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CONTENTS

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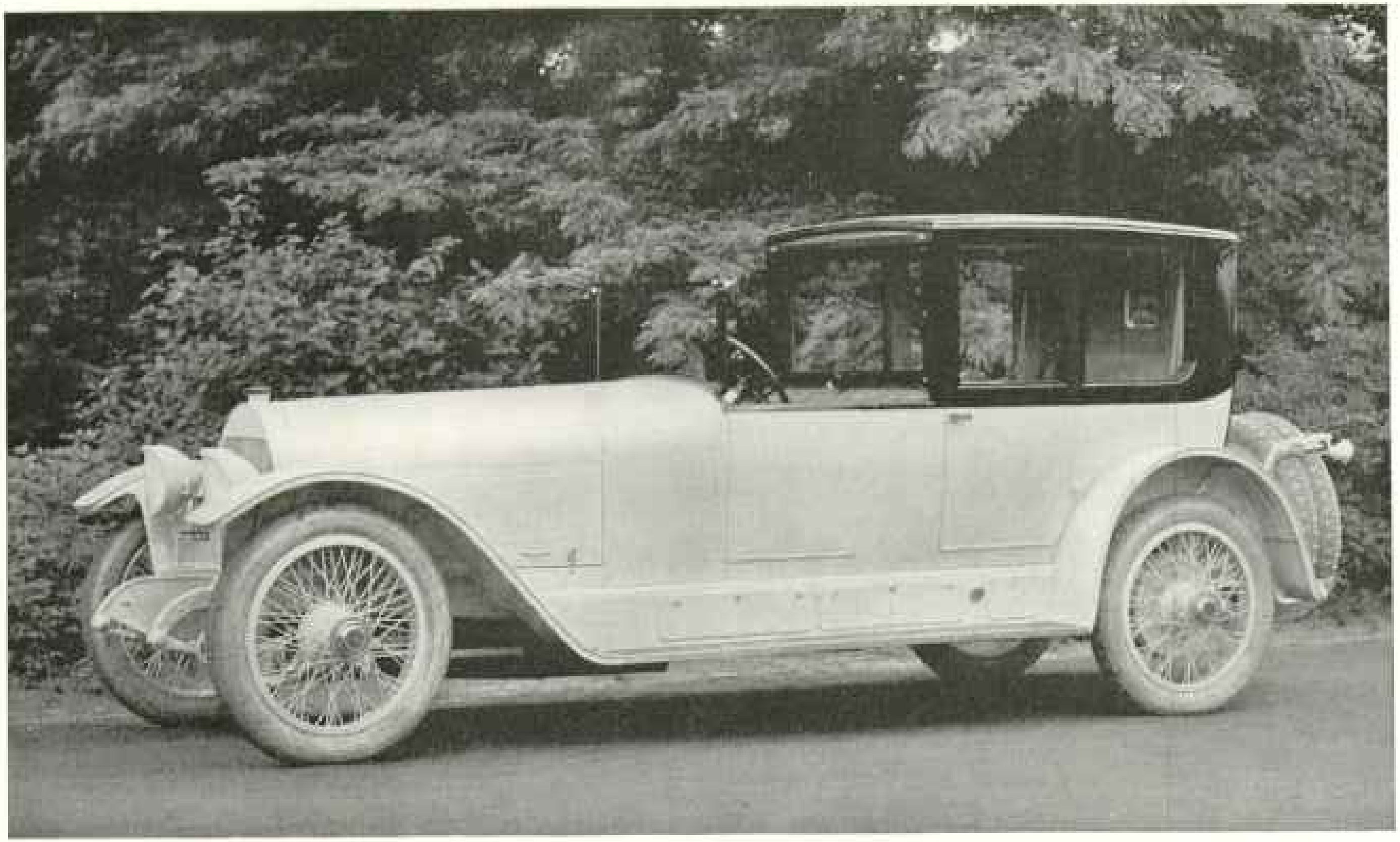
HUBBARD MEMORIAL HALL

SIXTEENTH AND M STREETS, WASHINGTON, D. C.

To carry out the purpose for which it was founded thirty-one years ago, namely, "the increase and diffusion of geographic knowledge," the National Geographic Society publishes this Magazine. All receipts from the publication are invested in the Magazine itself or expended directly to promote geographic knowledge and the study of geography. Articles or photographs from members of the Society, or other friends, are desired. For material that the Society can use, adequate remuneration is made. Contributions should be accompanied by an addressed return envelope and postage, and be addressed:

GILBERT GROSVENOR, EDITOR



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You know that boy—the world called him

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He is the boy we love so in "Treasure Island," he is the youth in "Kidnapped," he is the gallant soldier in "St. Ives," he is the irresponsible king in "Prince Otto," he is the preposterous lawyer in "The Wrong Box," he is the daring wanderer in the South Seas, he is boyhood eternal, undying. But in "The Master of Ballantrae" he finds no place—and in "Dr. Jekyll and Mr. Hyde" we look for him in vain; for these were written when the boy's soul was overborne by the wisdom of the world—for this was a wise man, this ROBERT LOUIS STEVENSON—for him genius flashed into the dark spots and the queer spots and the startling spots of human fates. If we could understand genius, then we might know how one man wrote two such books as the lovely "Child's Garden of Verses" and the dark and dreadful "Ebb Tide."

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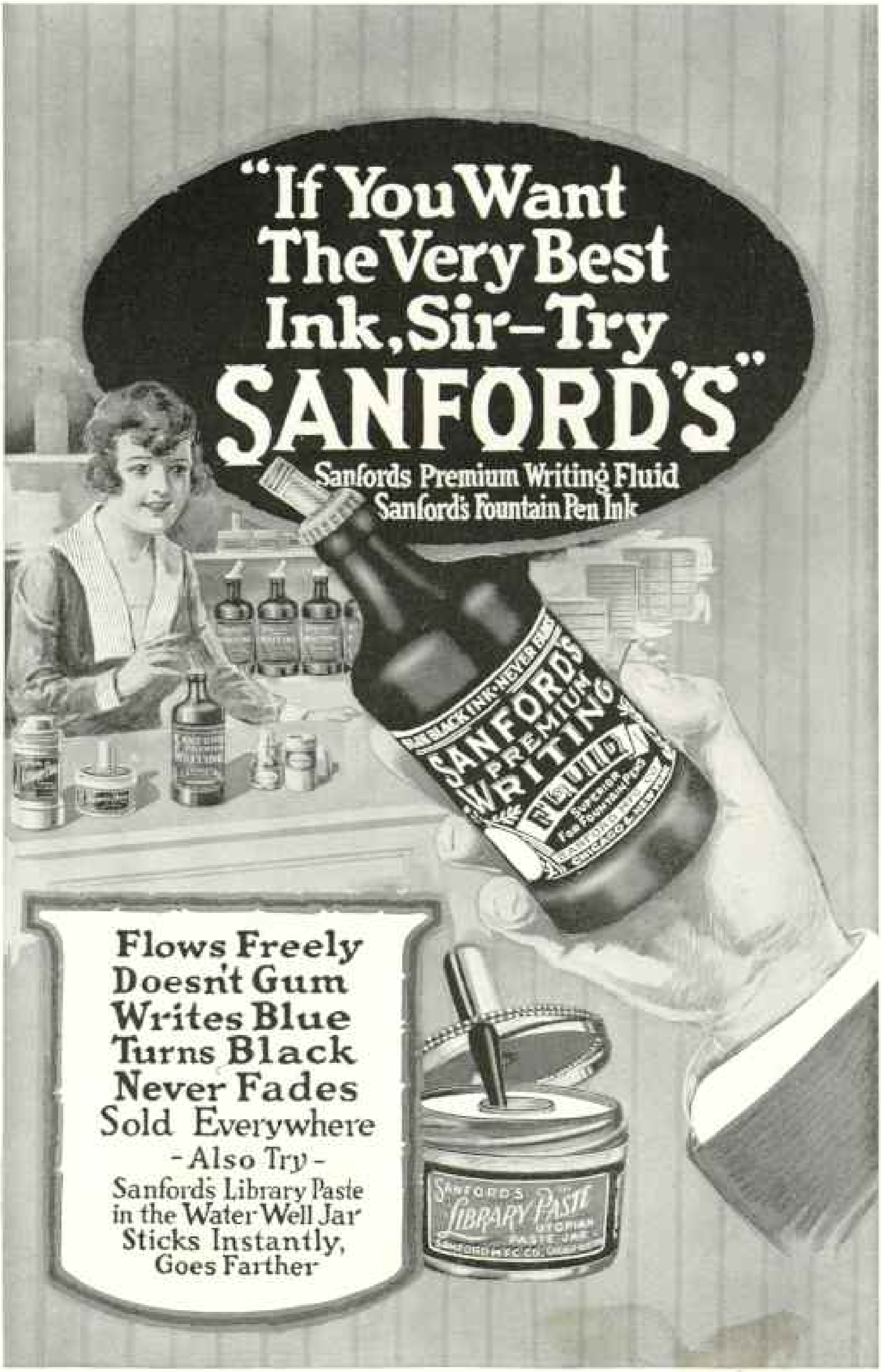
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(2066)

Concrete Roads and Lettuce Salad

HAVING lettuce salad when you want it may depend on the road. That may not interest you. **But the road that makes certain you can have lettuce salad every day in the year also makes certain that you can get fresh eggs, milk, poultry, butter, potatoes and other things when you want them—and that should interest you.** Think of the farm produce you would buy or sell if you could, but that now goes to waste because the roads prevent marketing.

The U. S. Food Administration estimates that bad roads in Erie Co., Pa., added at least $2,000,000 to the food bill of Erie and other cities in the county last winter.

In 1905 the Zuck Greenhouse Co. built a small greenhouse several miles out of Erie. The problem then of transporting produce to Erie and to the express companies operating out of Erie was a serious one. In 1910 the Zuck Company bought a motor truck, but the earth roads were so bad in wet weather that a team of horses always accompanied the truck to pull it out of mudholes.

Now the road has been paved with concrete. The Zuck plant consists of 13 modern greenhouses and produces large quantities of vegetables yearly.

Read what F. J. Zuck says about this concrete road:

"Now we can deliver our produce free from bruises, blemishes and disarrangements caused by jolting over rough roads through mud.

"The cost of hauling over the concrete road, when compared with the original earth road, has been reduced 50 per cent. This is due to the greater speed and larger loads possible over the concrete road, together with the reduction in cost of operating and maintaining our trucks. Added to this is the availability of the concrete road during the winter and spring, **when greenhouse food is in greatest demand.**

"Upon receiving assurances that the road upon which our greenhouses are located would be permanently improved with reinforced concrete, we immediately awarded contracts for additions to our plant. These, together with plans for further improvements, have been made possible by the economy of transportation over the concrete road to Erie."

Erie can have lettuce salad any day—and the road that will bring you lettuce salad when you want it will bring you the other things you want when you want them.

Is it necessary to ask whether concrete roads pay?

