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American Eclipse Expedition

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VOL. XVII, No. 11 WASHINGTON NOVEMBER, 1906

THE NATIONAL GEOGRAPHIC MAGAZINE

THE AMERICAN ECLIPSE EXPEDITION*

BY REAR ADMIRAL COLBY M. CHESTER, U.S.N., RETIRED

FORMERLY SUPERINTENDENT OF THE U. S. NAVAL OBSERVATORY AND COMMANDER-IN-CHIEF OF THE AMERICAN ECLIPSE EXPEDITION OF 1905

THE American Eclipse Expedition of 1905 was the largest one that was ever fitted out by any nation, and I have had difficulty in gleaning from the mass of scientific data resulting from its work a gist of the matter which in a popular form I shall endeavor to place before you tonight.

In studying the records of parties who had observed eclipses of the sun, it became evident to me that the larger the number of instruments and observers that could be put into the field the better was the chance for procuring results, provided the observers were properly educated for the work. It also appeared that the military training of a man-of-war's crew gave them many of the qualities required for the observers, who were to take advantage of the important few moments during which the sun can be eclipsed, and I endeavored to procure as many men to select from as possible. This assumption was strongly fortified by the experience of Sir Norman Lockyer, the distinguished astrophysicist of England, who has written extensively of his association on eclipse work with the British navy. In the navy men are trained for years to prepare for the one important battle, possibly of a lifetime, which may last but for a few brief moments, and yet the results of which may make or ruin a nation. The importance of training for this event cannot therefore be overestimated.

Likewise an eclipse of the sun can cover but a short period of time, and but few of such events which can be properly observed occur in any one man's professional experience. It is necesary, then, to make thorough preparations if we would get from these rare occasions the full benefits which may be derived from them.

HOW ECLIPSES ARE CAUSED

It is hardly necessary to go into the theory of eclipses with this audience to make clear the operations undertaken by the eclipse expedition of 1905, and without being didactical I will simply explain why we go so far as Spain to observe a total eclipse of the sun.

It is well known that an eclipse of the sun is caused by the moon passing in its orbit between that body and the only known people from whom its view can be shut out. Now the sun is about four hundred times as far away from our inhabited globe as is the moon. By an in-

* An address to the National Geographic Society, March 30, 1906.

teresting coincidence it happens that the sun's diameter is about four hundred times as large as the moon's; so that if these ratios were exact and remained constant, there would be a total eclipse whenever the three bodies were in line with each other; but the moon's orbit being elliptical, it is nearer its primary sometimes than at others, and if near it shuts out more of the sun's light from our visions than when far away. A simple illustration will make this point clear. If one places a coin say one inch from his eye, and looks toward a bright object four hundred times its size, say 400 inches away, the light will just be shut out of view. If the coin be moved away half an inch, some of the light will be seen around the edge of the coin, but if moved nearer it will be cut out entirely and the shadow of the coin will cover the eye. When the moon moving in its orbit is farthest from the earth in the direction of the sun, the light of the sun will not be completely obscured from us and the moon's shadow will not reach the earth. Such a phase is called an annular eclipse because a bright ring is seen around the black disk of the moon. When the moon is nearest the earth, the light of the sun will be cut off completely and a shadow with a maximum width of about 160 miles will form and travel along the earth's surface as the moon moves in its orbit. If it were possible for an observer to be stationed on the moon at this time, he might see the shadow of his own globe depicted as a little dot on the bright side of our earth.

CHOOSING THE POINT OF OBSERVATION

At the time of the eclipse last year the moon's shadow traversed a belt of the earth's surface about 120 miles wide, striking the earth first in British America, moving across Labrador into the Atlantic Ocean, across the Atlantic, thence over Spain in a southeasterly direction, the Mediterranean, Algeria, Tunis, and southern Egypt.

In British America the eclipse began soon after daylight, but the low altitude of the sun at this time of the day tended to lessen the value of such observations as should be made; but, waiving this drawback, the great amount of fog which usually covers the coast of Labrador in summer made it highly probable that the sun would not be seen at all. These considerations led me to eliminate the American Continent from the problem of eclipse stations. As afterward learned, nearly the whole of eastern North America was dominated by a heavy storm of large extent during the whole day of August 30 and no observations were made of the eclipse. Owing to the great importance to science of the eclipse of 1905, astronomers and meteorologists for several preceding years carried on an exhaustive study of the physical characteristics of the countries where the eclipse would be total. In general, Spain offered the greatest inducements to astronomers to observe the eclipse, as there it would take place soon after noon, when the sun was high in the heavens, relieving the observations of a great amount of refraction. Practically all the nations of Europe sent parties thither to observe the eclipse.

Spain has three distinct geographical features, where the meteorological conditions are different: First, the lowlands of the east coast of Spain are affected by the general meteorological conditions of the Mediterranean Sea, which were favorable for good weather during August. Second, the high plateau country of central Spain is usually very dry during August, except that frequent thunderstorms occur in the afternoon. As the eclipse would take place between noon and 2 p. m., the probability of the sky being free from clouds was good. Third, the mountainous region of western Spain being a stormy section itself, the storms passing over from the Atlantic Ocean frequently breaking here, the mountains thus acted as a buffer for eastern sections of the country.

As the maximum duration of totality occurred in Spain and as predictions pointed generally to good weather, it was decided to locate parties there. Moreover,

it was thought that by choosing a site for one eclipse station in the central and another in the eastern section, if bad weather affected the observations of one it might not the other, and out of the two stations we would procure at least one set of observations.

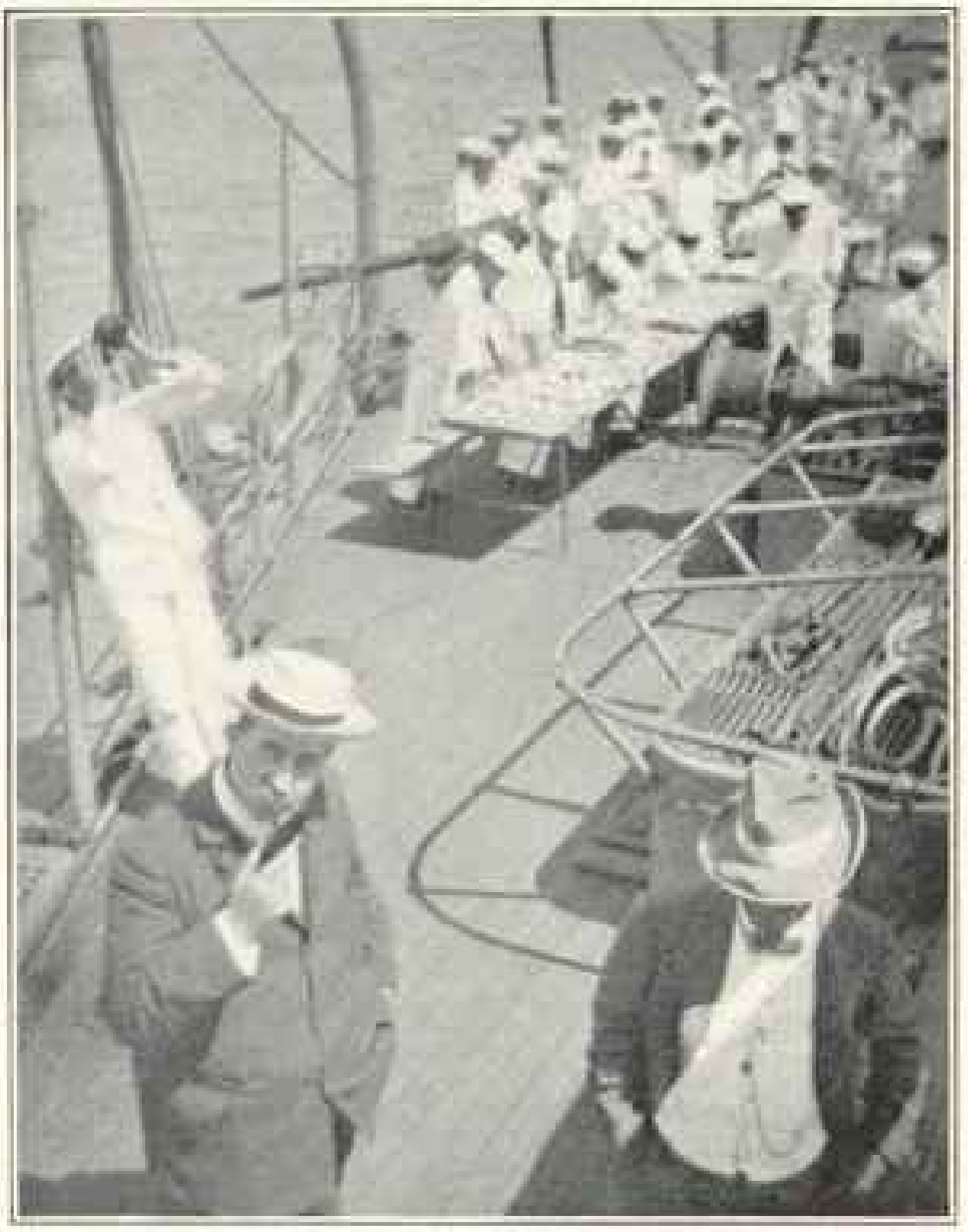
Records indicated that the north coast of Africa was also comparatively free of storms at this time of the year, and as good harbors existed on its coast, affording suitable means for the transshipment of delicate instruments, one station was located in Algeria, at Guelma. This locality was elevated about 1,500 feet above the sea, was far enough back from the Mediterranean to avoid its sometimes foggy conditions, and yet it was easily reached by railroad. The selection of this station was fortunate in many respects.

MONTHS OF PREPARATION

Several months before the expedition started, instruments were prepared and set up at the naval observatory, most of them being newly designed or rebuilt for the occasion. All the apparatus was constructed as perfectly as ingenuity and skill could make it.

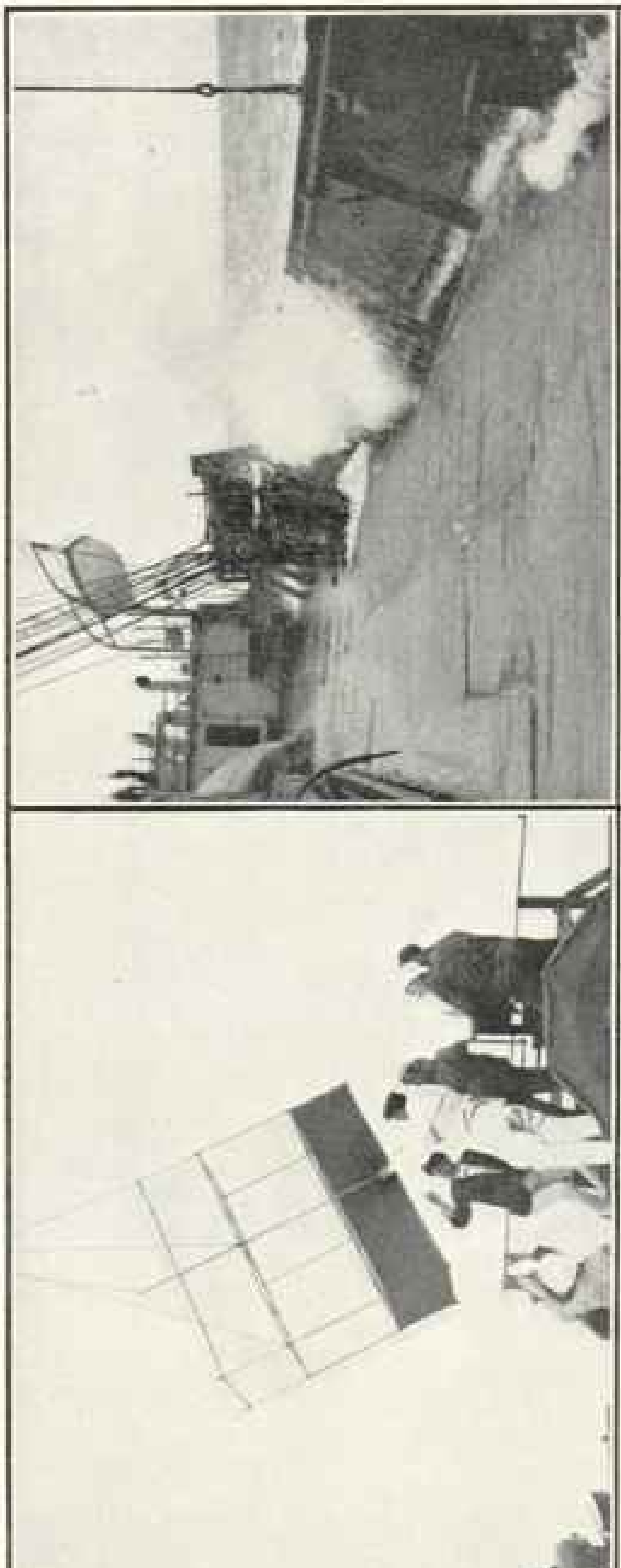
In order that during the brief maximum time of 3 minutes and 42 seconds of totality as many photographs of the eclipse phenomena might be taken as possible, the mechanism must be arranged to go without a hitch and the people in charge of instruments made confident by frequent drills that all parts would work smoothly and quickly. Mr W. W. Dinwiddie, one of the assistants, who was well fitted by natural mechanical ability as well as by experience for the work, was put in charge of instrumental construction, and before the expedition sailed all new instruments and practically all that had been used on previous occasions were set up and tested.

A new lens of 7½ inches aperture and 65 feet focal length, composed of three pieces of glass, was purchased for the occasion as well as for future use at the observatory. The two outer lenses are of

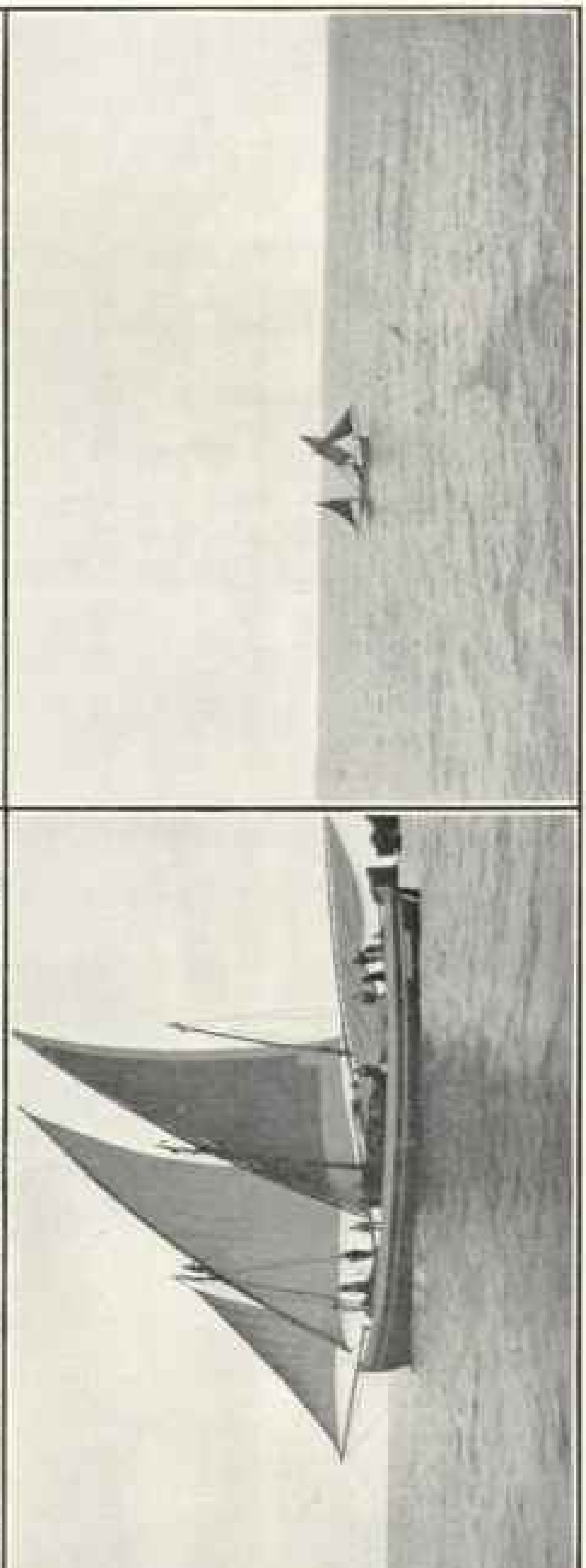


Making Sketches During Eclipse

flint glass, covering a double convex lens of crown glass. The flint glass is of two different varieties, enabling the optician to correct for both the red and blue end of the spectrum. Thus the lens is absolutely achromatic, and both the ordinary or orthochromatic plates can be used with it to equal advantage. This is not the case with the ordinary lens, composed of



Weather Service Kite



Spanish Bolits

Deck of the *Cæsar*

two different pieces of glass, as in that case either the red or blue rays must be left outstanding, the red in the photographic objective and the blue in the visual one. This lens is composed of glass manufactured by Mantois & Cie, of France near Paris. The curves were computed by Dr C. S. Hastings, of the Yale University, and the lens constructed by the John A. Brashear Co., of Allegheny, Pennsylvania. The most important part of this instrument, as in all cameras, is the lens, and this lens alone cost $1,000. The camera is actuated from within the house by a focal plane slit and shutter affording an exposure of less than a thousandth of a second when used in full sunlight, but of course during the eclipse the exposures were much longer.

The illustration shown is the 65-foot photoheliograph, on which a vast amount of thought was expended. It is composed of a long wooden framework ending in a little house. The house is made to be taken apart for transportation, and contains a double door, so that members of the party may enter it without admitting light. Portions of the roof are hinged to allow ventilation and light when desired. The photoheliograph is set up on a horizontal plane, and the light from the sun is reflected into the long box or camera through the lens by means of a cœlostat. The cœlostat is simply a mirror or set of mirrors on a movable polar axis which is actuated by clock-work regulated for solar time, by which the reflected image of the sun, which has apparent motion, is always maintained in the line of collimation of the camera. This instrument is sometimes called Joshua because it makes the sun stand still. Formerly such cameras were set up pointing directly at the sun, the upper end resting upon a scaffold; but while this installation has some advantages, so long an instrument thus mounted is more or less unstable, and the difficulties of protecting it from the wind and in making the adjustments are greatly augmented.

Three new polar axes were constructed, one for each of the three principal observing stations. These were made of iron, which gave a much more rigid support to the delicate photographic cameras and telescopes that were attached to them than was possible with the old wooden machines heretofore relied upon for the purpose. The axes carrying the cameras and other instruments were set up on wooden frames and adjusted parallel to the axis of the earth; hence its name polar axis. The whole apparatus was made to take apart for transportation, and as thus constructed the same instruments could be used many times over.

The polar axes were strong enough to carry photographic cameras, some of which were also made of angle-irons 10 to 15 feet in length. Cœlostats were also used to reflect the image of the sun into other instruments, such as the spectroscopes.

The instruments, having all been set up and adjusted, were taken apart, boxed, and transported to Alexandria, Virginia, where they were shipped on board the *Cæsar* for ports in the Mediterranean.

CROSSING THE OCEAN

The vessels assigned for the Special Service Squadron for the purpose of carrying the experts and furnishing the men who were to assist them in observing the eclipse were the *U. S. S. Minneapolis*, Captain J. M. Miller, U. S. N., commanding (which vessel was the flagship of the commander-in-chief); the *U. S. S. Dixie*, Commander G. A. Merriam, U. S. N., commanding; and the *U. S.* collier *Cæsar*, Lieutenant Commander G. H. Stafford, U. S. N., commanding.

The *Cæsar* left Alexandria on June 18 and Norfolk on June 22 for Gibraltar, and the *Dixie* left Philadelphia June 26, 1905.

Incidental to but connected with the eclipse problem, is the important study of meteorology. Prof. F. H. Bigelow, of the Weather Bureau, was invited to go

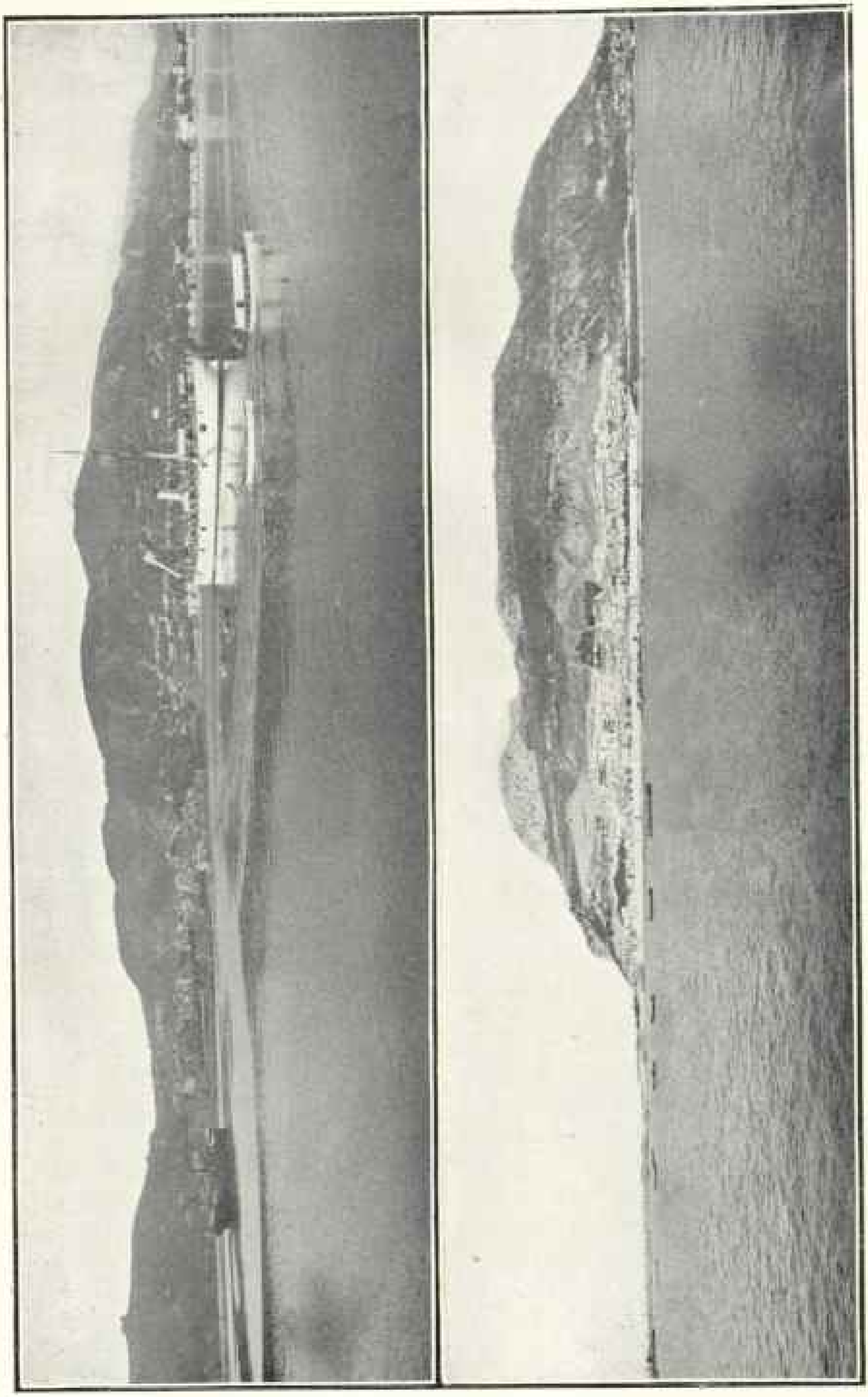
on the expedition and take charge of this work, and Professor Moore, the Chief of the Weather Bureau, kindly detailed him for this duty, thus relieving me of all care of this important matter except, as we say in the navy, "to pay out rope," which means to give a free hand and plenty of assistance.

An important part of meteorology is a study of the upper strata of the atmosphere lying over the ocean, and in order to make observations in this out-of-the-way field for research Professor Bigelow took passage on board the *Cæsar*, and by means of kites carried on a series of meteorological observations which extended through a period lasting until his return to the United States in October. The *Cæsar*, with her large and spacious decks fitted with numerous steam winches, gave efficient means for flying these kites and reeling in the wire lines which made them captive. Once a mishap occurred, making it necessary to drop a boat and regain the water-borne kite before it should sink with its delicate instruments or before they should be destroyed by hauling through the water. The boat, once returned to the ship, must then be hoisted with care, possibly with difficulty, owing to the ocean swell, in order that the instruments should not be disarranged.

DRILLING THE SAILORS

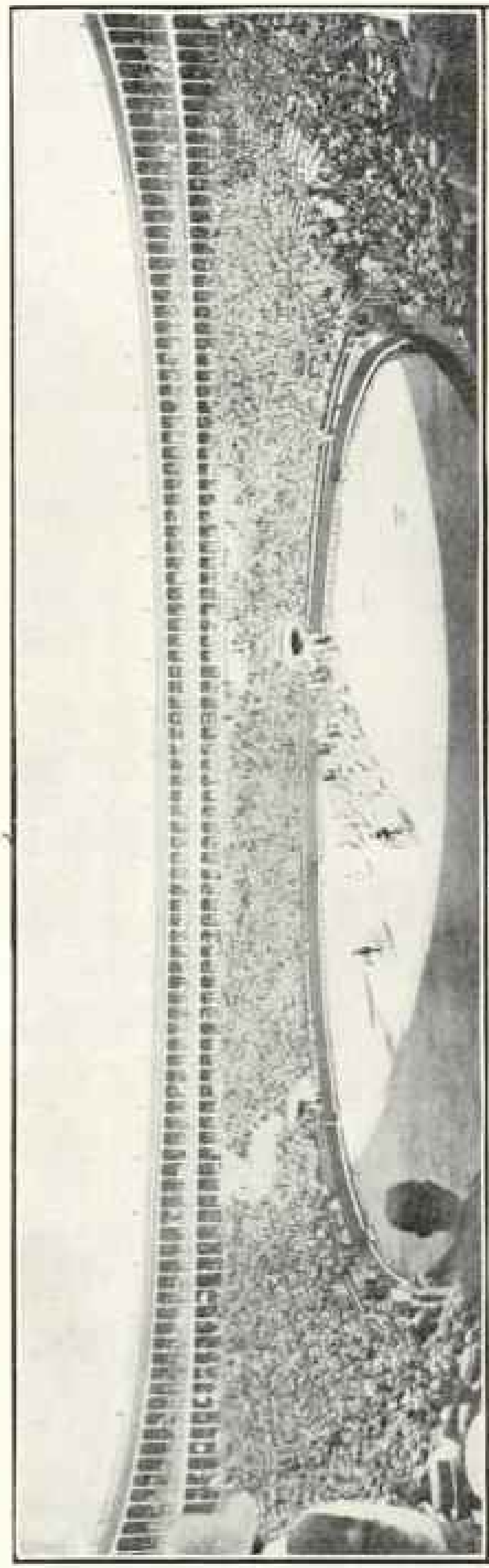
The *Minneapolis* left the United States on July 3, 1905, with the last of the expeditionary force on board, bound for Gibraltar, whither both the *Dixie* and the *Cæsar* had preceded her. En route across the Atlantic frequent lectures were given to the crew of the ships by the experts on board, to prepare the men for the work in which they were to take part, and these lectures were listened to with marked interest by all. It was not found necessary to call for volunteers for the service to be performed, for every one showed his eagerness to take part in observing the eclipse. The instruments and objects of making the observations were explained by means of lantern slides, and there were also shown pictures of the countries about to be visited, giving the probable conditions likely to be met with. Classes were formed from the officers and crew to make both plain and colored drawings of the corona as well as for the study of other parts of the work. The classes were drilled in the use of color charts, which were taken along to compare the colors actually observed in the eclipse phenomena. The colors on the chart marked by numbers gave a ready and quick method for use in preparing colored drawings. For this purpose the coronal field was laid out in sections. Observers were assigned to each section, and the color of the corona as seen by them was separately recorded on the chart to the nearest shade noted. The color of the different parts of the corona was then established by majority vote of the three observers as recorded. In this way colored maps of the corona and protuberances of the sun have been compounded, one of which is published with this article.

