth tractatus of liber I: 'Rei a' gñate ē ul̄tiū 2 finis in t̄p̄r aut actu aut pō. quia si ē corrupta tūc h̄t actu finē 2 si ē adhuc corrup̄t.' ('Rei autem generate est ultimū et finis in tempore aut actu aut potentia: quia si est corrupta, tunc habet actu finem: et si est adhuc corruptabilis' — the rest of the sentence being 'habet finem potentia.')

After the blank folio, f. 31, r., opens with these words from tractatus I of liber II: 'que est f̄b'a sepata' ('quæ est substantia separata,' the preceding missing words of the sentence being 'quæ tamen non limitant operationem formæ ejus'). Aside from this the manuscript is complete. F. 89 closes in col. 1 with the words 'Explicit liber de celo et mūdo fratris alberti deo agamus gratias.' F. 90, r., is blank, but 90, v., has the zodiac and planets.

There is a brief reference to Pythagorean arithmetic in liber I, tractatus I, caput II.

The best edition of this work is in 'B. Alberti Magni // Ratisbonensis Episcopi, ordinis Prædicatorum, // opera omnia, // . . . cura ac labore // Augusti Borgnet, // Volumen quartum // Parisiis . . . MDCCCXC.' The first edition of the Opera Omnia appeared in Leyden in 1651.

EUCLID.

Latin MS., 1375.

See p. 11.

Title. The work begins: 'Punctus est cui⁹ ps nō e⁻.'

Description. Fol., 20.9 × 30.1 cm., the text being 11.9 × 19.5 cm. 39 ff. unnumb. + 1 blank = 40 ff., 44-47 ll. A Latin manuscript, written on paper, c. 1375.

This manuscript includes the first five books of Euclid. This is followed by a treatise upon astronomy and mensuration, also in Latin, in a different but contemporary hand. The mensuration includes some work on areas and volumes.

ANONYMOUS.

Latin MS., 1384.

Title. None. A *Computus manualis*.

Description. 4°, 13.3 × 18.8 cm., the text being 9 × 13.3 cm. 33 ff. (3 blank), 40–44 ll., written on paper.

The first written folio has been torn, and the opening lines are missing. The work is that particular kind of mediæval computus (see p. 7) in which a finger mnemonic system is used (see p. 34). It is a copy of an older treatise, the text of which is here written in Gothic characters, the copyist's notes appearing in a smaller hand. As in most computi, the numerals are generally in Roman, both in the text and in the commentary, but the date is twice given, as follows (f. 19, r.): 'año dñj 1000.300.80.4̄'; 'anno dnj 1000.300.80.4̄' (see Fig. 221). The text is in Latin, except for one page which is in French. A later owner has written the date of his ownership, 1600 (f. 2, r.).

ANONYMOUS.

Italian MS., 1393.

Title. '¶ Qui chominchia ilpologho d'l conpoto // d'lcorfo d'l folo d' d'lla luno // Prolagho.' (F. 3, r., Fig. 222.)

Description. Fol., 22 × 29.7 cm., written in double columns, each being 7.5 × 20.5 cm. 70 ff. (6 blank), 35 ll.

This is an excellent example of a computus (see p. 7). The verse 'Thirty days hath September,' the only relic of the old computi now familiar to most people, appears in this manuscript in the following Italian form: 'Trenta di a noubre apile // giugno & fettenbre di uentotto (. . . .) vno tutti gialtrj fono trentuno.' (F. 12, v.) (See also p. 33.)

GIOVANNI, the son of Luca da Firenze. Italian MS., 1422.

The son of Maestro Luca, a celebrated Florentine arithmetician, mentioned on p. 468.

Title. 'Trattato di aritmetica.' (F. 1, r.)

Description. 4°, 14.9 × 21.9 cm., the text being 9.3 × 16.3 cm. 145 ff. 27–30 ll.

clausus numerus unius quatuor duo diei 1000 300 80. d' -
 quatuor .i.e. .i. numerus unius et diei numerus secundus in
 subtrahendo digitorum ut dicitur in **P**rimo quatuor .i.e. .i. diei
 fuit **P**rimo ut dicitur quatuor in illo dicitur addit .ii. .ii. .ii. .ii.
 et ita cum 30 et ut dicitur per dicitur anno diei 1000. 300.
 80 et ut dicitur modo fuit **P**rimo et alius per omni digitos
Primo ut dicitur quatuor fuit dicitur per dicitur dicitur
 dicitur .i.e. .i. fuit dicitur et modo dicitur fuit dicitur
 dicitur sequitur et in illo dicitur modo dicitur fuit
 in dicitur dicitur quatuor **P**rimo quatuor dicitur dicitur
 fuit .ii. .ii. .ii. .ii. fuit dicitur fuit dicitur ut dicitur
 in dicitur dicitur quatuor per modo fuit dicitur dicitur
 in dicitur dicitur quatuor et fuit dicitur dicitur dicitur
 in dicitur dicitur sequitur dicitur dicitur fuit dicitur dicitur
Primo dicitur quatuor dicitur a dicitur quatuor dicitur dicitur
 dicitur et fuit in illo dicitur fuit in dicitur dicitur dicitur
 dicitur sequitur dicitur dicitur dicitur dicitur dicitur

Prius clausus unius cognoscere mobile fecit
 in ostē tu dantes per met' sequētia d'
 Tūc anni nūq' vultur lūme digitorū
 Minos quog' tres decem plus d'le tēnuos
 Vn' digiti septa digito per clausū apta
 Vol' fuit inlequit' medius medicus quinnus p'
 Si q'draginta lupent' tringenta moueto
 Clausus ab vltimo ad q'draginta referunt
 Est unū clausus illud tibi quod remanēbit
 Annobillexen' sept' vult' quod requirit
 In tabillexu tu vngas clausū vnum
 Prolep' ul' quadrā billexo die luy' adda'
 Premulaq' jam **P**rimo dicitur dicitur dicitur
 clausus in dicitur dicitur quatuor dicitur dicitur
 quatuor fuit in dicitur dicitur dicitur dicitur
 dicitur et in dicitur dicitur dicitur dicitur dicitur
 dicitur dicitur dicitur dicitur dicitur dicitur
 dicitur dicitur dicitur dicitur dicitur dicitur
 dicitur dicitur dicitur dicitur dicitur dicitur
 dicitur dicitur dicitur dicitur dicitur dicitur
 dicitur dicitur dicitur dicitur dicitur dicitur
 dicitur dicitur dicitur dicitur dicitur dicitur

FIG. 221. FROM THE 1384 COMPUTUS

This is one of the best examples of an early fifteenth-century commercial arithmetic known. Florence was at this time an important financial center, and the arithmeticians of the city were highly esteemed. Several of the applications found in arithmetics for the next three centuries had their origin here. Subjects like equation of payments and partnership involving time, customs like 'days of grace' in exchange, and forms like time drafts in sets of two or three can be studied to good advantage in the arithmetical manuscripts of this period.

Tut hominina ipolagho d'itumpato
d'itropo d'ipolo d'illa l'una
ipolagho

Io padre nel principio
della creazione d'itmo
de sigome d'itc moise
nel principio del primo
libro della bibia d'it

diama d'itmo forte nel quarto di
la d'itra creazione tute p'le e p'ia
nre e p'no stile nel firmamento. In
tra d'it al p'ante n'itric due d'it
d'itima luminaria nac il sole ge
illuminate il di e la luna d'it allu
nasse. l'antre. C'gelle stelle d'it al
firmamento suo p'p'io corso. Calle pi
ante altro loro p'p'io corso. Il p'ale
puose r'ntario altro del firm
mento d'it al firmamento il cor
so suo p'p'io il quale sic son grandi
l'ima urto nra e son gran grandissi
ma forteza. Et c' il corso del firma
mento d'it gira dall'antre i' fine al
m'go di d'ipente. Et era urto l'ana
modana. Et nre in l'antre. Et p'
g'p'ia grande urto d'it corso g'gla
il firmamento. Et p'p'io il corso de
lle p'ante al'antre d'it il corso de
lle p'ante sic l'antre d'it p'ante
urto il m'go di d'it'antre e p'p'io g'
r'ando urto trametana nre d'it po

nre e g'og'p'io loro corso r'ntre
no l'antre d'it firmamento. Et
p'p'io tute p'ante al'antre corso r'nt
trario al firmamento no ane p'no
uno medesimo corso l'una g'ome
l'altra g'ituna l'ap'no lento d'it l'altra
e l'altra p'no forte e t'no p'no d'it l'altra
e p'no g'ome g'it'ant' p'ia g'it'ant' p'
ante uol'g'ano e g'ome dall'antre
p' m'go p'ante. n'one p'no g'it'ant'
illoro p'p'io corso. Anz' sic l'antre ne
l'antre d'it firmamento g'elle in me
na d'it d'it'ant' il loro p'p'io corso
Et m'ntale si forte g'it'ant' suo co
rso l'antre dall'antre e m'go di in
p'ante f'ant'ant' d'it'ant' d'it'ant'
p' l'altra m'p'no p' d'it'ant' t'ana i'
l'antre in urto g'it'ant' ore t'ant' d'
l'antre. Et g'it'ant' g'it'ant' d'it'ant'
f'ant'ant' fare in urto g'it'ant' ore p'na
il sole a g'it'ant' p'lo suo p'p'io corso
d'it'ant' t'ant' am e l'aluna d'it'ant' e a
m. Et g'it'ant' l'alre p'ante tal' i' p'no
am e tal' d'it'ant'. Et p' d'it'ant' d'it'
p'p'io m'ntare in g'it'ant' m' d'it'ant'
r'nt' d'it'ant' d'it'ant' g'it'ant' m' d'it'ant'
molto forte. Et d'it'ant' l'una firm
ga g'it'ant' andare e g'it'ant' in t'ant'
no. a g'it'ant' marina. Et u' d'it'ant'
no d'it'ant' g'it'ant' l'ant' d'it'ant' p'na
ara l'ant' d'it'ant' g'it'ant' in t'ant' d'it'ant'
molto d'it'ant' d'it'ant' d'it'ant' d'it'ant'
p'nta ante g'it'ant' p' d'it'ant' o d'it'ant'
l'ant' d'it'ant' una sola d'it'ant' d'it'ant' a

FIG. 222. FIRST PAGE OF THE 1393 COMPUTUS

On f. 1, v., the writer says he proposes to treat of arithmetic or the abacus: 'arismetricho volgharemente e chiamata abacho.' The word 'abacus' had come at this time, in Italy, to mean simply arithmetic, the original meaning having been lost. Following a custom of Florentine arithmeticians, Giovanni gives an extensive multiplication table, for purposes of reference, and then begins at once with examples in compound numbers and fractions, thus presupposing a knowledge of the fundamental operations. These examples are of a mercantile character and constitute the entire portion devoted to arithmetic. The examples in the equation of payments serve, as usual, to fix the date of the manuscript. They all refer to the years 1418-1426 (ff. 113-122). The date is, however, fixed exactly by the closing lines of a folio near the end: 'questo libro Iscrive Giouannj del maestro lucho dellabacho e finillo questo d ottobre 1422 —' (f. 136, v.). In the first page is the date 'ad 28 dottobre 1422.'

The book also contains a section on mensuration and the calendar, with curious illustrations of the months (Pl. VII). The last five folios, originally blank, seem to have been written by a different hand about the same period.

ROLLANDUS.

Latin MS., 1424.

A native of Lisbon, canon of Sainte-Chapelle, Paris, c. 1425.

Title. 'Scientia de numero ac virtute numeri.' (F. 3, 1.)

Description. Fol., 21 × 29.8 cm., the text being 15.5 × 21.5 cm. 168 ff., 28-31 ll.

This is an exceedingly interesting manuscript, written in the year 1424. It was prepared at the command of John of Lancaster, Duke of Bedford, son of Henry IV of England, at one time Protector of England and Regent of France. To him Rollandus dedicates the treatise: 'Illustriſſimo ac fereniſſimo principi metuendiſſimo domino domino Iohanni patruo domini noſtri regis ffrancie et anglie regenti Regnum ffrancie. duci bethfordie Rollandus ſcriptoris veſtre celſitudinis phyſicus vlex-bonenſis ſe ipſum ex debito iuramenti.' In 1423 Lancaster issued an ordinance for the restoration of studies in the University of Paris, and it was probably as a result of this that this textbook was written by a Portuguese phyſician, Rollandus, who was then a canon of Sainte-Chapelle in Paris. The dedication ſets forth Lancaster's interest in learning in France and the ſtatus of mathematics at that time. Rollandus covers all of theoretical arithmetic as then known, but takes up no practical problems. He alſo treats of irrational numbers, a topic

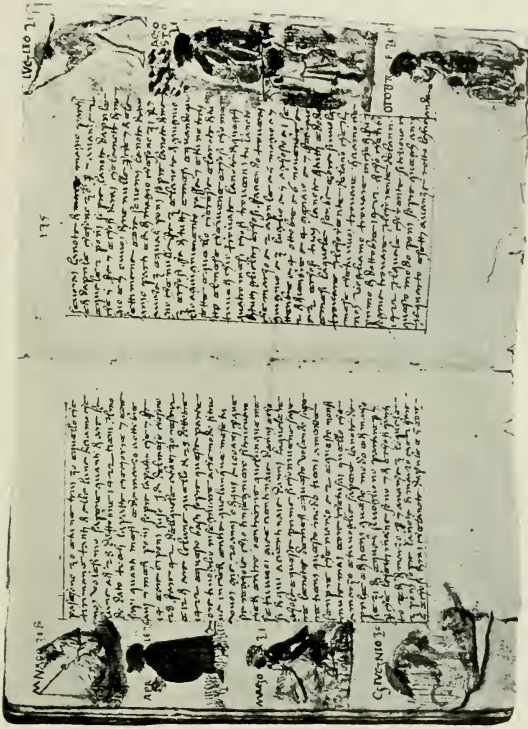


PLATE VII. FROM A MANUSCRIPT OF GIOVANNI DA FIRENZE, 1422



which is now considered part of algebra. It is doubtful if there is a manuscript extant which throws more light upon the nature of French university mathematics at the time this was written. Rollandus also wrote a work on surgery and one on physiognomy. He may possibly be the Rolland who in 1410 was rector of the University. Since this manuscript is evidently a copy, others must have existed, but I have found no reference to them. Fig. 223 shows the forms of the numerals used at this time. It should be noticed that the numerals that have changed materially in form since the twelfth century are 4, 5, and 7. These are shown opposite the letters *b*, *i*, and *p*, respectively, in Fig. 223. The changes in the other forms have been more evidently due to the fashion in handwriting. All of the forms are, however, quite different from the primitive ones found in the cave inscriptions of India.

ANONYMOUS.

Italian and Latin MSS., c. 1430
and 1478.

Title. The first folio is missing.

Description. Fol., 17×22.1 cm., the text being 11.2×14.4 cm. 183 ff., 25-28 ll.