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Concrete for Permanence

WEED TIRE CHAINS SAVED THEIR LIVES

Without tire chains, the brakes would have been useless—with brakes alone, disaster could not have been prevented.

The above picture illustrates one of the numerous situations in which you may be placed during bad road weather—when suddenly some one ***appears directly in your path*** and, in a fraction of a second, you must apply your brakes and bring your car to a quick stop. It is ***then*** you require a firm, ***unfailing grip*** on the road which can only be obtained by equipping ***all four tires*** with

WEED TIRE CHAINS

Cars with ***Chainless tires*** on wet, greasy, slippery pavements lack brake power to the same degree as they would if their brake linings were made of wet, greasy, slippery bands of rubber. ***Tire Chains*** are the most effective supplementary addition to brake power—in fact, ***brake efficiency*** is largely dependent upon the use of chains.

No matter how expert and careful you are when driving on wet pavements and muddy roads, ***the treacherous bare tires defeat your very best efforts*** to prevent a skid or bring your car safely to a sudden stop.

The memory of one accident spoils future enjoyment in the use of a car so don't run the risk of such accidents. Don't forever forfeit the pleasures and comforts of motoring. Safety and confidence can surely be yours ***by equipping all four tires with Weed Chains.***

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And you asked us for Lewis Machine Guns—nothing but Lewis Machine Guns—all we could make. And you got them and used them—in uniform—under the Stars and Stripes.

And you've won the war. So now we can go back to making your hunting rifles and pistols again for you as individuals—for your private, personal needs in civil life.

We're working hard to get you the guns that you've unselfishly and patriotically waited for so long.

And the .32 Savage Automatic Pistol and the .22 Savage Hi-Power and .250-3000 Savage Rifles will be ready by April.

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How I Improved My Memory In One Evening

The Amazing Experience of Victor Jones

"Of *course* I place you! Mr. Addison Sims of Seattle.

"If I remember correctly—and I *do* remember correctly—Mr. Burroughs, the lumberman, introduced me to you at the luncheon of the Seattle Rotary Club three years ago in May. This is a pleasure indeed! I haven't laid eyes on you since that day. How is the grain business? And how did that amalgamation work out?"

The assurance of the speaker—in the crowded corridor of the Hotel McAlpin—compelled me to turn and look at him, though I must say it is not my usual habit to "listen in" even in a hotel lobby.

"He is David M. Roth, the most famous memory expert in the United States," said my friend Kennedy, answering my question before I could get it out. "He will show you a lot more wonderful things than that, before the evening is over."

And he did.

As we went into the banquet room the toastmaster was introducing a long line of the guests to Mr. Roth. I got in line and when it came my turn, Mr. Roth asked, "What are your initials, Mr. Jones, and your business connection and telephone number?" Why he asked this I learned later, when he picked out from the crowd the 80 men he had met two hours before and called each by name without a mistake. What is more, he named each man's business and telephone number, for good measure.

I won't tell you all the other amazing things this man did except to tell how he called back, without a minute's hesitation, long lists of numbers, bank clearings, prices, lot numbers, parcel-post rates and anything else the guests gave him in rapid order.

* * * * * * *

When I met Mr. Roth again—which you may be sure I did the first chance I got—he rather bowled me over by saying, in his quiet, modest way:

"There is nothing miraculous about my remembering anything I want to remember, whether it be names, faces, figures, facts, or something I have read in a magazine.

"*You can do this just as easily as I do.* Any one with an average mind can learn quickly to do exactly the same things which seem so miraculous when I do them.

"My own memory," continued Mr. Roth, "was originally very faulty. Yes it was—a really *poor* memory. On meeting a man I would lose his name in thirty seconds, while now there are probably 10,000 men and women in the United States, many of whom I have met but once, whose names I can tell instantly on meeting them."

"That is all right for you, Mr. Roth," I interrupted, "you have given years to it. But how about me?"

"Mr. Jones," he replied, "I can teach you the secret of a good memory in one evening. This is not a guess, because I have done it with thousands of pupils. In the first of seven simple lessons which I have prepared for home study, I show you the basic principle of my whole system and you will find it—not hard work, as you might fear—but just like playing a fascinating game. I will prove it to you."

He didn't have to prove it. His Course did: I got it the very next day from his publishers, the Independent Corporation.

When I tackled the first lesson, I suppose I was the most surprised man in forty-eight states to find that I had learned—in about one hour—how to remember a list of one hundred words so that I could call them off forward and back without a single mistake.

That first lesson *stuck*. And so did the other six.

Read this letter from Terence J. McManus, of the firm of Olcott, Bonynge, McManus & Ernst, Attorneys and Counsellors at Law, 170 Broadway, and one of the most famous trial lawyers in New York:

> "May I take occasion to state that I regard your service in giving this system to the world as a public benefaction. The wonderful simplicity of the method, and the ease with which its principles may be acquired, especially appeal to me. I may add that I already had occasion to test the effectiveness of the first two lessons in the preparation for trial of an important action in which I am about to engage."

Mr. McManus didn't put it a bit too strong.

The Roth Course is priceless! I can absolutely *count* on my memory now. I can call the name of most any man I have met before—and I am getting better all the time. I can remember any figures I wish to remember. Telephone numbers come to mind instantly, once I have filed them by Mr. Roth's easy method. Street addresses are just as easy.

The old fear of forgetting (you know what that is) has vanished. I used to be "scared stiff" on my feet—because I wasn't sure. I couldn't remember what I wanted to say.

Now I am sure of myself, and confident and "easy as an old shoe" when I get on my feet at the club, or at a banquet, or in a business meeting, or in any social gathering.

Perhaps the most enjoyable part of it all is that I have become a good conversationalist—and I used to be as silent as a sphinx when I got into a crowd of people who knew things.

Now I can call up like a flash of lightning most any fact I want right at the instant I need it most. I used to think a "hair-trigger" memory belonged only to the prodigy and genius. Now I see that every man of us has that kind of a memory if he only knows how to make it work right.

I tell you it is a wonderful thing, after groping around in the dark for so many years, to be able to switch the big search-light on your mind and see instantly everything you want to remember.

This Roth Course will do wonders in your office.

Since we took it up you never hear any one in our office say "I guess" or "I think it was about so much" or "I forget that right now" or "I can't remember" or "I must look up his name." Now they are right there with the answer—like a shot.

Have you ever heard of "Multigraph" Smith? Real name H. O. Smith, Division Manager of the Multigraph Sales Company, Ltd., in Montreal. Here is just a bit from a letter of his that I saw last week:

> "Here is the whole thing in a nutshell: Mr. Roth has a most remarkable Memory Course. It is simple, and easy as falling off a log. Yet with one hour a day of practice, any one—I don't care who he is—can improve his Memory 100% in a week and 1,000% in six months."

My advice to you is, don't wait another minute. Send to Independent Corporation for Mr. Roth's amazing course and see what a wonderful memory you have got. Your dividends in *increased earning power* will be enormous.

VICTOR JONES.

Send No Money

So confident is the Independent Corporation, the publishers of the Roth Memory Course, that once you have an opportunity to see in your own home how easy it is to double—yes, triple—your memory power in a few short hours, that they are willing to send the course on free examination.

Don't send any money. Merely mail the coupon or write a letter and the complete course will be sent, all charges prepaid, at once. If you are not entirely satisfied send it back any time within five days after you receive it and you will owe nothing.

On the other hand, if you are as pleased as are the thousands of other men and women who have used the course, send only $5 in full payment. You take no risk and you have everything to gain, so mail the coupon now, before this remarkable offer is withdrawn.

FREE EXAMINATION COUPON

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Address.....

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Nat. Geog. 2-15.

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Just rub the lively, bubbling suds deep down into the pores. Massage as vigorously as you please. Remember that Ivory cannot irritate—physicians recommend it for a baby's tender skin.

The rich, lasting lather softens every particle of dirt; dislodges every atom of the skin's excretions. Then, because Ivory contains no sticky, clinging oil, a quick rinsing carries away every trace of the soap, and the loosened dirt goes with it.

After a washing with Ivory Soap, the skin tingles with the delicious, refreshing, *thorough cleanliness* that is the basis of skin health.

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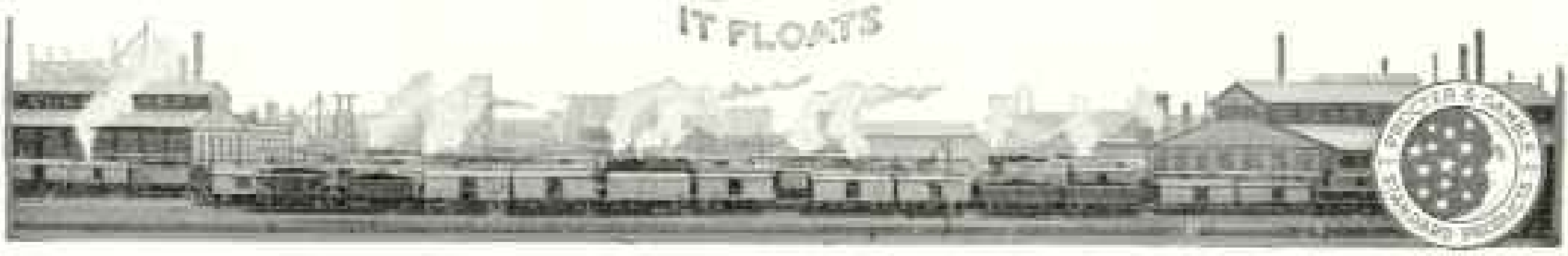


VOL. XXXV, NO. 2 WASHINGTON FEBRUARY, 1919

THE NATIONAL GEOGRAPHIC MAGAZINE

THE NORTH SEA MINE BARRAGE*

BY CAPT. REGINALD R. BELKNAP, U. S. N.

SAVAGE beasts are trapped most easily near their dens. That is the action which our Navy Department urged against the enemy submarine campaign.

From the moment of entering into the war, our Navy advocated strong offensive measures to block the German bases, so that no more submarines, or very few, might get out, and those returning might be caught and destroyed.

Now, the German forces were very strong for operations near their own coast, and although the British destroyers were constantly planting mines in the Helgoland Bight, they could not prevent the German mine-sweepers from keeping channels open through these mine fields.

ELEMENTS WHICH AIDED THE ENEMY AND HANDICAPPED THE ALLIES

The enemy even had special vessels called barrage-breakers, and they were also very much assisted by bad weather, fogs, and variable currents, which handicapped the Germans much less than the British, who had to operate from a starting point farther away.

There was also the Skagerrack passage between Denmark and Norway, where no barrier could be placed without violating neutral waters. Consequently, the enemy submarines could always use this channel going to and from their bases at Kiel and Wilhelmshaven.

Any barriers that the allied navies could place near the German coast and near the Skagerrack were so close to the German bases that the enemy could at any time break through at some point by suddenly attacking there with more force than the allies could maintain over any one section of the whole line, so far away from the bases in Great Britain. Just as in a game of football, no matter how strong the line is, a wedge of two or three players together, striking the line in one place can nearly always break through before more men can get there to stop them. That was the situation eighteen months ago.