One of the requisites in selecting members of the crews for service with the eclipse parties was that they should be first-class conduct men—that is, they must be exceptionally well behaved at all times, whether afloat or ashore. This matter was very important, for with the late Spanish-American trouble still fresh in the minds of the many into whose society we were about to enter, any act of bad conduct or discourtesy on the part of any of our people was likely to produce a result disastrous to the entire expedition. It is pleasing to state that while every member of the crews of the ships visiting Spain landed on its shores, many of them to remain for several weeks, there was not a single man who did not comport himself as a gentleman. I would like to state here with reference to the men of the navy, that when called upon for extraordinary good conduct as well as for extraordinary heroism, they may be expected to meet the issue with a full sense of their obligation to the country. A noteworthy instance of this kind de-

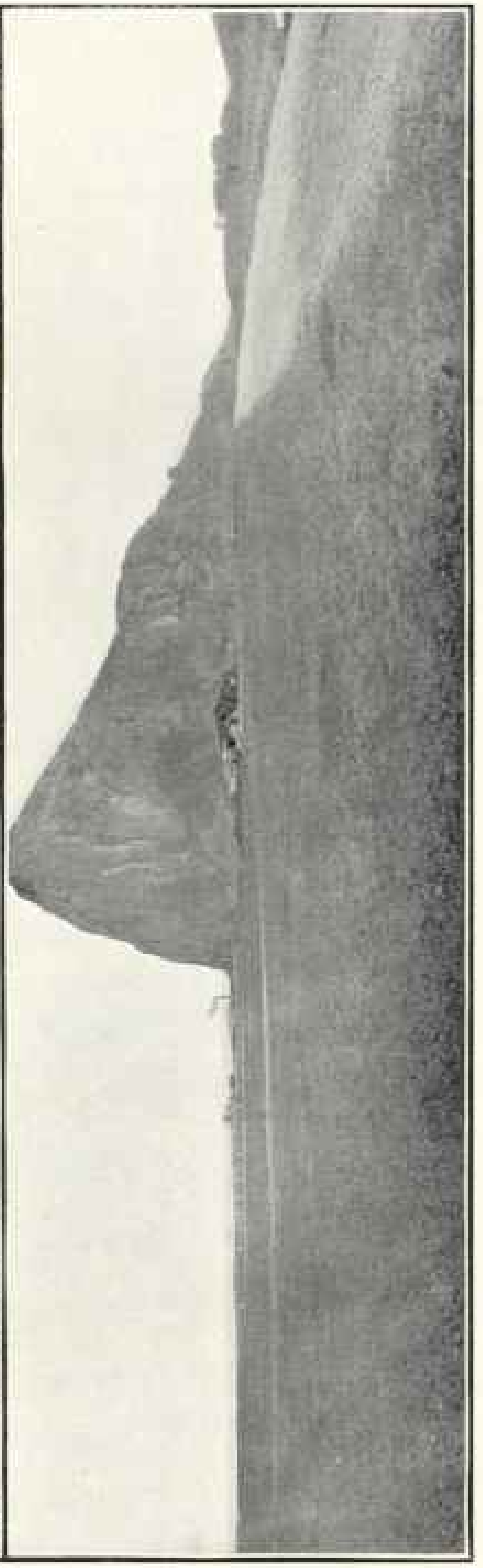


U. S. S. Dixie

Gibraltar



A Spanish Bull Fight



The Rock of Gibraltar

veloped during the Spanish-American war. On all ships of the navy there is held by the captain what are called police courts, to investigate and punish for minor infractions of the regulations, that the discipline which is characteristic of the service may be maintained. But the moment war was declared I think on almost every ship in the navy the bad men became good, the lazy zealous, and the careless attentive; so that practically the police court was put out of business. The desire, therefore, to take part in observing the solar eclipse became an incentive to good conduct on the part of the crews of the ships and acted for the betterment of the discipline of the command.

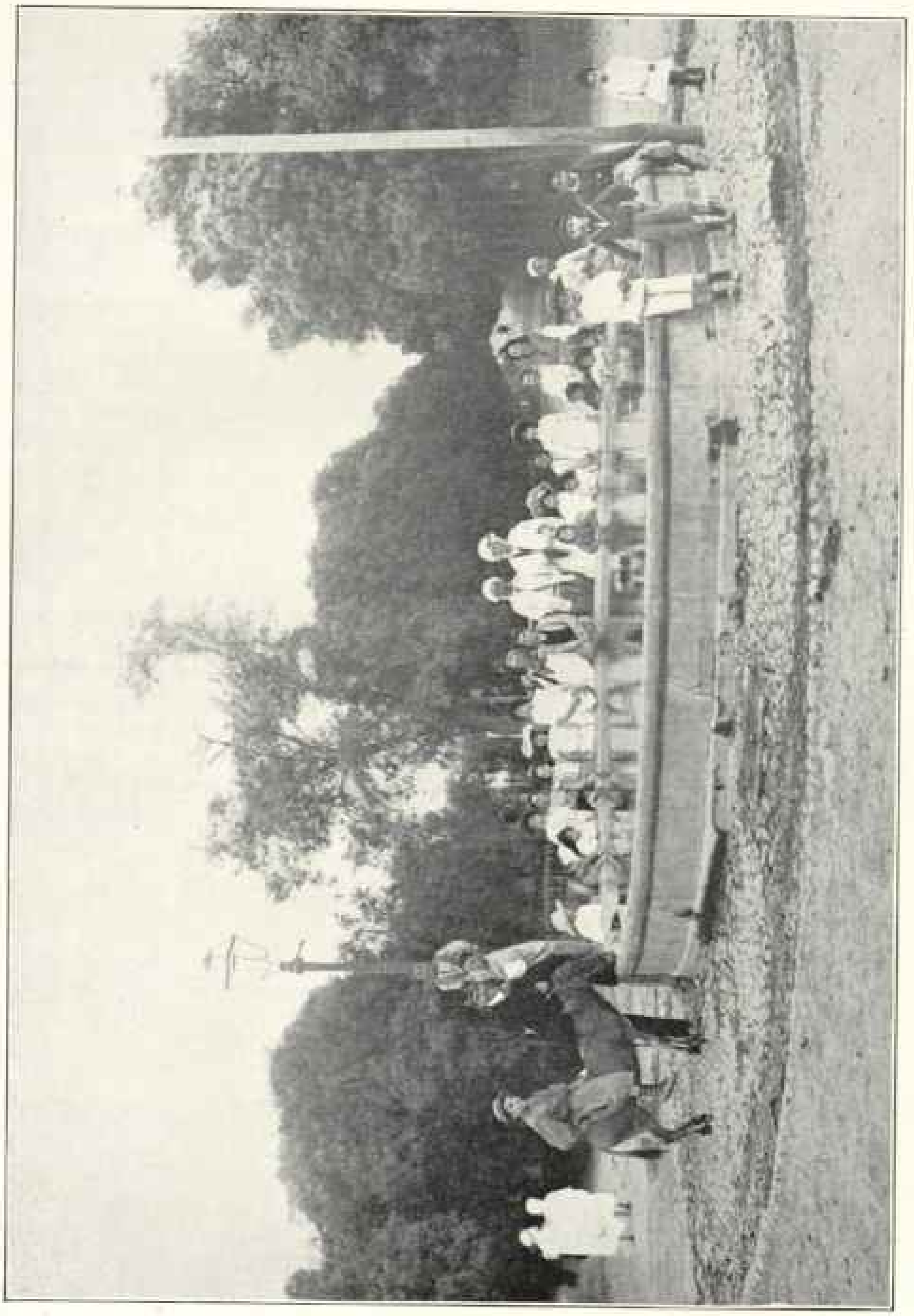
After a short but pleasant and profitable voyage, the shores of Spain were sighted from the *Minneapolis* on the 14th of July, and, steaming near Cape Trafalgar, where Nelson not only won a peerage but a tomb in Westminster Abbey as well, we passed the port of Tarifa, the most southern town of Europe and the most thoroughly Moorish in Andalusia. The ancient importation practices of this town gave a name to a principle about which the people of the United States in political parties assembled have fought many a campaign. That the party which had as its motto "Tariff for revenue only" would have had the sympathy of the ancient Arabs who controlled the destinies of Tarifa is unquestionable.

THE ROCK OF GIBRALTAR

Upon entering the Straits of Gibraltar on a bright moonlight night, the *Minneapolis* was put in communication with the *Dixie* at Gibraltar by wireless telegraph, and Captain Merriam assured us of a hearty welcome by our British friends, who hold this celebrated stronghold with a tenacity of purpose that is characteristic of the nation. The bay, as you know, is noted for its beauty. The low land on the north and west slopes gradually back to the mountains, with here and there an elevation of moderate height, which covered by the green fields of Andalusia is a typical formation of nearly all the Mediterranean coast of Spain. In one of the pretty niches between the bluffs is located the town of Algeciras, where sat a congress of nations to decide the destinies of Morocco. We trust if it has no other result it will break up such acts of brigandage in that country as were recently so well described in this hall by one of its victims, Mr Perdicaris.

On the east of the beautiful bay lies the celebrated Rock of Gibraltar, which is too well known to need description here. You may not all know, however, that at its foot England has built, at an enormous cost, a land-locked harbor, which is reached through two narrow entrances, that seems as substantial as the rock itself and as strong as the "sea power" that Mahan has shown is wielded by the owners with the force of a giant. In this harbor there is generally present a fleet of battleships, of nearly equal size to the combined fleets of almost any single nation of the globe, that is at all times ready for action. This fleet is in constant touch with the home office in London, ready to be dispatched, at the touch of a button, to any point where British interests may be put in question. While we were accepting from the large concourse of officers here assembled the hospitalities of the port, a portion of the British Atlantic fleet which here makes its headquarters was receiving in our American ports an ovation that has bound still closer the ties of friendship existing between the two nations.

Entering the beautiful Bay of Gibraltar in the early morning, the ship makes her bow to the English nation in a twenty-one-gun salute, which reverberates over the waters and partially hides our pretty ship from view. The salute is returned in kind by guns from the wonderful casemates of the "Mount," as it is called, which wreathes the hills in smoke, adding to the picturesqueness of the scene. Once at anchor, a boat is seen approaching, whose narrow pennant flying at the bow indicates that a commanding officer of one of the ships is about to visit the flag-



Public Fountain, Guelma, Algeria

ship, and preparations are made to receive the officer with the honors of his rank. This is always an important event in the life of naval men after a long trip at sea. The first boat usually brings the mail-bag, which is watched by many an eager eye as it is passed over the side of the ship, to bring good tidings for the many, but possibly it will bring an alarming message for some poor soul, whose thoughts during the long passage he has made have been seldom away from the bedside of some loved one whom he was forced to leave behind with anxiety and sorrow. Let us hope the bright sunlight of the day portends good news for all.

As the scattered threads of our plans are gathered together here at Gibraltar from our reconnoitering parties, sent out in advance of our arrival, and from our diplomatic agents abroad, the members of the three parties about to take the eclipse field are assigned to their respective stations, and a final consultation with the officers of the African party is held over a dinner on board the *Minneapolis* preparatory to their early start the next morning. This party takes its departure on board the U. S. S. *Dixie* July 18 for Bona, Algeria, and three days later the cable announces their arrival at this interesting port.

BONA, ALGERIA

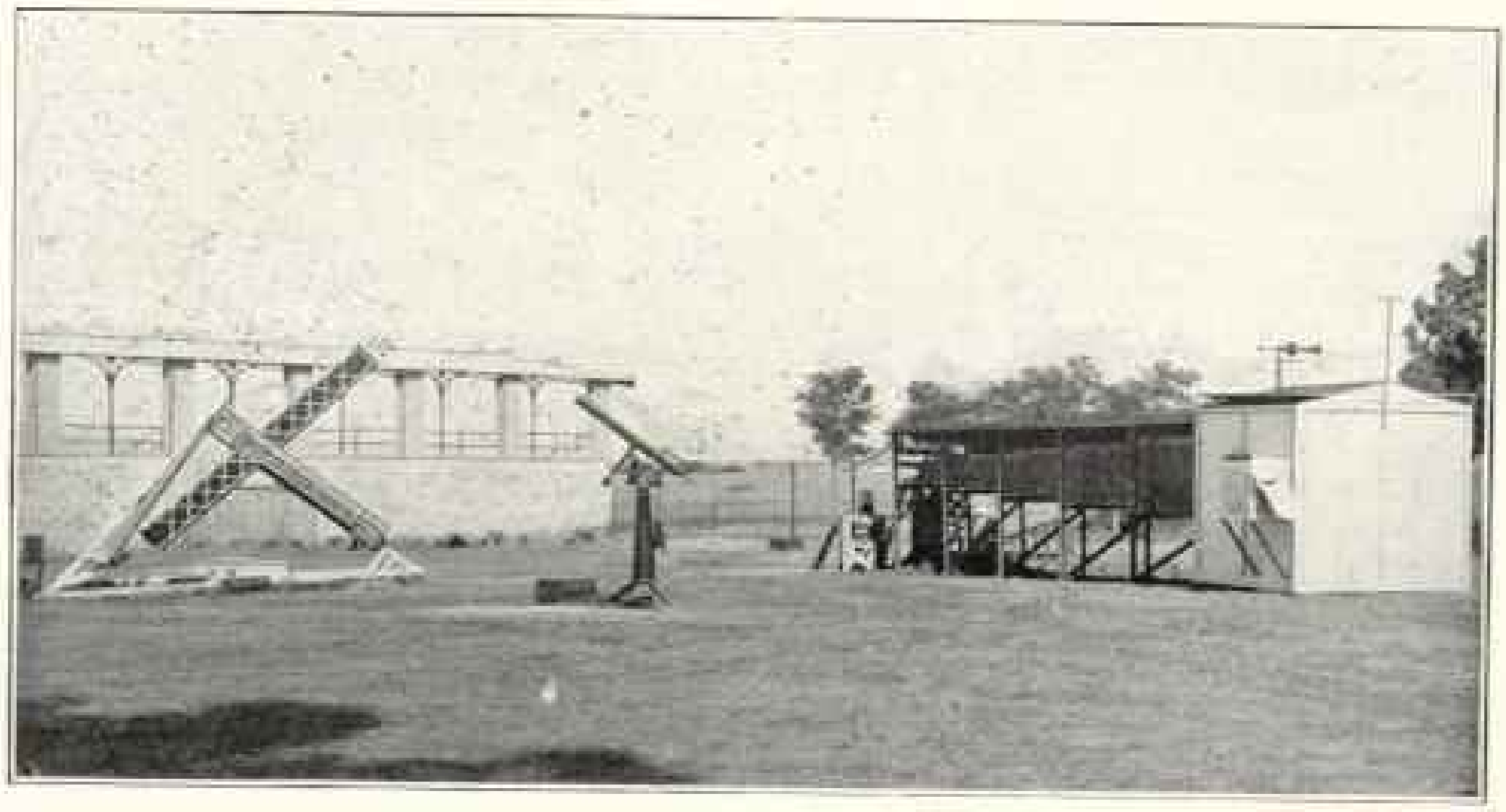
The harbor of Bona is a large basin formed by a break-water built out into the Mediterranean, rivaling in size that at Algiers. The shipment of a vast export trade from the interior of Algeria is here carried on in connection with a railroad leading from Constantine to the city of Bona. The trade of Bona has increased enormously within a few years, so rapidly in fact that I have found but few Americans who know of the large and imposing city which has sprung up like one of our prairie towns. Through the kind efforts of the American consul, the arrival of the *Dixie* was anticipated, and as the general site for the African station had already been selected at Guelma, Captain John A. Norris, U. S. N., the officer in charge of this station, soon had his party en route to that point over the railroad just mentioned. Here were seen the ruins of an ancient theater of the once famous nearby city of Hippo Regius, the favorite residence of the Numidian kings and the central station of commerce and civilization in North Africa. Other remains still exist here, giving archæologists a field for research of which advantage is being taken.

THE STATION AT GUELMA, ALGERIA

Captain Norris and his party were received at Guelma with marked kindness by the mayor of that pretty little city, who placed at their disposal a site for an eclipse station such as is rarely to be found. The mid-summer weather made horse-racing impractical at the time our party was there, and the park in which the track was located was selected for our camp, and its free use was given to this the first eclipse party that had arrived in the country. The grounds were naturally shut off from the public and its policing became a matter easily regulated. All persons not connected with the expedition were excluded from the premises, but a fine large grandstand attached to the grounds gave them an opportunity to witness the eclipse phenomena without interfering with the operations of the party.

Captain Norris, who had direct charge of the transit work, soon had his instrument mounted and under cover ready to observe the latitude of the station, on which the adjustments for the other instruments depended. His long experience in building up the chain of longitude stations, covering the entire globe, in which American officers have bound the countries of the world together by telegraphic observations from Greenwich and Washington—a scheme that was inaugurated by the late Captain F. M. Green, U. S. N.—well equipped him for this important part of the work.

One of the polar axes was soon in place and adjusted to the exact latitude and longitude of the station, which had



Eclipse Instruments, Guelma

first been established, the former element by the transit instrument and the longitude by telegraphic comparisons of time from the fine observatory at Algiers.

Then the photographic dark-room, that prerequisite of every eclipse station, was assembled and put together for immediate use in the development of photographs used in testing the instruments.

Naturally the long forty-foot photoheliograph camera required considerable time to put in place, for besides its installation it had to be covered by screens to protect it from the rain, sunshine, and strong winds.

An equatorially mounted telescope, to be used by the director general of the camp, was mounted in a central position, which commanded a view of all the instruments under his control.

During the time the instrumental installation was going on, one of the party strayed away from the camp and fell into the hands of the Arabs of this desert country, but it is apparent he was not treated as inhumanely as those other brigands in Morocco treated our friend Mr Perdicaris. One of the junior members of this Arab party went so far as to pat our sailor man on the cheek.

Probably the next most important instrument we have in the party is the grating spectrograph, under the charge of Mr Jewell, of Johns Hopkins University. It is difficult to conceive of the thought and labor that has been expended upon this instrument. An introduction of a prism in the line of the sun's rays passing through a lens to the photographic plate is easily accomplished, but the fitting of a grating which will give probably better results is quite another affair. It is doubtful if there be a piece of machinery so carefully constructed as an engine which cuts 20,000 lines to the inch on a piece of metal which is necessary for this delicate work. This must be done to make a diffraction grating.

Now we come to a picture of the artists who are to draw the corona and its extensions, some of them being provided with telescopes to extend their view of the coronal streamers to the outer limits of vision. Finally is seen the whole party assembled around their completed instruments, with the tall form of Captain Norris, the chief of the party, on the left.

OUR RECEPTION IN SPAIN

Having seen the African party ready

for work, let us return to the two ships that were left at Gibraltar to prepare for the campaign in Spain.

From Gibraltar the *Cæsar* precedes the *Minneapolis* to the port of Valencia, Spain, and announces to the flagship by signal when that vessel reaches the approaches to the harbor that cordial greetings had been extended by the Spanish authorities upon her arrival. The *Cæsar* not being a saluting ship, it became the duty of the *Minneapolis* to fire the first national salute to the Spanish flag that had been given, I believe, in a Spanish port since 1898. This was also probably the first salute that was ever given by an American man-of-war in the Grao de Valencia.

The recital of the facts of this first visit of an United States war vessel to Spain since the Spanish-American war seems rather tame, but the visit was attended with momentous possibilities that might wreck plans that had taken many months to get into shape, and the manner of our reception therefore was most important to us.

It is seldom that one enters the confines of Spanish territory and does not find in progress some sort of entertainment for its pleasure-loving inhabitants, and this occasion was no exception to the rule. A ten days' fiesta had just begun, and soon we were drawn into crowds of men, women, and children, all bound for a good time and as indifferent to every other care as if all business had ceased for them forever.

The *Minneapolis*, after having been made to shine like a new pin, was thrown open to visitors, and as this was about the only place of interest in Valencia for which there was no admittance fee, advantage was taken of the concession, not usually given by their own men-of-war, and thousands visited the ship almost daily during the entire stay in port. The ship was secured to the quays which mark the limits of the port and form a promenade, and our fine band gave to the many people usually found there a free concert morning and evening, a treat that was apparently appreciated by all.

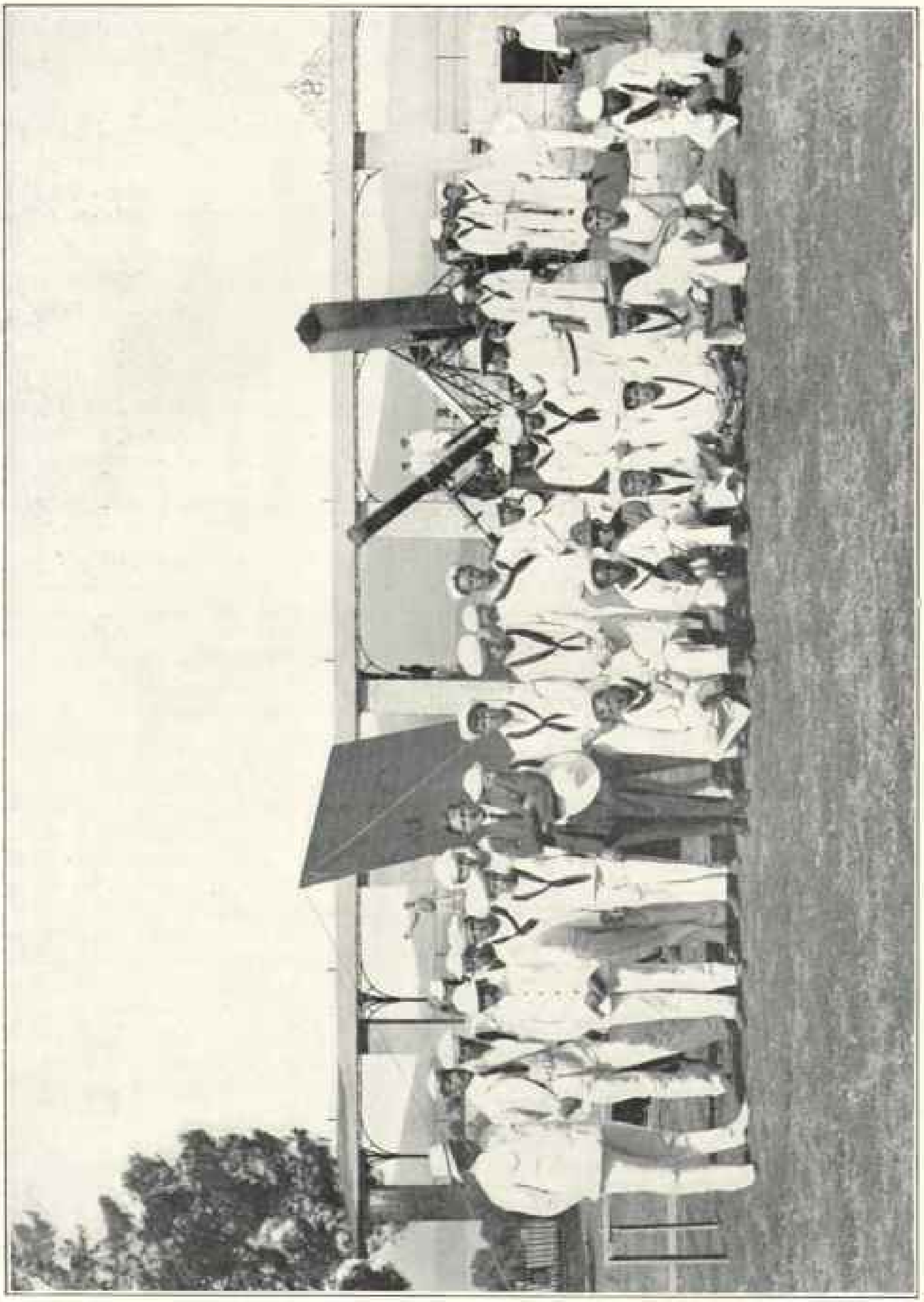
One of the features of the fiesta was a boat race, which took place in the harbor, and we were early invited to take part in it; but I must admit that the honors on this occasion were something like those of the boy who stood next to the head of his class of two members. The only two boats which entered for the regatta prize were from the *Minneapolis* and the *Cæsar*, the trophy going to the winning scrub crew, which had never pulled together before, owing to a fluke which brought misfortune to the other. Still the squadron brought back to our country a portion of that $20,000,000 which went to pay for the Philippine Islands.

Of course no saint's day or week could be properly celebrated in Spain without a bull fight, and we were all invited to witness the one that took place soon after our arrival. Some of us escaped this ordeal, however, owing to a misunderstanding which happily removed the event from an official basis. I wish to say here that not all people in Spain go to bull fights, and two officials whom I asked if they intended to witness the scene replied in rather resenting tones that they never went to such entertainments.