This volume consists of two Florentine manuscripts, one on commercial arithmetic and the other on the computus. The portion on arithmetic was probably written between 1420 and 1444, these being the extremes of the dates in the examples in equation of payments. It is not unlike the other contemporary Florentine arithmetics described on pp. 443 and 464. The author

assumes the student's ability to perform the fundamental operations with integers, although, after numerous multiplication tables, he gives (see Fig. 224) an example under 'Multiplicha p modo de barichocholo' (the Florentine name for our present method), and one under 'Multiplicha p modo de Quadrato' (the 'gelosia' method of the Venetians).

| | | |
|-----------|---|----------|
| v | — | 1028416. |
| t | — | 422288. |
| o | — | 262122. |
| si | — | 131011. |
| q | — | 64436. |
| p | — | 32168. |
| o | — | 16382. |
| n | — | 8192. |
| m | — | 2096. |
| r | — | 2028. |
| p | — | 1022. |
| l | — | 412. |
| b | — | 216. |
| g | — | 128. |
| f | — | 62. |
| e | — | 32. |
| d | — | 16. |
| c | — | 8. |
| b | — | 2. |
| a | — | 2. |
| vntio. 1. | | |

FIG. 223. FROM THE
1424 ROLLANDUS

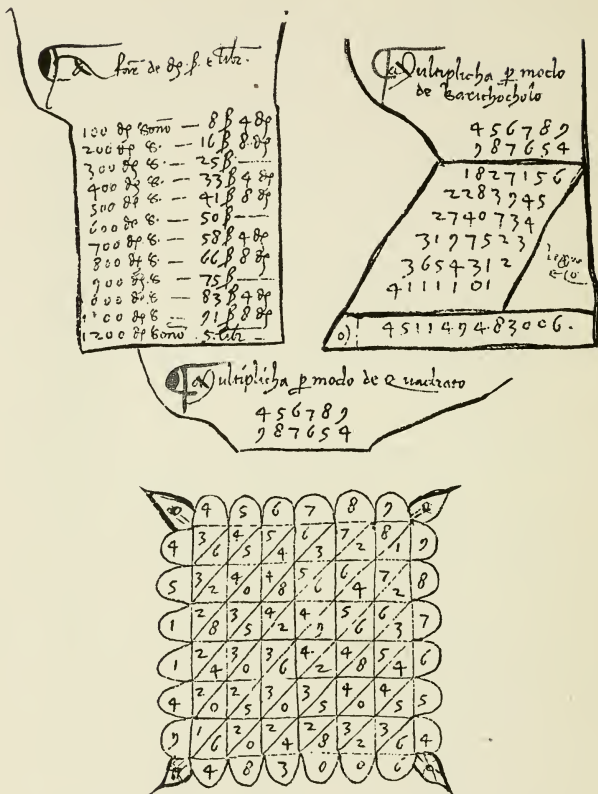


FIG. 224. FROM THE ANONYMOUS MANUSCRIPT OF C. 1430

In the latter part of the work, as if it were a new topic, the author has introduced (f. 126, v.) a chapter entitled 'Partire a danda.' He closes with several folios on mensuration.

The second part (beginning on f. 154, v.) is in a different hand. It is a computus, and from the dates it would seem that it was written in 1475. There is a third part (beginning on f. 172, r.) consisting of a set of religious verses, in a still different hand, bearing the date 1478. The language is Italian, excepting for the computus which is Latin.

ANONYMOUS.

Latin MS., c. 1435.

Title. 'De tempore de compositione quadrātis et compositione astrolabii plani,' etc.

Description. Bound with the 'Computus cyrometralis' of 1476. Written on paper, in a German hand. Some dates which it contains indicate that the book was written about 1435. It is related to the history of arithmetic only in the forms of numerals used.

JOANNES DE GMUNDEN.

Latin MS., c. 1439.

See p. 117.

Title. None. A treatise on the computus.

Colophon. On f. 17, v., are the words, 'Explicit kalendariū mgrī Joh'is gmünd.'

Description. Fol., 19.1 × 25.7 cm., the written part being about 14.1 × 18.5 cm. (The tables vary and are larger.) 20 ff., 32-38 ll. Latin manuscript. Written on vellum, in red and black, about 1439, as shown by the dates on f. 16.

Although entitled a 'Kalendarium,' it is so much like the mediæval computi as to have a place in this list. It is really a semiarithmetical treatise on the Church calendar.

ANONYMOUS.

Latin MS., c. 1441.

Title. None. A computus.

Description. Fol., 21.5 × 28.5 cm. (varies), 10 ff. (1 blank); the number of lines to each folio varies considerably. Latin manuscript, c. 1441.

The first part of this manuscript is a computus, not very extended. It relates rather to the calendar itself than to the computations upon

which it is founded. The last folio is in a later hand, and from the tables which it contains it seems to have been written c. 1524.

ANONYMOUS.

Latin MS., c. 1442.

Title. None. A treatise on the planets.

Description. Bound with the 'Computus cyrometralis' of 1476. Written on paper, in a German hand. It contains the date 1442 in two places (f. 102). Its value in connection with arithmetic is confined to the forms of the numerals used.

JOHANNES SACROBOSCO.

Latin MS., c. 1442.

See p. 31.

Title. An algorismus, beginning with the words, 'Omnia que a primeua rerum origine processerunt.' (F. 3. r.)

Description. 4°, 14.1 × 20 cm., the text being 10.5 × 17.6 cm. 21 ff., 25-39 ll.

The first folio has a picture of an astronomer with a celestial sphere, and the name of the student who copied the MS., 'hainricus muglinckk' (f. 1, r.). On the next page (f. 1, v.) Mugling's name again appears, together with three dates: 'Item hainric⁹ mugling afronim⁹, 1442, 1443, 1444. The 'Algorismus' begins on folio 2, r.: 'Omnia que a primeua // rerū originē,' and ends on f. 10, v.: 'Explicat algorafmus.' Then follows a picture (Pl. VIII) in colors, representing a master teaching his pupil the Hindu numerals from a kind of large hornbook, with a motto: 'Ich pin algorifm⁹ genant // Das . . . (?) . . . hau ich in mein // nes hant.' A table explaining place value is given on f. 11, r. Beginning on f. 11, v., is another treatise on arithmetic, giving the fundamental operations and some work in progression, and ending with a multiplication table (ff. 18, v.; 19, r.). A later hand has added three pages on progressions, rule of three, partnership, and interest. (Ff. 19, v.; 20.)

Sacrobosco's algorismus was the first arithmetic, based on the new numerals, written by an English scholar. It consists of eleven chapters, viz. Numeratio, Additio, Subtractio, Mediatio, Duplatio, Multiplicatio, Divisio, Progressio, Perambulum ad radicem extractionem, Extractio radicum in cubicis. For the various editions of this work see p. 32. The title of the Paris edition of 1510 is 'Opvscvlvm de praxi numerorum quod algorifmum vocant,' and the work consists merely of four folios containing the chapter 'De arte numerandi.' There was also published at Antwerp in 1547 (with later editions, Paris 1550, Venice 1564,



PLATE VIII. FROM A MANUSCRIPT OF SACROSCOTO, C. 1442

Wittenberg 1578), Sacrobosco's 'Libellvs, de anni ratione: seu vt vocatur vulgo, Computus ecclesiasticus.' His work on the Sphere was published in 1488 at Venice. For a discussion of the authenticity of the *Algorismus*, see De Morgan, p. 13.

As stated on p. 31, the date of the death of Sacrobosco is uncertain. It is either 1244 or 1256, according as we interpret certain lines on his tomb:

'M. Christi bis C quarto deno quater anno
De Sacro Bosco discrevit tempora ramus,
Gratia cui dederat nomen divina Johannes.'

MARO ANTONIO ROZINO.

Latin MS., 1447.

Title. 'Qoñes Marci Antonij rozoni artiū // doctoris sacre theologie magrī et papię phiam legentis.' (F. 1, r.)

Description. Fol., 20.3 × 28.1 cm., the text being 13.7 × 24 cm. 99 ff., 32-33 ll.

This is not an arithmetic, and it has been included in this list only because it is semi-mathematical and is bound with Bradwardin's treatise on the theory of proportion. It is a Latin treatise on the theory of perspective. It is written in a clear Italian hand, and was part of a volume numbered 493 in the Boncompagni sale, containing four manuscripts. Some dealer has removed the first of these manuscripts, the 'Perspectiva communis' of John Peckham, archbishop of Canterbury. A memorandum in the Boncompagni catalogue, probably from a leaf removed with the first treatise, shows that the manuscript was copied in 1447: 'scripte per me antonium confaronesium ut (vocatur?) de lavilata Anno dñi M^occccxlvij.' The other manuscripts bound with this are described below and on p. 452.

THOMAS BRADWARDIN.

Latin MS., 1447.

See p. 61.

Title. None. A treatise on proportion.

Colophon. 'Expliciñt propor^{nes} thomi brardi // scripte p me.' (F. 115, r.)

Description. Fol., 20.3 × 28.1 cm., the text being 13.7 × 22.8 cm. 15 ff., 33 ll.

This forms part of the volume last mentioned, and is written in the same hand. Bradwardin's treatise on proportion was published in Paris, 1495 (p. 61).

ANONYMOUS.

Latin MS., 1447.

Title. A treatise on lenses.*Description.* Fol., 20.3 × 28.1 cm., written in two columns, each being 6.6 × 22.9 cm. 7 ff., 24-33 ll.

This rather early work on optics forms part of the volume mentioned on p. 451, and is written in the same hand.

ST. BERNARD OF SIENA.

Latin MS., c. 1450.

Born at Massa, Tuscany, in 1383; died at Aquila in 1444. He was a zealous founder of monasteries, and wrote various religious treatises.

Title. This book of sermons begins as follows: 'S^{mo}. 33.^o .de reftitutiōe.// Doñi .q̄. in quadrageffa ordo dicendoꝝ p̄ feptimanā fequēteꝝ ī li^o de x'ana re//ligione .a. R^{do} p. S. B.^{no} de fenif ordonif minoꝝ edito.' (F. 1, r.)*Colophon.* 'Explicit tra//ctatuf de ufif 2 5ctibꝝ f3uꝝ Bntuꝝ // Bnardiniz (?) de fenif. ordif minorꝝ.' (F. 129, r.)*Description.* 4^o, 14.8 × 19.8 cm., the text being 10 × 13.8 cm. 129 ff., part vellum and part paper. After f. 60 the pages are arranged in double columns, each being 5 × 14.5 cm., 44-46 ll.

This beautifully written manuscript of c. 1450 is included in this list because it contains several sermons bearing upon the mercantile customs of the time, including 'De usuris,' 'De cambiis,' 'De contractibus,' and 'De mercatoribus.'

Part of this work was translated into Italian in the fifteenth century, as appears from a codex in the Biblioteca Comunale at Siena. One of the sermons was published by Riccomanni, in the *Scelta di Curiosità Letterarie inedite o rare* (no. 13) of Romagnoli, Bologna, 1862. This sermon, 'Sulle Soccite di Bestiami,' contains considerable information as to the business problems of monastic institutions of the fifteenth century. A copy of several of these sermons, made by one Eustachio da Feltre in 1469, is mentioned on p. 466.

ANONYMOUS.

Latin MS., c. 1450.

Title. None. On the Quadrivium.*Description.* 4^o, 14.7 × 21 cm., the text being 14.5 × 17 cm., 47 pp., 18-40 ll.

This is a Latin manuscript on the Quadrivium. It is written on paper, in a German hand of about 1450. It includes a brief treatment

of arithmetic (5 ff. + 1 blank, the text occupying ff. 18 – 22, v.), and a brief treatment of the calendar and the zodiac (ff. 15, r. – 17, v.). The geometry begins with modifications of Euclid's definitions : ' Punct⁹ est c⁹ pars nō est / Linea ē longi⁹ do fñ latitūe ⁊ pfūditate.' It closes : ' ¶ Explicat prim⁹ liber euclidis cū ꝯmeto cāpani.'

JOHANNES SACROBOSCO.

Latin MS., c. 1450.

See p. 31.

Title. 'Spera mundi secundum Joha//nnem de sacrobosco.'

(F. 1, r.)

Colophon. 'Explicit tractat⁹ de spha sꝯm // Jōhem de sacrobosco am.' (F. 35, v.)

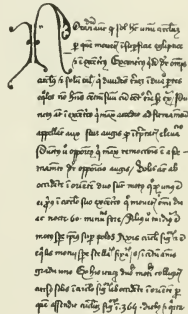
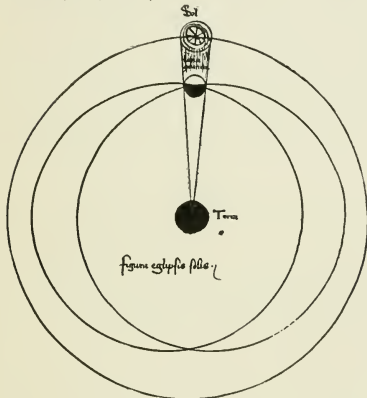


FIG. 225. FROM SACROBOSCO'S *Sphaera*, c. 1450

Description. Fol., 35 ff., written on vellum.

Printed works of this kind have not been included in this catalogue. This manuscript, however, shows the state of the numerals about 1450, and therefore is mentioned.

The treatise begins (f. 1, r.) : ' De sphaera in quatuor capitula distincti⁹ // dicentes p'mo quid sit sphaera/quid eius // centrum/quid axis sphaerae / et quid sit polus.'

The first four folios have a marginal commentary, closely written in a later hand. The figures are carefully drawn throughout (see Fig. 225).

There is nothing to show the exact date of the MS., but the handwriting and numerals indicate the last half of the fifteenth century.

Sacrobosco's 'Sphere' was published in 1488, and often thereafter. It was the great mediæval work on astronomy.

ANONYMOUS.

Latin MS., c. 1450.

Title. 'Incipiūt floref Arifmetrice.' (F. 1, r.)

Description. 4°, 15 × 21.8 cm., the text being 8.4 × 15.5 cm. 70 ff. unnumb. + 2 blank = 72 ff., 45 ll. Latin MS., in a German hand, c. 1450.

This is a theoretical treatise on arithmetic and algebra, written respectively on the Boethian and Al-Khowarazmian models. Only a little elementary treatment of the fundamental operations (chiefly multiplication) is given, the writer devoting most of his attention in the first part of the work to subjects like progressions, ratios, and proportions. The latter part of the book is algebraic and may prove to be a copy of some mediæval work of importance. It resembles in some places the work of al-Khowarazmi, a manuscript of which follows this one in the same volume.

MOHAMMED IBN MUSA AL-KHOWARAZMI.

Latin MS., 1456.

ABU 'ABD ALLAH MOHAMMED IBN MUSA AL-KHŪWARIZMI. Born in the province of Khwarazm (whence his name), died c. 831. The most celebrated algebraist of his time, and the first to write a book bearing the title *Algebra*. From his name comes the word *algorism* (see p. 7).

Title. 'Liber mahometi de Algebra et almuchabila × compārīf et oppōf.' (See Fig. 226.)

Colophon. There is none, but f. numb. 85 bears the date 1456, and the forms of the numerals and letters are of that period.

Description. 4°, 15 × 21.8 cm., the text being 12 × 17.2 cm. 23 ff. unnumb. + 1 blank = 24 ff., 44-48 ll. Latin MS. in German hand, 1456.

This interesting manuscript of the first book bearing the name algebra is more complete than the one found by Libri in the Bibliothèque Nationale (*Histoire des sciences mathématiques*, I, note XII). It more nearly resembles the one which I found in the Columbia University Library in 1904, and showed to be in the handwriting of Scheubel. The two deserve to be edited and compared with the Rosen translation

(London, 1831). This manuscript is particularly valuable because, unlike the one published by Libri, it has the Arabic numerals and the mediæval algebraic symbols. The *et* used for plus so closely resembles the + as to leave little doubt that the latter was derived from this Latin word. Like Regiomontanus, the writer uses $\bar{1}^9$ for minus.

This is followed (ff. numb. 97) by a brief treatise on rhetoric, and by three manuscripts on mathematics of 1501, c. 1475, and c. 1550, described on pp. 480, 468, 486.

ANONYMOUS.

Italian MS., c. 1450.

Title. A treatise on mensuration, roots, and algorism.

Description. Fol., 21.6 × 30.3 cm., the text being 10.5 × 15.8 cm. 177 pp. (2 blank), 20–25 ll. Written on paper, in a Florentine hand, c. 1450.