There were mines in plenty near the German coast, forcing all enemy craft to be very careful and now and then doing them some damage; but the submarines could still go in or out. The barrier close to the German coast could not be made effective

AN AMERICAN INVENTOR'S IDEA ADAPTED BY THE BUREAU OF ORDNANCE

As soon as America went into the war a flood of inventions poured into Washington—all kinds of schemes for winning the war. Among them was one by an American electrician, which, though unsuited for naval purposes in the form in which submitted, had one part that was adaptable to a submarine mine, offering great

* An address delivered by Capt. Reginald R. Belknap, U. S. N., before the National Geographic Society, in Washington, D. C., February 7, 1919. Captain Belknap was the officer in direct command of the American Navy's mine-laying squadron.

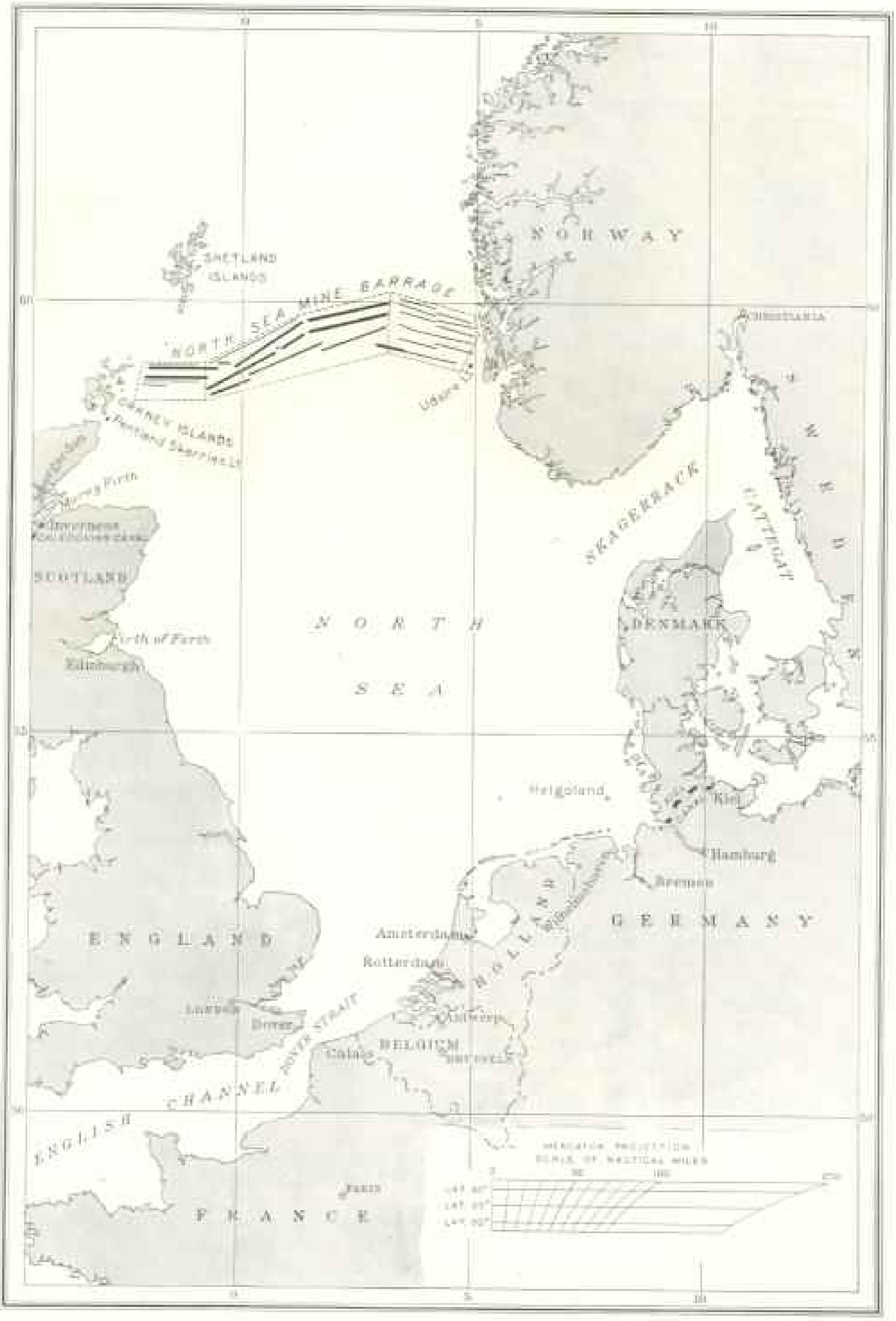
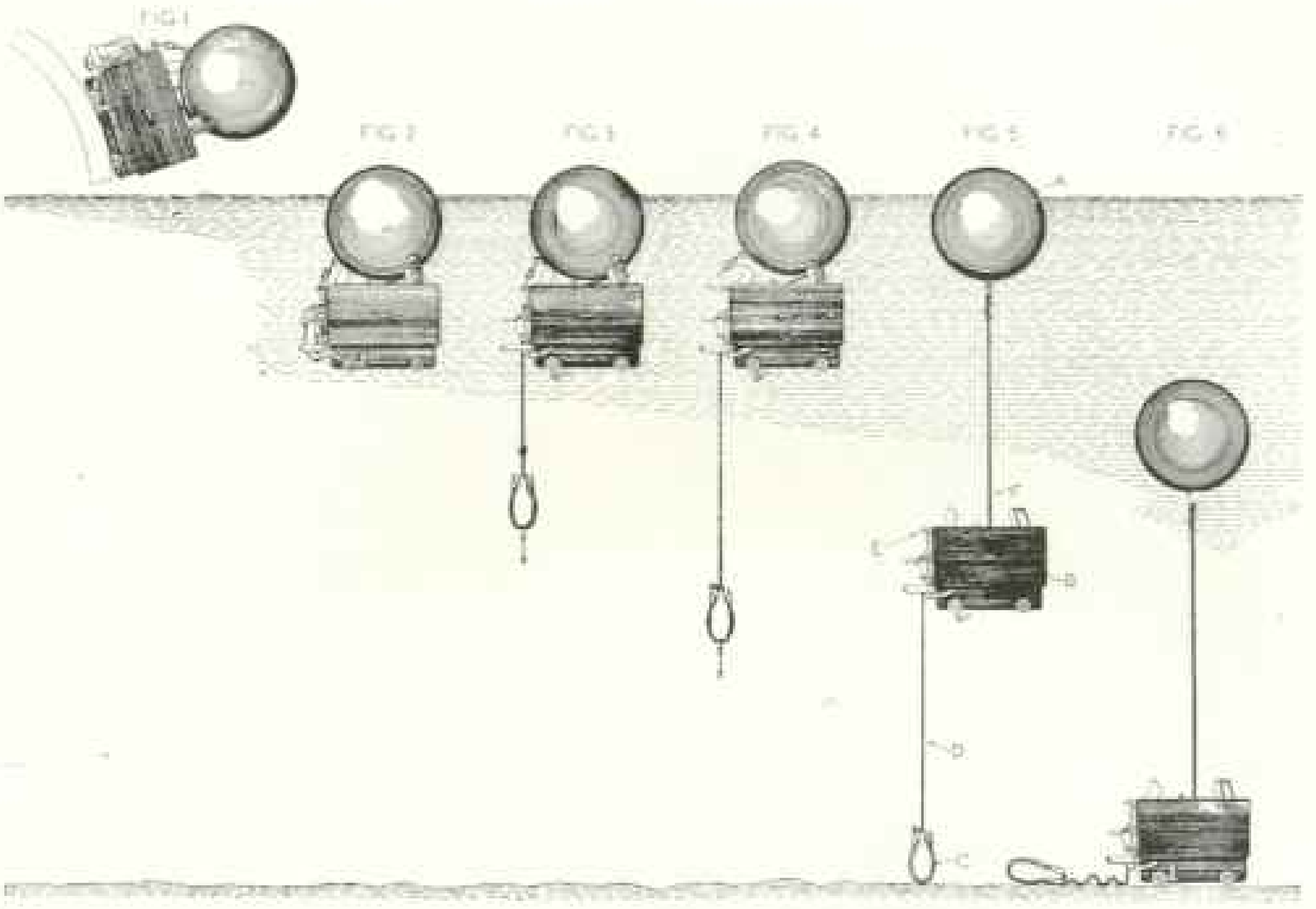


CHART OF THE NORTH SEA, SHOWING THE LOCATION OF THE MINE BARRAGE LAID BY THE AMERICAN AND BRITISH MINING SQUADRONS

When this mine barrage was found to be effective, Germany realized that her submarine warfare had failed and that the ultimate defeat of her land forces was inevitable (see also detailed map of the mine field on page 109).