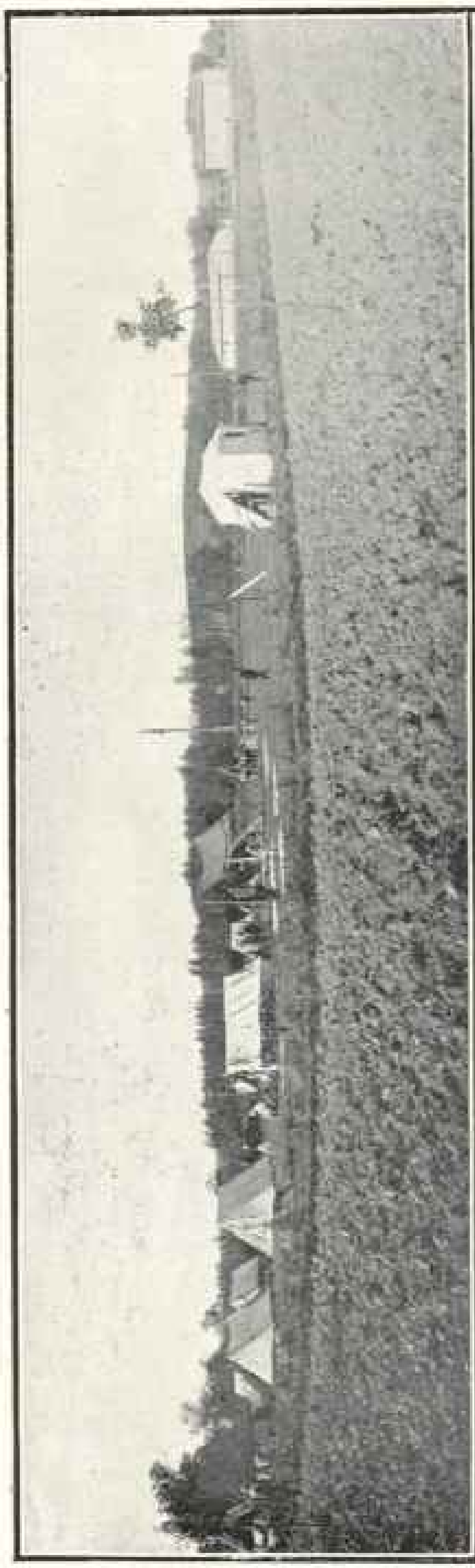
THE STATION AT DAROCA, SPAIN

But we had work to do, and after a reconnoitering party consisting of Lieutenant Commander Hayden, Professor Littell, and Mr. Peters had scoured the country, passing through miles of vineyards, where a native wine is produced and sold at a few cents a gallon, a spot is found on which to locate one of our camps. Arrangements were then made to establish stations, one about 12 miles from Valencia, at Porta Coeli, and the other at Daroca, on the highlands of the interior. The Daroca party and implements were transported by train along the coast to the old fortified town of Sagunta, where the road turns inland over the hills to the city of Calatayud, passing by the anciently walled city of Daroca.

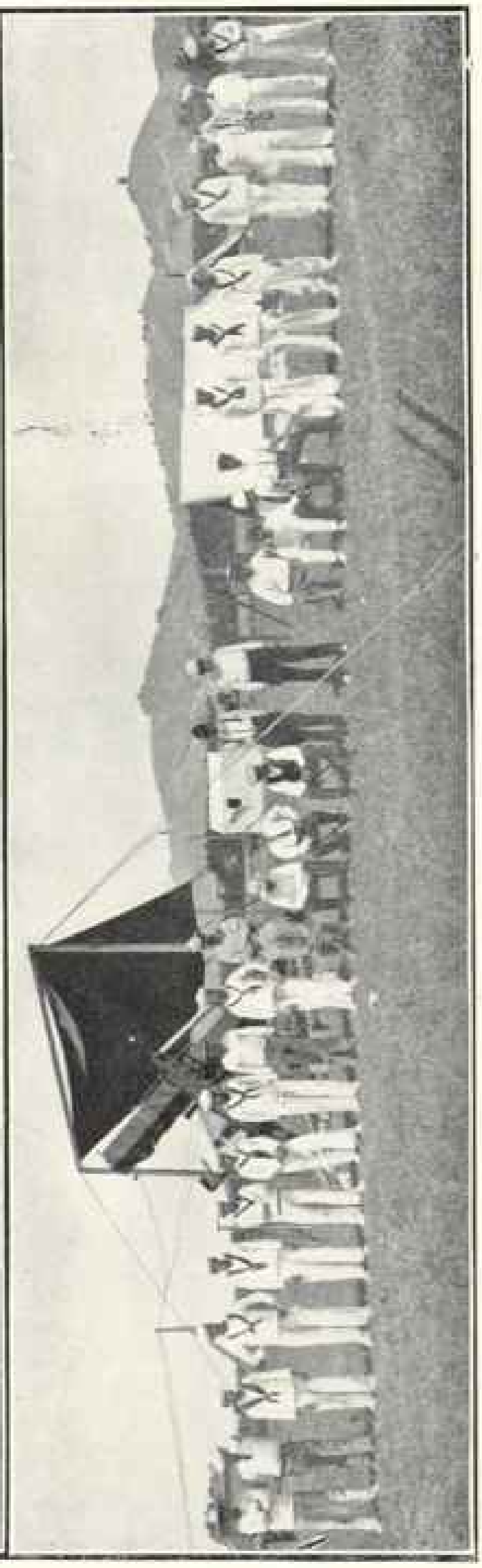
Historically, Sagunto is one of the most interesting cities in Spain, and the high hills on which it is located clearly



Eclipse Party at Quelima



Eclipse Party at Daroca, Spain



Camp at Daroca, Spain

Deck of the *Minneapolis* During Eclipse

show why Hannibal during his conquering march to the Roman capital had to wait so long to procure its surrender, which he did under a promise to spare the lives of its inhabitants, but which promise he kept by killing every one of them.

Under the kindly concessions of the railroad company, our party disembarked personnel and material at Daroca by July 29. With nearly every inch of available land in Spain under cultivation, it is no easy matter to find a location for an eclipse camp. The blowing sands from the alkali plains of the highlands would ruin the instruments in no time, and a large grass field was about the only suitable place which would answer the requirements. Fortunately the use of the only grass plot in the whole region around Daroca was kindly offered Professor Eichelberger, the chief of the party, for a small rental. Here the instruments and camp were set up. The polar axis was soon in place and covered by an awning to shield it from the wind and sun.

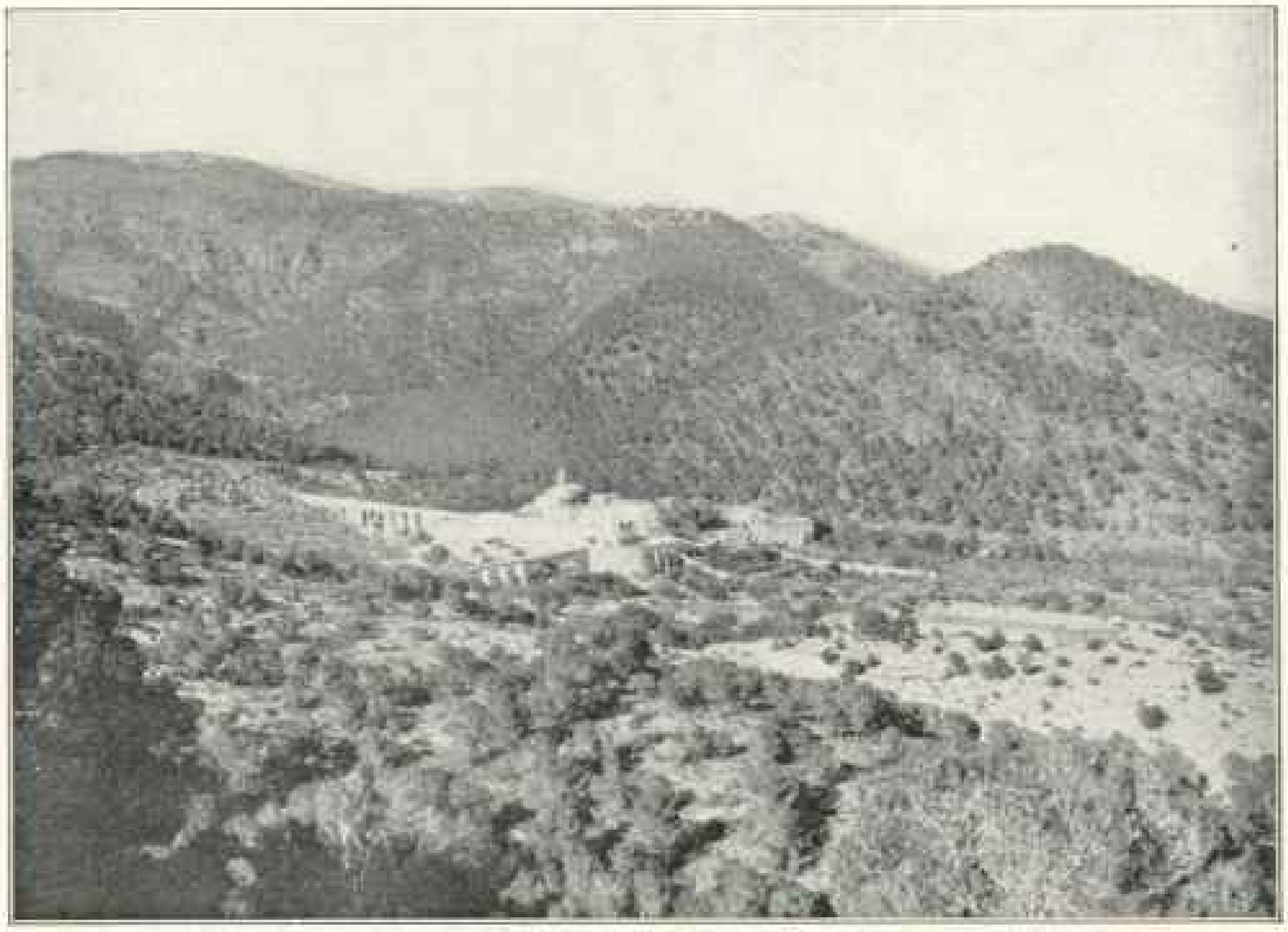
THE PROGRAM FOR THE SHIPS

Having seen this camp completed, the instruments installed, and the party assembled, let me refer you to the program for the ships.

Notwithstanding the concessions made by the railroad companies in Spain to the eclipse expedition, it was found that the expenses of transportation were such a drain on our resources that I decided to retain the draftsman detailed for the Daroca party with those who were to remain on board the *Minneapolis*. The ship accordingly had a double force with which to make drawings of the eclipse phenomena, and thus equipped Captain Miller was ordered to take station with his vessel on the center line of totality, about a mile from the east coast of Spain. Here the artists had a fine view of the landscape, reaching over the coast line and far into the mountains.

Astronomers have tried in vain to photograph the moon's shadow as it sweeps over the land at the moment of totality, and it was thought that even did we not procure a photograph of this desirable feature of the eclipse, a good description of it might be made by our large force of observers.

For the purpose of photographing the shadow bands, the ship's deck was covered with white sheeting and screens of the same colored cloth were erected perpendicular thereto. It was hoped to catch with the camera the lights and shades



"The Gates of Heaven"—Porta Coeli, Spain

pictured on their surface; but, as in photographing lightning flashes, this was found to be a difficult undertaking.

The *Minneapolis* party were, however, paid for their efforts to obtain this desirable result by getting with their field of observation, which covered both the sea and the land, one of the most entrancing views of the eclipse phenomena that was ever presented. The officers and men of the *Minneapolis* were early at their stations and 300 eager pairs of eyes were ready to take advantage of the brief time of totality.

During the first phase of the eclipse—that is, from the time the two disks came together until totality began—the crew of the ship amused themselves chasing the little crescent shadows of the partially eclipsed sun over the decks. These shadows were formed by the light shining through pin-holes in a sheet of paper.

Here are seen the corps of draftsmen ready for work, and the genial face of the Honorable Charles A. Bryan, minister to Portugal, who has come all the way from Lisbon to witness the scene. He is welcomed, as everywhere else, by a host of friends. He takes special charge of the fowls, to see if they perform, as predicted, at the proper moment. The rooster being a little slow to begin his part when the sun shines forth after its eclipse, the ambassador's own voice may be heard as a substitute.

The King of Spain took much interest in the visit of astronomers to Spain to view the eclipse, and on the day it took place he was stationed at Burgos, where most of the European astronomers were assembled. He was only partially rewarded for the long trip to that interesting city by obtaining a dim glimpse of the eclipsed sun as it occasionally appeared through the dense clouds which

swept across the sky, seeing nothing of the corona itself.

PORTA COELI—"THE GATES OF HEAVEN"

Having seen every other party settled, I would like to take you back to the headquarters of the expedition at beautiful Porta Coeli, or, in plain English, "The Gates of Heaven."

Spanish Mendicant

Surely upon the perfect summer day upon which we arrived at Porta Coeli this name seemed most appropriate. A group of green hills with verdant valleys between; here and there the tall smokestacks of the vineyards near by, cutting the skyline like pins in a mat; and topping one of the hills an ancient and picturesque monastery looked down upon a beautiful valley that wended its way to the sea. The monastery was once the retreat of the Carthusian monks, but is now the property of Don Francisco Carbajosa, who has preserved intact as far as he could the wonderful chapel itself. A former owner had despoiled the chapel of some of its adornments to grace cathedrals at Madrid and elsewhere, but in the main it is as the ancient monks left it. Like other old Spanish ruins of a once religious character, it also has its legends. One of these in particular is most interesting. It tells of a Carthusian monk who loved not wisely but too well, and was doomed for his sin to life imprisonment within the circumscribed limits of a narrow cell. The only window in this cell, a small one, opened upon the chapel, through which he could hear the daily mass, but the beautiful view into the Gates of Heaven and all other communi-

cation with the outside world were cut off. This and minor legends give the place the flavor of its romance. Here in this ancient monastery hospitality was generously dispensed by the owner to all members of the party, to whom he loved to show the beauties of the chapel. My one night under its roof before the dawn of the eventful day which was to make or

Spanish School

break all our plans was most gratefully appreciated.

Senor Carbajosa placed his whole plantation at our disposal, and as a part of the buildings had once been turned into a summer hotel, the isolation of our station was not so marked as it would have been but for the presence of its visitors.

There was also an ancient church on the place that had been built many centuries before; but, as there was no chaplain present with the party until the day of the eclipse, our people seemed to have no use for it. The Sundays were usually spent, after a week of hard work, in roaming the fields, the result of such expeditions being shown in many kodak films.

With all needed concessions granted for use of the camp, the advance guard of the party for No. 2 station reaches the spot over a rather rough road from Ilotera, a distance of 7 miles, in a coach the movements of which were such an aid to digestion as would give an appetite even to one of the eclipse instruments.

Then the equipage for the station next came limbering along behind carts

drawn by mules with drivers who had no conception of time, and who between the lashing of their teams to keep them moving at all and an occasional stop to pick the grapes that lined the road, sang with the contentment of their race.

And now the party is at its destination, the men with their hammocks and camp outfit to spend weeks in such an outing that but few of them will forget.

The building construction soon begins, and the dark room is put up for the large new 65-foot photoheliograph fitted with the thousand-dollar lens from which we expect valuable results in photographing the corona if all goes well.

Also the coelostat is set in place with its two mirrors, the one to reflect the sun rays to its lens of the photoheliograph and the other to throw light into the spectrograph. It may be stated in passing that the principal object of locating the large photoheliograph of 65 feet of focal length, which will produce a picture of 7½ inches in diameter, here is to make observations of the inner corona, and for this purpose a station is selected only 10 miles inside the edge of the moon's shadow. Thus we compromise between Daroca, where we have 3 minutes and 42 seconds of totality, and a station on the edge of totality, where the period is but an instant.

Of course we cannot take as many photographs here, where the eclipse lasts only 1 minute and 46 seconds, as at Daroca; but, as the lower edge of the moon's disk barely covers that of the sun, we can better observe the protuberances and corona near the polar region. A 7½-inch photograph may not seem colossal in size, but when you realize that it is about 200 times as large as a picture of the sun taken with an ordinary kodak, its size may be appreciated.

And now visitors come to camp, and a native of Porto Rico, the one sailor who is at home with the Spanish language, sits at the feet of the senoritas; but before the party finally leaves the place he becomes so popular that they are willing to sit at his feet—notwithstanding by this time a number of men had also become more or less proficient with the language, under the teachings of the young ladies, so that Garrion has rivals in their affections.

A frequent and interested visitor comes to camp. He is said to be the wealthiest man living in the vicinity. The troubadors also put in an appearance and play the Spanish fandango for the benefit of the eclipse party.

Another picture shows our native guard, the mountain rangers.

A charming young lady, who is about to become an American citizen by marrying a gentleman from Porto Rico, visits our officers and captivates them as she has her fiancé.

The last contingent from the *Minneapolis* reaches the station on August 28, under charge of Lieutenant Commander Hayden. With the party now augmented to nearly 60 members, he took charge of the drills and prepared them for the eventful occasion to come later.

CORDIAL COÖPERATION BY THE SPANISH AUTHORITIES

The three principal stations of the American party for observing the eclipse were prepared for the eventful 30th of August with the greatest care, and the instruments adjusted to the exact location of the point occupied with refined accuracy. The determination of latitude was easy, but as the stations selected were necessarily well away from centers of activity, the proper means for determining longitude were wanting. Here the government officials in Spain and the telegraph companies in Algeria came to our rescue and not only extended the telegraph lines to our camps, but detailed operators to assist us in the work. We were thus connected at Guelma with the fine astronomical observatory at Algiers, and the Daroca and Porta Coeli stations were given, at stated intervals, the tick of the clock of the Royal Observatory at Madrid. The extension line from Valencia to Porta Coeli alone was nearly 18 miles in length and was put up at very con-

Visitors at Porta Coeli

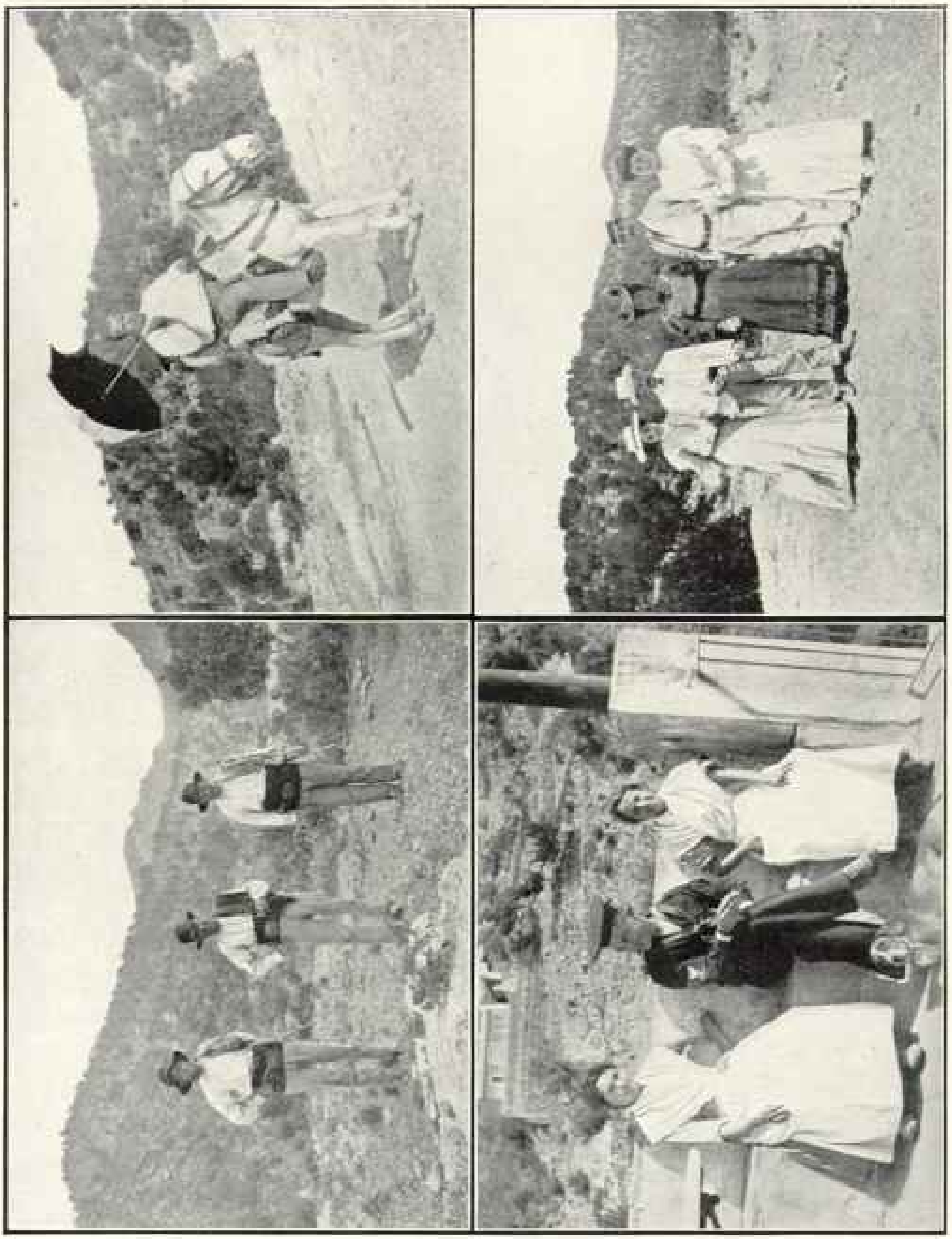
siderable expense to the Spanish government.

This was only one of the many features of the eclipse expedition for which we were under obligations to the Spanish authorities. I desire to place on record here that so cordial was our reception from the alcalde of Segorbe as to include the offer of the principal park of the city for a camp ground and a good portion of its municipal buildings for the use of one of the parties, but its location was about 20 miles within the eclipse belt, and Porta Coeli, 10 miles nearer the edge, was selected for station 2.

OUR ANXIETY IN THE MORNING

The morning of August the 30th dawned with gloom in the air as well as in the minds of many an anxious astronomer in Spain; great masses of black clouds chased each other across the heavens, as if bent on shutting out from the view of man the grand performance of nature about to be enacted; but toward noon it began to clear at our Porta Coeli station. There were, however, signs of a return of the clouds that kept us between hope and fear for several hours. The Daroca station telegraphed about two hours before the eclipse, "Cloudy but clearing." Our anxiety simply became intensified by this brief message. If it would clear at one station in time to make observations, the strain on our overwrought nerves would be compensated for; otherwise the labor of years would be thrown away and I fear the chief of the expedition would be the victim of the "fool's errand."

For six weeks preceding the eclipse a drought had covered the land and the sky had been cloudless, but the want of rain left the air full of impurities, and its motion, being magnified in our instruments, gave an indistinct picture in our



Interested Visitor
Spanish-American Alliance

The Three Guardsmen
Spanish-American Complications

cameras that caused alarm. The storm then sweeping over Spain, however, cleared away all the imperfections and caused a distinctiveness to our photographs rarely seen during an eclipse. Clouds still surrounded us, however, drifting with great rapidity, and we watched with keen interest to see if they were steering toward our objective; but the miss which they made was as good as many miles to us. We afterward learned that at Betera, only six miles from Porta Coeli, the sun was obscured by clouds all during the time of totality. It was then a source of congratulation that the station had been selected at an elevation of some 1,000 feet, which, while increasing the difficulty of transportation, gave us a better view of the eclipse than could be had on the lowlands near the Mediterranean shores.

THE ECLIPSE

Soon after noon the sun sent out her glorious rays down into the "gates of heaven" on as fair a view as can be imagined. Mr Hill, assistant astronomer, in charge of the 9-foot camera, called my attention to the picture of the sun on his ground-glass plate. "As clear as a bell," said he—not a quiver in the atmosphere.

As the time drew near for the first contact, all eyes became riveted on the sun. Suddenly Mr Hill sang out, "Here he comes." It was twenty seconds ahead of the time predicted, but why we did not stop to consider. At first only through the delicate instruments could we discern the contact of the sun and moon and no appreciable effect was observed on the landscape, but as the opaque body of the moon gradually covered the bright disk of the sun, the many thousands of interested observers became conscious of the growing darkness. We were then watching the partial phase of the eclipse, which might be seen by almost any of the 2,000,000,000 of the earth's inhabitants who were favored with daylight and good weather; but the comparatively few in number who were located within the 60-mile belt of totality were yet to see the grand picture of the corona, the object of our ambition. As the moon advanced across the sun the interest became greater. Presently the resonant tones of the ship's bugle sounded the call for action. A silence fell over the camp, the members of which had already been prepared to take advantage of each of the 106 seconds of totality which were given us to determine the substance of the corona.

Slowly and steadily the twilight deepened, bringing with it a chill such as is common to evening. The stars came out one by one, Venus particularly shining resplendent in the skies. Suddenly, like a pall, the shadow of the moon swept through the air and over the landscape. For a moment utter darkness surrounded us; then, as our eyes adjusted themselves to the new conditions, the glorious corona appeared in all its magnificence. There, shining in the cloudless sky with silvery effulgence, was the crown of glory which has been fittingly styled "God's crown," a decoration that no earthly monarch can aspire to—the corona.

Great rays of pearly white light shot out in penciled sheaths to distances double that of the sun's diameter, or several million miles in length. These silvery streamers seem built up around the disk of the sun in regular order, but apparently shoot out with greater or less intensity, which is characteristic of the ways of nature, into color too dim to be noted by direct vision, but which photography has enabled us to carry into microscopic depths. To the devoutly inclined, the Divine Being who rules the universe is never more manifest than at this moment. Well might they exclaim in the language of Job, "Doth he not see my ways and count all my steps, if I beheld the sun when it shines or the moon walking in brightness?" The masses of human beings who have surrounded our camp and thrown themselves prostrate to the ground, crying out in loud and distressed tones, show its effect on the superstitious; but no one who witnesses this beautiful picture will pass it by without a quickened pulsebeat or a display of

conflicting emotions. Even fowls and birds steal away to their perches as at eventide, and a sense of uneasiness pervades all animated beings.

The interval of totality, as has been stated, was 106 seconds, each of which was counted off in clear monotone by observers stationed at the chronograph for the purpose of aiding the photographers in timing the exposure of their plates.

As in the times of our remote grandfathers, when this mysterious phenomenon was ascribed to the anger of God, who was hiding his face from his children, there was rejoicing when the sun shone forth again, and hearty congratulations were extended to us all that the eclipse of 1905 had passed with probably good results to at least one of our parties; and a telegram came soon afterward telling me that the Daroca party had also been fortunate in observing it. Congratulations came anew. On our return to the ship that night a telegram from Captain Norris, in charge of the Guelma station, told that his party had taken a number of photographs which were most promising, and Captain Miller, of the *Minneapolis*, returning with his ship from the station off the coast of Spain, reported interesting and satisfactory observations obtained by his large number of draughtsmen in making pictures of the corona.

Leaving the *Cæsar* at Valencia to pick up the scattered parties and their instruments, the *Minneapolis* proceeded to Genoa, where another object of the cruise was inaugurated. Here the commander-in-chief and two assistants started an inspection of all the principal observatories in Europe, a report of which will take several months to properly record.