This is a general treatise on mathematics, with divisions as follows: A 'pratica de Geometria' (ff. 2–11); fractions (ff. 13–16); square root (ff. 17–19, r.); cube root (ff. 19, v., – 21); ratios (ff. 22–26); algebra (ff. 26–30); mensuration (ff. 31–46); algorism (ff. 47–177).

The algorism is evidently the work of some Florentine teacher, and the handwriting is that of the middle of the fifteenth century. It includes the usual applications of the period, such as profit and loss, partnership, and interest, and it makes prominent the rule of three and the rule of false position.

PETER PAUL VERGERIUS.

Latin MS., c. 1450.

Born at Capo d'Istria, Venice, c. 1350; died in Hungary c. 1420, or possibly in 1444. Bishop of Capo d'Istria.

Title. 'De Ingeniis Moribus et liberalibus Studiis. Francis-cvs // fenior auus tuus cui⁹ ut extant // plurime res magnifice gefte ita // et multa passim ab eo fapiēter i // dicta memorantur. . . .' (F. 1, r.)

Colophon. 'Petrij pauli uergerij de uiftinopoli ad uber-//tinuz Cararienfem de ingenijs moribs ⁊ // liberalibs studijs adolefcentie liber felici-//ter. Explicit.// Amen.' (F. 23, v.)

Description. 4°, 14 × 20.3 cm., the text being 8.8 × 13.6 cm. 23 ff. (10 vellum, 13 paper), 26–36 ll. The first 10 (vellum) folios are in Gothic script; the last 14 are plainly written in cursive characters.

The treatise refers to 'arismeticha' and 'geumetria' (f. 15, r.) among the liberal arts. It is bound with several other manuscripts.

RAYMUNDUS LULLIUS.

Latin MS., c. 1450.

RAYMOND LULLY, RAMON LULL. Born in Palma, Majorca, c. 1234; died in 1315. He was a Catalan alchemist, philosopher, and missionary, and was known as 'Doctor illuminatus.'

Title. 'Ars Brevis.' A note by a somewhat later hand, written on f. 1, r., reads: 'Ars brevis Raymundi Luli quam scripsit Pisis // in monasterio Sancti Dominici anno 1307. à. c. 23.' The *Ars brevis* begins on f. 5, r.: 'Deus cū tua grā sapiā et amore Incipit ars brevis que est // ymago artis gñalis. Nā ifta fata ab intellectu fb'tili et fun//dato ipē pōt fcire gnalē artē.'

Colophon. 'Finiuit Raymundus artē breuen pifis in monaft'io fāc//ti dominici Anno ab incarnatione dñi. 1307.// Explicit feliciter.' (F. 23.)

Description. 4°, 15.4 × 20.8 cm., the text being 9.9 × 13.2 cm. 24 ff., 28 ll.

This is the second part of a manuscript of 59 folios, of which the first is the *Sensuale* of Lullius. This and several other manuscripts are bound with the Vergerius already described (p. 456).

The *Ars brevis* was originally written in 1307; this copy was made about 1450. Although not an arithmetic, the work contains several mathematical definitions.

JOHANNES ROS.

Latin MS., 1450.

A Valencian priest.

Title. 'Artificium artis arithmeticae.' (F. 1, r.) '[D]Eus qui es unus . . . Incip̄ artifi^m? ātis aīfmet'ce De alphabeto.' (F. 24, r.)

Colophon. 'Ad laudem // oīpotentis dei et uirginis marie . . . fi//niuit frat' Johānis ros de Valencia puincie aragonii hoc // artificū arifmetice pad . . . ī loco fratrum minoz̄ de ospitali // 1450 die .5. Januarij ī uigilia epiphanie domini.' (F. 14 = 37, r.)

Description. 4°, 15.1 × 19 cm., the text being 9.2 × 13.7 cm. 36 ff., 28 ll. Bound with the Lullius and Vergerius described above and on p. 456.

This rather early Spanish monastic treatise on algorism is the third of three manuscripts in the same hand, written c. 1450, of which the first two are mentioned on pp. 456, 457. It begins on f. 24, r., and ends on f. 37, r. After some definitions, tables, and computus figures, the author takes up the 'nine subjects': 'Nouē f'biecta ponūt ī arifmetica' (f. 3 = 26, v.). These are treated very briefly. This is followed by a religious work, in the same hand (to f. 57).

ANONYMOUS.

Latin MS., 1442.

Title. 'De ymagine mundi.' (F. 2, r.)

Colophon. '¶deō grat. añj. (amen?) Año. dñj. 1442 . . . ¶Explicit lib.^o de ymagine mundi deo grāt . . .'

Description. 8°, 14.5 × 21.5 cm., the text being 11.5 × 19 cm. 158 ff. in the entire manuscript, 11 ff. in this portion. The other portions are described on pp. 477, 478.

This is the first manuscript in a collection of 156 folios, and begins with the lines 'I. H. S.// ¶de ymagine Mundi' (f. 2, r.). It is written in Latin and treats of physical and descriptive geography. It has some interest in the history of arithmetic through the Roman numerals which are generally employed except in the case of large numbers. This manuscript and the others bound with it are described in Narducci's catalogue of the Boncompagni manuscripts (Rome, 1862, no. 81). As there stated, at one time it belonged to Alessandro Padovani, a celebrated collector of the sixteenth century.

ANONYMOUS.

Italian MS., c. 1456.

Title. The title is missing.

Description. 4°, 14.6 × 21 cm., the text being 11 × 15.6 cm. 111 ff., (12 with drawings), 30 ll. No. 168 in the Boncompagni sale catalogue.

This is a business arithmetic, written in northern Italy, and completed, as appears from a note, July 15, 1456. As in most of the business arithmetics of the period, the first pages contain a set of tables, these being followed by a discussion of the fundamental operations with denominate numbers. Although written in 1456 it is probably a copy of an earlier work of about 1420, for the examples in the equation of payments involve dates from 1418 to 1425 (ff. 78-84). The work is also interesting because it contains the early form of the sign % (see Fig. 227) already mentioned on p. 439. The column tables used by

merchants in their multiplication 'per colonna,' and common in the Italian manuscripts of this nature, are shown in Fig. 228.

62

5. congnara glana. gfla. bora. benbere. ara. 3 + b
 Selenynaro. & bella. 5. congnara. tra. 170 + & gfla. t. uba
 8. g. g. bello. del panno. fatto. egale. pero. g. g. la. da
 to. tanto. panno. g. g. d. vole. 150 + & tolto. tan
 to. lana. g. g. bole. 170 + & g. mag. bello. delalana
 fatto. bene. pero. g. g. la. dato. tanta. lana
 g. g. d. vole. 170 + & da. b. abuto. tanto. panno. g.
 g. d. vole. 150 + & ungue. g. g. b. g. g. bello. bella
 lana. g. g. bole. 170 + & g. g. abagna. g. g. fino. 150 + & o
 10 + & pero. g. g. ay. g. g. bello. delalana. bella. 170 +
 g. g. abagna. 10 + & no. 100. g. g. no. p. p. e. g. g. lo. g. g.
 g. g. abagna. p. 100. pero. del. g. g. y. p. l. g. g. no. 100. b. r. 10 +
 fanno. 1000 + & le. g. g. u. p. o. y. p. 170. g. g. no. b. e. n. e. 5 + ¹⁵
 & tanto. g. g. ay. g. g. bello. delalana. g. g. abagna. g. g. o.
 nella. r. a. t. o. & de. f. a. t. o.
 et. u. b. g. g. y. g. g. h. a. r. e. t. u. t. y. & b. r. a. t. y. g. o. g. o. f. a. t. o. g. g. a.
 n. g. & g. g. e. t. o. t. i. e. m. g. l. o. n. d. o. g. i. o. g. a. t. e. n. u. t. o. f. l. o. r. e.
 d. u. e. t. a. & f. e. t. u. f. r. u. o. d. y. g. g. l. l. o. n. n. o. p. a. v. o. g. n. a. l. e. e. o.
 g. g. n. b. n. o. n. g. g. abagna. & p. e. r. t. a. & t. u. g. g. e. l. l. a. & g. g. o.

FIG. 227. FROM AN ITALIAN ARITHMETIC OF c. 1456

ANONYMOUS.

Italian MS., c. 1460.

Possibly by Raffaele Canacci, a Florentine mathematician.

Title. There is none given, but the work is a general treatise on mathematics.

Description. Fol., 28.2 × 39 cm., the text being 16.5 × 28 cm. 2 blank + 322 numbered ff. = 324 ff., 51 ll. Italian manuscript, c. 1460.

This is an Italian manuscript, beautifully written on vellum, with finely executed initials in colors and gold at the beginning of each of its sixteen books. It belonged at one time to Libri, and later to Boncompagni. Narducci describes it in the catalogue of the latter's manuscripts (no. 14). The author begins (f. 1) with a description of the work: 'Come e in che modo eldetto trattato e diuifo/cioe cio che lopa cõtiene.' The successive chapters are as follows:

| | | | | | |
|------|------|-----|------|-------|------|
| 2 . | 41 . | 82 | 41 . | 100 . | 4100 |
| 3 . | 41 . | 123 | 41 . | 90 . | 3690 |
| 4 . | 41 . | 164 | 41 . | 80 . | 3280 |
| 5 . | 41 . | 205 | 41 . | 70 . | 2870 |
| 6 . | 41 . | 246 | 41 . | 60 . | 2460 |
| 7 . | 41 . | 287 | 41 . | 50 . | 2050 |
| 8 . | 41 . | 328 | 41 . | 40 . | 1640 |
| 9 . | 41 . | 369 | 41 . | 30 . | 1230 |
| 1 . | 41 . | 410 | 41 . | 20 . | 820 |
| 2 . | 43 . | 86 | 43 . | 100 . | 4300 |
| 3 . | 43 . | 129 | 43 . | 90 . | 3870 |
| 4 . | 43 . | 172 | 43 . | 80 . | 3440 |
| 5 . | 43 . | 215 | 43 . | 70 . | 3010 |
| 6 . | 43 . | 258 | 43 . | 60 . | 2580 |
| 7 . | 43 . | 301 | 43 . | 50 . | 2150 |
| 8 . | 43 . | 344 | 43 . | 40 . | 1720 |
| 9 . | 43 . | 387 | 43 . | 30 . | 1290 |
| 10 . | 43 . | 430 | 43 . | 20 . | 860 |
| 2 . | 47 . | 94 | 47 . | 100 . | 4700 |
| 3 . | 47 . | 141 | 47 . | 90 . | 4230 |
| 4 . | 47 . | 188 | 47 . | 80 . | 3760 |
| 5 . | 47 . | 235 | 47 . | 70 . | 3290 |
| 6 . | 47 . | 282 | 47 . | 60 . | 2820 |
| 7 . | 47 . | 329 | 47 . | 50 . | 2350 |
| 8 . | 47 . | 376 | 47 . | 40 . | 1880 |
| 9 . | 47 . | 423 | 47 . | 30 . | 1410 |
| 10 . | 47 . | 470 | 47 . | 20 . | 940 |

FIG. 228. FROM AN ITALIAN ARITHMETIC OF C. 1456

I. 'Qui chominchia el pimo libro del detto trattato, & pima pone la diuisione del detto primo libro/laquale e achapitoli/cioe e diuifo i .4. capitoli.' (F. 1, r.) The four 'capitoli' are as follows:

1. 'El primo capitolo del pimo libro/doue simoftra lordine e modo del numerare le figure cheufano afcriuere enumeri.' (F. 1, v.) In this are explained the Hindu-Arabic notation, the nine 'figure significatiue,' and the 0, 'che i arabia fidice zero.'

2. The title of chapter 2 is wanting, f. 3 having for some reason been left blank. It related to the addition of integers and compound numbers.

3. 'Qui chominchia el terzco capitolo del pimo libro/doue fitratta del modo & hordine del trarre el numero minore del numero maggiore.' (F. 5, r.) The method is that of borrowing and repaying.

4. 'El quarto capitolo del primo libro di questo trattato/ Doue fitratta del modo & hordine del \textcircled{m} chare e numerj.' (F. 6, v.) The column form of the multiplication table is first given, and is followed by various methods of multiplying. The names 'El berichuocholo' (f. 10, v.) and 'p quadrato' (f. 11, r.) show the work to be Florentine rather than Venetian, and the handwriting and the numerous references to Florence confirm this fact. The method 'per quadrato' is shown in Fig. 229. Five pages of multiplication tables are given, such an elaborate treatment having been rather common in the arithmetics of that city. Division is not treated in Book I.

The image shows a large, dense grid of multiplication tables, likely a 'per quadrato' method. The grid is composed of many small squares, each containing a number or a symbol. The numbers are arranged in columns and rows, and the grid is bounded by a double-line border. The top row and left column contain the numbers 1 through 9, and the grid extends to 9x9. The numbers are arranged in a way that suggests a multiplication table, with the product of the numbers in the row and column being the number in the square. The grid is very dense and contains many small numbers, likely representing the results of various multiplications.

FIG. 229. MULTIPLICATION 'PER QUADRATO,' C. 1460

II. 'El fecondo libro del detto trattato. Nelquale si contiene la natura & proprieta De numerj. & pima come e diuifo & aprj lontel-letto.' (F. 17, r.) This is divided into two chapters:

1. 'El pimo capitolo del fo libro/ Nelqual fitratta la natura che a ife el nūo con diffinitionj fapute.' (F. 17, r.) This relates to such ancient classifications of number as odd and even, prime and composite.

2. 'El fecondo capitolo del fo libro/ Doue fitratta de numerj nomi-nati per nomj apropiati alle figure geometre.' (Figure numbers.)

III. 'El terzo libro della prachica darifmetricha. Nelquale fitratta el modo di partire p nũj. & pima i che forma e modo el detto libro e diuifo.' (F. 23, r.) The subject of division is now taken up in three chapters:

1. By the use of the table, 'el modo di partire per gli numerj scripti i fulle libretinj.' (F. 23, v.)

2. The 'ripieghi' method (f. 28, v.), by the successive factors of the divisor.

3. Long division. (F. 32, r.) The author gives not only the galley method, but an early description of the method 'a danda,' substantially our present plan (see Fig. 230).

IV. This treats of common fractions. (F. 33, v.)

V. Ratios, 'quantita proportionalj.' (F. 46, v.)

VI. Mercantile arithmetic (f. 58, v.), with numerous references to the customs of Florentine merchants. Sixty-six large folios (132 pp.) are given to this book.

VII. The rule of false position: 'El septimo libro diquesto trattato nelquale fitratta del modo delafoluere de chafi p losemplice modo delchatain che p moltj fidicono principij del chatain.' (F. 124, v.)

FIG. 230. FROM AN ITALIAN MANUSCRIPT OF C. 1460

VIII. Simple and compound interest (f. 134, v.), with 2 pages (4 incomplete) of tables giving the interest on £100 for 1-21 yrs. at rates varying from '5 p 100. año' (f. 140, v.) to '40 p 100. año' (f. 150, v.). Equation of payments is also presented in this book (f. 152, v.), the dates ranging from 1458 to 1464.

IX. False position as treated by Leonardo of Pisa. (F. 170, v.) Leonardo is mentioned in Pl. IX.

X. Miscellaneous problems. (F. 176, r.) These are largely traditional examples, and include the hare and hound, finding numbers satisfying given conditions, problems about eating, the jealous husbands, and the testament complication.

XI. Proportion, based on Euclid V. (F. 225, r.)

XII. Algebra, 'della regola della algebra.' (F. 233, v.) Unfortunately few of the figures for this book were drawn. The treatment is rhetorical, practically no symbolism being used.