HOW A MINE IS ANCHORED AT THE DESIRED DEPTH BELOW THE SURFACE OF THE SEA

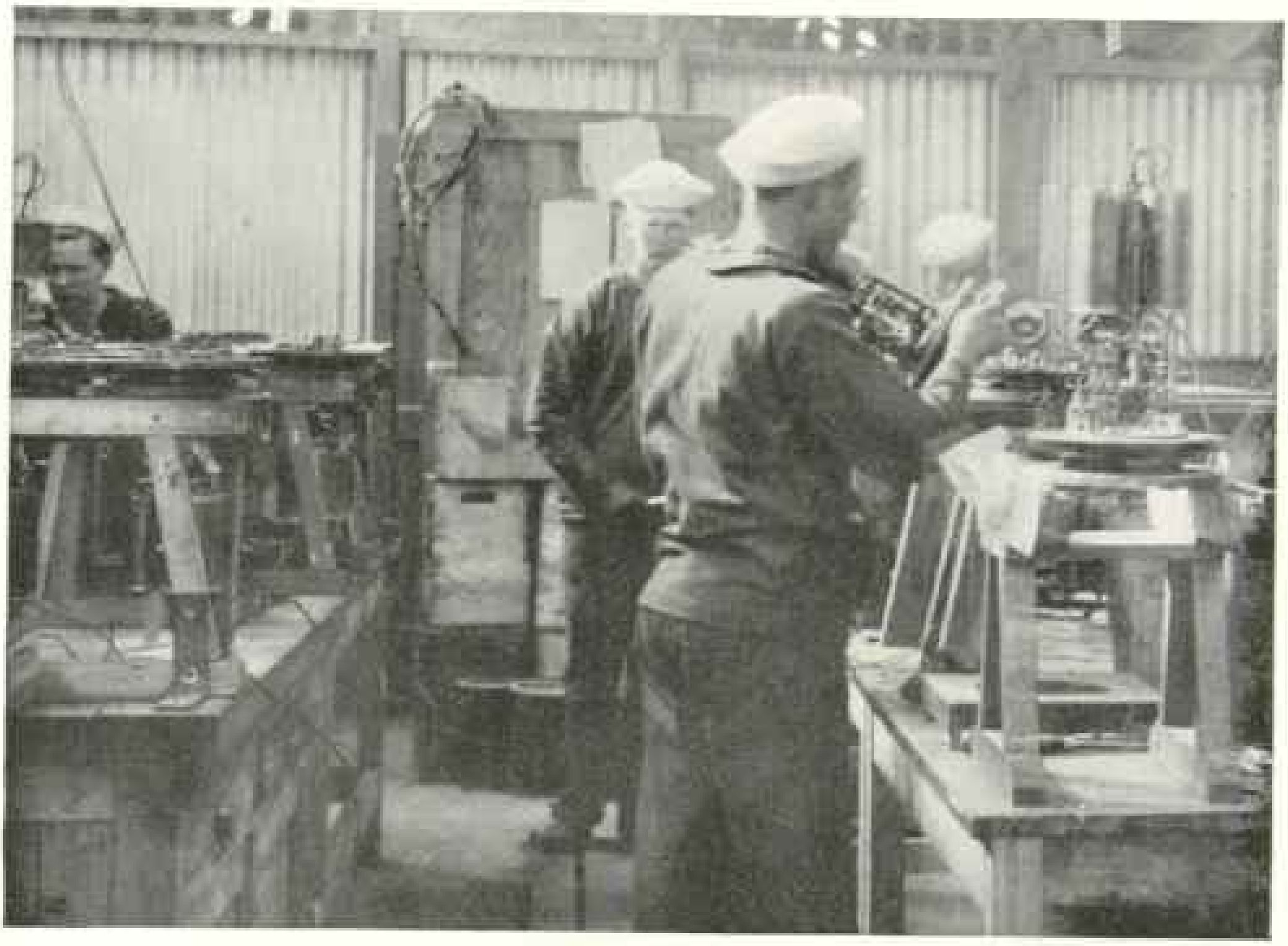
The progress of a mine after it is thrown overboard is shown in Figures 1 to 6. When a mine is dropped overboard, the mine proper (A) floats, while the box-like anchor (B) slowly sinks. Inside the anchor is the mooring wire (F), which unwinds from a reel as the anchor sinks. The reel is unlatched (E) by the downward pull of a plummet (C) at the end of a cord (D), which is made the same length as it is desired to have the mine stay below the surface. The plummet, being nearly solid metal, sinks faster than the more bulky anchor box (see Fig. 3), thus keeping the cord (D) taut. As soon as the plummet strikes bottom, however, the cord slackens and the reel in the anchor box is locked, thus preventing any more mooring wire from unwinding. The anchor continues to sink, pulling the mine case under the water until the anchor strikes bottom, as in Fig. 6 (see text, page 91).

possibilities, especially against submarines.*

After putting it through some tests, the Naval Bureau of Ordnance felt confident that here was what they were looking for. It was not long before the British naval authorities came to think so too, and a joint operation was projected, to be undertaken by the mining squadrons of the two navies.

The plan was to plant a mine field across the North Sea, from Scotland to Norway, a distance of 230 miles, or as far as from Boston to New York. It was a bold scheme; some said foolish, impossible. Nothing like it had ever been undertaken. Moreover, for lack of time, tens of millions would have to be spent outright, by the British as well as ourselves, before a single mine could be tested complete—most unusual procedure, requiring great administrative courage on the part of Rear Admiral Ralph Earle, Chief of the Naval Bureau of Ordnance, upon whom the odium would have fallen had the mine proved a failure. But it was the only way to make an

* The inventor to whom the author refers was Mr. Ralph C. Browne, of Salem, Mass., whose design for a submarine gun was adjudged impractical. One of the elements of this gun, however, was recognized by Commander S. P. Fullinwider, U. S. N., and his assistant, Lieutenant Commander T. S. Wilkinson, Jr., U. S. N., in the Bureau of Naval Ordnance, as having great possibilities if adapted to a mine against submarines. Mr. Browne gladly acceded to the Naval Ordnance Bureau's request to collaborate with its experts in the development of such a mine.



AMERICAN BLUEJACKETS ADJUSTING THE DELICATE MECHANISM WHICH CHANGES A MINE FROM A HARMLESS, INSENSATE BALL OF STEEL TO CONCENTRATED CATACLYSM FOR ANYTHING WHICH TOUCHES IT

effective barrier that could be maintained against attempts to break through (see maps on pages 86 and 109).

If mines of previous types were used their number was prohibitive, impossible to manufacture or provide with explosive within two years, under existing conditions, not to mention the task of planting; but the new American mine would do more than twice what the others could, and the joining of our mining forces with the British would more than double the means available.

From the outset, the operation was seen to be of great magnitude, with a mass of detail requiring constant foresight and careful adjustment. Besides the bigness, other features promised great difficulty, such as deep water, 300 to 900 feet, danger to the mine-layers from their own mine fields in bad weather and fog, and inexperience of the large proportion of new personnel.

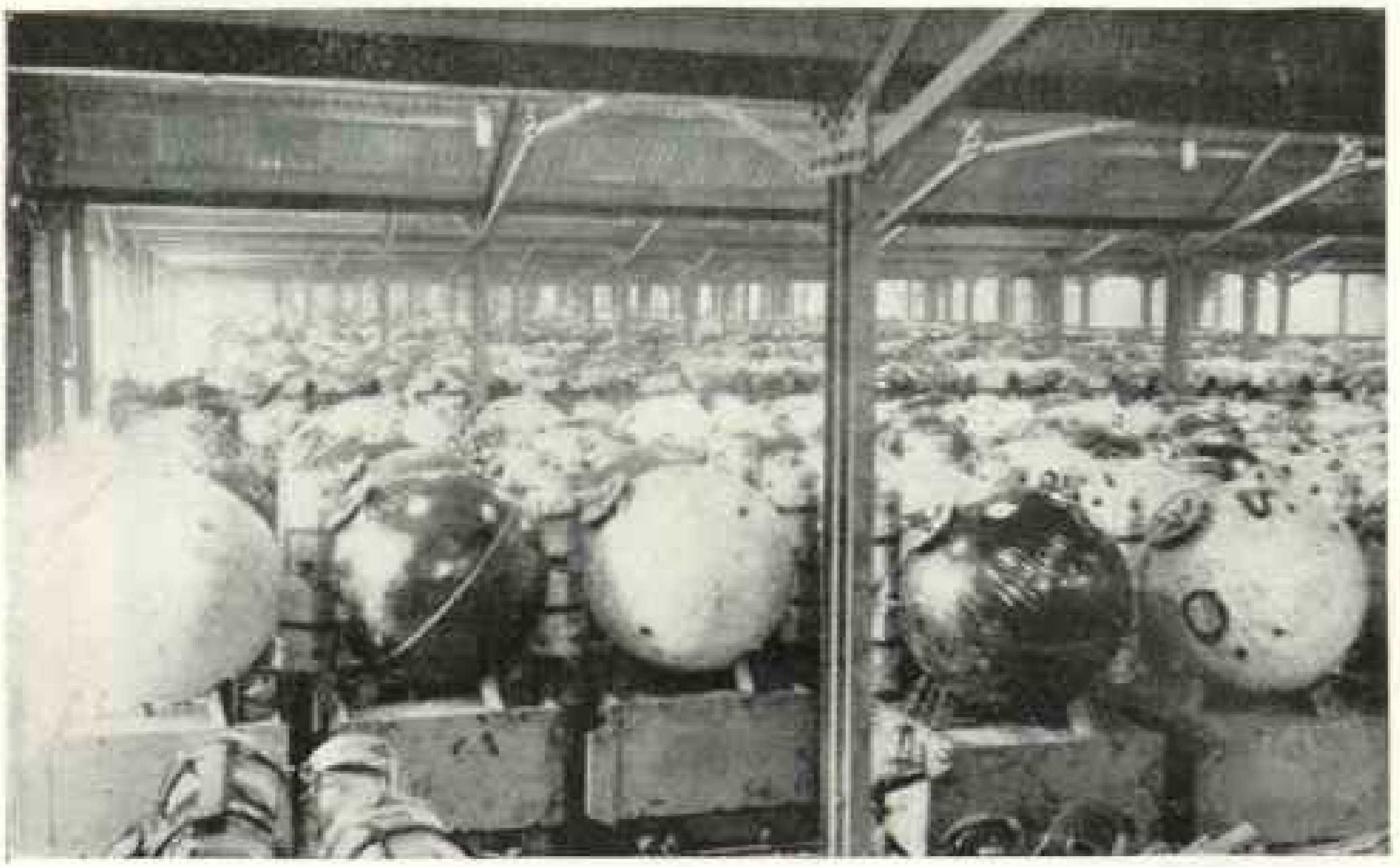
Fortunately, our Navy had been developing a mining force for nearly three years. It was small but well trained, and it looked upon difficulties only as things to be overcome. On the strength of its own experience, this force was confident that the large operation could be accomplished.

Likewise, the British, with their three years' experience in the war and knowledge of North Sea weather, felt sure it could be done.

Difficult in many ways, seen and also unseen—venturesome, arduous, and very hazardous—it was all of these beyond any doubt; yet, if only half successful, the operation would go far toward beating the submarines, and it *could be done*. So it was undertaken. From the President down, every one in authority was strong for it.

THE ORDER: "GO AHEAD"

All these preliminaries take time, and the new invention itself had to be put through severe trials before we could feel sure enough; but by the end of October,



STORED LIKE GIANT EGGS IN A GIGANTIC CRATE

A warehouse containing some of the 70,117 mines which were laid jointly by the British and American mine-laying squadrons in the North Sea. Four-fifths of the mines were laid by American ships. The actual casualties inflicted on the enemy submarine fleet probably will never be known, but the Germans themselves are said to admit the loss of 23 undersea boats in this area. The British admiralty staff hold that the surrender of the German fleet and the armistice were caused largely by the failure of the submarine warfare (see text, page 109).

1917, the definite order was given to go ahead. The Secretary of the Navy, Josephus Daniels, expressed the desire for the best efforts of all who might be concerned, and offered his own further action or influence whenever needed.

Cooperation in the fullest measure was necessary from the start. Over 500 contractors and subcontractors were soon engaged in the manufacture of the many parts, small and large, that go into the make-up of a complete mine.

Besides being a rush order all through, the task was complicated by the necessity for keeping parts of the mine secret. Some pieces had to be made here and others there and both kinds sent to a third place to be joined, and all of the parts were finally delivered at Norfolk, Va., for shipment to Scotland, where the complete mines were to be assembled and adjusted, ready to plant.

Such a manufacturing task would demand the utmost care in ordinary times. The hurry and pressure and disturbances due to war conditions added many difficulties; yet, so great was the interest and so well was the operation's importance understood, there was no halting nor slighting of the work anywhere.