From Genoa the flagship proceeded to the beautiful harbor of Villefranche, where she was joined by the *Dixie* and *Cæsar*, the latter to collect the material belonging to the several eclipse parties for transportation to Washington, and the *Dixie* to take on board the people who must return home to work in other fields. Here a good-bye is said to the several invited guests who have contributed so much to the success of the American Eclipse Expedition of 1905, and the ships separate for the last time as the Special Service Squadron.

It has long been one of the glories of the American Navy that more than any other it has been employed in exploration and investigation, and in this way has done service to mankind in promoting the arts of peace. This remark was originally made by Sir Norman Lockyer as applying to the British Navy. While in London after the eclipse last summer, I said to this distinguished astronomer, who has probably done more in eclipse research than any other man, that I claimed the service I represented, considering the comparative short period of its existence, was the peer of the British Navy in this respect.

He replied, "And well you may do so; for, after the example set by your government, under your command I yield the palm to it, and I hope to make more in the use of the precedent thereby established than you have done with my phraseology."

Let me say further, that not only was the expedition beneficial to the arts of peace, but that, owing to the disturbed condition of European politics the past summer, the squadron lost none of its importance as a military organization. It was simply spending the spare time of the officers and crews of the ships in the advancement of science rather than in the pursuit of pleasures; and it is believed the visit of the Special Service Squadron to Spain will make easier the task of rebinding the ties of friendship which ever should exist between the present owners of our glorious country and those who made it possible for us to produce the finest world power of the globe.

And now, without going into the vicissitudes which detained the flagship in Europe until late in December, nor how, according to the newspapers, she went to Russia, which she did not do, we return to the finest spot of all—"Home, sweet home."

THE BURIED CITY OF CEYLON

By John M. Abbot

COMPARATIVELY few people outside of Ceylon realize that on that little island in the Indian Ocean was once a civilization which when Christ was born was at its height. After all these centuries little of it remains except a few imperfect ruins of its most famous city, Anuradhapura.

At one time, about 200 B. C., this was the capital of the island. No estimate of its population has ever been made, but some idea of its size can be gathered from the fact that it harbored 96,000 Buddhist priests. In area the city occupied about 100 square miles, and it was divided into two parts, the inner, wherein are the remains of the temple and the monasteries, and the outer, where lived kings and the laymen.

The city was built in the wave of religious enthusiasm which struck Ceylon with the advent of Buddhism. Successive kings vied with each other to erect monuments worthy of themselves and their faith. But the hand of time and successive invasions by the Hindoo Tamils, who took pleasure in destroying what they could not replace, have left of this once mighty city of Anuradhapura nothing but a few granite posts in the thick jungle.

Thirty years ago these even were not visible, but from the Mahavansa, the one literary document in Singhalese history running from B. C. 542 to nearly our own day, the site of the ancient city was known, and so the British government set about the work of excavation. The greater part of the city was found about six or eight feet underground, and it is hard to realize that nature alone has accomplished this task.

Two thousand years ago the city was situated on a fertile plain. Water was brought from the mountains, forty miles distant, in a huge canal and stored in large artificial lakes, from which it was distributed to tanks in various parts of the city. One of the first acts of the Tamils was to destroy this system of irrigation, and with that ended the prosperity which the country had enjoyed. For four months of the year Ceylon is deluged by rains; for the rest of the time there is practically a drought. The tanks and lakes serve the same purpose for which the great dam of Egypt has been constructed—to keep back the water in time of plenty for use in time of need. Agriculture was brought to a standstill, and it was only by practically replacing these ancient works that the British government has made cultivation in this district possible.

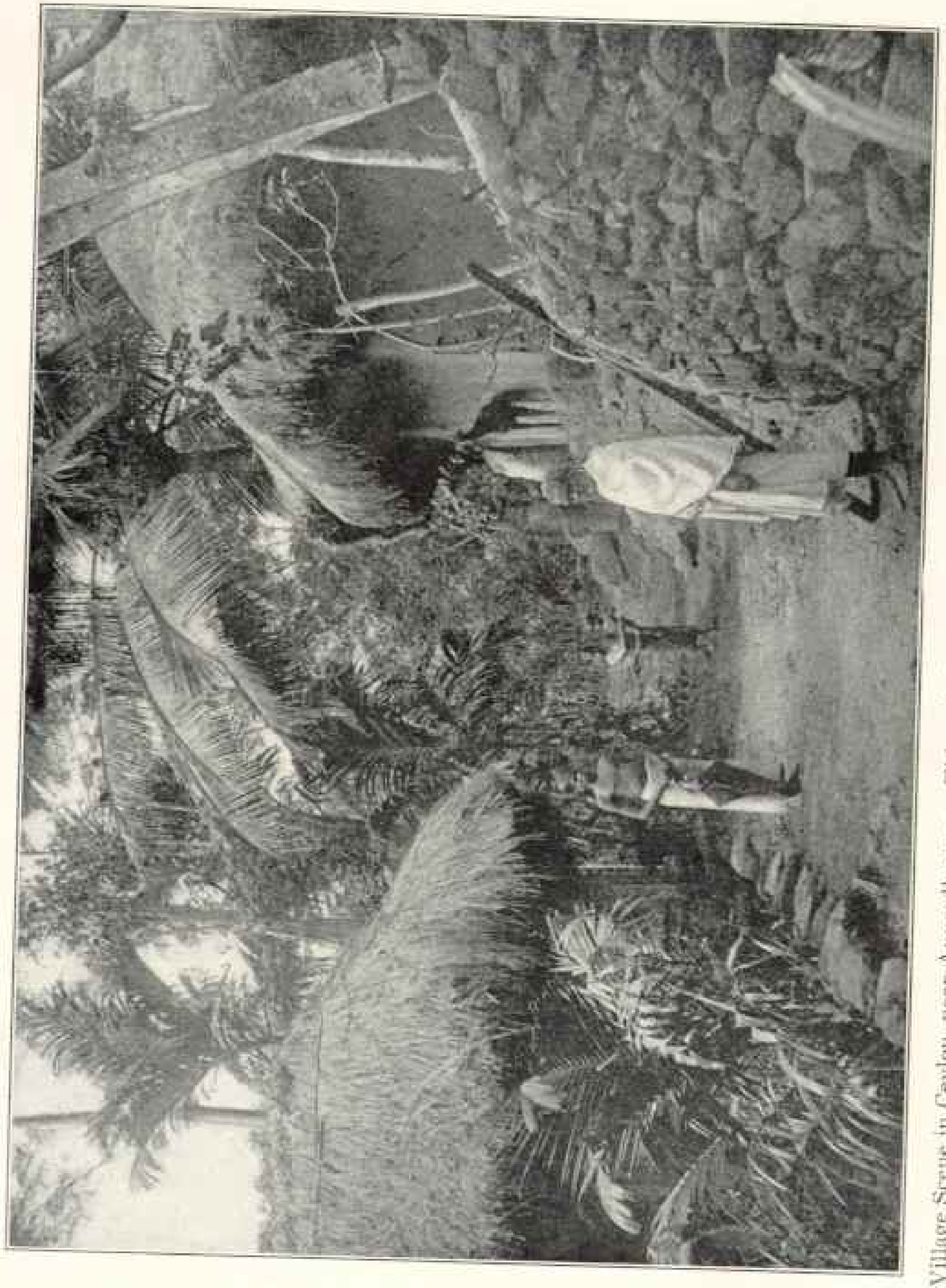
The Tamils destroyed the city, and Nature completed the work by concealing the remains. Like Jerusalem after its final destruction, not one stone remained above another.

The most imposing objects in Anuradhapura are the Dagobas, of which there are four. They are huge mounds of solid brick shaped like beehives and from three to four hundred feet high. They were erected by kings to commemorate different events—one to celebrate the conquest of a rival, another to the glory of Buddha, and so on.

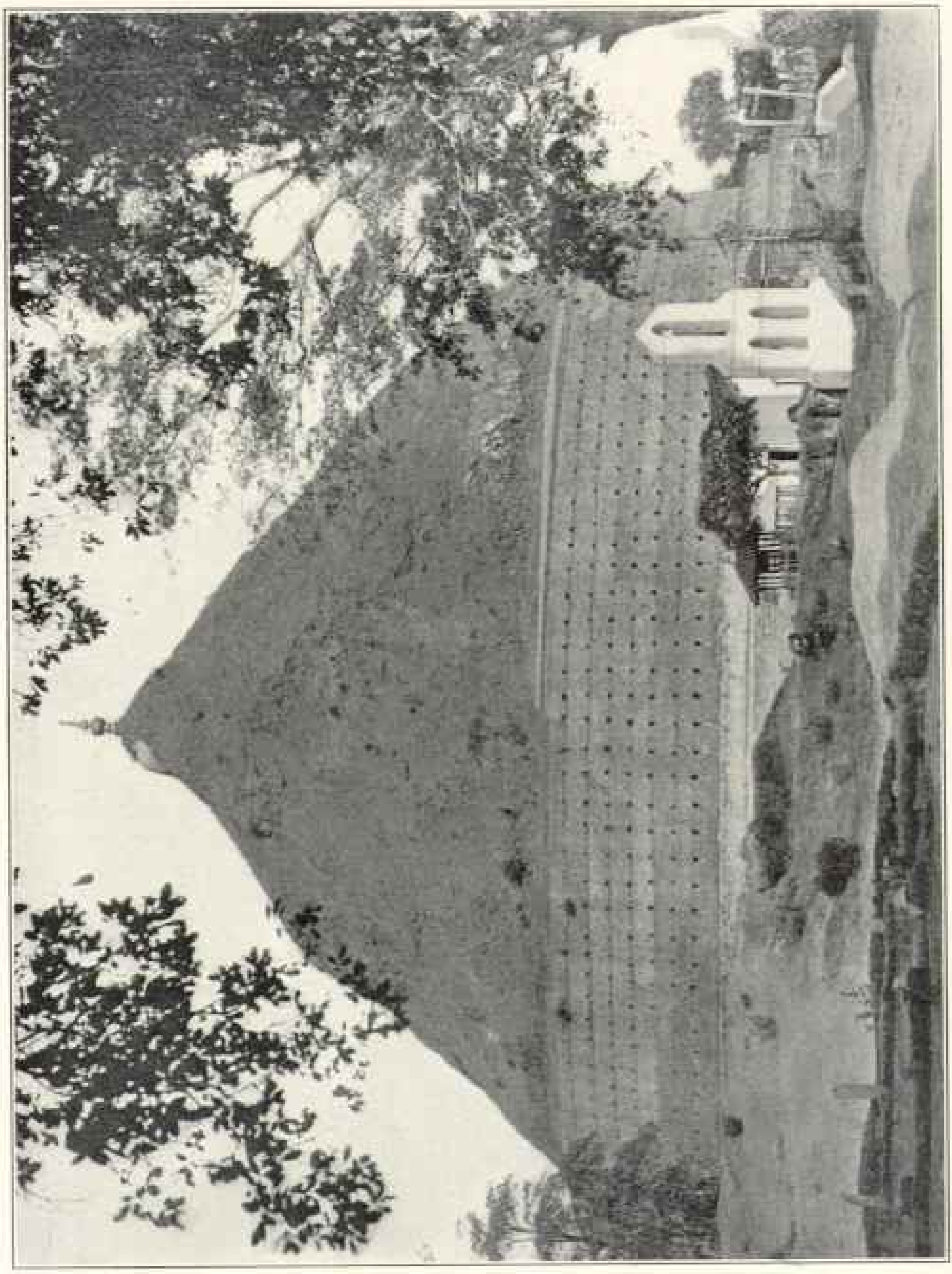
In the hot, dry atmosphere of Egypt they would be as perfect as two thousand years ago, but in Ceylon the hot summers and the rainy winters have very nearly proved too much for them.

Birds have dropped seed in their flight, and these, taking root in the cracks and crevices of the Dagobas, have grown until they have dislodged huge masses of brick, making frequent restorations necessary.

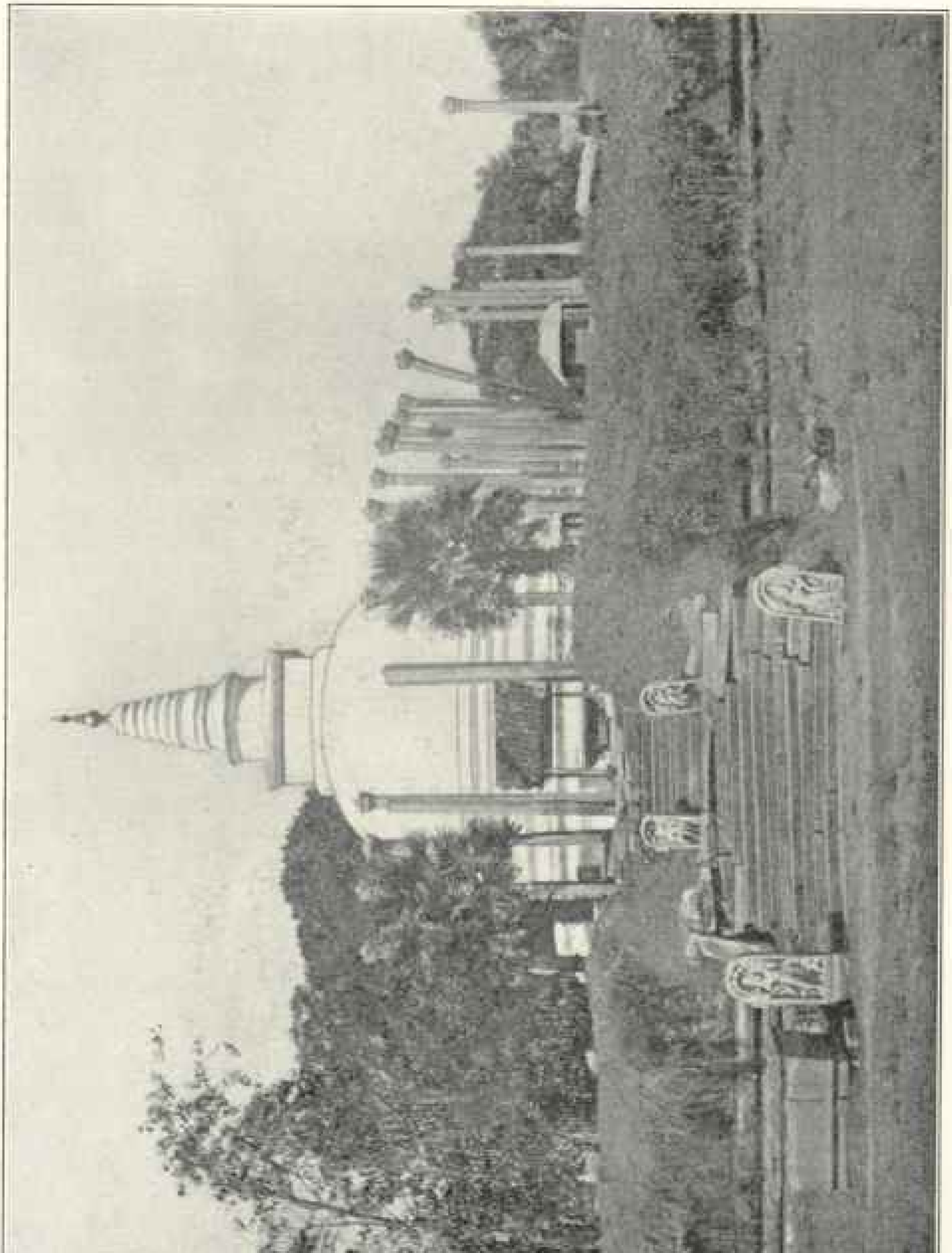
Originally these mounds were painted white with a composition called *chunam*, but now they resemble wooded hills from which in places the sides have fallen away, showing the bricks beneath.



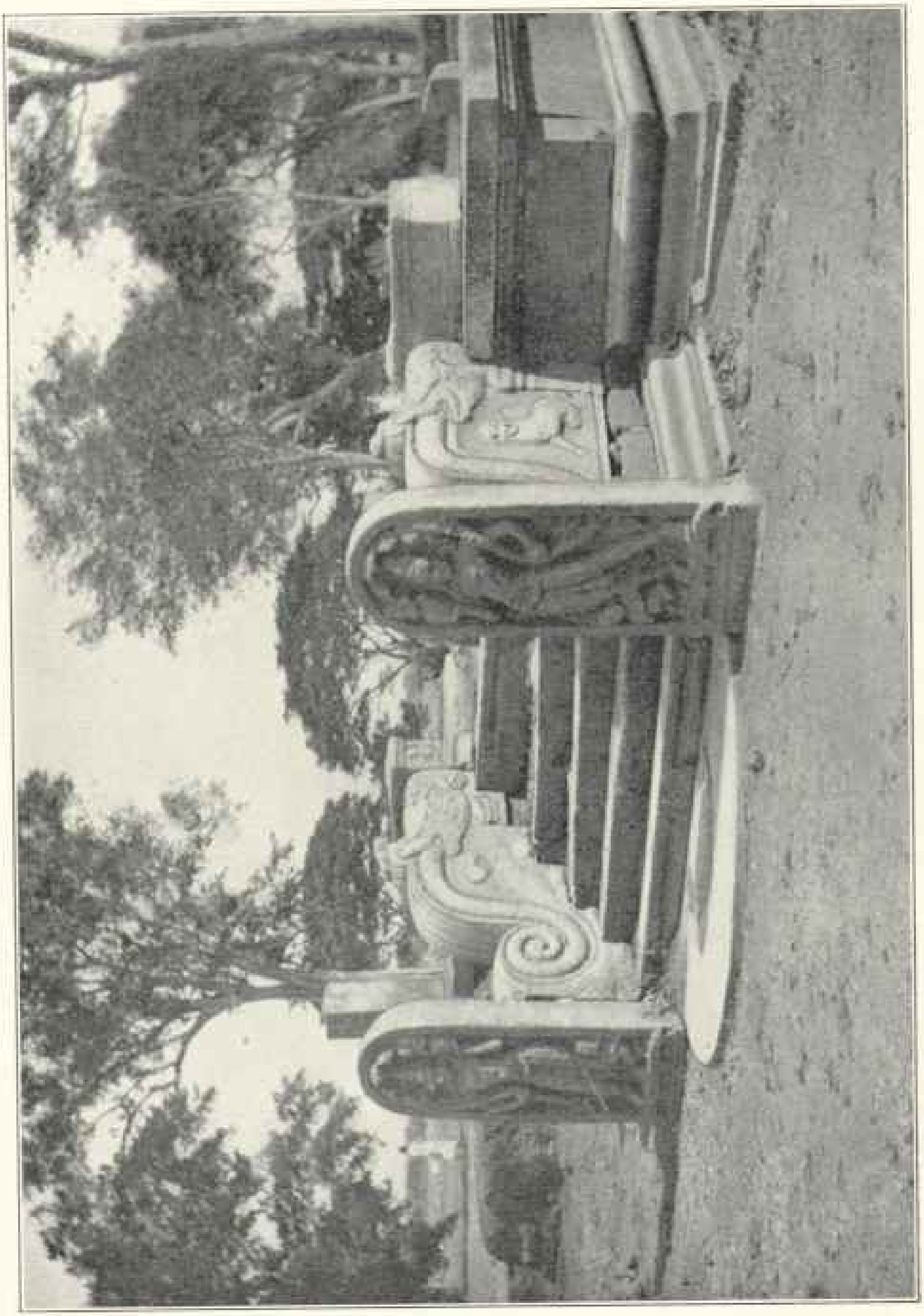
Village Scene in Ceylon, near Anuradhapura. This and the succeeding illustrations are from photographs by Mr Abbot



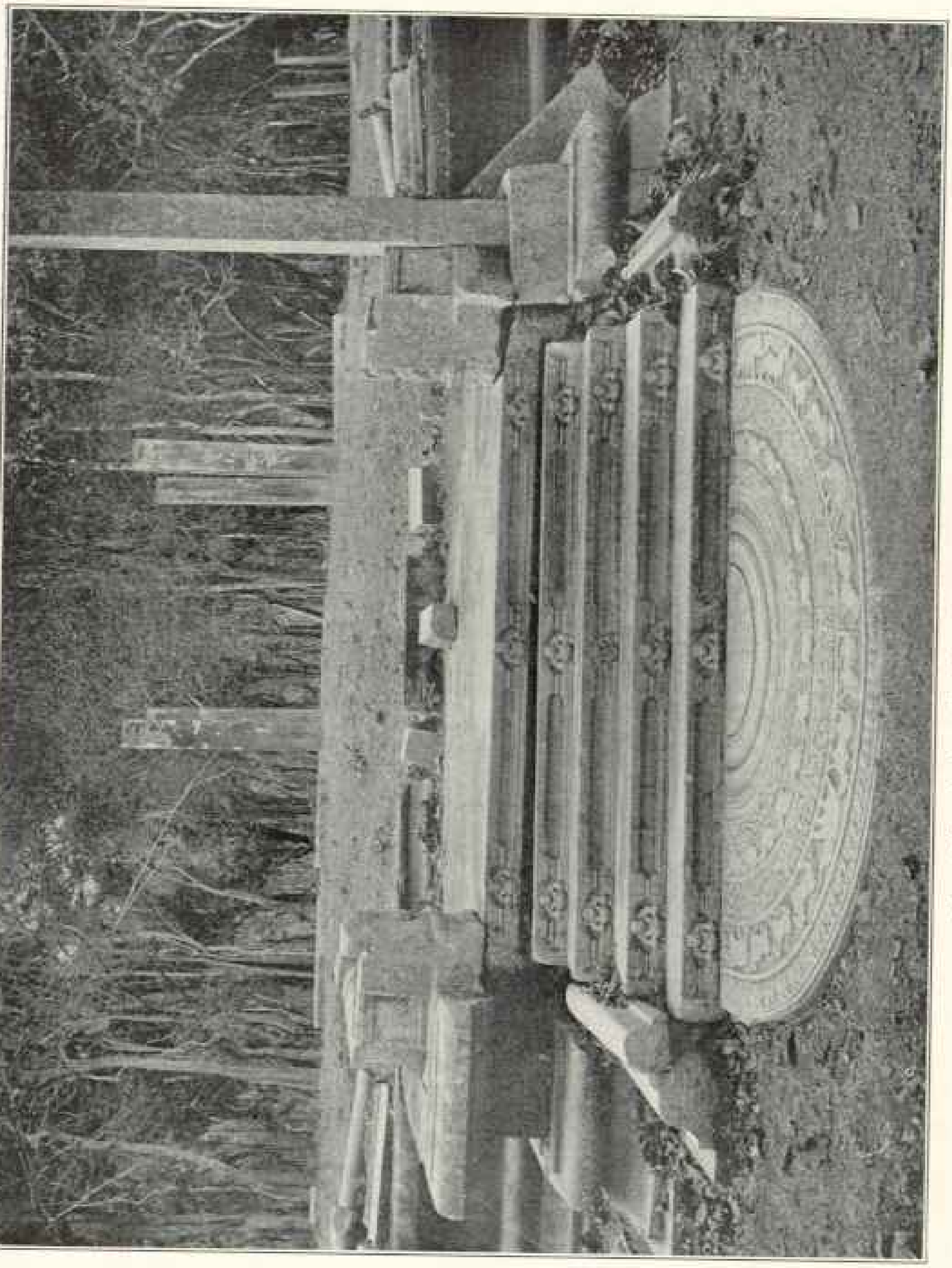
One of the Dagobas at Anuradhapura. The city was chosen capital by King Pondukabhoya in 437 B. C., and remained the capital of the island for 12 centuries



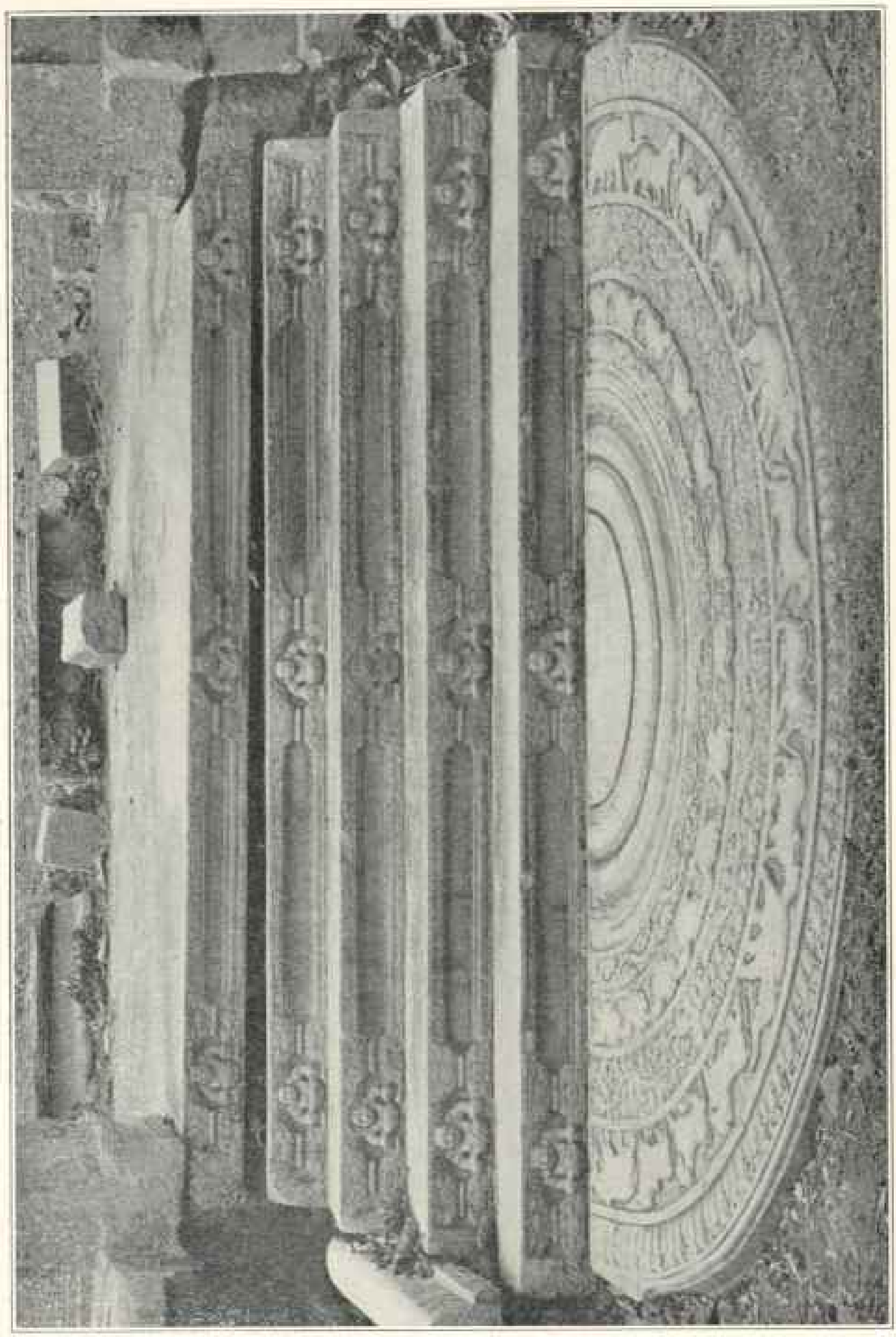
This Dagoba is the Resting Place of the Right Collar Bone of Buddha. It is the oldest monument in India or Ceylon, and was recently restored. The pillars seen in the picture originally supported a canopy over it