Incomincia il libro di trattato nel qual si contiene come et che modo si fa
 luono casi per regola de l'algebra amicabile. Et la divisione del detto libro
 in diuino gratio al alchimico. Così comincio et ceo po del algebra
 ba arabico nella regola delgeba la quale noi diciamo al
 gebra la quale regola delgeba secondo ghuguelmo delaruf
 reaslatra i porta i q. nomi cioe Gebe. Cimelchel. C-L
 chal. Chelch. C-farias. Difraebuzam. C-razem. C-quali
 nomi secondo el detto ghuguelmo sono così interpretati gebe
 equanto adire recuperatione. ipo che come plo segue scipendria
 nelle recuperatione di v. pte uguali salsue icaso. Cimelchel. C- quato
 adire exemplo ouero sfomigliamo ipo chel absolute de casti sicut
 oua pabfomigliare laquarta posta al caso dato. C-lchal. Equato adire
 oppositione p che di i ganta trouate luna e opra alatra. C- q. ad no p
 non ganta opote. icaso. e imo lubile. C-lchelif. C- quato adire dispo
 sitione ipo che benehell. r. ganta opote sicut eno albino dispositione
 auo delle regole. lo caso farebbe fuo de la regole. ipo abisogna legat
 ra disposte. C-farias. C- detto difraebuzam. che differetia e ifcanomy dalla
 deua regola. che no p. sicut. differetia la regola farebbe una v. sicut
 conto allonpossibile. Difraebuzam. C- detto ragione ipo che ciog
 lone tutto sicut a ragione uole sono et casti p la regola abfoluy. C-
 razem. C- detto finquere ipo chel fine ragione uole della regola e
 trouato gando p oppositione delle parti abiamo trouato C- lionaio
 piano nella terza pte del iij. cap. dice la regola della algebra amicabile
 bali. v. detta regola. oppositione edurazatione cioe dispoiameto
 come chiaro siuedra p casti f. caccio che questa regola sia bene copre
 diuideo el detto libro i. q. cap. N. C- l. p. fia la diuisione chiara p figu
 re delle deue g. u. g. N. C- l. p. fia come enam. ouero proprieta della de
 ua regola abisogne uol sicut hano N. C- l. terzo uulimo certe regole p
 le. 6. pastate. e le. 6. auora bando. v. casti exemplari. auar huna regola.

El primo capitulo del iij. libro nel quale se chiama p figure geometre
 le. 3. regole composte de la algebra.

Al computatio della regola de la algebra e amicabile. 3. proprieta
 che sono in casto nouo si considera C-lap. e quando si considera p radice
 e chiamallo casto. C-l. p. equato si considera p quadrato e chiamasi casto. C-l. uo
 terza considerandolo p suo esse se plice. e allora lodiamo diamo. C-l. uo
 go delle ganta ladiana. e uilissima. quasi come il punto nella linea.
 C- casto ad unte eza de casto. onde lo casto equadrato della cosa e p che
 ogni quadrato e sano della sua za i. sicut hata. lo casto naste della cosa
 p hata. imo che e sua za.

Udiamo sono dette nouo semplice. ipo che se si pongono solamete du
 nitadi. malla cosa uel casto sono composte iloro e sicut. C- po lodiamo
 no ane rispetto alle casto. ne alli casto. cioe adire del nouo sicut sapute lu
 nitadi malla cosa nede casto no sono sapute lunitadi. C- po lodiamo dia
 ma e sicut nouo semplice. ella cosa e za cioe quello che i. sicut hata fa
 quel nouo. C- casto e quello che naste della cosa cioe della za i. sicut hata
 ta lonu semplice cioe diamo e ganta che copazole sicut italmode che
 no. a. saputa propotione alle za. nullo casto.

Quando della za. cioe casto. uel casto si vogliono sapere lunitadi edibito
 gano che si falloro saguagliano loquale agualiamento i. 6. modi si puo fa
 re. de quali modi. e 3. si chiamano semplici. oglieluy. 3. composti. Onde p
 una diterno de gl'agualiamento semplicemente.

XIII. Algebra continued, 'la regola de Algebra amuecabale.' (f. 279, r.) This is a very interesting treatment of the subject 'fecondo ghuglielmo de lunis' and 'Lionardo pifano,' and it throws some light upon algebra as studied in the fifteenth century. (See Plate IX.)

XIV. Algebra continued (f. 295, v.), according to Master Biagio ('certj casj che scriue m^o biagio nel suo trattato di pratica') of 1340, Master Gratia de Castellani ('fecodo che scriue m^o gratia de castellani), and Leonardo of Pisa.

XV. Algebra continued (f. 312, r.), according to certain 'maestrij antichi,' viz.: 'Maestro paolo,' 'm^o Antonio,' 'm^o giouañj,' 'leonardo pifano,' 'm^o biagio che circha al. 1340. añj morj,' 'm^o paolo fiorj che circha al. 1360. duro,' 'm^o michele padre di m^o mariano,' 'm^o licha,' and 'un altro m^o biagio.'

XVI. This is missing, the manuscript ending with Book XV not quite completed. On f. 1, r., there is mentioned the 'fedecimo e ultimo' chapter, and this might have contained the name of the author had the work been finished.

EUCLID.

Latin MS., c. 1460.

See p. 11.

Title. None. The first book of the Elements.

Colophon. '¶Explicat prim^o liber euclidis cū smēto cāpani.' (F. 14, v.)

Description. 4°, 14.7 × 21.2 cm., the text being 9.9 × 15.8 cm. 22 ff., 18-40 ll.

This manuscript of the first book of Euclid, with the commentary by Campanus, has been included on account of the forms of the numerals used. It is written in a German hand of c. 1460, and is bound (ff. 1-14) with the two manuscripts next described.

ANONYMOUS.

Latin MS., c. 1460.

Title. None. A treatise on the calendar.

Description. See the preceding manuscript. This is ff. 15-17 of the volume.

This manuscript, bound with the Euclid just described, was probably written by the same hand. It is a brief treatise on the calendar, and was intended, as usual, for the Church schools. In it occurs the date 1460.

ANONYMOUS.

Latin MS., c. 1460.

Title. None. On the Quadrivium.*Description.* See p. 463. This is ff. 18–22 of the volume.

This is a general treatise on the quadrivium, and therefore contains a chapter on arithmetic.

BENEDETTO DA FIRENZE.

Italian MS., c. 1460.

A Florentine arithmetician of the first half of the fifteenth century.

Title. 'Inchomincia el trattato darifme//tricha efpelialmēte quella pte // che e sotto pofta alla mercatātia // e cominciando alnome didio.' (F. 11, r.)

| |
|-------------|
| 2. 43. 86 |
| 3. 43. 129 |
| 4. 43. 172 |
| 5. 43. 215 |
| 6. 43. 258 |
| 7. 43. 301 |
| 8. 43. 344 |
| 9. 43. 387 |
| 10. 43. 430 |

| |
|---------------|
| 43. 100. 4300 |
| 43. 90. 3870 |
| 43. 80. 3440 |
| 43. 70. 3010 |
| 43. 60. 2580 |
| 43. 50. 2150 |
| 43. 40. 1720 |
| 43. 30. 1290 |
| 43. 20. 860 |

| |
|-------------|
| 2. 47. 94 |
| 3. 47. 141 |
| 4. 47. 188 |
| 5. 47. 235 |
| 6. 47. 282 |
| 7. 47. 329 |
| 8. 47. 376 |
| 9. 47. 423 |
| 10. 47. 470 |

| |
|---------------|
| 47. 100. 4700 |
| 47. 90. 4270 |
| 47. 80. 3760 |
| 47. 70. 3290 |
| 47. 60. 2820 |
| 47. 50. 2350 |
| 47. 40. 1880 |
| 47. 30. 1410 |
| 47. 20. 940 |

| | | | | | | | | | |
|-----|------|------|------|------|---|---|---|---|---|
| 121 | 144 | 169 | 196 | 225 | | | | | |
| 1 | 1 | 2 | 1 | 3 | 1 | 4 | 1 | 5 | |
| 1 | 1 | 2 | 1 | 3 | 1 | 4 | 1 | 5 | |
| 256 | 289 | 324 | 361 | 400 | | | | | |
| 1 | 6 | 1 | 7 | 1 | 8 | 1 | 9 | 2 | 0 |
| 1 | 6 | 1 | 7 | 1 | 8 | 1 | 9 | 2 | 0 |
| 441 | 484 | 529 | 576 | 625 | | | | | |
| 2 | 1 | 2 | 2 | 2 | 2 | 2 | 4 | 2 | 5 |
| 2 | 1 | 2 | 2 | 2 | 2 | 2 | 4 | 2 | 5 |
| 676 | 729 | 784 | 841 | 900 | | | | | |
| 2 | 6 | 2 | 7 | 2 | 8 | 2 | 9 | 2 | 0 |
| 2 | 6 | 2 | 7 | 2 | 8 | 2 | 9 | 2 | 0 |
| 961 | 1024 | 1089 | 1156 | 1225 | | | | | |
| 3 | 1 | 3 | 2 | 3 | 3 | 3 | 4 | 3 | 5 |
| 3 | 1 | 3 | 2 | 3 | 3 | 3 | 4 | 3 | 5 |

FIG. 231. TABLES FROM BENEDETTO DA FIRENZE

Description. 8°, 8.3 × 11.7 cm., the text measurement varying. 2 ff. missing + 348 ff. unnumb. = 350 ff., 20 ll. Manuscript on parchment.

This is a parchment codex written about the middle of the fifteenth century. It lacks the first two folios and possibly also a few at the end. It is one of the best examples of the mercantile arithmetics in Italy

preceding the printed works. The author begins, as usual, with several pages of tables (see Fig. 231), the multiplication table including the prime numbers below fifty. There is also a table of squares and one for the multiplication of compound numbers. Benedetto presupposes that the reader is able to perform the fundamental operations with integers, and he begins at once with operations on compound numbers and fractions. The applications include exchange, partnership, and equation of

che aguantj a 1571 di. fa 1571 di
 | norta duno altro cho lungò
 305. e stopo, ed apre o f. gata
 eltopo friendo ogni di 2 bib. e
 lanoue tozina su 1/2 elagata
 sale ogni di 1/2 b. elanoue tozina
 fgua. Adimando i gati di sifo
 tezano i fame. dizea pò elultimo
 di enòe di bisogno tozino ad
 240. cheltopo uada 1/2 elagata
 1/2 doue 1/2 e 1/2 fa 1/2 chelzati dno.
 zima 19 1/2, ed 121 eltopo auò
 5 a ildit, elagata auanga 1/2
 chelzati dno auanga 1/2 doue
 le 19 1/2 pezano auanga 1/2 il
 di, e pòe ezotti ando aelstte
 alultimo di dizea 117 di nepali
 andra 117. uia 1/2 b. fa 19 1/2 di
 pifino 170 ne 1/2 elultimo di
 ua 1/2 doue e 1/2 pezo andare 1/2
 di di che e 1/2 di 17 di sifo tezano //
 Vna lepre e inangi a 1/2 cane
 100. passi, e ogni 1/2 passi del cane

sono p. 7. della lepre. Adimando
 i gati passi elcane azaguinto
 la lepre. dizea 1/2. 5. delcane
 sono p. 7. della lepre, aduaga
 elcane auanga alla lepre p
 5. passi. 2. passi. e po dizea quanto
 peza auagaze. 5. passi. 100. //
 100. p. 5. ed uidi 1/2. e uene. 250.
 e 150. passi fara ciastruno cioe
 150. elcane, e 250. la lepre //
 Vna lepre e inangi a 1/2 cane. 1000.
 passi ducane e 1/2 delcane sono
 p. 9. della lepre. Adimando i gati
 passi elcane azaguinto la lepre,
 di p. 5. p. 9. di lepre. 1000. del
 cane qantj fiene // 1000. uia
 9. ed uidi 1/2. e uene 1800. dile
 pre. Oza 1/2 lepre e inangi a 1/2
 cane. 1800. e 1/2 p. 9. aduaga
 elcane de 1/2 nauanga. 9. alla
 lepre. qantj passi fara elcane
 aduagaze alla lepre. 1800. //
 1800. uia 9. ed uidi 1/2. e uie. 1250 //

FIG. 232. FROM BENEDETTO DA FIRENZE

payments, the dates in the problems including the years from 1460 to 1464. The latter part of the book contains a number of such traditional problems as those of the grains of wheat on a chess-board, the couriers, the hare and hound (see Fig. 232), the jealous husbands, and the testament of the dying man. The author closes with a brief treatment of mensuration.

ALBERT OF SAXONY.

Latin MS., 1462.

See p. 9.

Title. 'Tractatus proportionum. Incipiūt pportioēf cōpote a dño albertutio. // [] Roportio cōtr dā ē duoꝝ pperitoꝝ in a^{co} t'rio unico // ad inuicē hītudo.' (F. 1, v.)

Colophon. 'Explicāt pportioēf ppo^{te} // p reuēdo m̄rō alberto defisona // Finis // ' (F. 12, v.)

Description. 4°, 14.5 × 21.8 cm., the text being 11.8 × 13.8 cm. (varies). 19 ff., 23 ll. Bound with the Vergerius and Lullius mentioned on pp. 456, 457.

This is the treatise on proportion that was printed without date, probably at Venice c. 1478 (p. 9). It is followed by another treatise in the same hand, 'De latitudinibus formarum,' which bears the date 1462.

ST. BERNARD OF SIENA.

Latin MS., 1469.

See p. 452.

Title. None. Sermons of St. Bernard (Bernardinus) of Siena.

Description. 4°, 15 × 20.6 cm., the text being 11.5 × 14 cm. 130 ff. (12 blank), 28 ll.

Editions. The works of St. Bernard were first printed in Venice in 1591, 4°, and again in Paris in 1636, 2 vol., fol. Some of his sermons were, however, printed in Florence, and some in Venice, in 1495.

This manuscript, containing several of the sermons of St. Bernard, was copied by one Eustachio de Feltre in 1469. Two dates are given showing the completion of parts of the work, September 22, 1469, and October 6, 1469. For the reasons for including this manuscript, see p. 452.

ANONYMOUS.

Italian MS., 1473.

Title. 'Trattato della Arithmetica.' (F. 1, r.)

Description. Fol., 16.7 × 23.7 cm., the text being 10 × 16.2 cm. 190 ff., 35 ll.

This treatise was composed, as the first folio states (Fig. 233), in the year 1473. In the examples in partial payments the dates given are about 1490, and this particular manuscript may have been copied about that time. There is, however, one example with the date 1392, which would seem to indicate that at least part of the book was copied from some earlier writer. There is also (f. 183) a brief treatment of the calendar with two dates 1443. On f. 180 there are also the dates 1452 and 1453. In the margins some sixteenth-century dates have been added by a later owner.