A submarine mine of today consists of a mine case, shaped like a ball or egg, about one yard in diameter, and an anchor in the form of an iron box about two feet square, connected by a wire rope mooring cable the size of one's little finger. The mine case contains the charge of high explosive—300 pounds of TNT in our mines—and the firing mechanism.

When assembled, the mine case is mounted on the anchor, the combination standing about five feet high and weighing 1,400 pounds. The anchor has four small wheels, like car wheels, to run on steel tracks, and thus the mines may be easily moved along the decks to the launching point.

WHEN THE MINE GOES OVERBOARD

When the mine goes overboard, the mine case floats on the surface, while the

A WET WINTER MORNING AT A U. S. NAVAL BASE IN FOG-AND-MIST-DRENCHED SCOTLAND

American mine material was unloaded on the west side of Scotland and thence the cargoes were forwarded by canal barges and by rail to Inverness and Invergordon, on Cromarty Firth. These harbors open on Moray Firth, about eight miles apart, on the northeast coast of Scotland.

TRUCKING TONS OF TNT AT A U. S. NAVAL BASE IN SCOTLAND

These black globes of imprisoned death will be attached to their box anchors and then transferred to the mine-laying vessels of the American Navy.

box-like anchor slowly sinks. Inside the anchor the mooring wire is wound on a reel, which unwinds as the anchor goes down. This reel is unlatched by the downward pull of a plummet at the end of a cord, which is made the same length that it is desired to have the mine stay below the surface. Thus, if the mine is to be 15 feet beneath the surface, the plummet cord is 15 feet long.

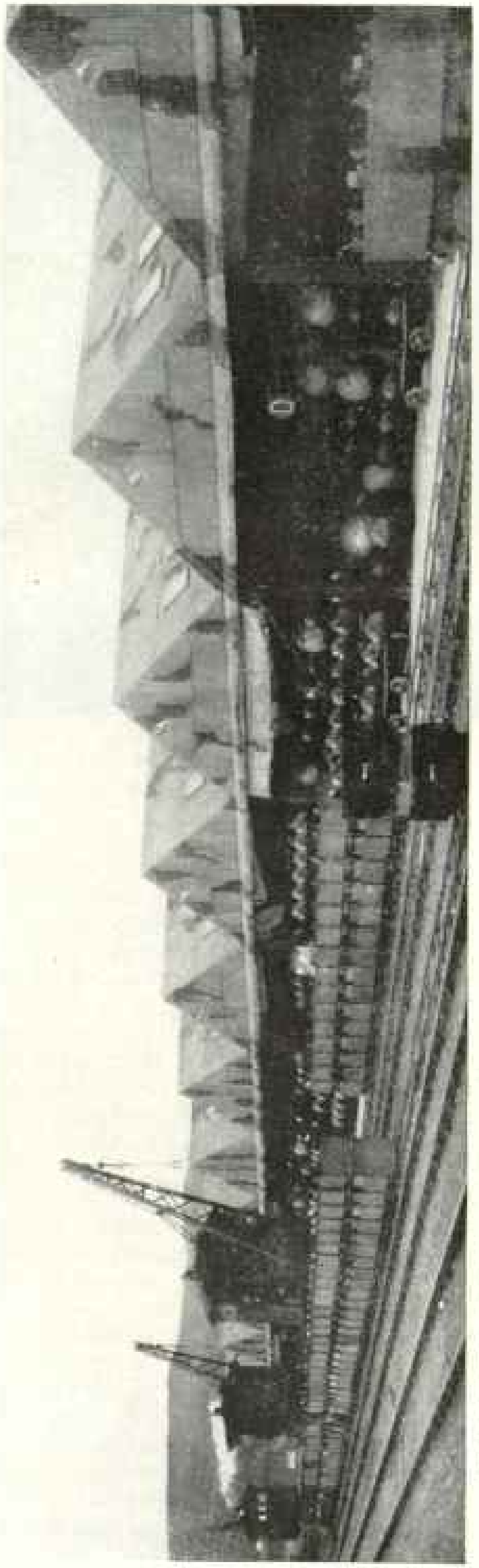
The plummet, being nearly solid and quite heavy, about 90 pounds, tends to sink faster than the more bulky anchor, thus keeping the cord taut; but as soon as the plummet strikes bottom, its cord is at once slackened, releasing the latch, locking the reel, and preventing any more mooring wire paying out. The anchor continues to sink, pulling the mine case under water until the anchor strikes bottom.

The mine case is thus finally moored always at the desired depth beneath the surface, no matter how irregular the ocean bed may be. The mermaids would see our summer's work like a vast field of tulip buds 50 feet or so under water, swaying on their long, slender stems.

The mine cases are buoyant enough to pull straight up from their anchors ordinarily, but in a current they are swayed away from the vertical, which drags them down somewhat deeper than intended. For this reason, any locality where the currents are strong is unfavorable for a mine field. This was one of the difficulties the British Navy had to contend with in closing the Straits of Dover

To receive the large amount of mine material and general supplies that soon began to collect, a large steamship pier was taken over at Norfolk, to serve as a storage as well as loading point.

Near by a plant was constructed for charging the mine spheres with explosive—great steam kettles for melting the TNT, which was poured into the spheres. Then these would move along on a conveyor, slowly, so that by the time the sphere reached the end it was cool enough



THOUSANDS OF MINES AND MINE ANCHORS STORED IN CAMOUFLAGED SHEDS PREPARATORY TO BEING TRANSFERRED TO MINE-LAYING VESSELS

These mines were sown like peas in the furrows of the North Sea for a distance of 230 miles, as far as from Boston to New York

either to load into a waiting ship or to put away in store.

CONSTANT DANGER IN THE WORK

This work was a constant danger from fire risk and the poisonous fumes of the molten explosive. The sailors in attendance had to wash their heads and necks thoroughly afterward. Several were overcome seriously in the course of the work, and one man died; but the rest quietly stuck to it, as if they liked it.

There was a great transportation problem involved, originally estimated to absorb the use of 60,000 tons of shipping for five months. Beginning their sailings in late February, a group of 24 steamers, managed by the Naval Overseas Transport Service, were constantly employed, with two or three departures every eight days, carrying mine material and stores for the northern barrage.

It was through a submarine sinking one of these ships, the *Lake Moor*, with 41 of her crew, that our operation suffered its greatest, almost the only, loss of life.

Meantime the British naval authorities were preparing depots for us in Scotland. The mine material was to be unloaded on the west side of Scotland; some cargoes at Fort William, at the western terminus of the Caledonian Canal, and some at Kyle, on Loch Alsh, opposite the Isle of Skye.

Thence the cargoes would be forwarded by canal barge and by rail to Inverness, and to Invergordon, on Cromarty Firth, respectively. These harbors open on Moray Firth, about eight miles apart, on the northeast coast of Scotland (see map, page 86).

A single depot would have been better, as far as assembling the mines was concerned, but the limited transporting capacity by canal and Highland railway made two assembling points necessary.

A TRAINLOAD OF AMERICAN MINES PROCEEDING TO THE EMBARKING QUAY

The big steel bubbles strewn about in the foreground are each filled with 300 pounds of TNT, one of the most powerful explosives used during the world war.

TRANSFERRING MINES FROM RAILROAD CARS TO LIGHTERS

A mine, shaped like a ball or an egg, is about one yard in diameter. With its iron box anchor, two feet square, and its wire mooring cable, it weighs 1,400 pounds.

LIGHTERS CONTAINING MINES GOING ALONGSIDE THE "SAN FRANCISCO," FLAGSHIP OF THE AMERICAN SQUADRON: INVERNESS FIRTH, SCOTLAND

The *San Francisco* and the *Baltimore* each carried 350 mines at a time, while four new ships could carry 880 each, two others 610 each, and the remaining two 350 (see text, page 96).

Our Captain Murfin was sent over in November, 1917, to supervise the preparation of these bases and be in charge of them when completed. The buildings, grounds, and adjacent vacant land of two idle distilleries afforded good accommodation for offices, men's quarters, messrooms, kitchens, and storage and ample space for erecting the mine assembly and storage plant.

When finished, these bases could together prepare 1,000 mines a day. Captain Murfin had twenty officers and a thousand men at each base and two outlying detachments, of three officers and sixty men each, at the unloading points—Fort William and Kyle.

With every reason to establish the mine-field barrier at the earliest possible date, the estimated rate at which the new mines could be manufactured was taken as the basis for determining the capacity of the new mine-laying squadron.

It was expected that the output would be 1,000 mines a day, and that one mine-laying operation could be accomplished at best in five days for the round trip. Hence the mine-laying squadron should have an aggregate capacity of 5,000 mines.

THE MINE SQUADRON

We had two ships to begin with—the *San Francisco*, Capt. Henry V. Butler, and the *Baltimore*, Capt. Albert W. Marshall. They were fine old war horses, dating back 28 years, but sound in wind and limb and as responsive as any thoroughbred. They and the gunboat *Dubuque*, Commander T. L. Johnson, a vessel much too small for the North Sea operation, constituted the original mine squadron under my command.

We had been developing and training in the art of mine-laying for over two years and were prepared to undertake any operation of the kind. As if in anticipation of this very war operation, we had planted a three-line mine field just below Sandy Hook one fine day in December, 1916—200 loaded mines. We did not tell the press about it, as it might have caused anxiety, and we took them all up next day.

TAKING ABOARD A CARGO OF CANNED VOLCANOES

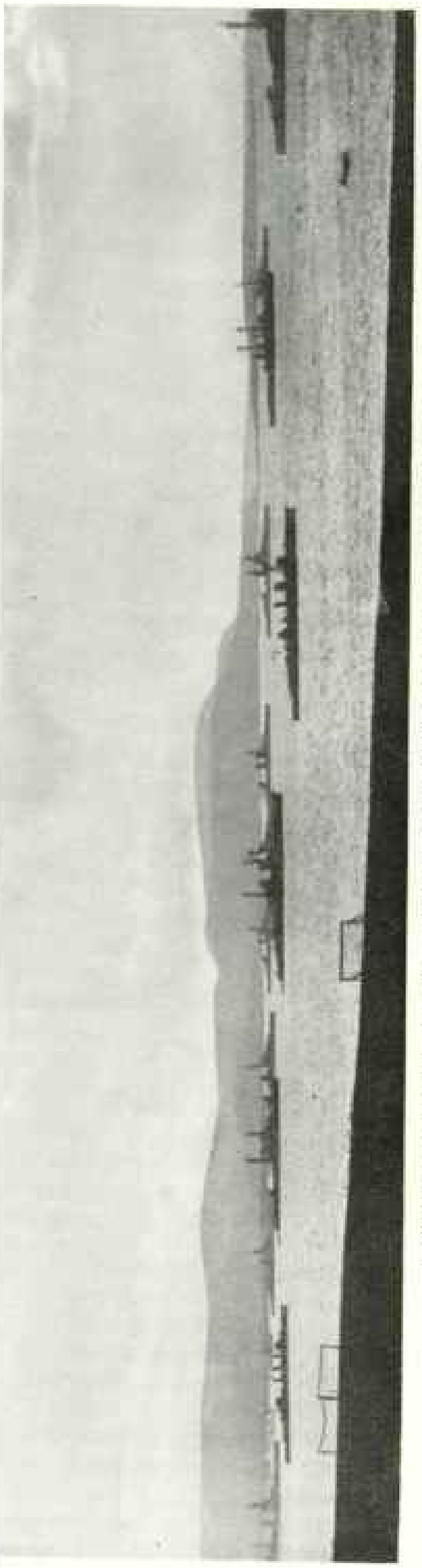
The flotilla of American warships which laid the North Sea mine barrage was appropriately called the "Suicide Squadron."