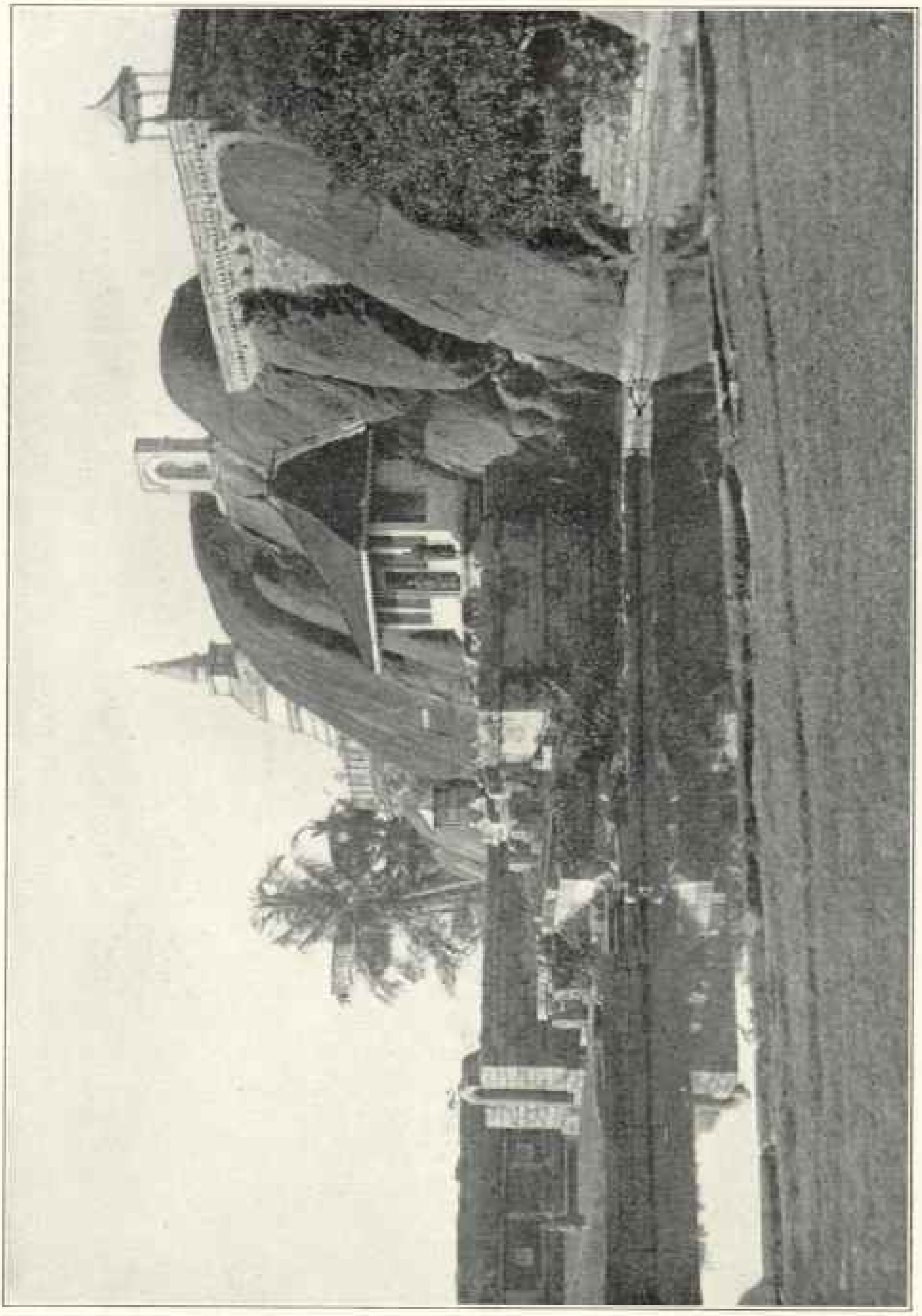
A View of the Steps Shown in the Preceding Picture



One of the Ancient Bathing Places, Anuradhapura



The Threshold of One of the Bathing Places, Anuradhapura (see page 622)



The Rock Temple, Carved Out of Solid Rock, Pollonnaruwa, Ceylon

In this Temple the Tooth of Buddha is Supposed to be Preserved—Kandy

It is only visible once or twice a year and on other times to distinguished strangers. People who have seen it say that it resembles more that of a crocodile. The original, according to unbelievers, was destroyed by the Portuguese. This and the preceding seven pictures are from photographs by James M. Abbot.

Sir Edwin Tennent says of one of them: "Even with the facilities which modern invention supplies for economizing labor, the building of such a mass would at present occupy 500 brick-layers from six to seven years and would involve an expenditure of at least a million sterling ($5,000,000). The materials are sufficient to raise 8,000 houses, each with 20 feet frontage, and these would form thirty streets each half a mile in length. They would construct a town the size of Ipswich or Coventry; they would line an ordinary railway tunnel 20 miles long, or form a wall one foot thick and ten feet high, reaching from London to Edinburgh." How long it took the original builders to construct these monuments is entirely a matter of conjecture.

Besides the Dagobas, there are many other objects of interest, not the least of which are the "Yogi" stones, divided into nine or twenty-five squares, at which the Buddhist priests were accustomed to gaze in order to get their minds in a proper frame for contemplation of the Infinite.

One is greatly impressed by the number and beauty of the Jokunas, or bathing places. Simple, even severe, in design, they are found near the sites of all the important buildings. Those which have been restored are beautiful in their simplicity and proportions. Before each of the buildings, and taking the place of the threshold, is one of the most unique remains of this ancient civilization. Although different in beauty and workmanship, they are all nearly the same. They have been dubbed "Moonstones," and that inexpressive term has to do duty for something both beautiful and artistic.

In shape they are half circles, but the words cannot do justice to the beauty and originality of the design. In concentric circles come first the border of lotus leaves, then a procession of lions, horses, Brahmany bulls, and elephants (see picture); another design of lotus leaves, and inside that a similar procession of geese. The center is taken up by half of the conventional lotus flower.

Probably a majority of people will be interested most by the fact that here is the oldest tree in the world. Its age is about 2,200 years and is undoubtedly authentic. It was brought to Ceylon about 300 B. C., and was a branch of the tree under which the Buddha Gautama sat when he attained Buddhahood. Greatly revered by the pilgrims, it has a temple erected in its honor. Through centuries it has been respected and spared by all. During its lifetime most of the world's history has been made. It was already old when Christ brought his message to the world, and standing in its present spot it witnessed the rapid rise of Anuradhapura and saw it sink to its present position of ruin and oblivion.

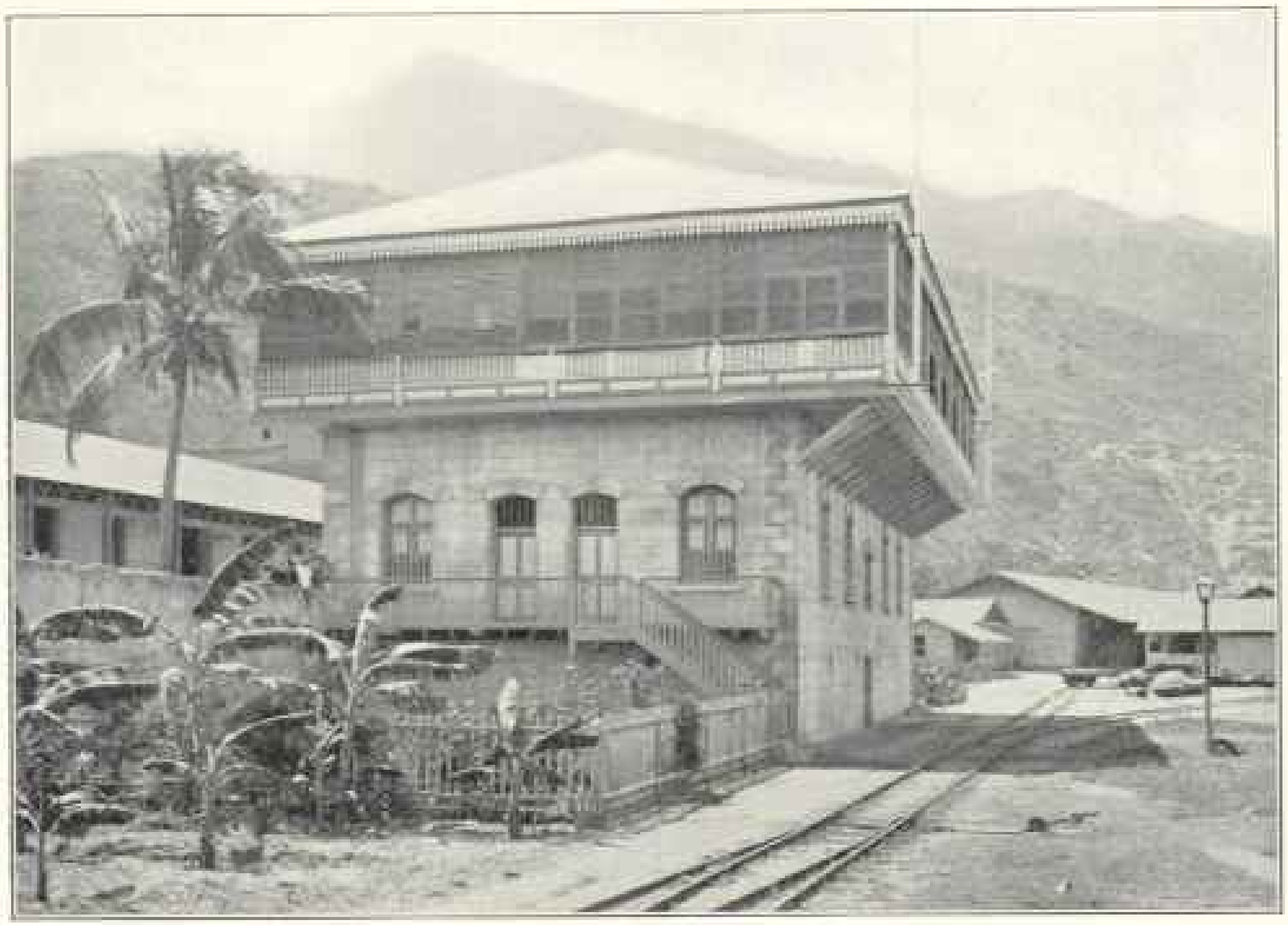
THREE OLD PORTS ON THE SPANISH MAIN*

By G. M. L. Brown

Member of the National Geographic Society

FEW expressions in English literature have given rise to more confusion than the term "Spanish Main." Applied originally, it would appear, to the waters of the Caribbean Sea and that part of the Atlantic Ocean traversed by the treasure ships of Spain, it gradually included the adjacent coasts of the continent, until, with most modern writers, it has come to mean this alone, and "sailing the Spanish Main," forsooth, will hereafter be an anachronism

*This is the first of two articles by Mr Brown; the second, "Across the Llanos," will appear in an early number.



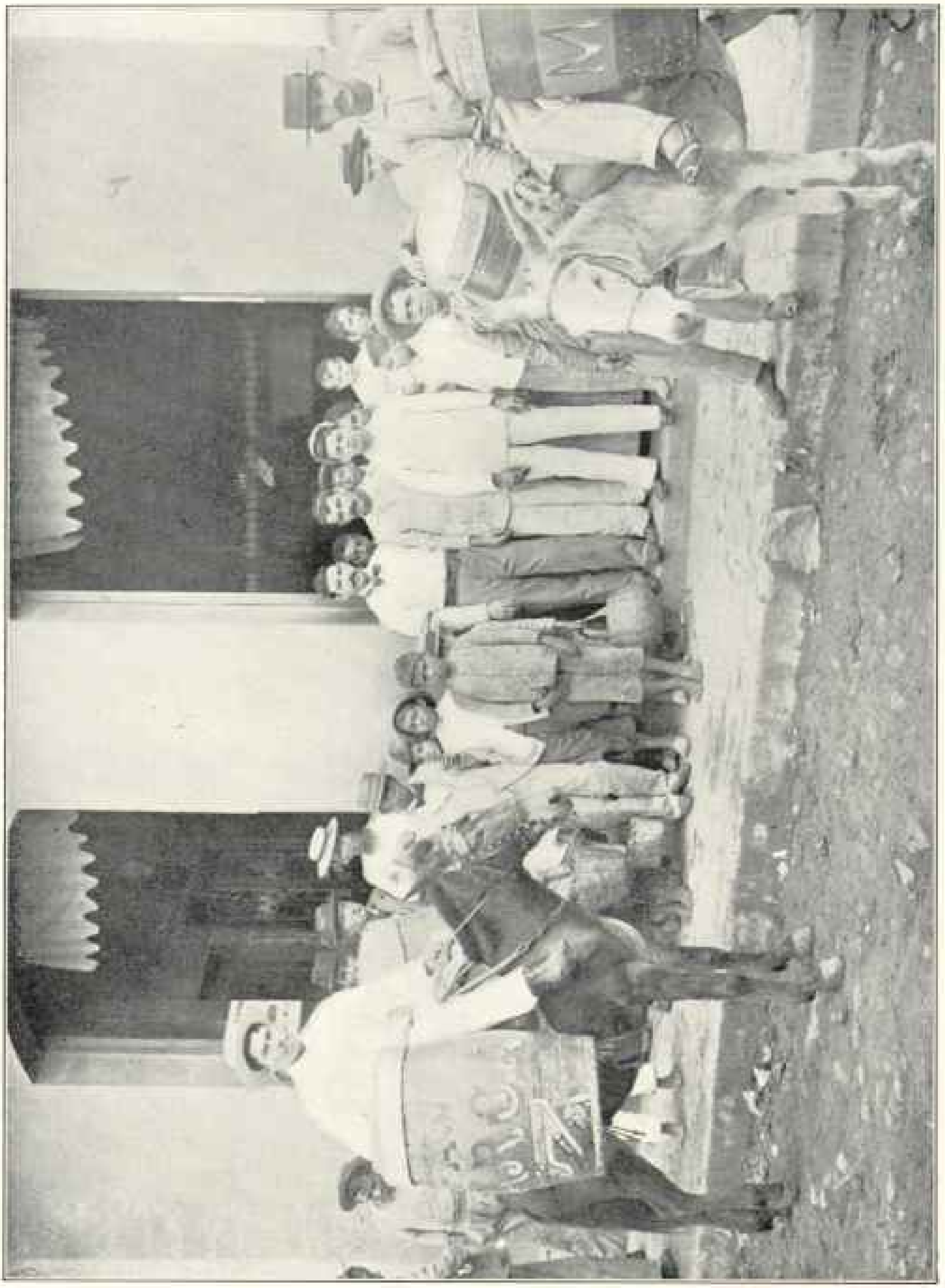
View in La Guaira

until such time as airships shall have become popular in Caribbean countries. In these pages, however, with the reader's permission, the term will be applied, in its original sense, to the sea only—to the "golden, tropic sea," which, deserted by its galleons, bereft of its romance and its mystery, deserves, surely, to retain its memories and its ancient glorious name.

But the coast has its historic memories as well—this far-famed coast of *Tierra Firme* which Columbus declared to be the site of the earthly Paradise, "the most beautiful (lands) in the world, and very populous."

After Columbus came Alonzo de Ojeda, who sailed westward to the Gulf of Maracaibo, where he chanced upon some Indian villages built on piles, and so named the land Venezuela, or "Little Venice." In the next year—the opening year of the sixteenth century—Pere Alonzo Nino sailed over the same course and, besides confirming the reports of his predecessors as to the richness of the vegetation and its numerous inhabitants, was fortunate enough to secure a quantity of pearls. Here, then, was a land yielding pearls, and probably gold, for the treasure-seeker; and Indians, suitable for slaves, so the Spaniards thought. To *Tierra Firme*, therefore, an adventurous rabble soon found their way, and the horrors of the Spanish Conquest began.

For a moment, however, the black shadow is lifted, and one Bartholomew de Las Casas steps forth—a simple priest, afterward a bishop, but "a figure," as Fiske eloquently observes, "which is in some respects the most sublime and beautiful in the annals of Christianity since the apostolic age." Las Casas had dedicated his life to the protection and conversion of the Indians, and, securing a grant from the king for a tract of land with two hundred and sixty leagues of



Street Scene in Caracas, but typical of any Venezuelan city

seaboard (the whole coast, in fact, from the peninsula of Paria to the province of Santa Marta), he set about organizing a semi-religious expedition, which, had it been successful, might have changed the entire history of Venezuela.

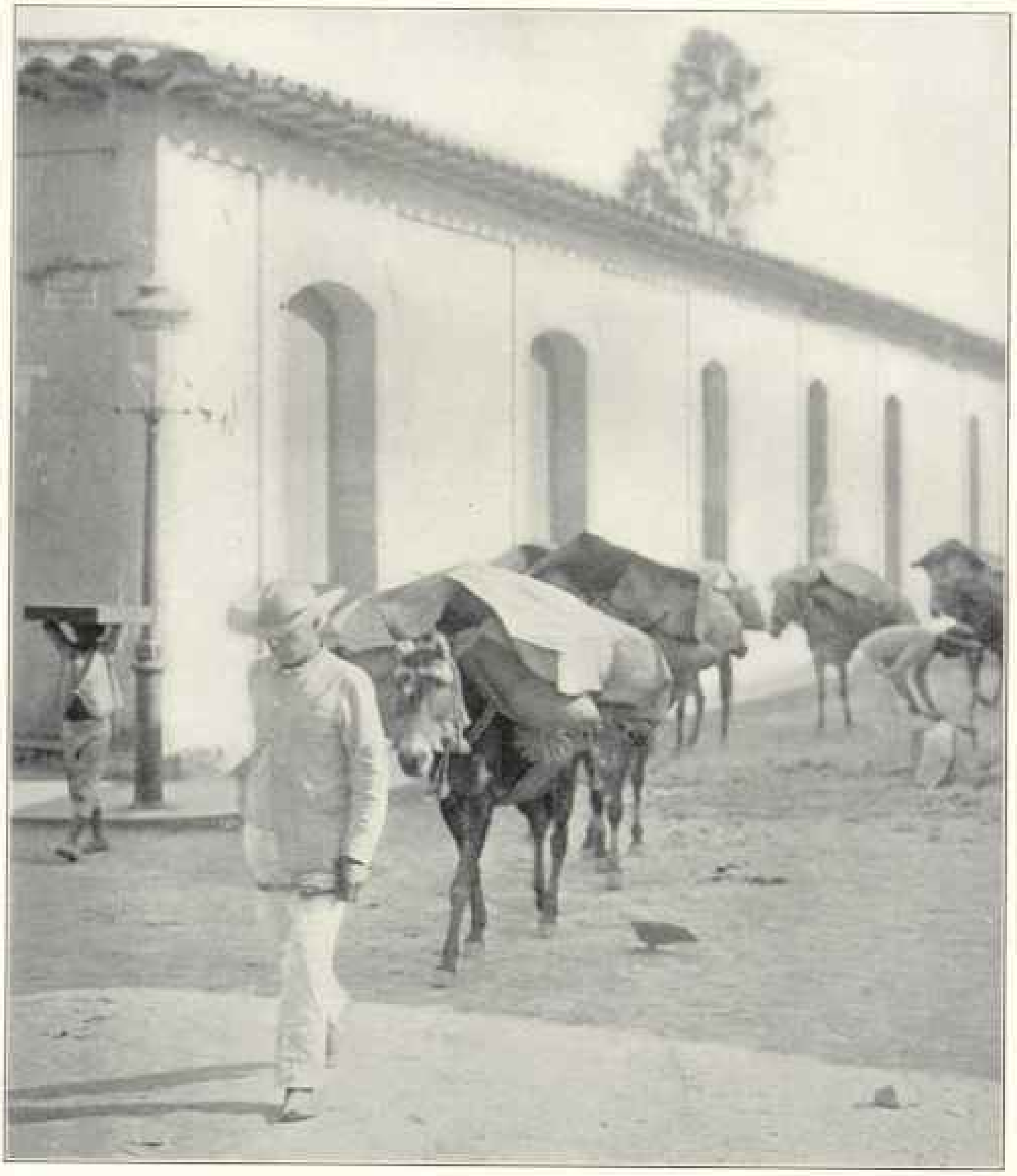
The first settlement was to be made at Cumana, where some Franciscan monks had established themselves in 1515, and was actually begun by Gonzalez Ocampo in 1520, though his cruelty and treachery toward the Indians brought Las Casas' cherished schemes to naught, a fitting prelude to the three—or, shall I say, nearly four—centuries of strife and misery that followed. Las Casas arrived at Cumana in 1521, but during his subsequent absence in Haiti the little colony was driven away by the enraged and deluded Indians, who thus banished from their shores the one man who would, and could, have saved them from their piteous fate.

Apart from the hallowed memories of this devoted priest, Cumana, or New Toledo, as it was formerly called, has the distinction of being the first European settlement in Venezuela, and with the exception of a supposed settlement of the Portuguese upon the Amazon, the first on the continent. Ocampo was preceded just one year by Cortes in Mexico, and it was ten years later that Pizarro set out for Peru. When John Cotton knelt upon the shore at Plymouth, surrounded by his devout pilgrim band, and asked God's blessing upon their enterprise, a century lacking one year had elapsed since his noble prototype had debarked his little following upon the lonely Pearl Coast, and prayed with equal earnestness for divine assistance in establishing a Christian colony. One prayer was answered, and the other was not, and Providence only knoweth why; but certainly no more sacred mission was ever undertaken than that of Las Casas to *Tierra Firme*. When we read, therefore, of the subsequent misdeeds of the *conquistadores*, let us not forget that the "Apostle of the Indies" also was a Spaniard, and, were it not for the one great mistake of his life—his defense and promotion of negro slavery, though the facts have been grossly exaggerated and, indeed, perverted—his work would perhaps be ranked as the greatest moral factor in the early history of the New World.

It is hard to leave this heroic figure and the desolate little settlement that marked the failure of his first great project, but Cumana, in time, became a prosperous town—that is, as prosperity was understood in the Spanish colonies—and has at least one other claim upon our notice, viz, that it was here that Humboldt landed and remained for a time, with his friend Bonpland, before beginning those remarkable journeys that added so materially to all branches of natural science, and, perhaps even more important at this day, to our knowledge of the economic and social conditions of colonial Spain—conditions that might never have been understood had this indefatigable traveler and scientist not arrived so opportunely before the revolutionary struggle began.

Cumana today is a humdrum city of about 10,000 inhabitants, the capital of the State of Bermudez, and an important port in the "Orient," as the eastern states of Venezuela are called, though the government of late has been openly hostile to its interests. It certainly presents a sorry contrast to the town of a century ago, then the independent capital of a large province, or rather of two, an important ecclesiastical center, and ranking easily first among all the cities of the coast in the culture and intelligence of its inhabitants, as indeed a Venezuelan (not a native of Cumana) informs me is still the case.