The work is beautifully written on vellum. The first part consists entirely of arithmetic, treated from the mercantile standpoint. That it is a copy of an earlier work also appears from the fact that a few pages

Eremo principio al nome di dio & de la santissima sua
 madre in s^{ta} Maria & del beato miss^o s^{co} Gioanni
 Batista & delo apostolo & del euangelista & del glo
 riosissimo pncipe deli apostoli Miss^o s^{co} Pietro
 & di Miss^o s^{co} paulo & de Beatissimi martiri miss^o
 s^{co} Crescentio. Aniano. Saurino & Vittorio & del
 gloriosa martire miss^o s^{co} Laurentio & del glorio
 sissimo confessore miss^o s^{co} Francesco & di s^{co} Niccolo & di
 s^{co} Giuliano & di miss^o s^{co} Gorgio chualiere & generalmete
 poxa exere exia a laude & santissima reuerentia di tutta la
 celestiale corte di paradiso equali deuotissimamente pghia
 mo & nel pncipio mezo & fine concedino gratia ditenece
 tutti quelli modi & heno alloro laude & reuerenza Santissi^{mi}
 & Ad honore & salute dell'anima n^{ra} Anno dⁿⁱ M^{ccc} lxxiij
 adi 26 didicerunt. ildi di s^{co} Gioanni Vangiolista // //

Onco sia cosa & tutti li animali Rationali humili
 nella p^{se}nte vita abino dispocto plo ordiname
 to dela natura di uolere istribuire la loro vita
 in alcuni exercitij di uersi. pli quali ellino si ce
 dino venire affine di beatitudine. alcuni di
 uenire oltre al naturale corso p phama dal chuna & tu nel
 quale ellino consumano il tempo loro. & posto & lantentio
 ne deli piu. sia fallita niente di meno la uolupta di quelli
 e pur di seghuire quello & y loro dato da la natura. coculu
 ta da la somma potentia al quale sempre ricoro quella p^{se}
 de deuotissimamente & spiri lomio debile igegno a potere
 parte dellarte darismetria ccofi nella semp p^{se}gato laltissimo // //

are left blank for subsequent insertions, the scribe having written : 'Hic deficiunt quatuor // chartæ q̄ non funt // i exemplario' (f. 65, v.) The second part of the work consists of practical geometry and mensuration (ff. 103 to 128). The third part (f. 129) relates to irrational numbers. On f. 135 begins the 'Regole de la Arcibra,' a chapter on algebra. There is nothing to indicate the name of the author or the copyist.

ANONYMOUS.

Latin MS., c. 1475.

Title. 'De duplirj Arti Viforir.' (F. 1, r.)

Description. 4°, 15 × 21.8 cm., the text being 10 × 17 cm. (varies). 11 ff. + 1 blank = 12 ff., 40-45 ll. Written in a German hand of c. 1450-1475. Bound with the manuscript of Mohammed ibn Musa (p. 454).

This manuscript gives some account of gauging, and closes with a brief treatment of trigonometry. The mediæval numeral forms are used throughout. A copy also appears in the 1501 manuscript described on p. 480.

LUCA DA FIRENZE.

Italian MS., c. 1475.

Maestro Luca da Firenze lived in the fifteenth century, and was the son of the celebrated Florentine arithmetician Matteo, who was born in the fourteenth century.

Title. 'Inprencipio darte dabaco.' (F. 1, r.) F. 2 begins : 'Inprencipio darte dabacho fecondo loftile dinfegniare del ma// eftro luca di Matteo da fflrençe.' (Fig. 234.)

Description. 4°, 16.8 × 23.3 cm., the text being 11.7 × 13.8 cm. 46 ff., 29 ll.

Although Fabbroni's *Storia dell' Università di Pisa* (I, 97) says that Luca's son Giovanni went with Lorenzo dei Medici to the University of Pisa in 1515, thus putting his birth about 1495 and Luca's birth perhaps about 1450, I feel that either this is incorrect, or it is to some other Giovanni and Luca that he refers. One of the best evidences of the date of an arithmetic is found in the dates given in its problems. Authors usually mention years that are not remote from the time when they write, and in the examples in equation of payments (f. 29, v.) Luca uses dates from 1410 to 1441. I therefore think that either he copied a problem from his father (Matteo), or, what is more probable, he himself wrote about that time, say c. 1425, and that in either case this Giovanni was a descendant but not a son.

The arithmetic resembles numerous others written in Florence about this time, such as those described on pp. 443 and 464. The author begins with the fundamental operations and follows these by a treatment

Incipio darte d'abcho secondo lo stile d'insegnare del maestro luca di Matteo di Firenze uolendo admaestrare molte cose cioe multiplicare diuidere z congiungere sottrarre z per numeri zotti anchora diremo aliquanti modi per le quali si poteranno struere tutte ragioni d'arithmetica z una gran parte di sotilita siccome detto fara innanzi se fara piacere di ddo z della uergine maria z pocha queste cose si uogliono fare chon figure tratteremo prima delle figure lequale sono chosi figurate come uedi qui appie aoe

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. —

Dobbiamo sapere chella prima figura nel primo luogo amano mancha struendo un' solo la prima parte medesima significa uno. La seconda parte medesima significa due. La terza parte medesima significa tre. La quarta parte medesima significa quattro. La quinta parte medesima significa cinque. La sesta parte medesima significa sei. La settima parte medesima significa sette. L'ottava parte medesima significa otto. La nona parte medesima significa noue. La decima parte medesima significa dieci.

Ora dobbiamo sapere intendere la detta figura consero z si fa sezo z chosi quando a due insieme 10/10/2 10/10/4 10/10/5 10/10/6 z noi n'altro n'altro parte per ordine infino alle sette secondo ch'eno' le trouamo piu alte parte et figurate. Et douiamo sapere chella prima figura posta da mano dritta andando verso



FIG. 234. FIRST PAGE OF LUCA DA FIRENZE

of fractions and denominate numbers, closing with a series of applications to the business problems of the time. Subjects like equation of payments, partnership, and exchange are given the most attention. The handwriting indicates that the manuscript is a copy made about

1475-1500. The symbols in Fig. 235 may also throw some light on the disputed origin of our symbol for dollars, \$. No one seriously considers such fanciful theories as the combination of U and S, or the Spanish banner about the Pillars of Hercules. The symbol first appears in print in *The American Accomptant*, by Chauncey Lee (Lansingburgh, 1797), but in a very different form from that now used. It was common among merchants for some time before it was cast in type form, for a note in one of the early American arithmetics says that the symbol was in use, but that there was no type for it. The third edition of Pike's arithmetic (1798) uses m., c., d., D., and E., for mills, cents, dimes, dollars, and eagles, but Daboll's *Schoolmaster's Affisstant* (4th ed., 1799, p. 20) gives the symbol \$ very nearly in its present form. Now whence come symbols like this? If they are invented *de novo* it is usually easy to find their first appearance, as in the case of symbols like π , e , and i (for $\sqrt{-1}$). But mercantile symbols usually develop slowly, like £ from *libra*, /- from the old *s* (*f*) from *soldi* or *solidi*, and *d* from *denarii*. So it is probable that \$ was simply developed from some earlier symbol of value, such as that for pounds or reales. Now the symbol for pounds (*libra*, *lire*) has various forms, appearing in England as £ or lb., but generally in Italy as L, or lb. with two bars across. The former is seen in Fig. 243, from a manuscript of 1545, and the latter in Fig. 216 from Dagomari's work. The latter form, in the fifteenth and sixteenth century manuscripts, appears as practically our dollar sign, as shown in Figs. 235, 237, 246, and it is not improbable that our early American merchants used it for the new unit of value, the dollar, just as the /- for shilling is still used in many parts of our country for 12½ c., although the original meaning is entirely lost. The symbol came into general use in printed books between 1800 and 1825.

ANONYMOUS.

Latin MS., 1476.

Title. 'Computus cyrometralis.'

Description. 4°, 15.5 × 20.9 cm. A volume of 180 ff., consisting of four treatises, the other three being elsewhere described.

The first of the four manuscripts is a computus of the usual fifteenth-century type. (See Fig. 236.) In it the Latin original of the verses beginning 'Thirty days hath September' appears (f. 6) as follows:

'Ja. mar
ma. iul. aug. oc. de. deca-
trib⁹. et. vno. alij. trigēta.
f3. februus. octo. viginte.'

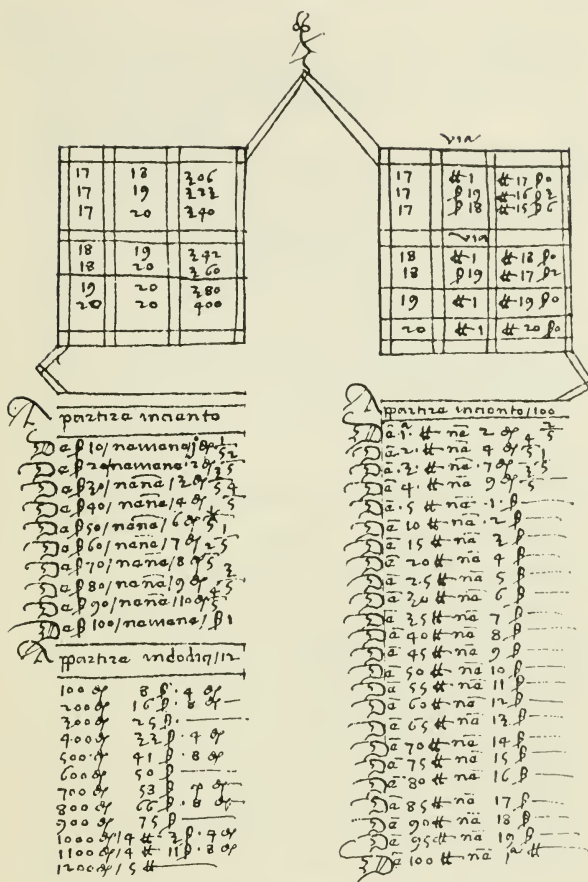


FIG. 235. TABLES FROM LUCA DA FIRENZE

(See also p. 33.) It does not start here, however, but goes back at least as far as Sacrobosco (13th cent., see p. 31), in whose *Computus* (see p. 451) it appears as follows:

'Sep. No. Iun. Ap. triginta dato, reliquis magis uno.
Ni fit Biffextus, Februus minor esto duobus.'

(1545 edn., f. K 6.)

JACOBUS OBERNHEYM.

Latin MS., 1476.

A Nürnberg computist of c. 1431.

Title. 'Computus noreMBERGENSIS.'

Colophon. 'Anno dn̄i 1476 completo.'

Description. See the preceding manuscript, with which it is bound.

This is a German *computus* written by the same hand as the preceding. It is evidently a copy of a work written in 1431, for the following statement appears on f. 65: 'Anno dn̄i m^occcc^oxxxi^o quarta feria p^o judica finit, ē liber iste per me Jacobū Obernheym.'

ANONYMOUS.

Latin MS., 1477.

Title. None. A *calendarium*. The first folio begins 'Albēto belo caro decagolo ca^o nobilis.'

Description. 4^o, 15.4 × 20.4 cm., the text being 10.5 × 16.4 cm. 14 ff., 17 ll. Bound with the Vergerius and Lullius described on pp. 456, 457.

This is a manuscript of 14 folios on the calendar, and has two dates, M^o.cccc^o.lviii^o and M^o.cccc^o.lxxvij, on the first folio. It also has some lunar tables for 1364–1381, the treatise having probably been copied about 1458–1477 from another one of a century earlier.

NICOLÒ DE ORBELLI.

Latin MS., 1478.

Title. 'Incipit op^o fratris (?) dorbelli fup . . .' (F. 1, r). 'Incipit. Matematica' (F. 132, r).

Colophon. On f. 126, v.: 'Explicunt Scriptā f̄r̄s nicolai de orbellis // doctoris eximini fup . . . // Deo gratias et xp̄o ih̄u Amen // M^o. 478.'

Description. 6^o, 10.5 × 15.6 cm., the text being 9.2 × 11.9 cm. 270 ff. (6 blank), 41 ll. Latin MS. on paper, 1478.

The first part of the book is devoted to dialectics and logic. The mathematics begins on f. 132, r., and consists of two folios on the theory of numbers and three on geometry. On f. 140, r., begins a treatise on philosophy, containing (f. 184, v.) a drawing of 'Johs scotus doctus subtilis.' On f. 193, r., begins a treatise on astronomy: 'Hic // Incipit liber de // celo & mundo.' The rest of the work relates to science in general. (See p. 23, 1485.)

LEONARDUS MAYNARDUS.

Latin MS., c. 1488.

A fifteenth-century mathematician of Cremona, Italy.

Title. 'Leonardi Cremonensis artis metri//ce pratice compilatio. Primus tractatus.' (F. 1, r.)

Description. 4°, 17.2 × 24.4 cm., the text being 7 × 10.8 cm. 24 ff., 25 ll., figures on the margins.

This is a treatise on trigonometry, and has been included in this catalogue because of the arithmetical nature of some of the problems.

Favaro's careful investigation of the time when Maynard lived still leaves the matter in doubt. He may have lived in the latter part of the fifteenth century, or he may possibly have been the 'Leonardus de Antoniis de Cremona, ordinis minorum, bacalarius' who lived early in the fifteenth century.

In the catalogue of the Boncompagni sale another Latin manuscript of Leonardo is given as 'in pelle di 33 carte membranacie del secolo XIV.' If this is correct, which is doubtful, Leonardo must have lived before 1400. See also Eneström in *Bibliotheca Mathematica* IV (3), p. 290, and Favaro in the same journal IV (3), p. 334. The latter gives a bibliography, with some quotations.

In 1902 M. Curtze translated and edited one of the three manuscripts of this work known to him. This is in the Venetian dialect, and belongs to the University library at Göttingen. He also consulted the two Latin manuscripts formerly belonging to the Boncompagni library, of which this is the later by a few years. This manuscript belonged to the advocate Cav. Carlo Morbio, in Milan, before Boncompagni secured it. A note on f. 15, r., shows that in 1655 it belonged to Bonifacio or Joseffo Aliprandi. Another note, on f. 1, refers to a passage in a work by Franciscus Arisius, printed at Parma in 1702. This passage is as follows: 'LXXXVIII (i.e. 1488) Leonardus Maynardus Insignis Astronomus, Physicus et Mathematicus, cuius opusculum M. S. Mediolani servatur, mihi indicatum ab eruditissimo Viro Lazaro Augstino Cotta I. C. amico meo nequaquam satis laudato, cui est initium: (Here

follow the first few lines of this work, so nearly identical with the manuscript as to show that Arisius probably had this very one at hand.) . . . Fuit ante Blasium *Leonardus Maynardus*, qui suo tempore non tantum inter nos, sed etiam inter omnes in iis studiis tenuit principatum.' A similar passage appears in the manuscript *Biografia Cremonese* of Vincenzo Lancetti, now in the civic library at Cremona, from which we may infer that he lived before Battista Piasio, of a noble Cremonese family, a philosopher, physician, and astrologer, who flourished about 1500. This manuscript of Maynardus is described (no. 254) in Narducci's catalogue of the Boncompagni manuscripts (Rome, 1862).

ANONYMOUS.

Italian MS., c. 1490.

Title. None. A manuscript on elementary mathematics. 'Choncio fia chofa che fono noue figure nellaba//cho.' (F. 1, r.)

Description. 4°, 14.5 × 21.5 cm., the text being 9 × 15.2 cm. 158 ff. (5 blank), 26 ll.

The arithmetic is of the ordinary commercial type, and includes the fundamental operations together with a considerable range of business applications. It follows the general style of the Florentine arithmetics and uses the Tuscan *berichuocholo* instead of the Venetian *scachero* to designate our present multiplication: 'Volendo multiprichare .2. numeri p berichuocolo' (f. 17). The dates in the problems in equation of payments indicate that it was written about 1490 (ff. 83-86-129). The per-cent symbol % here appears as p c̄, p c°, p c̄°, as well as p 100 (ff. 84, 86, 134, v. See Fig. 237).

The second part of the work (f. 91) relates to algebra: 'Qui apriffo fcriuerio lareghola dellarabre (dell' algebra). m'ochabili" (e muqabala).' The work is rhetorical, there being practically no symbolism employed. This part of the work closes with the words, 'Voglia hora fare fine enondire piu fopa a que//fta reghola delagebrem°ghabile . . . (f. 109, r.).

The geometry begins on f. 109, r., and is confined to simple mensuration. The work closes (ff. 123-153) with a series of miscellaneous problems.

ANDREA DI GIOVANNI BATTISTA LANFREDUCCI.

Italian MS., c. 1490.

An officer of the Republic of Pisa in 1505.