This and other appropriate exercises, together with many and varied tasks and experiments given us to do, produced a set of working principles, a well-seasoned skill, a self-reliant spirit, and a united, resolute confidence, all based on actual accomplishment, which made this small mine force an invaluable nucleus for the project in hand. It was the more valuable because a substitute was nowhere else obtainable.

The Allies had done considerable mine-laying, but not on the scale nor in such a way as to be of much use as a guide in the gigantic operation ahead. In fact, when the *Baltimore* was sent over, early in March, 1918, in advance of the others, in response to an urgent request for a vessel to help lay a field of British mines in the North Irish Channel, she was ready to do it immediately on arrival, and as soon as the mines were received she proceeded to lay the whole field alone, without any assistance or preliminary trials.

This was a good sample of our quality, which strengthened the confidence of our British colleagues.

The great task of the whole preparation was to expand this small force into



THE GRAND FLEET AND ITS FLOTILLA OF PROTECTING DESTROYERS IN SCAPA FLOW

This magnificent harbor in the Orkney Islands was one of the headquarters of the British home fleet before as well as during the war.

a large squadron equally capable. No matter how superior and numerous our mines might be, the success of the barrier depended on its being properly planted.

NO TIME TO WASTE

There was no time to waste. Eight merchant ships of suitable size, speed, and condition were soon taken over; a special training camp for their officers and men was established under the direction of the *San Francisco*, and the *Baltimore* took up experimenting with various features of the new mine.

The captains and officers of the new ships were ordered in connection with converting them, taking some of the *Dubuque's* officers, since she would not be employed.

Commander Johnson was sent over to London at the same time with Captain Murfin, with a long memorandum of information to bring back as soon as he could—everything we could think of as useful to know about the preparations and local conditions at the base from which we were to work.

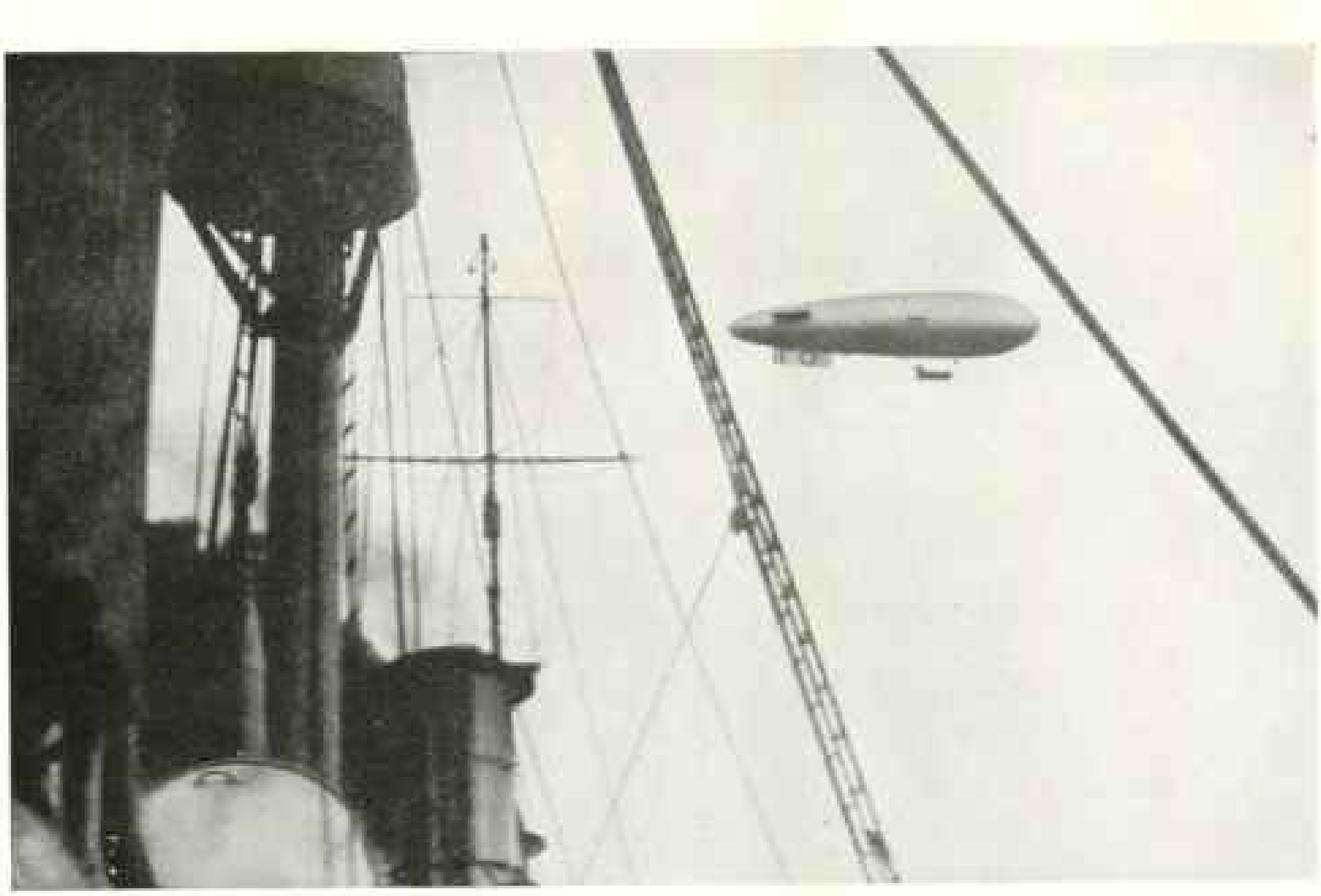
One most important step for early settlement was to provide elevators in the new ships. In a ship about 400 feet long, the size of ours, about four-fifths the length is available for installing mine tracks. Four such tracks on one deck hold about 350 mines, and, using two or more decks for mines, the total load could be increased accordingly (see page 105).

Four new ships could thus carry 860 mines each, two of them 610, and the remaining two 350 each. With 350 more in the *San Francisco* and *Baltimore*, we would have a total of 5,700, giving a reasonable margin over the requisite 5,000, for contingencies.

If all the mines in a ship could be raised to the launching deck rapidly enough for all to be planted in a continuous string, it would result in a great saving of time and great saving of space in the mine-field area, besides making better mine fields than if the mines were laid one deck-load at a time, in comparatively short strings.

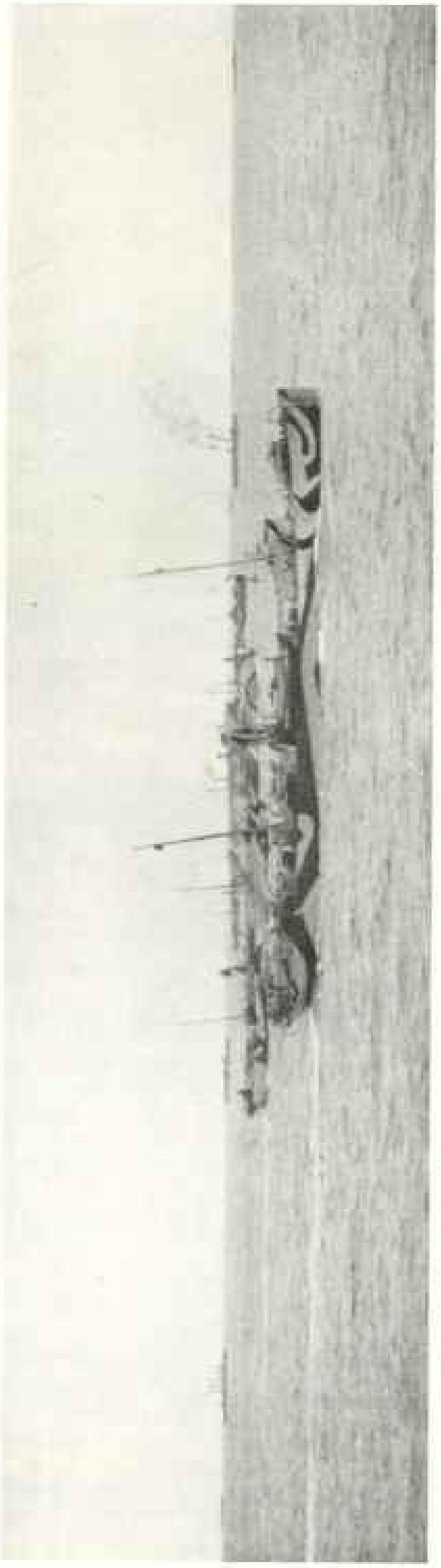
The British had tried elevators, but with little satisfaction. For our ships, Naval Constructor Reuret called in the Otis Elevator Company's representatives

NINE OF THE TEN SHIPS WHICH COMPRISED THE AMERICAN SQUADRON OUTWARD BOUND ON A MINE-LAYING EXCURSION



WATCH AND WARD FROM THE SKIES

While laying the North Sea mine barrage, the American warships were in constant danger of attack from the submarines, whose death traps were being set. To give warning of such attacks, dirigibles hovered guard over the fleet.



THE AMERICAN MINING SQUADRON IN FORMATION OF LINE AHREAST PLANTING MINES (SEE PAGE 107)

Note the elaborate design of the camouflage, used not with the idea of concealing the ships from the enemy, but to deceive as to the ships' heading. These vessels, while their primary object was mine-laying, at the same time were dangled as an enticing bait before the guns of the Helgoland fortifications. Main High Seas Fleet in an effort to make it sally forth beyond the protection of the

the very first day, and we thrashed it out together. The result was an excellent installation of six elevators in each of the largest ships; four elevators in the two next largest.

One of the Otis Company inspectors was enrolled as a reservist for the squadron to assist in the installation, care, and operation of the elevators. These installations proved entirely satisfactory. Out of the 32 elevators, only one failed—just once during the whole period of service.

Like all other work during that winter, ours suffered from the abnormal fuel, traffic, labor, and weather conditions. There were many vexations, but by doing all possible to anticipate and avert delays we managed to get five ships completed, making in all 4,000 mines capacity, early in April.

I left Washington then and took command of the mine squadron again, on board the *San Francisco* at Hampton Roads, and on April 12 the *Roanoke*, Captain Stearns, and *Housatonic*, Captain Greenslade, the first of the new vessels, joined the flag—an event long worked for.