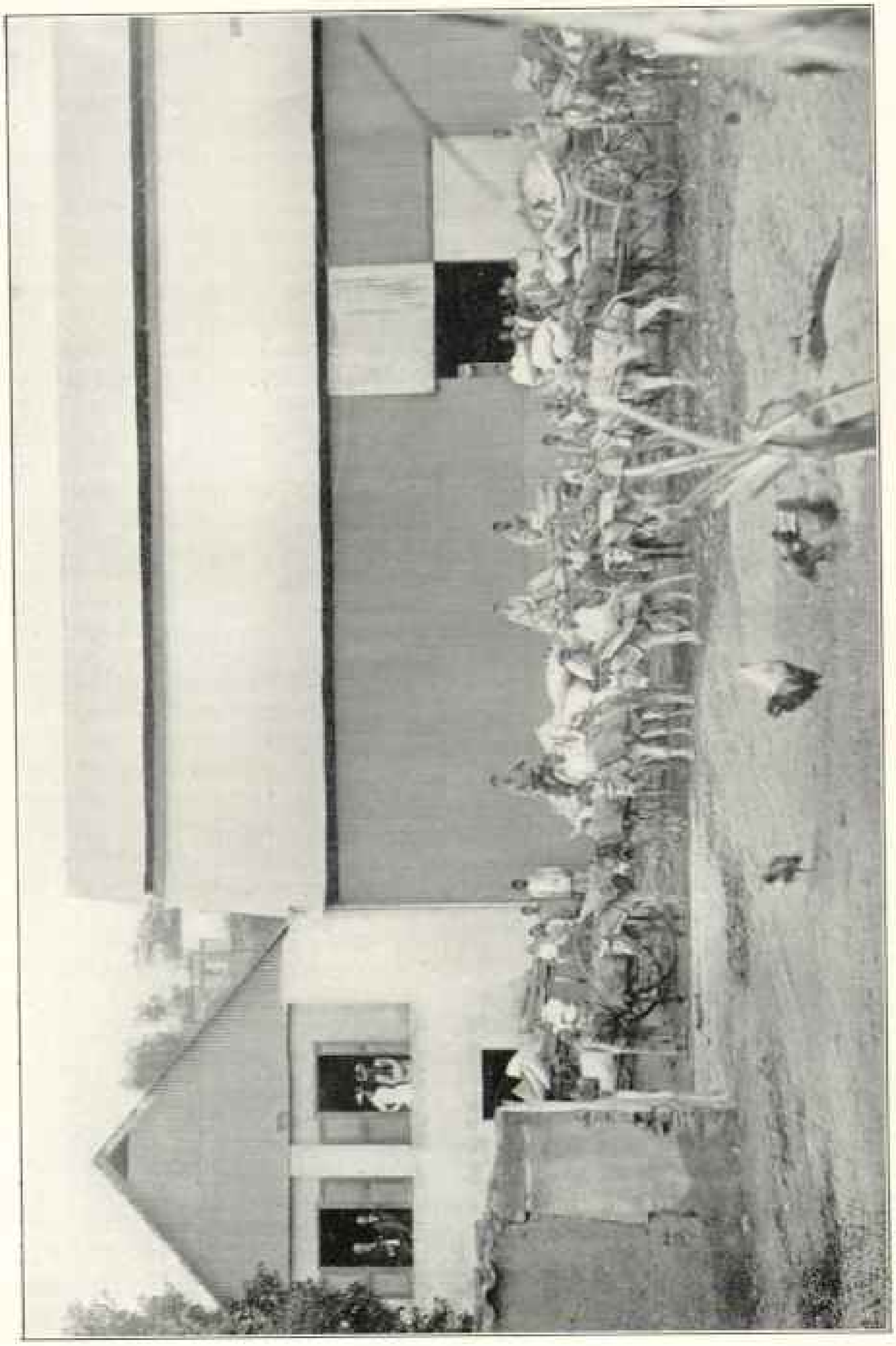
Cumana is as yet almost unknown to the traveler, partly owing to the ignorance or lack of enterprise of the steamship companies that make it a port of call; but some day the tourist tide will set in, and not only the city itself, but the delightful hill country of the interior, as well as the neighboring towns of Barcelona—which, like Cumana, was the



A Coffee Train Entering Maracaibo

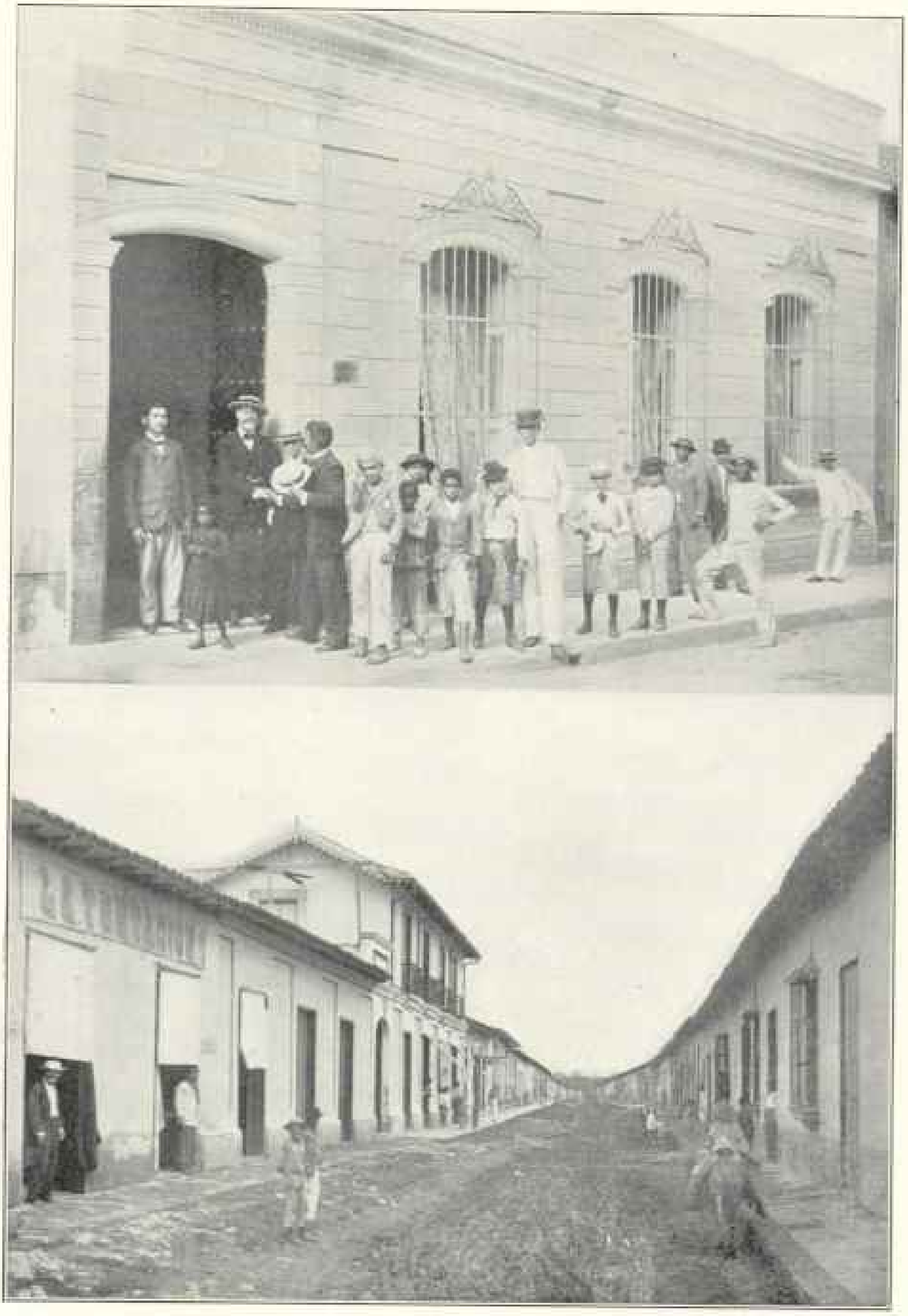
scene of many stirring events during the war of independence—and Carupano, noted for its trade in agricultural products and for its incomparable rum—all, no doubt, will in time be "stopped over" at and duly photographed, as will the extensive *salinas* or salt beds of Araya and the neighboring island of Margarita, where the famous pearl fisheries are situated. It is a country well worth visiting.

"So, westward-ho they ran," writes



A Coffee Mill near Maracaibo

The beans are here removed from the husks by machinery, cleaned, and packed in bags ready for shipment.



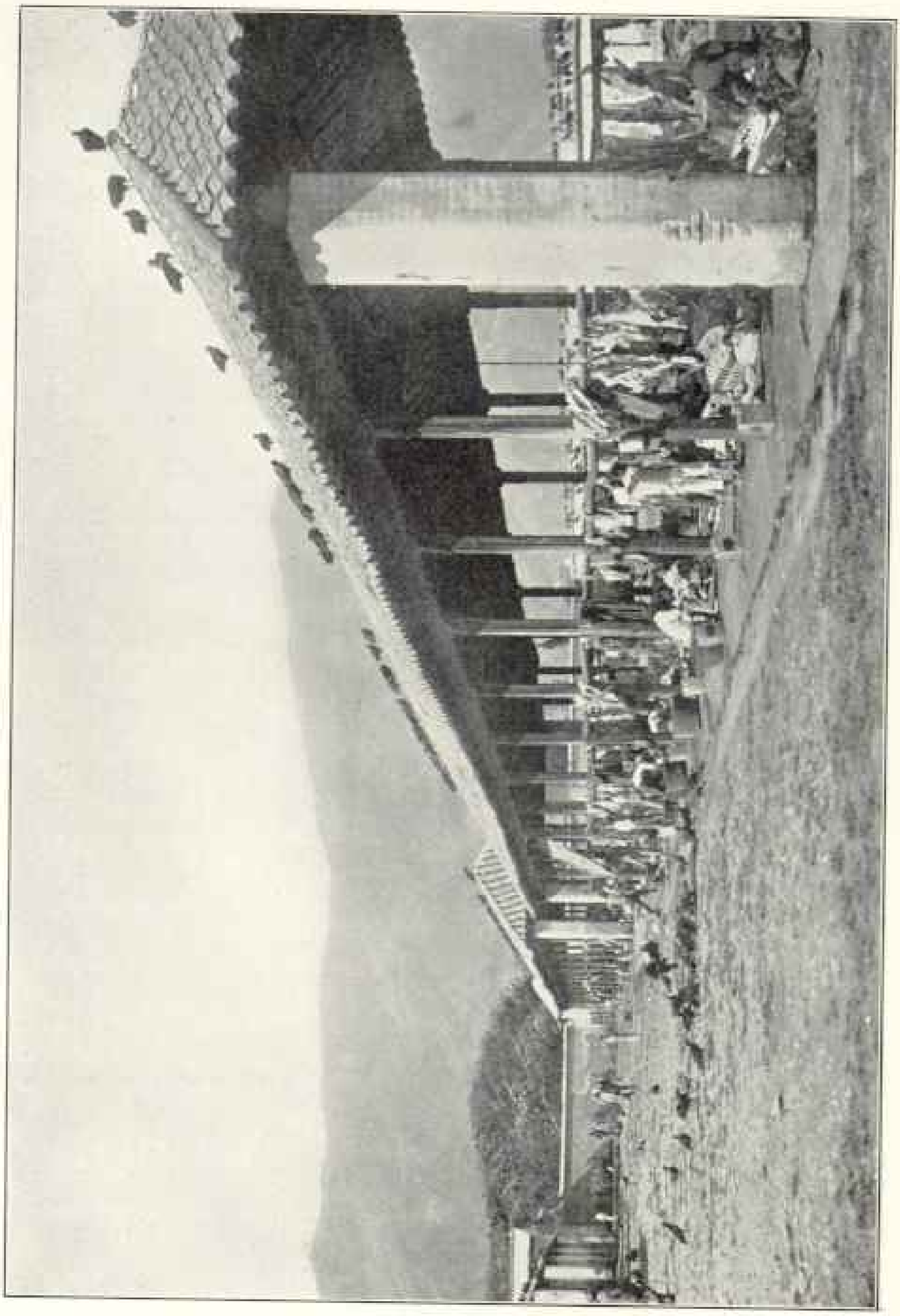
One of Better Class Residences of Caracas

A Street in Caracas

A Maracaibo "Caballero"

Kingsley of the good ship *Rose*, as she skirted the coast between Cape Codera and La Guaira, "beneath the mighty northern wall, the highest cliff on earth, some seven thousand feet of rock parted from the sea by a narrow strip of bright, green lowland. Here and there a patch of sugar-cane or a knot of cocoanut trees, close to the water's edge, reminded them that they were in the tropics; but above, all was savage, rough and bare as an Alpine precipice. Sometimes deep clefts allowed the southern sun to pour a blaze of light down to the sea marge, and gave glimpses far above of strange and stately trees lining the glens, and of a veil of perpetual mist which shrouded the inner summits, while up and down, between them and the mountain side, white, fleecy clouds hung motionless in the burning air, increasing the impression of vastness and of solemn rest, which was already overpowering."

And so, indeed, as Kingsley so vividly pictures them, do these mighty cliffs appear; and one learns with regret that the talented novelist should never have beheld their awful grandeur, he who alone, perhaps, has done justice to the scene. Inaccuracies, to be sure, have crept into the description, and as the steamer approaches from the north the traveler may fail, through a misjudgment of distance, to appreciate the magnitude of the greenish-brown mass before him; but presently he spies something to measure with, a cluster of buildings, a little toy city, which he is told is La Guaira, while apparently but a stone's throw away lies Macuto, the well-known watering place. Then, perhaps, though almost too late—for the Red D line has a schedule to maintain—does the full impressiveness of the scene burst upon his awakened senses; and if there yet be time, let him gaze intently before him, for the view



A Venezuelan Abattoir. (Note the vultures on the roof)

entirely changes when he lands, and not until he is once more on board and the vessel well in the offing can the noble proportions of the "Silla" again be appreciated. In my case, unfortunately, my first view was my last.

La Guaira, for all its fame, or rather notoriety, is a city of but fourteen thousand inhabitants, or about two-thirds the size of Bangor, Maine; but even this seems an overestimate when one climbs the hillside and looks down upon its jumbled mass of dark-red roofs, with a thin line running east and west along the shore and a short spur following a cleft in the otherwise impassable barrier behind it. Prominent at the water front are the market-place, the large custom-house—practically the *raison d'etre* of the city—the inevitable plaza, and the new shore batteries, erected by President Castro.

Here, also, is the terminus of the La Guaira and Caracas Railway, and jutting out from the shore a distance of two thousand feet or more is the famous breakwater, which has done so much to increase the traffic of the port, though the passenger is apt to forget, when charged to set foot upon it and denied the alternative of hiring a boat, that this formerly was one of the most disagreeable roadsteads in the world. Anyway, in a land of habitual "graft," why should the stranger be spared on the day of his arrival? "Why, indeed!" echoes the collector of customs, who incidentally is the proprietor of the Hotel *Neptuno*, the only decent hostelry in the place, as he delays the inspection of luggage till the Caracas train has departed and complacently watches the passengers stream off for breakfast—wherever they like to go, of course!

La Guaira can boast of several churches (one a rather imposing structure), a bull ring, a large theater, and a diminutive fort, the latter perched high above it, like the turret of a battleship, and provided with the same armament as the shore battery, viz, two Cruezot guns of the latest type. To one side, but below this fort, stand the ruins of the old governor's castle, where the "Rose of Torridge" dwelt, and if the tourist be so inclined he may seat himself upon a crumbling wall, and, with the whole scene before him and the sound of the surf in his ears, may imagine he sees the brave Devon lads fighting their way to the boat, their best loved leader a prisoner, several of their comrades dead, and the daring venture of the *Rose*, so they think, an utter failure.

An American who recently came to La Guaira and has experienced exceptionally pleasant weather calls the coast hereabout the "Riviera of the Tropics," while a well-known writer who delights in big phrases styles Macuto the "Saratoga, the Newport, and the Coney Island of Venezuela, all in one." Both comparisons are about as apt as is the term "Paris of South America," applied to Caracas, a comparison, to digress for a moment, that unquestionably aided the floating of a recent continental syndicate, which was capitalized at several million francs and proposed establishing a large gambling casino in that city. The enterprise, of course, came to grief, though the disappointment of the projectors who reached Caracas could hardly exceed that of the American tourist who should travel to La Guaira—hot, ill-smelling old town that it is!—expecting to find a new Riviera. Nevertheless, La Guaira has been dealt unjustly with, as well, even in the matter of smells, which few tropical towns are free from, not excepting the much-governed city of Port-of-Spain; and while one can sympathize with the former American consul, who in the elation of departure wrote:

"Farewell, ye gloomy *casas*,[1] *mejor dicho*,[2]
prison cells;
Ye narrow, crooked *calles*,[3] reeking with atrocious smells."

and in another stanza:

"Home of the wailing donkey and the all-abounding flea,
Manana,[4] *gracias a Dios*[5] I bid farewell to thee;"

it does seem as if the final lines, both

from a sense of fair play and for diplomatic reasons, might have been somewhat modified:

"Good-bye, ye Latin greasers, *su atento servidor*;[6]
Que van bien;[7] *pues adios*;[8]—my boat is on the shore.
Oh dirty people, dirty homes, oh despicable spot,
Departing I will bless you in your dirtiness and rot!"

Equally unjust is the cool assertion—pardon the seeming paradox—of the writer above referred to, who gives the town a steady temperature of "100° Fahrenheit from one year's end to another." As a matter of fact, the mean temperature is about 84° Fahrenheit, and the maximum very little over ninety, which, owing to the moisture of the air, could easily deceive the perspiring tourist. "It is generally the duration of a high temperature," observes Humboldt, "and not the excess of heat, or its absolute quantity, which occasions the sufferings of the inhabitants of the torrid zone;" and eighty-four degrees with a humid atmosphere is certainly excessive.

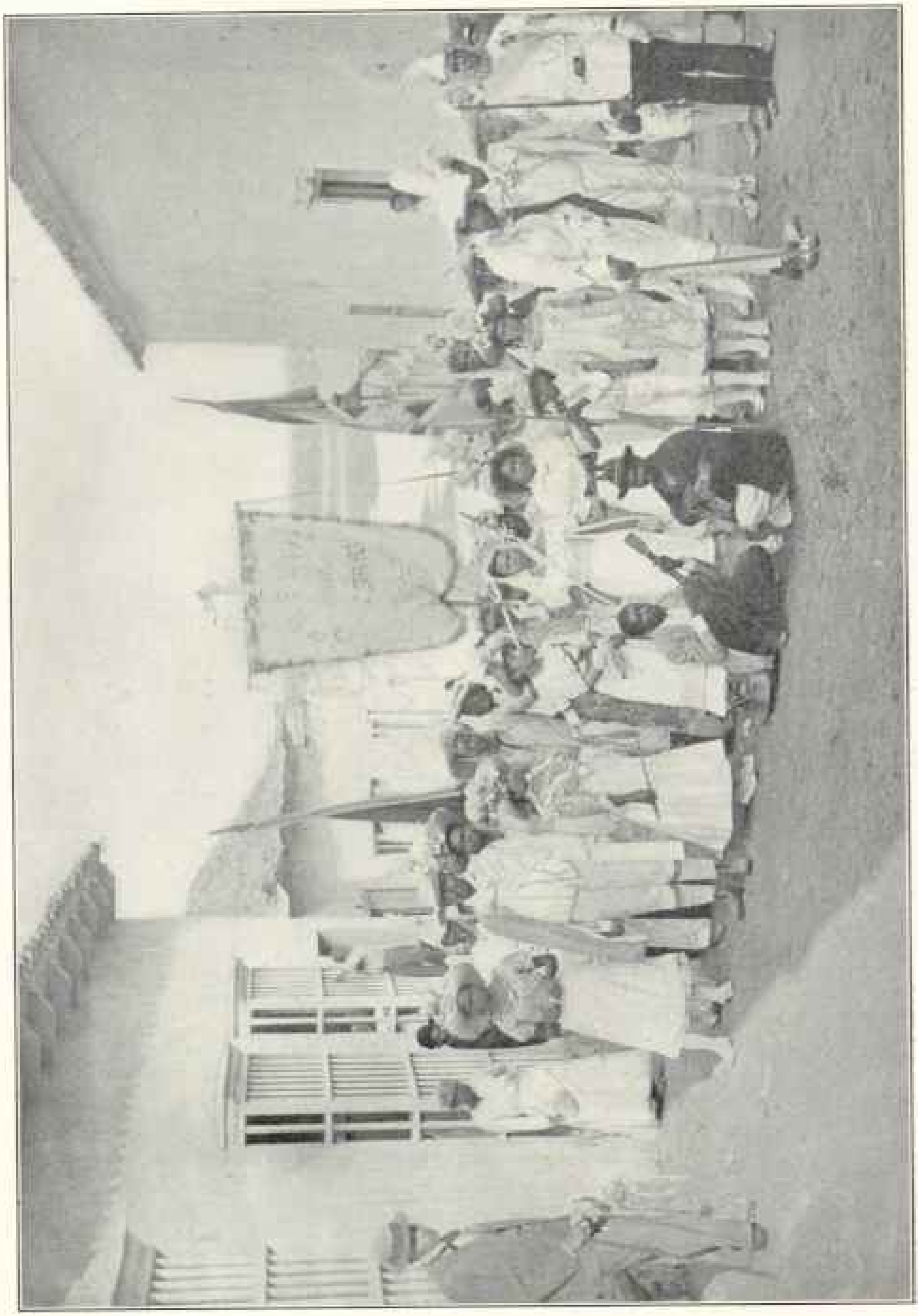
Another stigma cast upon La Guaira is its unhealthfulness, and especially the prevalence of yellow fever. La Guaira, be it known, is not particularly unhealthful, certainly not so unhealthful as Caracas, and while a mild form of yellow fever lurks in the neighborhood, it is not greatly to be dreaded. "Indeed," the inhabitants might exclaim, "who gave us the yellow fever? Was it not communicated to the city originally by a vessel from Philadelphia, after we had enjoyed more than two centuries of immunity?" This charge, to be sure, has not been proven, but the crew of an American vessel in port (in the year 1799) were actually the first to be stricken, and local historians draw their own conclusions.

La Guaira was founded in 1558, two years before our ancient city of St Augustine, and has shared the usual vicissitudes of the Spanish settlements upon the coast, having been repeatedly attacked by pirates and foreign fleets, several of which, notably that of the British commodore Knowles, were successfully repulsed. The city, furthermore, was destroyed by the great earthquake of 1812, and experienced many exciting events in the war of independence, as, indeed, it has at intervals ever since, not least of which was the blockade of the powers a few years ago. This indignity, however, its officials assert, will never be repeated, and they point to the well-equipped batteries, silent and grim, but ever ready for the enemy—ready, that is, in a Pickwickian sense!

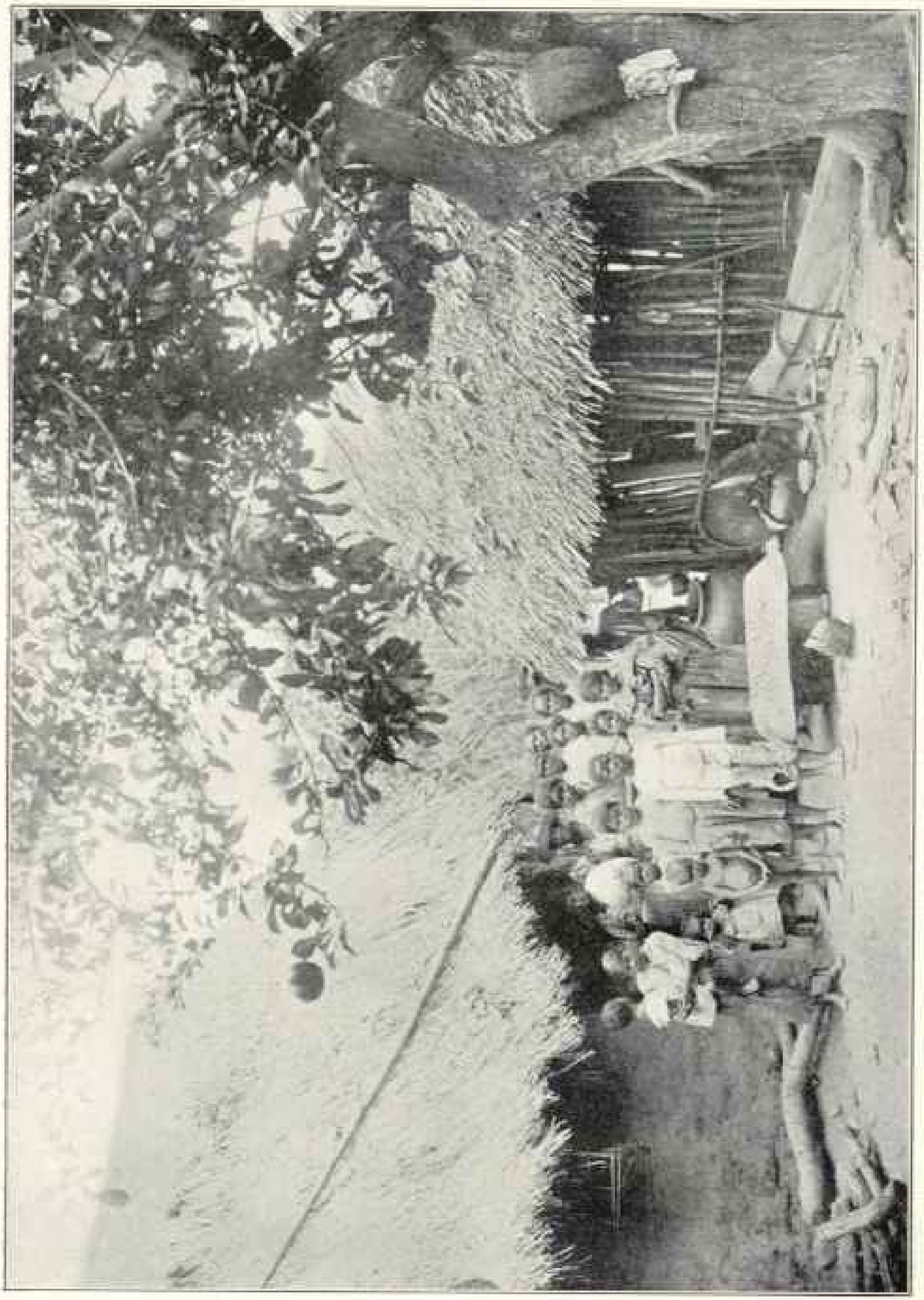
I have coupled Maracaibo with Cumana and La Guaira in naming this article, though the situation of the former makes the title plainly a misnomer. It is difficult, however, in passing to this western city to resist mentioning a few of the interesting towns in the intervening region, historic old places, such as Tocuyo, founded in 1545; Coro, the ancient capital of the province of Venezuela and the seat of the Welsers, founded in 1527, just seven years after Cumana, and in reality the first permanent settlement in *Tierra Firme;* Carora, founded in 1572, more than half a century after Cumana, yet a hundred and ten years before William Penn established his colony on the Northern Continent; Ocumare—but why continue the list: no more historic region can be found in the New World than these southern shores of the Caribbean Sea, and none, certainly, are more neglected by the traveler.

Maracaibo, as the reader is aware, is situated upon the lake of the same name, or rather upon the strait connecting the lake with the outer gulf. Like La Guaira and Puerto Cabello, it has excellent steamer communications with Curacao and New York, an American line having built two vessels of sufficiently light draft to pass the dangerous sand bars that obstruct the entrance to the lake. Were navigation entirely unobstructed and the city not preyed upon as it has

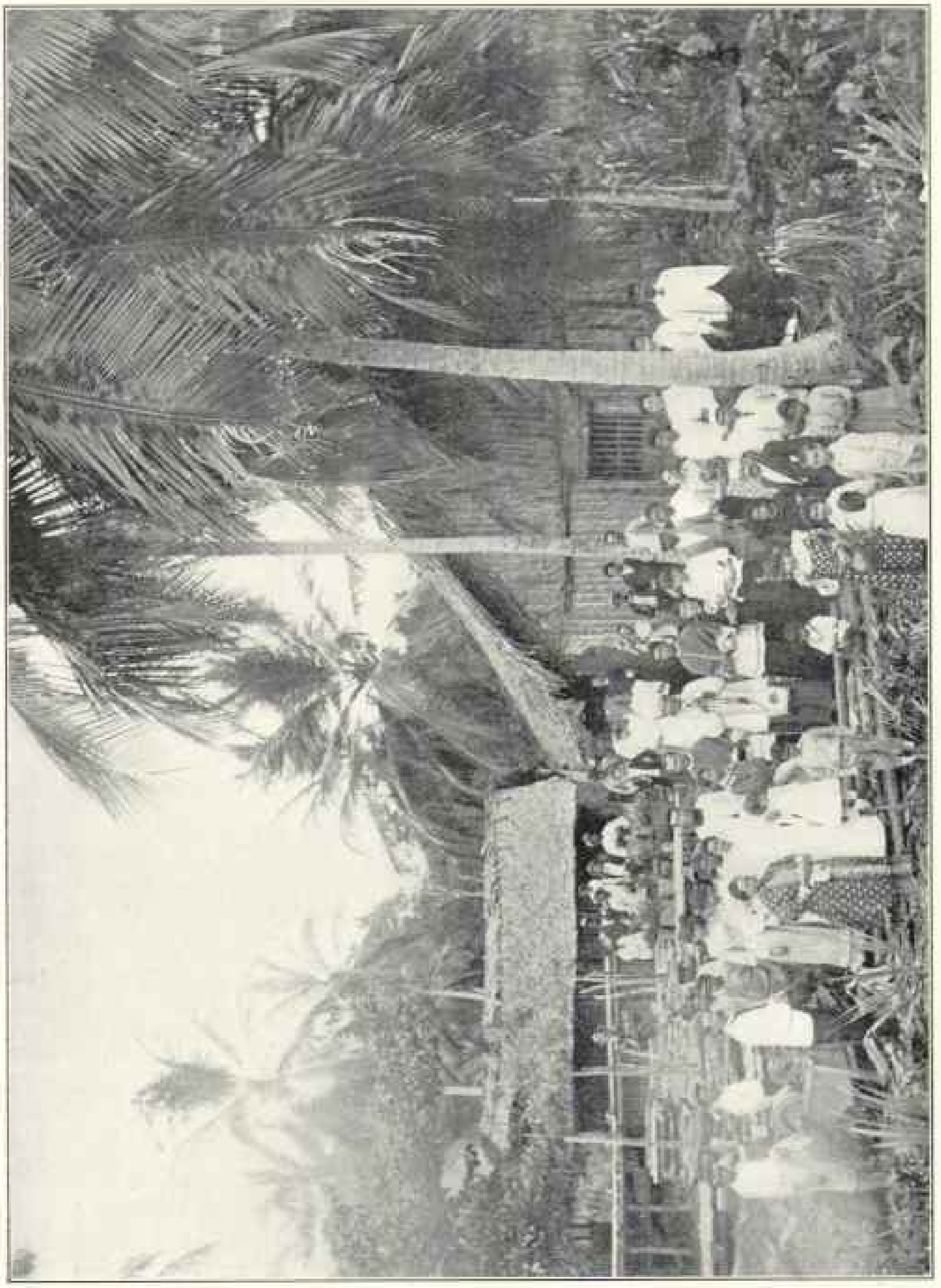
[6] Houses; [7] better said; [8] streets; [9] tomorrow; [10] thank God; [11] at your service; [12] good luck to you; [13] so good-bye.