Title. None. A treatise on arithmetic. 'Choncio fia chofa che fono noue figure nellabacho.' (F. 3, r.)

ildi de partire il ghuadagnio del mese. in 30
 equello che ne viene tanto ghuadagnia ildi
 equando ai ueduto quello de ghuadagnia
 il suo capitale. l'ano e il mese e ildi uedi quate
 tempo entra nel merito della detta partita
 equello tempo che nescie. pollo sopra alla prima
 partita equello detta doli uene arechato. La
 sopadetta partita a undie. hora seghuendo. la
 detta ragione dobbiamo uedere quanto tempo
 e dalla prima partita alla 1^a coc. di 25 di luglio
 nello 89 infino ad 4. di settenbre nello 89
 cui uno mese e 9 di a. 10. p. c. coc. a. 20 p. t. il me
 se merita. 461 t. 88 q. ghuadagniano in 1
 mese e 9 di 5 t. 08 q. ora dei uedere quanto
 tempo e dalla prima partita alla terza coc. di 25
 di luglio nello 89 infino ad 23 di dicembre
 nel 90. cui. 5. mesi. 4 di. ora dei meritare. 602 t.
 168 q. in 5. mesi. 3 di a. 10. p. c. coc. a. 20 p. t.
 il mese ghuadagniano. 15 t. 12 q. hora dei
 uedere quanto tempo e dalla prima partita alla
 1^a coc. di 25. di luglio. nello 89. infino ad 10^o
 di marzo nello 90 cui. 7. mesi e. 6. di. hora dei
 meritare. 943 t. 08 q. in. 7. mesi e. 6. di a. 20
 p. t. il mese ghuadagniano 56 t. 11 q. hora
 dei uedere quanto e dalla prima partita alla
 coc. di 25 di luglio. nello 89. p. infino ad 5 di
 luglio nel. 90. cui. 11. mesi. 10 di hora dei meri

FIG. 237. FROM THE ANONYMOUS MANUSCRIPT OF C. 1490

Colophon. 'Qvesto Libro. afcritto. difua. popia ajano. andrea. Lanfreduccj.' (F. 96, v.)

Description. 4°, 16.8 × 23.4 cm., the text being 12.1 × 16.5 cm. 96 ff. (15 blank), 29 ll.

This book is an Italian commercial arithmetic of the Florentine type written about 1490. After a brief treatment of notation the author takes up the 'Libretine minore,' or the smaller multiplication table to 10 × 10, following this by several examples. He then gives (f. 9, r.) 'le libretine maggiore' or larger table, with multiplication 'p quadrato' and 'p berichuochulo,' these names showing the work to be Tuscan. Division is followed by a large number of problems, per cent (il $\frac{c}{100}$ and p 100) playing a large part. The problems in equation of payments show the book to have been written between 1489 and 1491 (ff. 72-74).

JOHANN NEWDÖRFFER.

German MS., 1492.

A Nürnberg Rechenmeister, c. 1450-1500.

Title. 'Hanns Dimpfel //(Multiplication table)// Johann Newdörffer Rechen-//maister vnd Modift zu N.// 1492.' (F. 1, r.)

Description. 8°, 10.5 × 13.9 cm. 11 ff., 20 ll. Written on vellum.

This is a beautifully written primer apparently done under the guidance of one of the celebrated Rechenmeisters of the Newdörffer family of Nürnberg. It was written in 1492 and is evidently the work of a beginner in commercial arithmetic. It opens with the addition and multiplication of compound numbers, and this is followed by the rule of three, with some applied problems.

The name Hanns Dimpfel is doubtless that of the pupil whose work was done under the direction of Newdörffer. As to the latter, it is not improbable that he was the father of the celebrated Schreib- and Rechenmeister Johann Newdörffer, the founder of the German calligraphy, who was born at Nürnberg in 1497, and died there November 12, 1563, and whose son Johann (b. February 22, 1543, d. October 28, 1581) was also a well-known Rechenmeister.

ANONYMOUS.

Latin MS., c. 1500.

Title. 'De comūtatā pporñe.' (F. 14.)

Description. Fol., 14.5 × 21.5 cm., the text being 11.5 × 19 cm. This is the second part of the 1442 manuscript, ff. 14-32 (p. 458).

This is a Latin treatise on arithmetic, apparently written about 1450–1500. It relates almost exclusively to Boethian ratios and figurate numbers. It closes with a few pages on the circle, including the following: ‘Rem nouā mirabileꝫ. quadra//tura; circuli velut ifcritabileꝫ.// apud doctof ppli’ olim. f. fabile.// pure cernūt oculi vere demra//bilem nūc i fine feculi’ (f. 30, v.); ‘¶de quadraturā circuli’ (f. 32, r.). The table in Fig. 238 shows some work in series such as is common in arith-

| | | | | | | | | | | |
|---|-----|-----|------|------|------|------|------|------|------|------|
| 1 | .2. | .3. | .4. | .5. | .6. | .7. | .8. | .9. | .10. | .11. |
| 2 | .4. | .6. | .8. | .10. | .12. | .14. | .16. | .18. | .20. | .22. |
| 3 | .6. | .9. | .12. | .15. | .18. | .21. | .24. | .27. | .30. | .33. |

FIG. 238. FROM *De comūtata pporiē*, c. 1500

metics of this period. Fig. 239 shows the multiplication table as commonly seen in the Boethian arithmetics (compare p. 26). It also shows (on line 1) the use of the Roman numerals in connection with the Arabic, and (on lines 9 and 10) the absurdly long Latin names for ratios.

ANONYMOUS.

c. 1500.

Description. Fol., 14.5 × 21.5 cm. It is bound with the preceding manuscript, but is in a later hand. It consists of ff. 33–38 of the volume.

The manuscript consists of an interesting set of drawings, including one of an astrolabe (f. 33) and several horoscopes (f. 35). The latter serve to fix the date of this portion (c. 1500) and the country (Hungary) in which it was written. They include (f. 35, r.) a horoscope cast at the birth (1456) of Ladislas or Uladislas VII, possibly by Peurbach (see p. 53), and one at his coronation as king of Hungary on September 18, 1490, mentioning his coronation as king of Bohemia on August 25, 1471, and his election as king of Hungary on July 15, 1490.

ANONYMOUS.

Latin MS., c. 1500.

Description. Fol., 14.5 × 21.5 cm. It is bound with the preceding manuscript, is possibly in the same hand as the horoscopes, and is certainly on the same paper. It occupies ff. 39–44 of the volume.

This is a treatise on the mensuration of the circle and dates from c. 1500. It has some bearing upon the metrical computations of the time.

Vel dupl' triplicat' quales ut xiiij ad v ut septimas ut xliij ad viij et sic de
 variis. nites huius nri sp'ib' que variata vident et expte multiplicatis et h' p'p'eta
 aboz i quib' p'ces sup' multiplicata videntur omnes sunt. Alij do' scilicet
 quoz p'ces sup' multiplicatae habedunt nri h'nt que diliget' iquisitoz q'q' mo
 pote p' ea que dicta sunt agnosce. Simil' .e. qui h'nt nri m'oz in
 equalitatis sub dictis vident nri .e. quati vocari debent qz sic illi qui
 dnt' m'ozis iequalitatis. nisi q' adu'ga debe' eis h'ec p'p'osio sub. et ex
 vnaq' p'ce ut saltem ex alia ut dicat' aliqui nri sub dupl' triplicat' et dupl'
 sub triplicat' et sub dupl' sub triplicat' et sic de aliis. Prop'ietat' h'oz n'oz
 alique tracte sunt .e. mlt' alie tamq' poss' qui illas h'nt .e. tm' h'ic m'ozis
 vellet similit' .e. h'ij nri quati p'p'et'. Et tm' aliqd' de hoc apparet .e. redu
 cant' ad m'ozia om' tracte quique sp'is m'ozis .e. m'ozis iequalitatis
 ponenda est h'ic qu'eda' valde nobilis m'ozis descriptio qua' dat' nob' hoc arit'
 h'ic libro p'mo In qua mlt'a p'nt' speculati ut q' multiplicatis certis i equali
 tatis sp'is nri' au'cedat. Similit' .e. sp'is cuius ordo .e. p'p'ato necno .e.
 aliaz ut sup'p'it' sup'p'it' multiplicatis p'nt' .e. multiplicat' sup'p'it' in
 Ad huc p'nt' ibi videri qualitas retrogenoz .e. Longitudoz n'ozis .e. alia
 multaz. Et aut' descriptio illa talis.

Ex po' parte
 descriptus

Secda vniuers

| | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|-----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 |
| 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 |
| 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 |
| 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 |
| 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 |
| 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 |
| 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

Secda vniuers ordo sim' l'at' decam'
 vniuers' i'ap' .e. r'el'at'iu' nri' r'el'at'iu'. Sunt .em' i' illo p'mo ordo nri' nri' sim' d'is'p'oz

Intra de
 scripto duo
 nri' d'nt' sunt
 nri' ordo nri'
 vni' sim' l'at'
 qu' a l'at' l'at' i
 deozis d'cedit
 Alut' h'ic l'at'
 qui l'at' aliu'
 l'at' .e. ex'p'oz
 r'el'at' .e. illoz
 quilibet .e. nri'
 ordoz vider' et
 P'zam' ordo h'ic
 ar'cedat' sim' l'at'
 h'ic sim' l'at'
 nri' sim' d'is'p'oz

FIG. 239. FROM *De comutata p'p'one*, c. 1500

The fifth portion of the volume (ff. 45-52) consists of a set of Latin, and the sixth (ff. 53-58) of a set of Italian verses. The seventh (ff. 59-60) contains a brief reference to astrology. The rest of the book is of a literary or astrological character. There are, in all, thirteen different manuscripts in the volume. For details concerning the non-mathematical portions, see Narducci, l. c., p. 31.

ANONYMOUS.

Italian MS., c. 1500.

Title. 'Regole per far Orologi da sole // con le sue Figure.'

Description. 4°, 16.8 × 22.3 cm. 22 ff. Bound with the Vergerius manuscript described on p. 456, but written in a later hand.

This is an Italian treatise on dialing, written in a fine hand of the sixteenth century, with well-executed figures. Several other manuscripts, not of a mathematical character, are also bound with it.

ANONYMOUS.

Latin MS., 1501.

Title. None. A treatise on mensuration.

Colophon. There is none, but one of the folios bears the date '1501 adj feptembr In Nürnberg.'

Description. 4°, 15 × 21.8 cm., the text being 9.8 × 17.1 cm. 89 ff. unnumb. + 7 blank = 96 ff., 27-30 ll. Latin MS., written in a German hand. Bound with the manuscript of Mohammed ibn Musa (p. 454).

This is a treatise on mensuration, of no particular merit save as it shows the nature of the work at the opening of the sixteenth century. It contains a copy of the c. 1475 manuscript described on p. 468.

STEPHANO DI BAPTISTA DELLI STEPHANI DA
MERCATELLO. Italian MS., Mercatello, c. 1522.

An Italian teacher, born at Mercatello, and living there in 1522. He was a pupil of Paciolo.

Title. 'Svmme // Arismetice.' (F. 1, r.) 'Stephano.D.B.Del-
listpha // ni.damercatello.atvti.qve // ili.liqvali.in arte.mercan //
tile.exercitare.sidilectano.' (F. 1, v.)

Description. 8°, 13.5 × 20.7 cm., the written part being 9.1 × 14.3 cm. 153 ff. numbered (5 blank), 29 ll. Italian MS. on paper, except f. 1, which is on vellum. Written, as the problems show, at Mercatello, c. 1522.

This is a manuscript on commercial arithmetic, unusually complete in its applications, and also unusually well written. It is of the general Florentine type, but, as appears from a date on f. 101, r., was written at Mercatello, a town south of Ferrara and east of Florence. The name of the author appears not only in the dedicatory epistle, but also at the end of a bill of exchange dated '1522 A di./25/maggio in M^{llo}' (Mercatello), in the latter case as 'Stefano di Bap^{ia} Stefanj f3.' The examples in equation of payments are dated 1371-72, showing that these were copied from some earlier work, and in fact they were taken from Paciolo ('Distinctio nona, tractatus quintus'), who in turn borrowed them from some predecessor.

Stephano states in his dedicatory epistle that he was a pupil of Paciolo, and that he is chiefly indebted to him for his material: 'et maxime dal mio R^{do}. et ex^{te} affme & p̄ceptor'. M. Luca dal Borgo.' This is quite evident on comparing certain passages; for, while Stephano does not usually copy his master verbatim, there is often a great similarity between them, and sometimes (as in the chapter 'De le. 2. false positioni') there is evident plagiarism. Stephano, however, omits most of the theory of numbers to be found in Paciolo, and confines himself to mercantile applications. These cover barter, partnership, various forms of discount and exchange, and other similar topics. There are also given a number of mediæval puzzles, including the testament problem, the sale of the eggs, the hound and hare, and the guessing of numbers. A little work in mensuration and the calendar is given at the end of the book.

BARTOLOMEO ZAMBERTO, editor. Latin MS., c. 1525.

A Venetian scholar of c. 1500. He was born c. 1473.

Title. 'Evclidis // Megarensis græci philoso-//phi ex Theone græco com-//mētare Interprete Zāber-//to veneto triplex p̄cipiorū // genus primū diffinitiones: // Signū // est cuius pars nulla: // Linea vero, lon-//gitudō illa tabilis. // Lineæ autem limites, sunt signa. // Recta linea, est quæ ex æqua-//li sua interiacet signa. Superfi-//cies, est quæ longitudinem latitu-//dinemq; tantum habet. Super-//ficii extrema, sunt lineæ. Pla-//na superficies, est quæ ex æqua-//li, suas interiacet lineas.' (F. 2, r.)

Description. 12°, 8 × 11.7 cm. 152 ff. (2 blank), 16-20 ll. Written on parchment.

This beautifully written manuscript has been included in this catalogue of arithmetics without much justification, since it does not

contain even Book V. It is, however, valuable in showing the influence of printing upon written numerals. It is a copy of a translation of the first three books of Euclid made by Bartolomeo Zamberti of Venice in 1513. The complete translation was first printed in Venice in 1513, the statement of some bibliographers that it appeared in Paris in 1505 being unsupported by any evidence. It also appeared in Venice in 1517, in Paris in 1516, and in Basel in 1537, 1546, and 1558. See Riccardi, II, 1, 644; Weissenborn, *Die Uebersetzungen des Euklid durch Campano und Zamberti*, Halle, 1882. This manuscript was evidently written about 1525 for some noble family, for it has (f. 2, r.) three illuminated coats of arms.

ANONYMOUS.

Latin MS., 1533.

Title. 'Declaratio Calendarii et // Almanach huius Cifte.' (F. 1, r.) 'Ars supputandi cum Denariis.' (F. 66, r.)

Description. 4°, 16.6 × 23.3 cm., the text being 11.8 × 16.3 cm. 81 ff. unnumb., 18 ll. Latin MS., written on vellum, in 1533.

This beautifully written Latin manuscript consists of two distinct works. Of these the first is a computus in twenty-three chapters, written apparently in Salisbury cathedral in 1533. The second part is a treatise on counter reckoning, and consisted originally of six chapters, 'De Numeratione, Additione, Subfractione, Multiplicatione, Diuisione, Fractione minutiis.' The last of these chapters is missing. The manuscript is particularly interesting because it gives the counter reckoning as it was used in England early in the sixteenth century, the numbers all being written in Roman when they are not represented 'on the line.' It is illustrated by numerous diagrams representing the line abacus. The manuscript closes with five pages 'De proportione vel regula Detri,' and 'De Proba regule Detri.'

ANONYMOUS.

Italian MS., c. 1535.

Title. 'Trattato d'Aritmetica, e del Misure.' (F. 1, r.)