No account of an accomplishment so extraordinary should omit to name our full squadron, all names familiar in the old Navy:

San Francisco, flagship, Captain H. V. Butler.

Aroostook, Captain J. Harvey Tomb.

Baltimore, Captain A. W. Marshall.

Canandaigua, Commander W. H. Reynolds.

Canonicus, Captain T. L. Johnson.

Housatonic, Captain J. W. Greenslade.

Quinnebaug, Commander D. Pratt Mannix.

Roanoke, Captain C. D. Stearns.

Saranac, Captain Sinclair Gannon.

Shawmut, Captain W. T. Cluverius.

A VIEW OF THE STERN OF THE U. S. S. "BALTIMORE," SHOWING MUCH OF THE PARAPHERNALIA WITH WHICH A MINE-LAYER IS EQUIPPED

The four placarded affairs are marking buoys ready to be dropped overboard. Smoke-making apparatus, depth-charges, and a towing-spar are also within the camera's vision.

The ships' complements totaled 4,000 officers and men.

THE START IN SECRECY

We may pass over, lightly enough now, the trials and vexations of the next four weeks, viz., breakdowns, losing anchors, fogs, elusive stores, men coming without pay accounts, and accounts coming without the men. It all wound up in four crowded days at Newport, taking final coal, water, stores, and 500 men for the mine depots.

We would have been justified in staying another week or two, our training together had been so meager, but the sense of urgency was strong and none of us felt like waiting longer.

At midnight Saturday, May 11, in all secrecy, without signals or lights, the squadron got under way for Scotland. Leaving harbor, the *San Francisco* was closely followed by the *Quinnebaug*, but off Brentons Reef we waited for the others—and waited. Presently they all appeared, and we were off—only 17 minutes late, after all.

Never shall I forget the blessed peace of the next forenoon, that quiet Sunday of smooth sea and steady, uneventful steaming, headed at last toward our goal.

The peace and quiet did not continue long. Soon after lunch fog shut in and the ships could be seen no more until next forenoon. It was rather early for such a test, but all ships kept together well and were in good station when the fog lifted. It was just in time, for immediately the *Quinnebaug's* steering gear went wrong and she turned directly across the *Housatonic's* bow, having a narrow escape.

This was the beginning of a series of events which made the two weeks' passage a continuous expectancy. Fortunately, I had kept the *Sonoma*, one of the large mine force tugs, with the squadron; so that when a ship broke down one morning the tug could tow her for a whole day, while the other ships rehearsed for target firing.

The German submarines that arrived on our coast May 25 were on their way over while we were crossing. I had been warned of them, and after the disabled ship was repaired the squadron spent an afternoon in gunnery practice—doing very well, considering our hasty preparation. After that we felt we could give a

A BUOY READY TO BE LOWERED INTO THE SEA TO MARK THE LIMIT OF A MINE FIELD

After each day's work it was necessary to mark the extent of the mine field with buoys. These marks were necessary in order to safeguard the mine-layers from falling victims to their own mines. The rope coiled about the buoy is its anchor line.

good account of any submarines we might meet on the surface.

THE WORST DANGERS—TORPEDOES AND FIRE

The worst dangers were torpedoes and fire. All the ships had loaded mines on board, and as they cruised only 500 yards apart, an explosion in one ship would probably disable, if not wholly destroy, the others, too.

In due course bad weather came. The mine ships stood it well enough, but the big collier *Jason*, in our company, began to charge about and to roll heavily. She was a sister of the ill-fated *Cyclops*, and, with a whole garage-full of automobiles on her after deck, the high wind made it impossible for her to keep on the course, and for twenty hours she was lost to view.

Several days later she disappeared again in a heavy squall. Four days passed without a sign, and we had almost given her up for lost, when at early daylight of the morning of arrival she came lumbering up astern, and had regained her proper station before the time set for rendezvous.

As we approached the meeting point, nothing was to be seen up to 15 minutes before 5 o'clock; then two, three, five destroyers emerged from the haze, and another, and others, gyrating, cutting about, chasing their tails.

They had been stretched on a north and south line to allow for our being out of our reckoning, and we, after 3,500 miles, with not a few vicissitudes on the voyage, had struck the middle of their line, right on the dot.

That was indeed a crowded day, and the waters passed through were the most dangerous of any; yet so great was the sense of relief, due to near approach to destination and to the presence of the destroyer escort, that it seemed like Sunday.

And, considering the utter chaos these ships had been in only two months be-

fore, it will be understood, when each one reported herself fit for immediate service, how deep was the satisfaction and how well the future promised!

Various arrangements now interposed a few days' delay, but by June 3 preparations were going full blast for the first mining excursion.

This term, excursion, was adopted as a cheerful offset to the sense of danger. That there were many risks in our undertaking must have been plain to everybody. One cargo of TNT had been enough to devastate Halifax, and our squadron had ten cargoes. Our course would lie through areas where it was necessary to search for mines constantly, and we would come frequently in the regular thoroughfare for enemy submarines.

Moreover, the area where we were to mine had been publicly notified two months beforehand, to warn neutrals, and it would have been natural enough for the Germans to strew a hundred or so mines there on the chance of blowing us up.

Then it was also expected that when the barrier should begin to bring results the Germans would send out more and more force to break it and incidentally destroy us.

In this way we would serve as bait, eventually to draw out the German fleet. We were to have "a front seat at the second battle of Jutland." And so it was not altogether inappropriate to dub us the "Suicide Squadron."

"STICK TO YOUR JOB AND GO UP WITH IT"

The risks in prospect, however, had been no deterrent in getting officers and men. It was a very popular operation. While the ships were fitting out, a favorite slogan was "Stick to your job and go up with it."

There were countless volunteers, and those who were fortunate enough to belong to the squadron felt themselves objects of envy. They buckled to and did all they could to hasten the shipyard work and their own preparation.

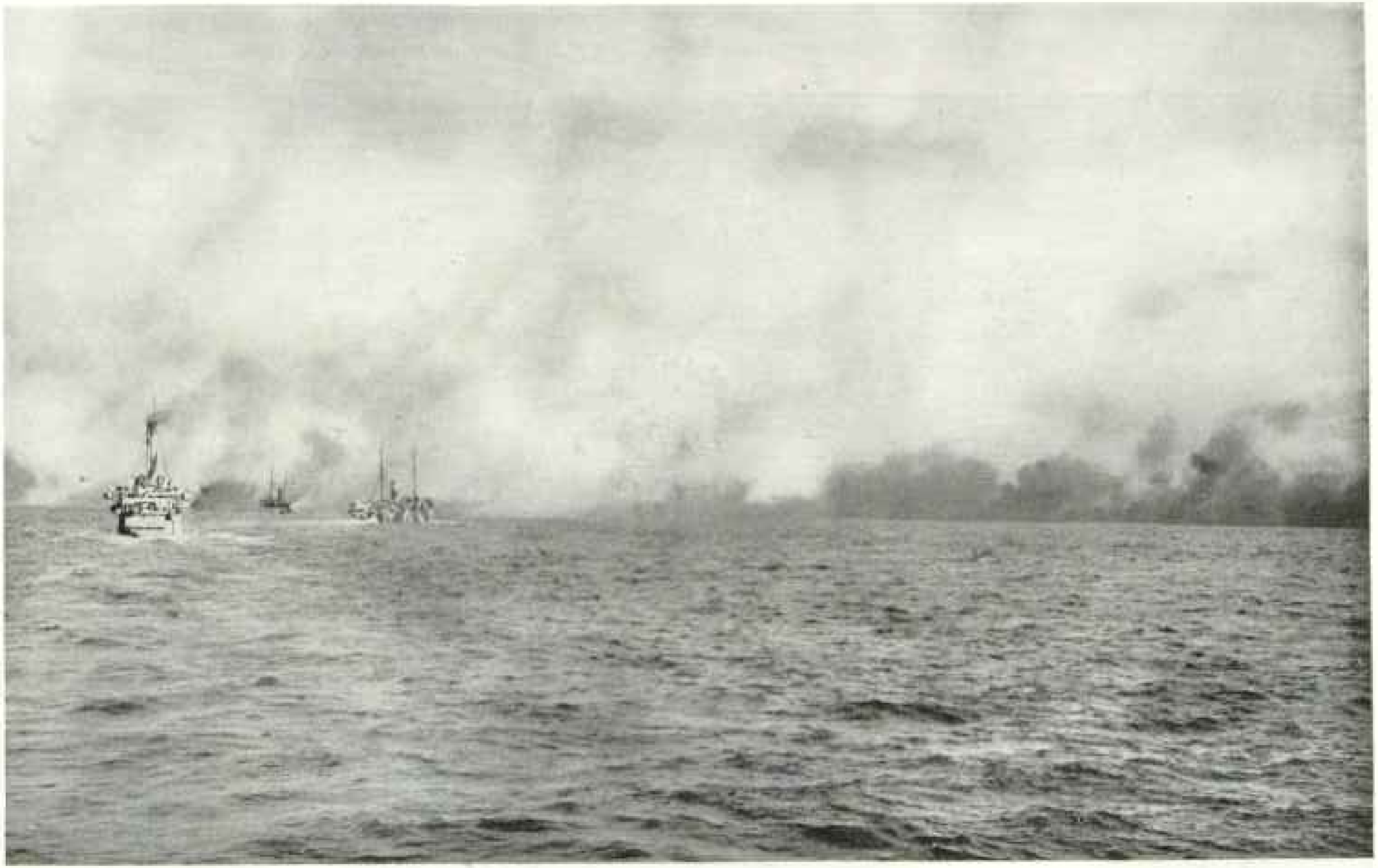
Especially with the *Shawmut*, Captain Cluverius, and *Aroostook*, Captain Harvey Tomb, at Boston, the officers and men made a very substantial contribution

A DEFECTIVE MINE EXPLODING PREMATURELY (SEE PAGE 107)

Note the four dark splotches on the surface of the sea, forming a "dotted line" in the wake of the mine-layer, which is proceeding away from the geyser of spray thrown into the air by the premature explosion. They convey to the reader some idea as to how thickly the North Sea was strewn with explosives.