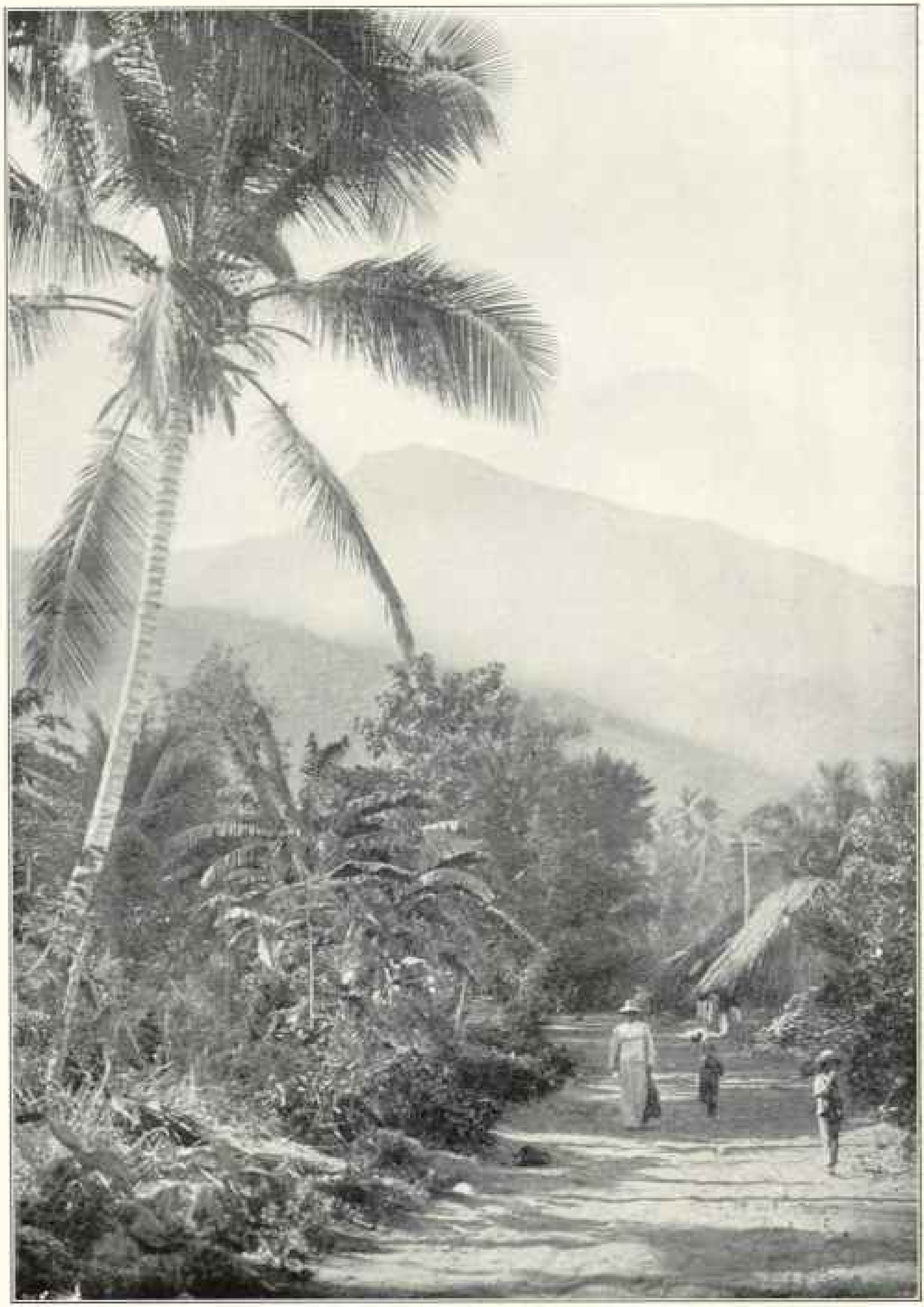
Carnival in Venezuelan Town



The Rising Generation. A typical scene on the Venezuelan coast regions



A Religious Festival on a Cocoa Estate in the Orinoco Delta



Country Road, near La Guaira

been by every government since the time of Guzman-Blanco, it would long since have been one of the most important ports in Caribbean countries, for behind it lies a vast lowland region, rich in all manner of tropical products and only rendered inaccessible in places by the very profusion of its wealth. Furthermore, Maracaibo is the port of a considerable section of Colombia, and nearly all of the coffee that bears its name comes either from across the boundary or from the Venezuelan Cordillera region south and east of the lake. At intervals of a year or so, it would appear, President Castro from some fancied grievance prohibits all intercourse with the neighboring republic; whereupon the exports of "Maracaibo" coffee fall to half the usual amount, only to leap to an abnormal figure when his wrath has been appeased Colombian cities are allowed to discharge their accumulated supply. When I outlined this article the barriers, if I mistake not, were up; at the present writing they have been removed. And yet Colombia, like Curacao, was at one time a haven of refuge when the President was a fugitive. What unheard-of indignities might they not suffer today, had they not received him so hospitably!

Maracaibo has the unenviable reputation of being one of the most unhealthful cities in the world, which is sheer nonsense, for its climate is said to be rather agreeable, though moist and hot. Yellow fever is prevalent at times, but of such a mild type that it is seldom fatal, and German commercial houses in Cucuta, where this disease, on the contrary, is most deadly, are said to station their newly arrived clerks in Maracaibo until they have taken the fever before allowing them to enter the interior. I did not believe this story until a gentleman of unquestionable veracity assured me that such is actually the case, and that Maracaibo fever, like the measles, is really welcomed, that the ordeal may be over for all time.

Perhaps Maracaibo's bad name originated in the story of the consul and the coffin, of which many versions are current. Ex-Minister Scruggs gives it as follows:

"A western politician of some local prominence, who had long been pressed upon the attention of our State Department for a consular position in South America, was finally nominated and confirmed as consul to Maracaibo, much to the disgust and discomfort of the incumbent, who wanted to retain his place. The new consul arrived at his post in mid-summer, and became the guest of his predecessor, whom he was about to relieve. Discovering a metallic coffin in an obscure closet of his bedroom, he inquired of his host the next morning why such an article of furniture should be there. The host was profuse in his apologies, but added by way of explanation that such things were not unusual in Maracaibo, especially during 'the fever season, which,' said he, 'is just now setting in!' The new consul took the return steamer for New York, leaving his predecessor undisturbed."

Here again I was long dubious about accepting such a good yarn seriously till I was assured not once, but a dozen times, that it is essentially true; that the wily consul is none other than the present incumbent, and that he himself is nothing loath to admit the fact. Yet few travelers go to verify either story, perhaps from an unmanly feeling that if they have been misinformed they may pay for the error by taking up a permanent residence there, without the assurance even of a consular coffin.

I am writing of Maracaibo as if it were an out-of-the-way village instead of an important city and port, with ocean vessels coming and going and fleets of sailing craft plying to various towns upon the lake, as well as to up-river ports—a city that can boast of electric light, tramway lines, telephones, telegraphs, a submarine cable, a splendid theater, a legislative palace, seven churches, a dockyard, and, to quote verbatim from the official report, "2 clubs, 5 hotels, 17 inns, 24 restaurants, and all modern improvements," which, of course, is equally misleading.

Maracaibo was founded in 1571, and has had its ups and downs, like the other cities upon the coast, the greatest disaster in its history being the raid of the notorious buccaneer, Morgan, in 1669, which, had it been two years later, might have been regarded as a centenary celebration. Today, happily, the city enjoys comparative prosperity, and despite the unfortunate reputation for unhealthfulness that it has gained abroad, and, within the republic, the equally unfortunate association in the popular mind with its huge dungeon, crowded with political suspects and the wretched leaders of the last revolution—for Maracaibo and its prison have become almost synonymous terms in Venezuela—its citizens might be excused for boasting of their western metropolis, the only city upon the Venezuelan coast which has refused to be merely a port of call for vessels—an aggregation of buildings, so to speak, surrounding a customs-house.

Notwithstanding the drawbacks, from the tourist's standpoint, to many of the places I have mentioned, I believe the trip to and from the Venezuela coast will soon become an attractive one, even to the comfort-loving American. He will visit Caracas, La Guaira, and Macuto, and perhaps Puerto Cabello, returning either by Curaçao and Porto Rico or by Margarita, Trinidad, and the beautiful islands of the Windward group; and if he has read and treasured as a child the strange and terrible stories of the Spanish Main, with its gold-laden galleons, its fierce buccaneers, and the occasional English freebooter from the Drake of history to the Amyas Leigh of fiction, no trip could be more fascinating to him. The invalid, also, will in time be attracted to these southern waters, and will find to his surprise that a voyage through the Caribbean Sea is almost as delightful and quite as beneficial as a tour of the Mediterranean.

FARTHEST NORTH

AS this number goes to press news is received of Peary's success in reaching the "Farthest North," 87° 6'. Our information is limited to the brief telegrams printed below, but they tell enough to show that the latest expedition of Peary has been the most successful he has yet made. The public will probably be most interested in the fact that Peary has won back for America the record of the farthest north, held by Nansen and Abruzzi since 1896. Previous to Nansen's voyage, America had held the record for 14 years by reason of the achievement of Lockwood and Brainerd, of the Greely expedition, in reaching 83° 24'.

Peary's first telegram was as follows:

"HOPEDALE, LABRADOR,
"VIA TWILLINGATE, NEWFOUNDLAND,
"*November* 2, 1906.

"*Secretary Herbert L. Bridgman, Peary Arctic Club:*

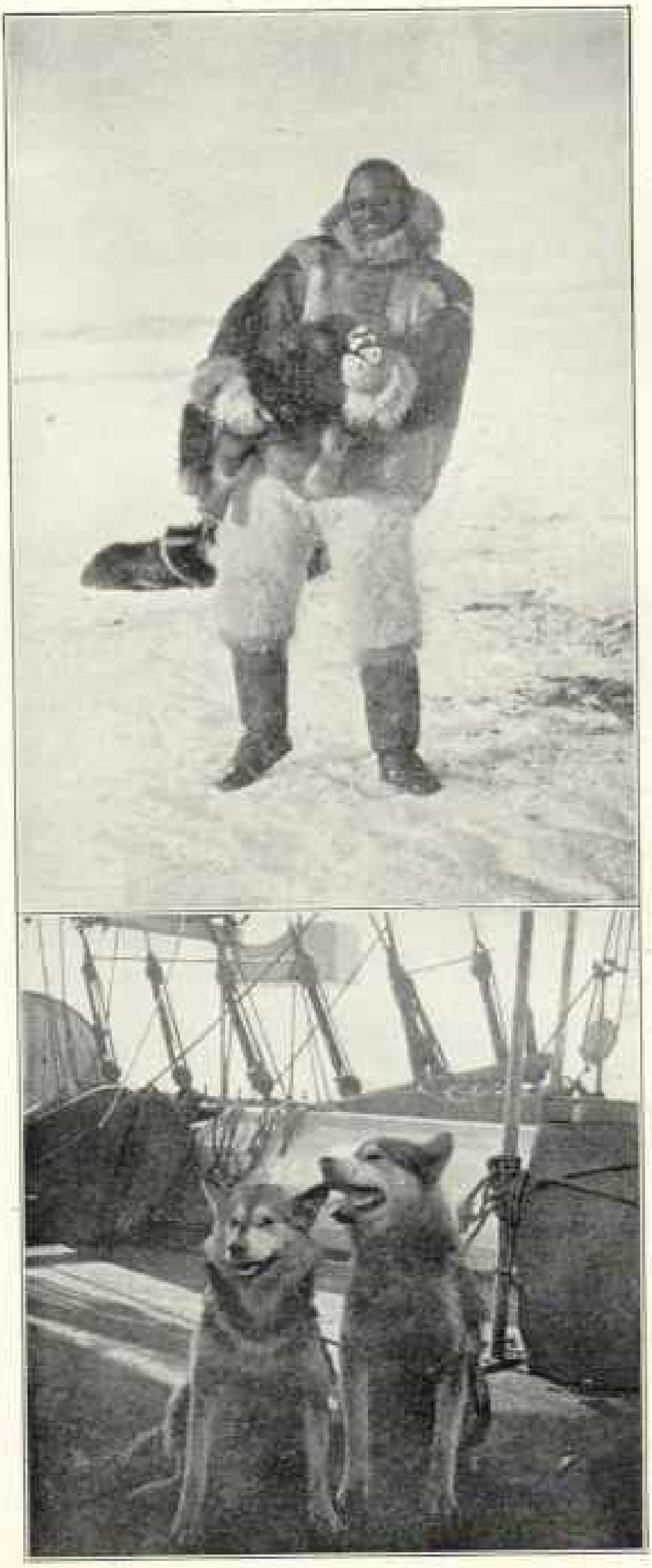
"*Roosevelt* wintered north coast Grant Land, somewhat north Alert's winter quarters. Went north with sledges February via Hecla and Columbia. Delayed by open water between 84 and 85 degrees. Beyond 85 a six days' gale disrupted ice, destroyed caches, cut off communication with supporting parties, and drifted east. Reached 87 degrees 6 minutes N. latitude over ice drifting steadily eastward. Returning ate dogs. Drifted eastward, delayed by open water. Reached north coast Greenland in straitened conditions. Killed musk oxen and returned along Greenland coast to ship. Two supporting parties driven on north coast Greenland. One rescued by me in starving condition. After one week's recuperation on *Roosevelt* sledged west, completing north coast Grant Land, and reached other land near 100th meridian. *Roosevelt* magnificent ice fighter and sea boat. No deaths or illness in expedition.

"PEARY."

A more detailed account of the new land which Peary reports he has discov-

Photo by Gilbert H. Grosvenor

Commander Robert E. Peary, U. S. N.

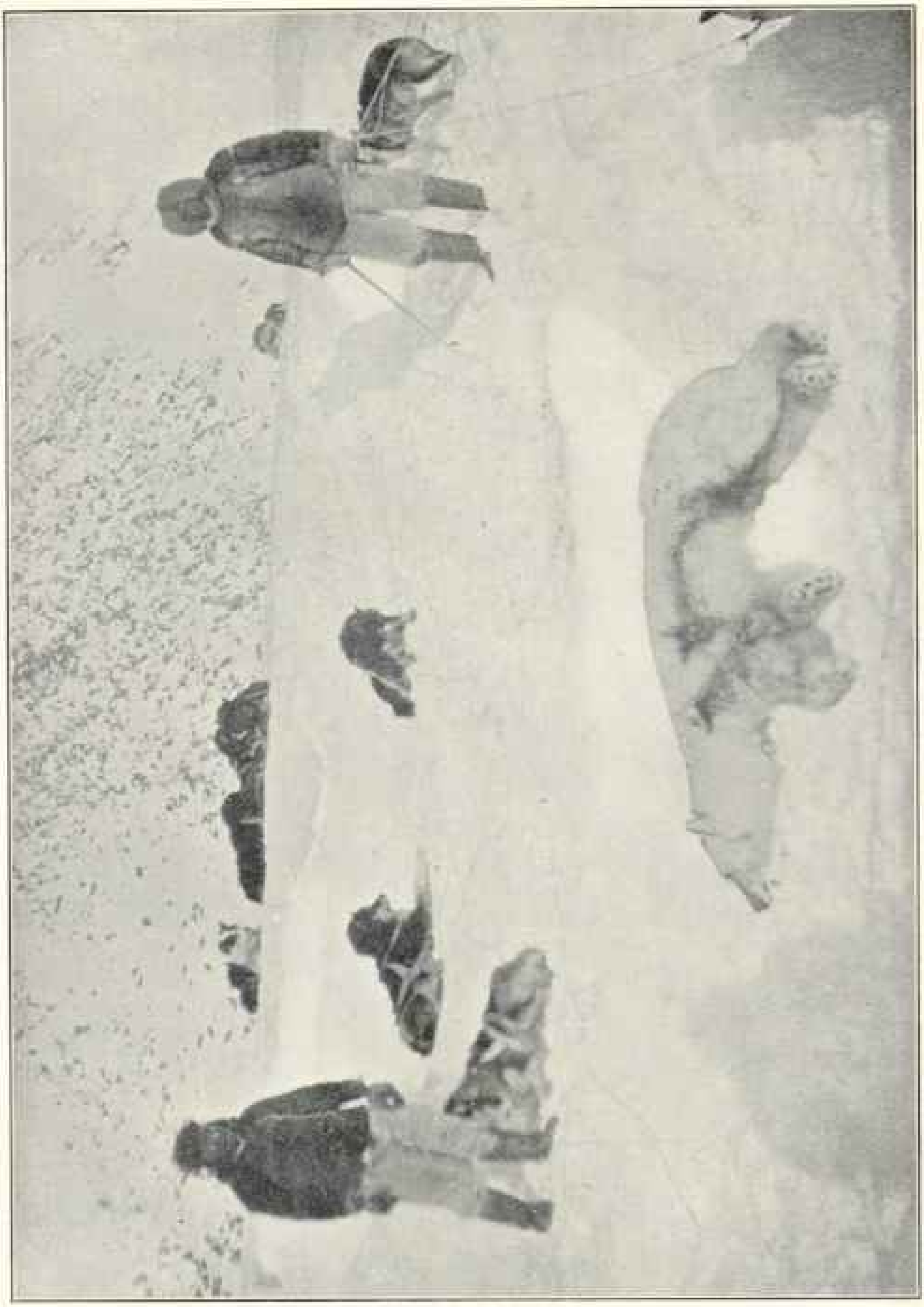


Photos by Robert E. Peary

Mat Henson, the Companion of Peary in all Sledging Trips

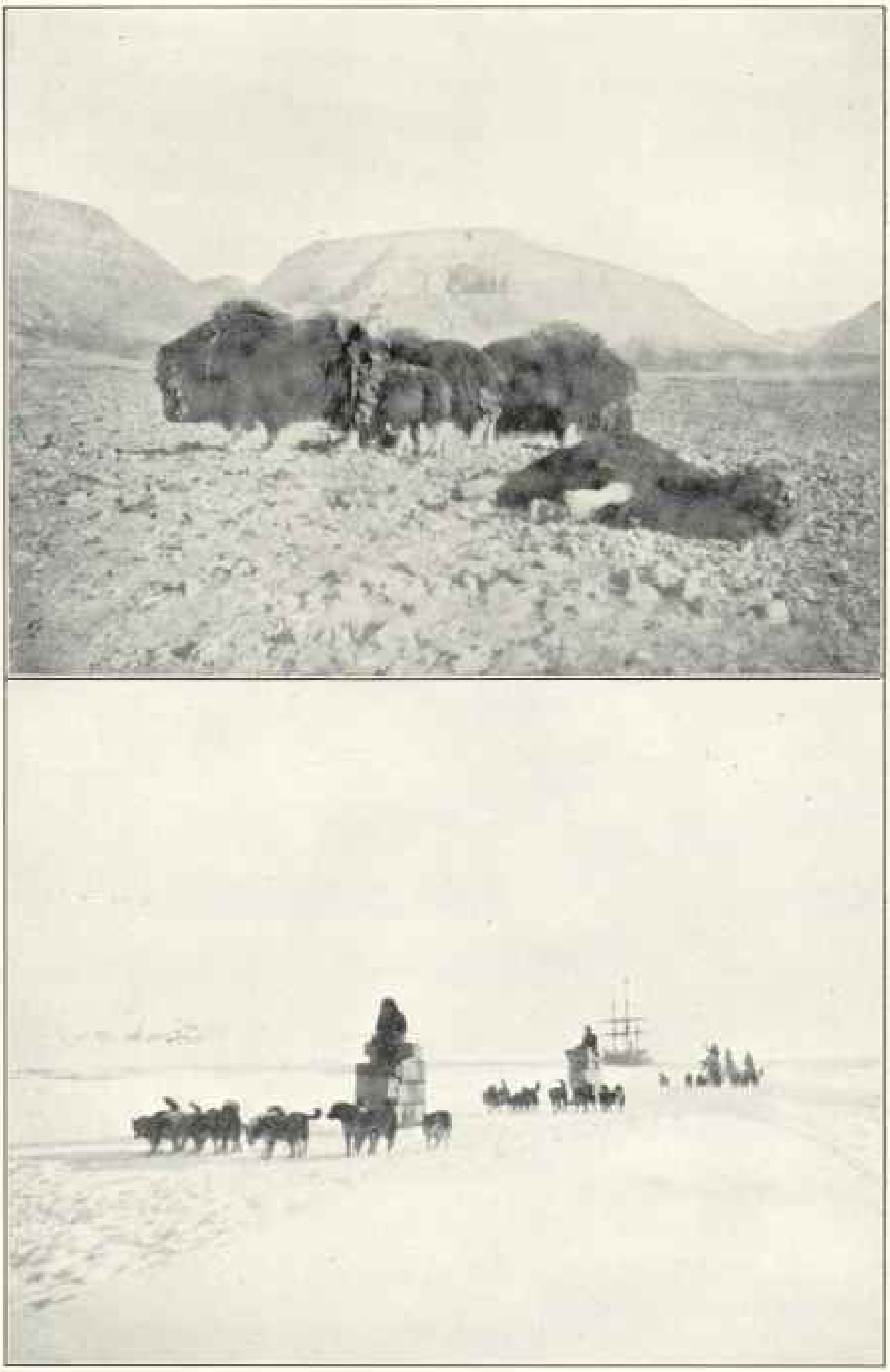
ered near the 100th meridian is awaited with much interest. There are many possibilities connected with this new land. It may be simply a small island or it may be a large body of land extending considerably northward, and thus afford future explorers opportunity to carry their base nearer to the Pole than has been possible in the past. In the June, 1904, number of the NATIONAL GEOGRAPHIC MAGAZINE, Dr R. A. Harris, of the U. S. Coast and Geodetic Survey, who had been making a careful study of tidal records taken on the north coast of North America, argued that there must be a considerable body of land in the unexplored region to the north. He could account for the rise and fall of the tides there in no other way. Dr Harris outlined the supposed land as extending eastward to about the 100th meridian, and also to the Pole. Perhaps the land Peary has found is this "supposed land."

Peary took his ship, the *Roosevelt*, further north than any ship had previously been, and passed the winter on the north coast of the most northern known land. In every previous expedition Peary has been prevented from getting his ship to this point because the channel through which his ship must pass has every time been choked with ice. As a result, he has always been obliged to make his base far to the south of his last base, which was only 500 miles from the Pole. It has been generally believed that if he could once get his base as far north as he did last year, he would reach the Pole, for the four great sledging journeys he has made in the arctics have averaged more than this distance to the Pole and back. Open water



A Polar Bear Hunt

Photo by Robert E. Peary



Photos by Robert E. Peary

Musk Oxen, Grant Land

Sledding Supplies to the Land

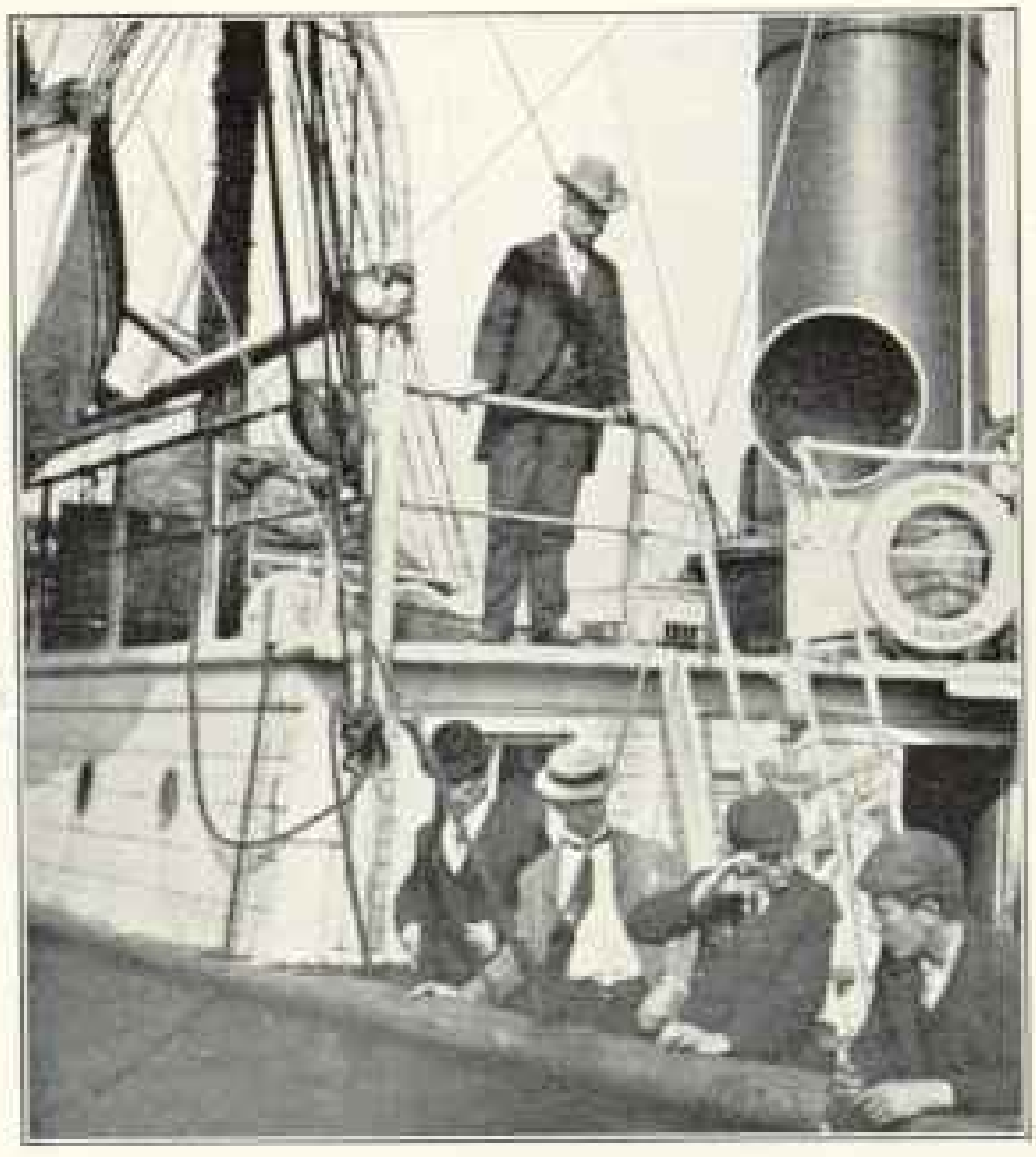


Photo by Gilbert H. Grosvenor

Herbert L. Bridgman, Secretary of Peary Arctic Club

and the drift of the ice, however, prevented his advancing further than 87° 6′, which is 174 geographical miles, or 200.36 statute miles, from the Pole.