Description. Fol., 18 × 23.8 cm., the text being 14.5 × 21 cm. 148 ff., 23-27 ll.

This is an Italian manuscript, written, as the dates on folios 67, 68 show, about 1535. It is a commercial treatise, beginning, as was frequently the case, with the fundamental operations with compound numbers. The method of division 'a danda' is preferred to that 'per galea,' although both are given: 'Il partir a galea e molto legiadro et

speditiuo, ma non tanto sicuro per un principiante quanto il partir a danda' (f. 19, v.). The applied problems are generally of a practical type useful to merchants' apprentices in the north of Italy. (Fig. 240.)

Esempio

Capitolo .84.

Capitale del p.^o Duc.^o 340
 Capitale del 2.^o Duc.^o 230
 Capitale del 3.^o Duc.^o 242

→ Guadagno Sur 5320

| | | | |
|-----------------------|------------------|----------|-------------------------|
| Summa de li capi. 812 | capital generale | guadagno | capital p. ^o |
| | 812 | 5320 | 740 |
| | | | |
| | | | |



64
 2 x x 7
 18 4 8 6
 x 8 8 8 6
 8 x 2 7 1
 8 1 8

2227 Ducati

| | | | | | |
|--|------|-------|--|--|--|
| | 5120 | | | | |
| | 740 | | | | |
| | | 0000 | | | |
| | | 21280 | | | |
| | | 15960 | | | |
| | | | | | |
| | | | | | |

| | | | |
|--------|----|---|---|
| Ducati | 4 | 7 | 6 |
| | | 6 | 0 |
| | | | |
| | 0 | 0 | 0 |
| | 28 | 5 | 6 |
| | | | |
| | 28 | 5 | 6 |
| | | | |
| | 28 | 5 | 6 |
| | | | |
| | 28 | 5 | 6 |
| | | | |



1 4
 4 4 3
 7 8 5 6 4
 8 7 7 2 5 8

140
 12
 1680

6 5 6
 1 6 8 0 14
 8 1 2 2 8 203 di Ducati

Tocca al p.^o Compagno del guadagno Sur 2227 p 3532 $\frac{14}{203}$ Duc.

FIG. 240. FROM THE ANONYMOUS Trattato OF C. 1535

Much of the latter part of the treatise relates to mensuration. A set of tables and some notes are given at the end. Among the notes is the celebrated problem of the horseshoe. (Fig. 241.)

Un Canalo che ha quanta ferri sotto li piedi et per ogni ferro ha sei chiodi cho sono chiodi 24 So dinando a un quattoro l'uno quanti quattini ualera quelli chiodi 24 copiniando dal primo sino al ultimo sempre radopiando de mano in mano che sequite li numeri sino al 24 come qui sotto ci uede descritte

| | | | |
|--|-----|---|-----|
| | 1 | — | 1 |
| | 2 | — | 2 |
| | 3 | — | 3 |
| | 4 | — | 4 |
| | 5 | — | 5 |
| | 6 | — | 6 |
| | 7 | — | 7 |
| | 8 | — | 8 |
| | 9 | — | 9 |
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Si che ci uede che 24 chiodi sempre radopiando li numeri, come al incanto ci uede l'esempio, sono quattini cento sessanta setta, milioni, e setanta sette milia, e due cento e, quindici, dico 1677725
 Che fanno gasetta, a quattini sei per gasetta dico 2796202:0 quattini 3
 Che sono berlingotti: 279620:0 et gasetta due, e, quattini 3
 Che fanno sudii trenta noue milia noue cento, e, quaranta cinque, et berlingotti cinque, e gasette due, e quattini tre dico 39945:5:2:3
 dico a ~~per~~ quattini sei per gasetta et a berlingotti 7 per sudio
 Ma uolendo che la gasetta ualua quattini 7 per gasetta faranno se non sudii dico, trenta quattro milia due cento e trenta noue et un berlingotto dico 34239:1:—
 ci che da li sei quattini alli sette per gasetta ai re di differentia dico sudii cinque milia sette cento e sei berlingotti quatro, gasette due, e quattini 3 dico 5706:4:2:5

FIG. 241. NOTES IN THE ANONYMOUS MANUSCRIPT OF C. 1535

The manuscript is no. 23 in Narducci's catalogue of the Boncompagni manuscripts (Rome, 1862, p. 16).

LUDOVICO ALT DI SALISPURGO. Italian MS., 1545.

A sixteenth-century student.

Title. 'M.D.XLV.// Ludouicho alt de Salifpurga.' (F. 1, r.)

Description. 8°, 12.6 × 17.8 cm. 92 ff.

This is a business arithmetic written by some student in 1545. The author first treats of the fundamental operations with denominate numbers, following this by a treatment of fractions. (Fig. 242.) The last part

Partir cum la proua
 Nota che al partire di Rotto se fa in questo modo. Da poi che tu
 hay redutt^o li numeri alla sua natura, cioè al suo rotto. Sempre
 tu dei Multiplicar le figure cominciando della man sinistra
 andando verso la ditta Im croce. Et quello partito per la mult
 iplication della figura: cominciando della man ditta andando
 la sinistra Im croce, et quello che tene uigiro. Sarà quello
 che domadi. Ha nota che se di bisogno cel partitor staga
 della man sinistra
 Se haui a partire Rotto per rotto

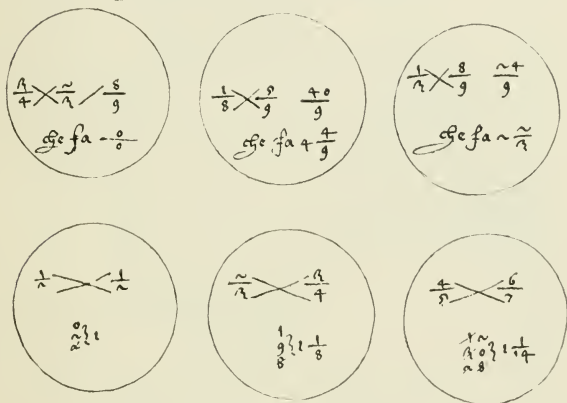


FIG. 242. FROM THE LUDOVICO ALT

of the work is a 'pratica' (f. 48), and considers the ordinary business arithmetic of the time. The author uses almost the same form of the percent symbol as the writer of 1456 referred to on p. 458, viz. $\frac{\circ}{p}$ (see Fig. 243). The manuscript is described in Narducci's catalogue, p. 152.

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Dug 58 8 -
 dug 12 8 8
 Dug 71 8 8 Compro:

£ 100 — £ 87 — £ 13
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 * 2 9 9 2 9 2 8 1 6 9 2 9 vende
 * * *
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FIG. 243. FROM THE LUDOVICO ALT

ANONYMOUS.

Latin MS., c. 1550.

Title. 'Introducioriū breue sup elementa Euclidis.'

Description. 4°, 15 × 21.8 cm., the text being 14.2 × 19 cm.
 23 ff. unnumb. + 2 blank = 25 ff., 28–33 ll. Written in a Ger-
 man hand, c. 1550.

This manuscript is the last one in the volume containing the algebra of Mohammed ibn Musa (p. 454). It consists of introductions, book by book, to books I–XV of Euclid. The symbols +, ÷ (for −), $\sqrt{\quad}$, and W (for $\sqrt[3]{\quad}$) are used.

HONORATUS.

Latin MS., c. 1550–1600.

A Venetian monk of the sixteenth century.

Title. ‘Opus Arithmetica D. Honorati vene//ti monachj cocnobij S. Laurētij.’ (F. I.)

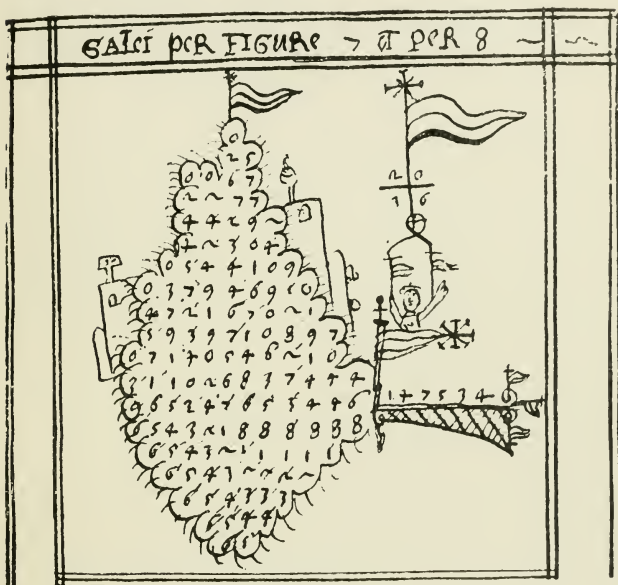


FIG. 244. FROM HONORATUS

Description. 8°, 10.9 × 16 cm., the text being about 9.5 × 15.8 cm. 111 ff.

This manuscript was written by a pupil of a Venetian monk named Honoratus evidently about 1550–1600. It is a practical arithmetic,

the author taking up rather fully the fundamental operations with integers and denominate numbers. He also treats of such common applications as partnership and barter. The illustrations are those which a pupil would be likely to make, and prove the manuscript to be the work of an immature hand. The common galley method of division is given, with the ship in full form (Fig. 244), and the sign % appears as per σ° (see p. 439).

ANONYMOUS.

Italian MS., c. 1560.

Title. 'Dichiarazione per intelligentia de Principiantj // del vso, che merchantilmente tiene la Citta dj Firenze // sopra le monete, pesi, e Misure.' (F. 2, r.) On f. 1, r., the coat of arms of the Angelotti (?) family is painted on parchment.

Description. Fol., 18.7 × 25.5 cm., the text being 12.5 × 20 cm. 166 ff. (3 blank), 8-42 ll.

This is a very clearly written Florentine manuscript on commercial arithmetic. The 8's are all made like S on its side, thus (8), a feature not infrequently seen in the second half of the sixteenth and even in the seventeenth century. As was often the case, the author presupposed a knowledge of the fundamental operations, reviewing them only briefly with compound numbers. The problems are of the common mercantile type of the period. The manuscript seems to have been written about 1560. (See Fig. 245.)

ANONYMOUS.

Latin MS., c. 1565.

Title. 'Trattato d'aritmetica mercantile.' (Cover.)

Description. Sm. 4°, 11.9 × 16.8 cm., 279 ff., 20-25 ll.

It appears by the problems that this mercantile arithmetic was written at Bologna about 1565. Like so many similar treatises, it opens with a set of column multiplication tables. The first operation is 'partiri piccoli,' or short division, this being necessary for the simple reductions in the addition of denominate numbers. This is followed by the addition of pounds, shillings, and pence ('Sommare di lire e s f s e de'). The next operation is multiplication, several methods being given. The first is cross multiplication ('modo di mcare p +'); the second, from left to right ('modo di multrip^{re}, per la dirieto,' multiply always appearing as 'multriply,' 'multripich,' in this manuscript); the third, by reference to the tables ('p colonna'); the fourth, our common form, the 'bericuocolo' of the Florentines, but here called 'modo per bilicuocolo'

Vno ha riceuto d'interessj 8 061-16-0
 però à ragione di 8 $\frac{3}{4}$ per 100-sj doman-
 da dunque quanto fu il fondo.

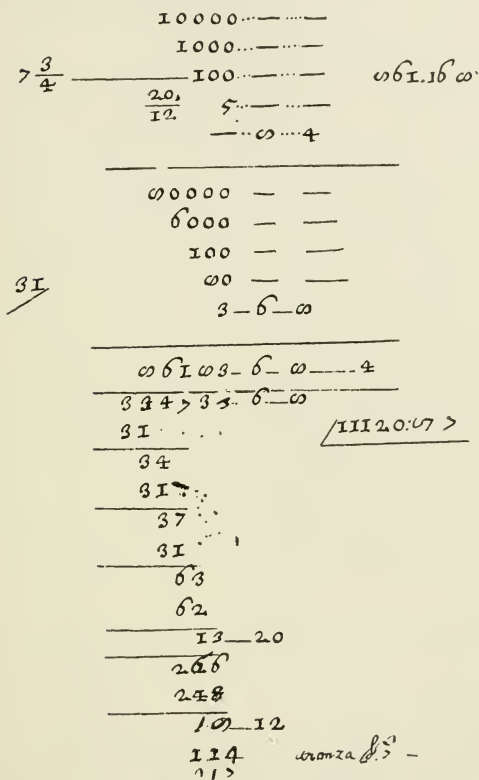


FIG. 245. FROM AN ITALIAN MANUSCRIPT OF C. 1560

(also 'bilicocolo'). This is followed by the subtraction of denominate numbers, and this by a more extended treatment of multiplication. Division follows, at first 'per ripiegno,' and then 'per danda' (Fig. 246), the galley method not being given. This is followed by a treatment of fractions, percentage ('Commicano e centi dalcuna merchantia'), the rule of three ('Commica lareghola del tre'), profit and loss, equation of payments, exchange, and the other mercantile rules of the period. Altogether it is one of the best of the sixteenth-century manuscripts on the commercial arithmetic of Northern Italy.

GAUDIOSO FRASCADA.

Italian MS., 1568.

A schoolmaster of Brescia, about the middle of the sixteenth century.

Title. 'Libro di Arithmetica // et Geometria.' (F. 1, r.)

Colophon. 'Il p̄nte libro ciove opera di abaco et geometria scritto ad // instantia de - - - - - figliolo di m Bertholameo sachtetto // habitante nella terra de' l'orala algise' scritto per mi // Camillo sachtetto l'anno 1568 a honor de dio et della // uergine maria laus deo' (f. 43, v.). But f. 5, v., has the following: 'Questo libro e stato scritto p Gaudioso frafcada cittadino di // Bressa a di 4 Nouembrio lanno 1555 laus dei.'

Description. Fol., 20.2 × 28.6 cm., the text being 14.7 × 24.2 cm. 46 ff. (3 blank), 17-29 ll.

This is a copy, made in 1568, of a treatise composed by Frascada, a schoolmaster of Brescia, in 1555. The author uses both the Florentine and the Venetian forms and names for the operations, as in the expression 'Multiplicar per schacchiere feu baricocolo.' Several forms of multiplication are given, as in the work of Paciuolo, but in division only the galley method appears. The examples are generally of the ordinary business nature, and the rules include 'Raggioni p lo cattayno, cioe position false.' The last few folios refer to practical geometry.

ANONYMOUS.

German MS., c. 1575.

Title. 'Von Künftlicher Abmeffung aller groffe, // ebene, oder nidere, in die lenge, höhe, breite vnd // tiefte als gräben Cisternen, vnd Brunnen.' (F. 1, r.)

Description. 12°, 10.2 × 15 cm., the text being 8.6 × 13 cm. 30 ff. unnumb. + 4 blank = 34 ff., 24 ll. Written in a German hand and in the German language, c. 1575.

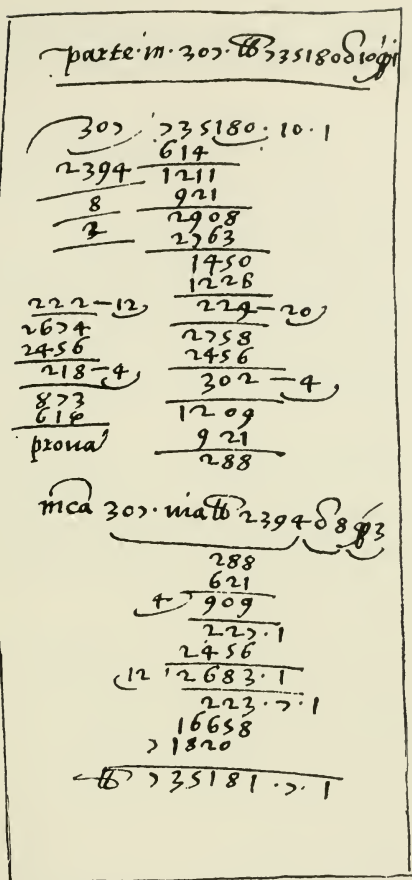


FIG. 246. FROM AN ITALIAN MANUSCRIPT OF C. 1565

This manuscript contains a few numerical problems in connection with mensuration. The work is of no merit save as it throws light upon the mensuration of the sixteenth century in Germany. Like most books of this kind, written at that time, it has little or no explanation of the rules used.

DOMENICHO DA BIEN DE VALSUGANA.

Italian MS., 1579.

A Venetian student of 1579.

Title. None. An elementary algorism.

Colophon. On p. 21 there is this statement: 'L'anno. 1579. a di .9. del // mese di marzo in liedolo // Per Domenicho da Bien de Valsugana.'

Description. 12°, 9.5 × 14.5 cm., the text being about 7.5 × 12.5 cm. 48 pp., varying number of lines. Probably written at or near Venice. 1579.

This is a student's manuscript on commercial arithmetic. It opens with the fundamental operations, the treatment of 'Multipticare Per scachiero' (p. 12) showing the Venetian instead of the Florentine influence. Division is performed only 'per galia, ouero per battello' ('p Galera' Domenicho calls it elsewhere), or 'per Collona,' the modern form not appearing. The examples are wholly mercantile, most of the applications being in the rule of three. The work also contains some simple examples in mensuration.

FRANCESCO GIUNTINI.

Italian MS., Lyons, 1579.

An Italian student or teacher of astronomy. I judge from his horoscope that he was born November 14, 1522, at Florence.

Title. None.

Colophon. 'Di Lione adi 13. di Maggio 1579: Francesco Giuntinj.'

Description. 4°, 15.5 × 21.8 cm., 32 ff. (2 blank), 26-30 ll. Written on paper.

This manuscript is clearly written in Italian, and relates to astrology, in particular to Giuntini's own horoscope. Its interest in the history of arithmetic lies wholly in such symbols as that for degrees, and in the forms of numerals.

JOHANNES KLUMPIUS. Latin MS., 1598-99.

Title. 'Varij Tractatus Mathematices // à Joanne Klumpio philiaē // studiofo except Ingol-//ftadij Anno // 1598 et fequentj.' (P. 1.)

Colophon. At the end of the 'Arithmetica practica' are the words 'Abfoluim9 15 Januarij // Anno 1599.'

Description. 4°, 15.3 × 20 cm., the text being 10.5 × 16.5 cm. (varying). 70 pp. blank + 442 pp. written = 512 pp., 19-21 ll. Latin MS., written in a German hand, Ingolstadt, 1598-99.

This is a set of lecture notes on general mathematics, including geometry, trigonometry, arithmetic, and astronomy. The arithmetic consists of two distinct parts, probably the result of two courses of lectures. The first treats of the four fundamental operations with integers and common fractions; the second of practical arithmetic, as Klumpius calls it, although it simply gives the fundamental operations, progressions, roots, and a few rules like the rule of three, partnership, alligation, and the rule of false.

B. ROTH. German MS., 1599.

A German student of c. 1600.

Title. 'Das Fünfft Capitel.// Item Im Funfften Capitel ift von dem Algorifmo // oder Cofs.' (F. 4, r.)

Colophon. Not entirely legible. It contains the date, August 4, 1599.

Description. 4°, 18.8 × 24.6 cm., the text being 13.5 × 19.8 cm. 321 ff. (13 blank), the lines varying.

This is a German manuscript containing the solutions of the problems in Stifel's edition of Rudolff's Coss, beginning with Chapter 5. (See p. 258.) This manuscript was written, as the colophon shows, in 1599. The name of the writer is not entirely legible, but it seems to be Britenus Roth. The solutions are written in a very clear hand, and furnish an excellent example of the symbolism of that period.

ANONYMOUS. Dutch MS., Louvain, c. 1600.

Title. None. A treatise on mensuration.

Description. Sm. 8°, 10.5 × 16 cm., the text being about 8 × 13 cm. 80 pp., 33-46 ll. Written on vellum.

This is a Dutch manuscript on gauging and general mensuration. The gauger's tables are as clearly written as in the best Florentine manuscripts.

ANONYMOUS.

Latin MS., c. 1600.

Title. None. A treatise on arithmetic.

Description. Sm. 4°, 10.5 × 14.1 cm., the text being about 6 × 12 cm. 197 ff. numb. (there have been added 8 ff. in the back, written on vellum, making a total of 205 ff.), 22 ll. (varies). Latin MS., written in a German hand.

This manuscript begins with the fundamental operations after the manner of algorism, and then takes up the theory of numbers according to the Boethian system. Figurate numbers and proportions (ratios) are treated at great length, as in the arithmetic of Boethius, although this is not a copy of that work. It is not common to find manuscripts written as late as this that go so fully into the ancient theory of pure arithmetic. At the end of the book the author has placed eight folios of 'Arithmetica tabulais et formularis,' clearly written on vellum, containing multiplication (or 'area') tables of primes, of 'oddly even' and 'evenly odd' numbers, of 'solid numbers,' and the like.

ANONYMOUS.

German MS., c. 1600.

Title. 'Nützlicher Gebraüch // Der Weldt Kügel.' (P. 3.)

Description. Fol., 20.5 × 33 cm., the text being 19.5 × 27 cm. (varies), 160 pp. (several blank), 24-29 ll. (varies). Written on paper, in German, c. 1600.

Although the first part of this manuscript is on the terrestrial sphere, the second part, beginning on p. 83, is on arithmetic as needed by cosmographers. This includes the fundamental operations, including square and cube roots. The galley method of division is used exclusively.

ADDENDA

Since the completion of the manuscript for the *édition de luxe* of this work, two years ago, numerous additions have been made to Mr. Plimpton's collection of early arithmetics. Excluding a number of early Arabic manuscripts, these acquisitions, with references to the pages on which they would naturally appear, are as follows:

PAGE 16. The 1561 edition of Borghi has been acquired.

PAGE 23. The 1485 edition of Nicolò de Orbelli has been acquired. See also page 473.

PAGE 36. There has been acquired a work on the calendar by Reginontanus: 'Almanach magiftri Johānis // de monteregio ad ānos. xvij. // acuratiffime calculata.' *Colophon*: . . . 'Erhardi Ratdolt Augufteñ // Vindelico . . . M.cccc.lxxxvij.' This is not an arithmetic, but it is interesting on account of its mathematical treatment of the calendar.

PAGE 62. There has been acquired a Cracow edition of a work by Faber Stapulensis, containing a little arithmetic: 'Jacobi Fa//bri Stapv-//leñ ī Artiū diuifione itroductio . . .' *Colophon*: 'Cracouię . . . 1534.' 4°, 13.8 × 18.7 cm., the text being 10.2 × 16 cm.



PAGE 82. The first (1503) edition of the Margarita Philosophica has been acquired. The colophon is as follows: 'Chalchographatum primiciali hac // peffura/Friburgi p Ioannē Scho//ttū Argeñ. citra feftū Margarethę // anno gratie M:CCCC.III.'

PAGE 114. An edition of Tagliente's 'Libro //de abaco,' 'Vinegia . . . M.D.XLIIII' has been acquired. Also the Venice edition of 1570, and an edition s. a.

PAGE 115. The 1570 Milan edition of Tagliente has been acquired: 'Libro //de Abbaco che inse-//gna a fare ogni ragione // mercadantile . . . Milano 1570.'

PAGE 139. The 1525 edition of Riese's first book has been acquired: 'Rechnung auff der linihen //gemacht durch Adam Riefen vonn Staffel-//fteyn/in maffen man es pflegt tzu lern in allen //rechenfchulen

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gruntlich begriffen anno 1518.// vleyfigklich vberlefen/ vnd zum andern mall // in trugk vorfertiget.//  Getruckt zu Erffordt zcum // Schwartzzen Horn.// 1525.' *Colophon*: '  Gedruckt tzu Erffordt/ durch // Mathes Maler. M.//CCCC.xxv. Jar.' 8°, 8.8 × 14.6 cm., the text being 7.1 × 10.7 cm. 44 ff., 17-20 ll.

PAGE 139. Another Erfurt edition of Riese's second work has been acquired: ' Rechnung auff // der Lynihen vñ Federn/// Auff allerley handthirung/ gemacht durch // Adam Ryfen.// Zum andern mal vberfehen/// vnd gemehrt.// Anno M. D. XXvij.' *Colophon*: ' Gedruckt zu Erffurdt zum Schwartzzen Horn.'

PAGE 148. The 1570 Venice edition of Feliciano has been acquired. 4 + 79 ff.

PAGE 167. ' Ulrich Kern von Freysing Eyn new Kunstlichs wolge-// gründts Vifierbuch/ gar grviß vnnd behend // aufz rechter art der Geometria/ . . . M.D.XXXI.' Fol., 18 × 27.8 cm., the text being 12.7 × 23 cm. 57 ff., 46 ll. Strasburg, 1531. A work on gauging.

PAGE 181. Two more editions of Mariani's 'Tariffa' have been acquired, Venice 1564 and 1572.

PAGE 223. There is mentioned an arithmetic by Medlerus, 1543, with a second edition in 1550. This work, recently acquired, may be all that there is of the 1550 edition: ' Facili-//ma et exactis-//sima ratio extra//hendi radicem Quadratam // & Cubicam, a Doctore // Nicolao Medlero in // gratiam studiosæ // iuuentutis // ædita. // Anno Domini. // M.D.L.' *Colophon*: ' Impressvm VVitem-// bergae, per Vi-//tum Creutzer.' 8°, 9 × 14.8 cm., the text being 7 × 11.2 cm. 7 ff., 27 ll.

PAGE 322. The 1575 edition of Lapazzaia has been acquired. It is not the same, however, as the work described on page 322, either in title or in contents. ' Opera // terza // de aritmeti-//ca et geo-//metria. // Dell' Abbate Georgio Lapazaia // da Monopoli. // Intitolata il Ramaglietto. // In Napoli // Apreffo Mattio Cancer. M.D.LXXV.' 14.2 × 20 cm., the text being 11 × 16 cm. 4 + 169 pp., 29 ll.

PAGE 322. The 1566 edition of Lapazzaia has been acquired: ' Familiarita // d'arithmetica, e geometria // con l'vsitata prattica Napo-// litana, Composta & ordinata per Abbate Geor-//gio Lapizzaya Canonico Monopolitano // Nuouamente con fomma diligentia // Riftampata, e corretta.// . . . In Napoli // Apreffo Horatio Saluiani // MDLXVI.' 4°, 14 × 22 cm., the text being 11.2 × 16.2 cm. 2 + 62 ff., 28 ll.

ADDENDA

PAGE 340. 'L'Arithmetique//militaire d'Alexandre//Vandenbussche Flandrois//departie en deux liures.//... A Paris...' (s. a.). 8°, 14.8 × 20.8 cm., the text being 9.8 × 16 cm. 35 ff., 34 ll. Paris 1571. The Proeme is dated "De la grosse tour de Bourges le douziefme d'o-//ctobre. 1571." An arithmetic for instruction in military circles.

PAGE 347. A 1590 Antwerp edition of Menher has been acquired: 'Livre // d'Arithme-//tique contenant plusieurs belles que-//ftions & demandes, bien propres & // vtils à tous Marchans, // Par M. Valentin Mennher // de Kempten. // Reueu par M. Melchior van Elftaer.//...'

PAGE 375. The 1584 Cologne edition of Clavius has been acquired.

PAGE 383. 'Arithmetica // oder // Rechenbuch // ... durch // Anthonium Schultzen/... Zur Liegnitz... 1600.' Fol., 13.6 × 18.5 cm., the text being 10.2 × 13.5 cm. 4 + 259 ff., besides an appendix on 'Buchhalten,' 30 ll. The first edition appeared in 1583. A book of no particular merit.

PAGE 389. In 1585 Fr. Barocio published a *Cosmographia*, at Venice. It contains 5 pp. on arithmetic.

PAGE 391. The work of Aurelio Marinati has been acquired: 'La prima parte // della // somma di vtte // le scienze // nella quale si tratta delle // sette arti liberali // ... Roma... 1587.' 4°, 16 × 21.5 cm., the text being 11 × 17.7 cm. 8 + 156 pp. The chapter 'Dell' aritmetica' begins on p. 99 and ends on p. 114.

PAGE 408. Vila's arithmetic has been acquired: 'Reglas // brevs de Arith-//metica ... per Bernat // Vila, ... Barcelona ... Any. M.D.-LXXXVI.' 8°, 9.8 × 14.3 cm., the text being 7.5 × 12 cm. 8 + 136 ff.

PAGE 418. The 1611 edition of Mariana's work has been acquired. 'Ioannis // Marianæ // Hifpani //, e socie. Iesv, // De Ponderibus // et Mensuris. // Typis Wecheliani. // Anno M.DC.XI.'

PAGE 425. A manuscript of Zuchetta's work, copied in 1692, has been acquired.

PAGE 440. There has been acquired one folio of manuscript on parchment, in a fourteenth-century hand, containing part of the *Ety-mologies* of Isidorus. 31 × 45.7 cm. See also p. 8.

PAGE 456. There has been acquired an anonymous manuscript on astrology, with some directions for arithmetical computations. It bears no date but was written c. 1450. 5 ff., on paper, in Latin, in a German hand.

PAGE 480. A manuscript of Bede, 'De Scientia computandi,' written in Latin, c. 1520, has been acquired. Fol., 22.7 × 33 cm., the text

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being 13×22.5 cm. In the same volume and written by the same hand is 'Franconis De Quadratura Circuli lib. V.'

PAGE 487. A manuscript of Boethius and Gerbert, on geometry, written in Latin, c. 1550, has been acquired. The manuscript of Gerbert begins 'Incipit liber geometrię artis æditvs ā Dnō // Gerberto Papa et Philosopho. Qvi et Silvester // secvndvs est nominatvs.' Each manuscript contains some interesting number work. Fol. on paper, 22×33.5 cm., the text being 15.5×23.5 cm.

As stated in the preface, there will naturally be found from time to time numerous additions to the bibliography contained in this work. The following have recently come to the attention of the author :

PAGE 70. Portius. There was also an edition, Rome, 1524, 4°.

PAGE 81. Boethius, Clichtoveus, and Stapulensis. There was also an edition, Paris, 1514, fol.

PAGE 97. There is an anonymous 'Algorithmus linealis,' 1513 at Göttingen, — probably Licht.

PAGE 106. Köbel. There was an edition of the 'Vysierbuch,' Oppenheim, 1519.

PAGE 123. Grammateus. There was also an edition, Frankfort, 1554.

PAGE 139. Riese. There was also an edition, 1559, and a Frankfort edition, 1563, of No. 2.

PAGE 180. Albert. There was also an edition, Magdeburg, 1588.

PAGE 195. Noviomagus. There was also an edition, Cologne, 1539.

PAGE 214. Recorde. There was also an edition, London, 1658.

PAGE 257. Gülfferich. There was also an edition, Frankfort, 1561.

PAGE 286. There was published a small Tariffa by Marcello in 1566.

PAGE 359. There may have been a Rechenbuch by Junge published in 1577.

PAGE 396. Lindebergius published at Rostock, in 1591, a work 'De præcipuorum . . .,' containing a little arithmetic.

PAGE 429. There is also a work by Lachar, 'Algorithmus mērcatorum,' s. l. a.

The statement in the preface, page ix, relating to the De Morgan library should be modified. While some of the books were sold (for example, see page 122), most of them were purchased by Lord Overstone and presented to the University of London, where they may now be seen.

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