It is evident that Commander Peary is planning one more campaign against the Pole, for he telegraphed Mr Morris K. Jessup, the president of the Peary Arctic Club and its most generous patron, as follows:

"*Morris K. Jessup, president of Peary Arctic Club, from Hopedale, Labrador, via Twillingate, N. F.*

"Steamer *Roosevelt* now here repairing rudder and stern, taking ballast and awaiting arrival mail steamer to secure coal. Return voyage incessant struggle with ice to Cape York, September 26. Then storms and head winds to Labrador coast, October 13. Carried away two rudders, stern post, and two blades of propeller, foretopmast and spanker boom. Lost one boat, burned all coal and some interior beams, using wood and blubber along the coast.

"Expect to communicate again from Chapeau. Progress will be slow, but have no anxiety for our safety, and give no credence to exaggerated reports.

"*Roosevelt* is returning this year for additional supplies and for repairs. Several tons of whale meat dog food thrown away last fall after poisoning number of the dogs. Other supplies lost by the breaking of ice in April. PEARY."

Commander Peary's polar steamship, the *Roosevelt*, left New York on her long journey in search of the North Pole July 16, 1905. The *Roosevelt* was built in Maine, and was refitted at New York before starting.

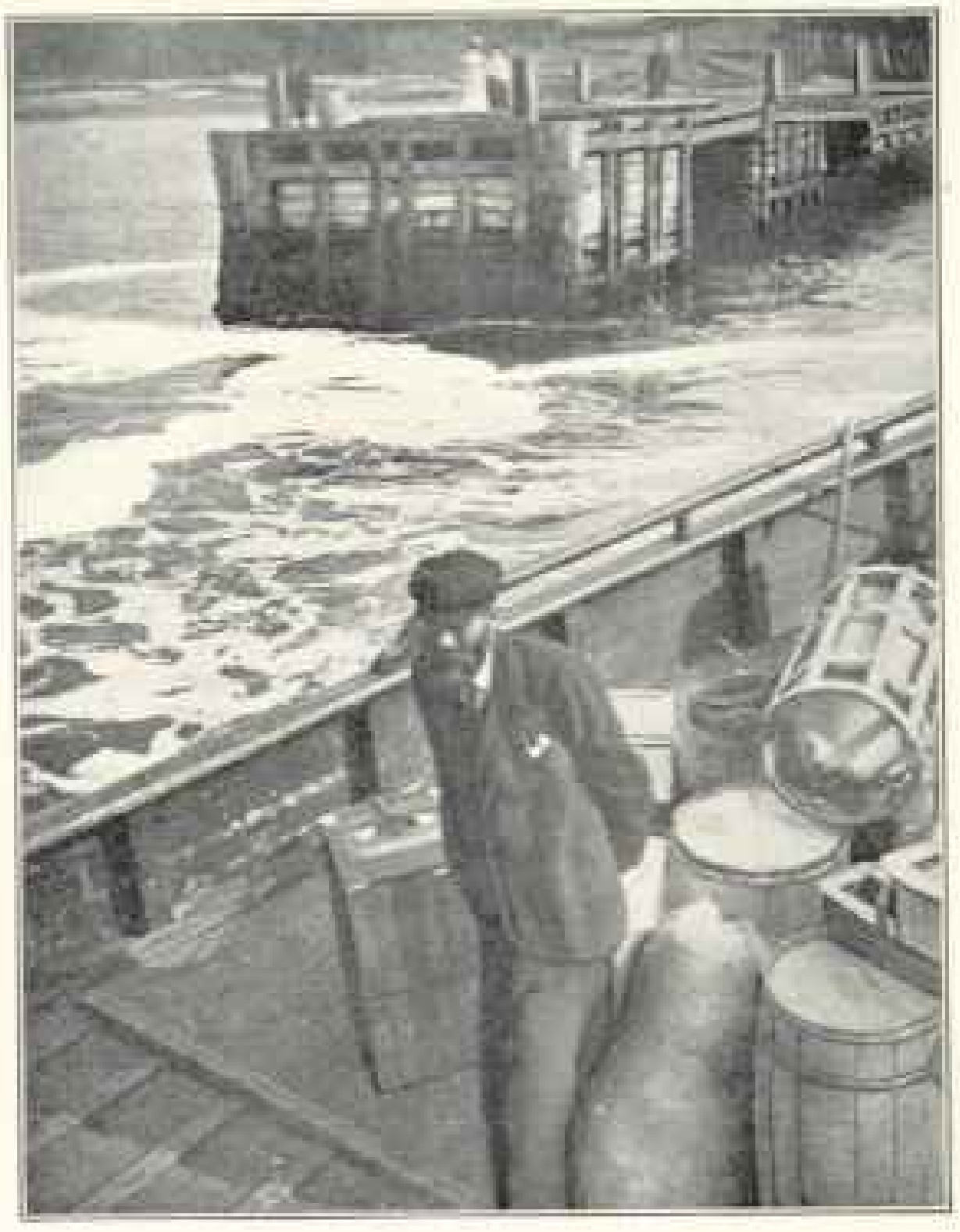


Photo by Gilbert H. Grosvenor

Captain Sam Bartlett, Sailing Master

An Eskimo Child

Eskimo Man and Wife

Photos by Robert E. Peary

The vessel, for which funds were furnished by the Peary Arctic Club of New York, was designed particularly for arctic exploration. She cost about $100,000. The vessel has a crew of 20 men, under Captain Bartlett.

The best part of the last 20 years Commander Peary has given to Arctic work. He has mapped over 600 miles of coast line, measuring from headland to headland, without following the numerous deep indentations. Nearly half of it is entirely new coast line which Peary alone has seen.

He has proved Greenland an island and mapped its northern coast line; he has defined and mapped the islands to the north of Greenland, known as the Greenland Archipelago; he has shown that an ice-covered Arctic sea probably extends from the Greenland Archipelago to the North Pole; he has reached the most northerly known land in the world; he has gained the most northerly point yet reached—87° 6′; he has studied the Eskimo as only one can who has lived with them for years; he has added much to our knowledge of Arctic fauna and flora; of the musk ox, the Arctic hare, and the deer; the notes he has made during the past years will benefit meteorology and geology.

Aside from the satisfaction of having done a great and heroic work, there has been no material gain for Mr Peary in these years devoted to Arctic discovery. He is known as one of the most talented men in the naval service, and if he had remained in active service would now probably hold a higher official rank than he does. Mrs Peary, the devoted and able assistant of her husband's plans; Mr Morris K. Jessup, and Mr Herbert L. Bridgman, president and secretary of the Peary Arctic Club, share in large measure in the success of the expedition.

TWO GREAT UNDERTAKINGS*

OPERATIONS under the Reclamation Act, which I signed on June 17, 1902, have been carried on energetically during the four years since that date. The Reclamation Service, consisting of over 400 skilled engineers and experts in various lines, has been organized, and it is now handling the work with rapidity and effectiveness. Construction is already well advanced on twenty-three great enterprises in the arid States and Territories. Over 1,000,000 acres of land have been laid out for irrigation, and of this 400,000 acres are now under ditch; 800 miles of canals and ditches and 30,000 feet of tunnel have been completed; and 16,000,000 cubic yards of earth and 3,000,000 cubic yards of rock have been moved. Detailed topographic surveys have been extended over 10,000 square miles of country within which the reclamation work is located, and 20,000 miles of level lines have been run. Three hundred buildings, including offices and sleeping quarters for workmen, have been erected by the Reclamation Service, and about an equal number by the contractors. Over 10,000 men and about 5,000 horses are at present employed.

The period of general surveys and examinations for projects is past. Effort is now concentrated in getting the water upon a sufficient area of irrigable land in each project to put it on a revenue-producing basis. To bring all the projects to this point will require upwards of $40,000,000, which amount, it is estimated, will be available from the receipts from the disposal of public lands for the years 1901-1908.

We may well congratulate ourselves upon the rapid progress already made, and rejoice that the infancy of the work has been safely passed. But we must not forget that there are dangers and difficulties still ahead, and that only unbroken vigilance, efficiency, integrity, and good sense will suffice to prevent disaster. There is now no question as to where the work shall be done, how it shall be done, or the precise way in which the expenditures shall be made. All that is settled. There remains, however, the critical question of how best to utilize the reclaimed lands by putting them into the hands of actual cultivators and home-makers, who will return the original outlay in annual installments paid back into the reclamation fund; the question of seeing that the lands are used for homes, and not for purposes of speculation or for the building up of large fortunes.

The pressing danger just now springs from the desire of nearly every man to get and hold as much land as he can, whether he can handle it profitably or not, and whether or not it is for the interest of the community that he should have it. The prosperity of the present irrigated areas came from the subdivision of the land and the consequent intensive cultivation. With an adequate supply of water, a farm of 5 acres in some parts of the arid West, or of 40 acres elsewhere, is as large as may be successfully tilled by one family. When, therefore, a man attempts to hold 160 acres of land completely irrigated by government work, he is preventing others from acquiring a home, and is actually keeping down the population of the State.

Speculation in lands reclaimed by the government must be checked at whatever cost. The object of the Reclamation Act is not to make money, but to make homes. Therefore, the requirement of the Reclamation Act that the size of the farm unit shall be limited in each region to the area which will comfortably support one family must be enforced in letter and in spirit. This does not mean that the farm unit shall be sufficient for the present family with its future grown children and grandchildren, but rather that during the ten years of pay-

*A letter from President Roosevelt to the Congress of Irrigation Engineers, held at Boise, Idaho, September, 1906.

ment the area assigned for each family shall be sufficient to support it. When once the farms have been fully tilled by freeholders, little danger of land monopoly will remain.

This great meeting of practical irrigators should give particular attention to this problem and others of the same kind. You should, and I doubt not that you will, give your effectual support to the officers of the government in making the reclamation law successful in all respects, and particularly in getting back the original investment, so that the money may be used again and again in the completion of other projects and thus in the general extension of prosperity in the West. Until it has been proved that this great investment of $40,000,000 in irrigation made by the government will be returning to the Treasury, it is useless to expect that the people of the country will consider direct appropriations for the work. Let us give the Reclamation Service a chance to utilize the present investment a second time before discussing such increase. I look forward with great confidence to the result.

By the side of the Reclamation Service there has grown up another service of not less interest and value to you of the West. This is the Forest Service, which was created when the charge of the forest reserves was transferred from the Interior Department to the Department of Agriculture. The forest policy of the Administration, which the Forest Service is engaged in carrying out, is based, as I have often said, on the vigorous purpose to make every resource of the forest reserves contribute in the highest degree to the permanent prosperity of the people who depend upon them. If ever the time should come when the western forests are destroyed, there will disappear with them the prosperity of the stockman, the miner, the lumberman, and the railroads, and, most important of all, the small ranchman who cultivates his own land. I know that you are with me in the intention to preserve the timber, the water, and the grass by using them fully, but wisely and conservatively. We propose to do this through the freest and most cordial cooperation between the government and every man who is in sympathy with this policy, the wisdom of which no man who knows the facts can for a moment doubt.

It is now less than two years since the Forest Service was established. It had a great task before it—to create or reorganize the Service on a hundred forest reserves and to ascertain and meet the very different local conditions and local needs all over the West. This task is not finished, and of course it could not have been finished in so short a time. But the work has been carried forward with energy and intelligence, and enough has been done to show how our forest policy is working out.

The result of first importance to you as irrigators is this: The Forest Service has proved that forest fires can be controlled, by controlling them. Only one-tenth of 1 per cent of the area of the forest reserves was burned over in 1905. This achievement was due both to the Forest Service and to the effective assistance of settlers and others in and near the reserves. Everything the government has ever spent upon its forest work is a small price to pay for the knowledge that the streams which make your prosperity can be and are being freed from the ever-present threat of forest fires.

The long-standing and formerly bitter differences between the stockmen and the forest officers are nearly all settled. Those which remain are in process of settlement. Hearty cooperation exists almost everywhere between the officers of the Forest Service and the local associations of stockmen, who are appointing advisory committees which are systematically consulted by the Forest Service on all questions in which they are concerned. This most satisfactory condition of mutual help will be as welcome to you as it is to the Administration and to the stockmen. To the stockmen it means more, and more certain, grass; to you, because of the better protection and wiser use of the range, it means steadier stream-flow and more water.

The sales of forest-reserve timber to settlers, miners, lumbermen, and other users are increasing very rapidly, and in that way also the reserves are successfully meeting a growing need.

Lands in the forest reserves that are more valuable for agriculture than for forest purposes are being opened to settlement and entry as fast as their agricultural character can be ascertained. There is therefore no longer excuse for saying that the reserves retard the legitimate settlement and development of the country. On the contrary, they promote and sustain that development, and they will do so in no way more powerfully than through their direct contributions to the schools and roads. Ten per cent. of all the money received from the forest reserves goes to the States for the use of the counties in which the reserves lie, to be used for schools and roads. The amount of this contribution is nearly $70,000 for the first year. It will grow steadily larger, and will form a certain and permanent source of income, which would not have been the case with the taxes whose place it takes.

Finally, a body of intelligent, practical, well-trained men, citizens of the West, is being built up—men in whose hands the public interests, including your own, are and will be safe.

All these results are good; but they have not been achieved by the Forest Service alone. On the contrary, they represent also the needs and suggestions of the people of the whole West. They embody constant changes and adjustments to meet these suggestions and needs. The forest policy of the Government in the West has now become what the West desired it to be. It is a national policy—wider than the boundaries of any State, and larger than the interests of any single industry. Of course it can not give any set of men exactly what they would choose. Undoubtedly the irrigator would often like to have less stock on his watersheds, while the stockman wants more. The lumberman would like to cut more timber, the settler and the miner would often like him to cut less. The county authorities want to see more money coming in for schools and roads, while the lumberman and stockman object to the rise in value of timber and grass. But the interests of the people as a whole are, I repeat, safe in the hands of the Forest Service.

By keeping the public forests in the public hands our forest policy substitutes the good of the whole people for the profits of the privileged few. With that result none will quarrel except the men who are losing the chance of personal profit at the public expense.

Our western forest policy is based upon meeting the wishes of the best public sentiment of the whole West. It proposes to create new reserves wherever forest lands still vacant are found in the public domain, and to give the reserves already made the highest possible usefulness to all the people. So far our promises to the people in regard to it have all been made good; and I have faith that this policy will be carried to successful completion, because I believe that the people of the West are behind it.

THE HIGHEST CAMP IN THE WORLD

MR. HARRINGTON PUTNAM, of New York, sends the following extract from a letter from Mrs Fanny Bullock Workman, who has been making some marvelous mountain ascents in the Himalayas:

"We have just finished a journey to the Nun Kun range, southwest of Ladakh, with six Italian porters and the guide, C. Savage, of Courmayeur. He was with us in 1903 and refused the offers of the Duke for Rumenzori, to go with me. It was my expedition, Dr Workman only deciding to go as my guest at the last moment. We made the first circuit of the range, 90 to 100 miles, over 40 miles of glaciers never before visited. I with Savage and one porter ascended one of the three highest Nun Kun peaks—survey measurement, 23,260 feet—and thus

can for a moment claim world record with men until some one goes higher. Dr Workman went to 22,650 feet. We camped higher than any one has yet camped, highest camp being 19,899 feet, 20,632 feet, and camp America 21,300 feet! All of us conquered two other virgin snow peaks of 18,743 feet and 20,168 feet and four snow columns from 16,500 to 17,300 feet. My idea was to have European porters carry all camp kit after coolies gave out, and this they did successfully from the third camp on. There was chance for observing the effects of rarefied air, and we found insomnia our greatest difficulty. No one slept more than a very few minutes at a time at our three last camps. Our lowest minimum temperature at Camp America was —6° F., and it was bitter in a Mummery tent. This is my last trip, I suppose, but it was glorious and I hate to leave the Himalayas. We climbed well above the Duke, did we not?"

ANNOUNCEMENT

ON another page is printed the program of addresses before the National Geographic Society during the season of 1906–1907, practically all of which will be published in this Magazine during the coming year. In our December number we shall publish a series of illustrations of "The Greatest Hunt in the World"—the drive of wild elephants in Siam—with an article by Miss Eliza R. Scidmore, Foreign Secretary of the National Geographic Society. The same number will contain the address of Hon. John W. Foster, formerly Secretary of State and chairman of the Chinese Delegation to The Hague, on "The New China"; the address of Dr A. P. Davis, Assistant Chief Engineer, U. S. Reclamation Service, on "The Great New Lake in Southern California made by the Colorado River," which has at last been reduced to control again, and also the address, "Colombia—a Land of Great Possibilities," by Hon. John Barrett, U. S. Minister to Colombia.

RECENT MAGNETIC WORK BY THE CARNEGIE INSTITUTION OF WASHINGTON

Magnetic Survey of Pacific Ocean.—The yacht *Galilee*, under the command of Mr W. J. Peters, successfully concluded a cruise of 20,000 miles, leaving San Diego March 2 last and returning October 20. The following region was embraced, as indicated by the ports of call, namely: Fanning Island, Samoan Islands, Fiji Islands, Marshall Islands, Guam, Yokohama, San Diego. Mr Peters' assistants were Mr J. P. Ault and Mr J. C. Pearson, magnetic observers, and Dr H. E. Martyn, surgeon and recorder, Captain J. T. Hayes being the sailing master, as in the cruise of 1905. In all thus far the magnetic elements have been charted over about half of the North Pacific Ocean during the two cruises of 1905 and 1906. The vessel is expected to leave early in December on a third cruise beginning at San Diego and touching at the following ports: Marquesas Islands, Tahiti, Apia, Yap, Shanghai, Hongkong, Yokohama, Dutch Harbor, Sitka, and returning to San Diego.

Land Magnetic Work.—Dr Charles K. Edmunds, professor of physics at Christian College, Macao, China, determined the three magnetic elements (declination, dip, and intensity) at a number of stations along the Chinese coast. In the South Pacific Ocean, observations were made on various islands by Mr G. Heimbrod. In Canada the magnetic elements were determined by Dr L. A. Bauer and Messrs P. H. Dike and E. H. Bowen at 70 stations, distributed uniformly between the parallels of 42° and 49° and the meridians of longitude 65° and 105° west; in this region but comparatively few observations existed. With the completion of the latter work it is now possible to extend the magnetic maps for the United States to the forty-ninth parallel across the continent. The United States Coast and Geodetic Survey has in preparation a new set of magnetic maps based upon all accurate data obtained to date.

PROGRAM OF MEETINGS OF THE NATIONAL GEOGRAPHIC SOCIETY, 1906-1907

The completed program of the popular and technical meetings of the National Geographic Society for 1906–1907 is given below.

The annual banquet of the Society will be held December 15, at the New Willard, Washington, D. C. It is hoped that many members from neighboring cities will attend.

The Library of the Society is open to members during office hours. The Society is receiving the geographical, scientific, and popular periodicals, and has a considerable number of useful geographical books.

THE POPULAR COURSE

The general subject of the popular course of addresses for 1906–1907 will be "Pan-America."

The addresses in this Course will be delivered in the National Rifles Armory, 920 G street, at 8 p. m., on Friday evenings of the following dates.

November 9—"Colombia—a Land of Great Possibilities." By Hon. John Barrett, U. S. Minister to Colombia. Illustrated.

November 16—"Digging the Ditch." By Dr Willis Fletcher Johnson, Associate Editor of the New York *Tribune* and author of "Four Centuries of the Panama Canal." Illustrated.

This will be a popular account of the greatest engineering feat of all ages, with a description of the Republic of Panama and of the Panamans.

November 30—"Beautiful Ecuador." By Hon. Joseph W. Lee, U. S. Minister to Ecuador. Illustrated.

December 7—"The New China." By Hon. John W. Foster, formerly Secretary of State and Chairman of the Chinese delegation to the Hague.

December 14—"Russia and the Duma." By Mr William E. Curtis. Illustrated.

December 21—"Our Immigrants: Where They Come From, What They Are, and What They Do After They Get Here." By Hon. F. P. Sargent, Commissioner General of Immigration. Illustrated.

January 4—"Camping Expeditions in the Canadian Rockies." By Mr Howard Du Bois.

January 18—"The Guianas." By Prof. Angelo Heilprin, of Yale University. Illustrated.

Very little is known about this fascinating section of South America—one of the most beautiful and luxuriant regions of the globe.

January 19 (Saturday)—"Two Thousand Miles in the Saddle Through Colombia and Ecuador." By Hon. John Barrett, U. S. Minister to Colombia. Illustrated.

January 25—"Bolivia—a Country Without a Debt." By the Bolivian Minister, Señor F. Calderon. Illustrated.

February 1—"The Rising Pacific Empire." By Hon. George C. Perkins, U. S. Senator from California.

February 8—"An American in Cuba." By Mr Walter D. Wilcox. Illustrated.

Mr Wilcox is well known to members of the National Geographic Society because of his previous wonderfully illustrated lectures on the Canadian Rockies. For the past two years he has been living in Cuba, where he is interested in a mahogany forest.

February 9—"A Trip to Argentine and Paraguay." By Mr John W. Titcomb, of the U. S. Bureau of Fisheries. Illustrated.

Mr Titcomb was recently invited by the Argentine government to investigate the fisheries of the republic and to recommend a plan for their improvement. He spent nearly a year in Argentine and Paraguay, engaged on the work, which gave him special opportunities of seeing the people and country.

February 15—"Ten Years of Polar Work; or, What we Know and What we Want to Know." By Mr Herbert L. Bridgman, Secretary of the Peary Aetic Club. Illustrated.

March 1—"Santo Domingo and Haiti." By Rear Admiral Chester, U. S. Navy. Illustrated.

March 15—"The Regeneration of Korea." By Mr George Kennan. Illustrated.

March 23—"Queer Methods of Travel in Curious Corners of the World." By Hon. O. P. Austin, Chief Bureau of Statistics. Illustrated.

March 29—"Mexico—the Treasure-house of the World." Illustrated.

April 5—"A Popular Explanation of Earthquakes and Volcanoes." By Dr G. K. Gilbert, of the U. S. Geological Survey. Illustrated.

April 12—"Captain John Smith and Old Jamestown." By Mr W. W. Ellsworth, Secretary of the Century Co.

The approaching Jamestown Exposition adds special value to this lecture, which will be illustrated with 150 stereopticon views of the famous colonial homes on the James river, of photographs connected with Captain John Smith, and of all the pictures that bear on the Pocahontas story.

Announcements will be made later of addresses by Commander Robert E. Peary, U. S. Navy, who has recently attained "Farthest North," and by Dr F. A. Cook, of Brooklyn, who has accomplished the first ascent of Mount McKinley, the highest mountain in North America.

SCIENTIFIC MEETINGS

The meetings of this course will be held at the home of the Society, Hubbard Memorial Hall, Sixteenth and M streets, at 8 p. m., on the following dates:

November 10 (Saturday)—"Prosperous Porto Rico." By Hon. William F. Willoughby, Treasurer of Porto Rico.

November 23 (Friday)—"The Great New Lake in Southern California made by the Colorado River." By Dr A. P. Davis, Assistant Chief Engineer, U. S. Reclamation Service. Illustrated.

December 10 (Monday)—"Agricultural Progress in the United States." By Hon. Willett M. Hays, Assistant Secretary of Agriculture. Illustrated.

December 17 (Monday)—"Enterprising Siam." By Mr Henry S. Kerr, of New York, who has recently returned from that distant land. Illustrated.

December 28 (Friday)—"Acclimatizing Fishes—or Transplanting Fishes from the Atlantic to the Pacific, and Vice Versa, etc." By Dr Hugh M. Smith, Deputy Commissioner, Bureau of Fisheries. Illustrated.

January 11 (Friday)—"Annual Meeting. "Aboriginal Agriculture in Guatemala." By Mr O. F. Cook, of the U. S. Department of Agriculture. Illustrated.

January 16 (Wednesday)—"The U. S. Forest Service." By Mr Gifford Pinchot, Forester. Illustrated. The Forest Service has charge of 114,666,058 acres of forest land, worth $400,000,000.

January 22 (Tuesday)—"The Coal Lands of the U. S. Public Domain." By Mr M. R. Campbell, of the U. S. Geological Survey. Illustrated.

February 9 (Saturday)—"A Visit to Sumatra." By Mr George H. Peters, of the U. S. Naval Observatory. Illustrated.

February 18 (Monday)—"Reclaiming the Desert." By Mr C. J. Blanchard, of the U. S. Reclamation Service. Illustrated. The Reclamation Service has a fund of $40,000,000, which is being invested in irrigation works.

February 22 (Friday)—"Reclaiming the Swamp Lands of the United States." By Mr H. M. Wilson, of the U. S. Geological Survey. Illustrated.

March 8 (Friday)—"Twenty Years in Beirut and Damascus; or, The Syria of Today." By Rev. F. E. Hoskins. Illustrated.

March 22 (Friday)—"Utilizing the Surface Waters of the United States for Power." By Mr H. A. Pressey, C. E. Illustrated.

April 6 (Saturday)—"The South Sea Islanders." By Mr A. B. Alexander, of the U. S. Bureau of Fisheries. Illustrated.

April 15—"Photographs of Wild Game Taken by Themselves." By Hon. George Shiras, 3d. Illustrated.

April 19 (Friday)—"The Bureau of American Republics." By Hon. W. C. Fox, Director of the Bureau of American Republics.

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The National Geographic Magazine is sent free of charge to all members of the National Geographic Society

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The following form is enclosed for use in the nomination of persons for membership

Please detach and fill in blanks and send to the Secretary

Dues: Annual membership, $2; Life membership, $50. If check be enclosed, please make it payable to order of the National Geographic Society, and, if at a distance from Washington, remit by New York draft or post-office money order.

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To the Secretary, National Geographic Society, Washington, D. C.:

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