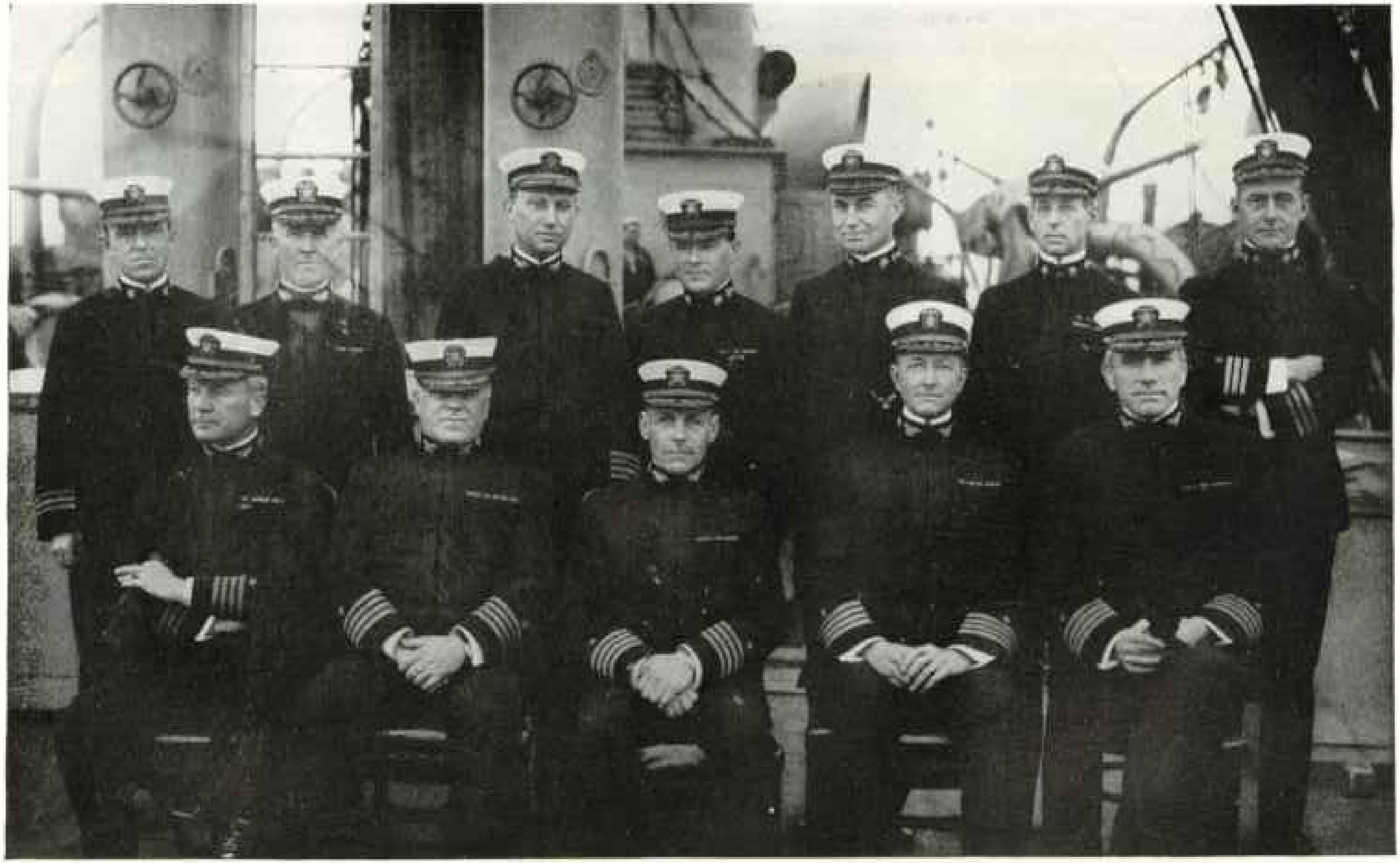
H. M. S. "VAMPIRE": CAPTAIN GODFREY, R. N., ESCORT LEADER, STARTING A SMOKE SCREEN TO PROTECT THE MINE SQUADRON WHILE RUSHING TOWARD A SUBMARINE DANGER QUARTER AT A SPEED OF THIRTY KNOTS

Two depth-charges were dropped, and "whatever was there, those charges will keep him down for a considerable time," signalled the *Vampire* after the excitement had subsided.



A SUBMARINE ATTACK ON THE MINE SQUADRON; NOTE THE SMOKE SCREEN SPREAD BY THE ESCORTING DESTROYERS AND THE SHIPS FLEEING IN A ZIGZAG COURSE TO ELUDE THE ENEMY

"Just after the soup at dinner, one of the ships of our squadron saw a periscope and let out the warning shrieks" (see text, page 158).



THE SQUADRON COMMANDER AND COMMANDING OFFICERS OF THE U. S. NAVY MINE-PLANTERS

Left to right, standing: Commander Canaga, Aid; Captain Johnson (*Canonicus*); Captain Tomb (*Aroostook*); Captain Greenslade (*Housatonic*); Captain Gannon (*Saranac*); Captain Reynolds (*Canandaigua*); Captain Mannix (*Quinnebaug*). Sitting: Captain Chverius (*Shawmut*); Captain Stearns (*Roanoke*); Captain Belknap (Squadron Commander); Captain Butler (*San Francisco*); Captain Marshall (*Baltimore*).

A STRING OF MINES ON THE DECK OF THE "SAN FRANCISCO"

A few links in the American-forged chain which strangled the Prussian submarine snakes in their nest. On each mine-laying excursion the American flotilla could carry a cargo of five thousand of these mines (see page 96).

toward hastening the construction, like Perry's men building their own ships to fight and win the battle of Lake Erie. The only thing that really bothered us was any delay in getting to the actual mine-laying.

By June 6 all was ready for the first excursion. As far as could be foreseen, everything had been planned and arranged for. Courses and distances to be steamed were listed, the formations of the ships were prescribed for various times, and a schedule was made for planting mines, accurate to the second.

The instructions were complete as to intentions, yet not so hard and fast as to hinder action in emergency. All the captains had been in conference on board the flagship *San Francisco*, and Captain Godfrey, R. N., commanding H. M. S. *Vampire*, the escort leader, and I had had a conference with Rear Admiral Strauss, U. S. Navy, Commander of the Mine Force.

Departure was to be at midnight, the two detachments to join at Cromarty Buoy at 1 a. m. The move was kept secret, because news could be sent through to the enemy in 18 or 20 hours—time enough for an attack of some kind.

THE HISTORIC DEPARTURE

The eve of departure brings drizzling, misty weather. On board the ships the wise ones try for some advance sleep. Midnight comes, and without signals or lights or any noise but the clanking chain, the flagship gets under way and heads out.

The signal quartermaster reports one ship after another under way and following. Fort George shows the signal for an open gate, and as the second ship passes out through the submarine net they all form column astern and close up to 500 yards apart.

The full number of lookouts are at their stations and warned to be alert, and

PREPARED FOR THE NORTH SEA

Beneath his cold-weather togs and his life-belt jacket, the heart of every man-Jack of them is beating with excitement—not from fear, but from the zest of the hunt for the man-made monsters of the deep.

the men are now sent to the battery, making a little stir for the moment. Then quiet falls again. Small patrol craft can be dimly seen here and there on watch against danger for us.

Fifteen minutes more and we see long, low forms slinking against the dark background of North Sutor, at the entrance to Cromarty. These are the destroyers of our escort going out to form a screen.

Close following them we count larger, higher moving shadows—one, two, three, four, five ships—all there! The heads of the two columns now reach the buoy at the same minute and the whole squadron stand on, without pause, together.

Four destroyers are ahead and another group on either side—12 in all. No signals, no lights. So we stand out Moray Firth, through the one-mile-wide channel, which is swept every day for mines.

Toward 8 o'clock we pass Pentland Skerries, near John O'Groat's house, and steer east, and then we see coming out from Scapa Flow four British light cruisers, four battle cruisers, with six destroyers, and last four battleships, with six more destroyers. They edge off to the southward and eastward, fading into the morning haze, to keep between us and possible harm from Germany. It was a force of the same strength that supported our latest excursion in October. On the second excursion, in June, our own battleships, under Rear Admiral Rodman in the *New York*, were the support, making a proud sight for us, as the great squadron filed out and swept off toward an intercepting station.

LAYING THE FIRST MINE

Straight over to Norway we go, making Udsire Light toward midnight; then off to the northwestward. It is a busy night and early morning, keeping the ships in station, going over the mines for final touches, watching on every hand for enemy submarines, and getting all clear for our first large operation.

A GROUP OF BLUEJACKETS OF THE U. S. S. "BALTIMORE"

The *Baltimore* was sent over seas in advance of the other ships of the mine-laying squadron at the request of the British, to assist in laying a field of British mines in the North Irish Channel. Immediately upon her arrival, the *Baltimore* reported ready for duty, and as soon as the mines were received proceeded to lay the whole field alone.

At 4.27 a. m. the signal is made that mining will begin at one hour later. The crews go to mining stations, and in the flagship we look for signals reporting whether the other ships are ready. They *are* ready, every one. It is like a horse-race when the starter's flag is up. How will it go, after all these months—for some of us years—of preparation?

The squadron stretches a mile and a half in a beautifully straight line abreast. Several destroyers ahead have their sweeps out, to explore for enemy mines in our path (see page 98).

Now the mine-planting signal is flying; they will begin when it starts down. Commander Canaga stands, watch in hand—"two minutes, one minute, thirty seconds more, fifteen"—he looks up inquiringly. All right, "Five seconds—haul down!"

And in answer red flags break out on the other ships, showing that they have begun to plant. On the flagship's bridge the call-bell rings, and from the launching station at the stern the report comes, "First mine over."

All well so far—a good beginning.

Now comes the trying time for the squadron commander—the endless waiting, all alert, for whatever may befall. Nothing to do while all goes well, but instant decision and action in case of mishap.

Hour after hour the mining goes on. The staff officers watch the scheduled events and compare the times with what they should be. A few seconds out here and there; otherwise all goes without a hitch—just as planned before leaving the United States.

Some defective mines explode astern, which is startling at first, then reassuring as to the safety features of the mine. At the same time, one's respect grows for the mine's deadly power (see page 101).

A WORLD RECORD IN MINE-LAYING

Now we watch the *Housatonic*, a new ship, with a new, untried installation, doing a string of 675 mines, one every 11½ seconds throughout two hours and ten minutes. Her mate stands by, ready for any interruption; but the *Housatonic*

completes the task without a break—a world record up to that time. In a later excursion the *Canonicus* lays 860 mines in 3 hours 35 minutes without a break, making a string longer than from Washington to Baltimore.

At last, after nearly four hours, the schedule is finished. We stand on for a mile and then three ships drop mark-buoys. The line of ships wheels to the right and plants more buoys to pick the field up by when we return to prolong it.

Now the ships reform in four columns and start back to base. Below decks the men are cleaning up, securing the gear, and getting a wash for themselves. That done, they drop in their tracks, dog-tired, and the decks are thick with sleeping forms.

THE CROWDED-HOUR CLUB

We hoped for a quiet afternoon that day, with a few cat-naps, handy to the bridge; but Captain Godfrey had plans for his destroyers which interfered, giving them a smoke-screen exercise about 2 p. m., which sent all of us tumbling up to the guns.

Then an airship claimed attention; one of our own ships had to drop behind to set up on a loose bearing, and a wide-spread smoke appeared, proving to be a convoy of fifty vessels. Finally, just after the soup at dinner, our next astern saw a periscope and let out the warning shrieks.

Our ships turned together, on signal, half right, to steer away from the danger quarter, while the *Vampire* ahead swooped down at 30 knots to drop two depth charges. "Whatever was there," he signaled, "those charges will keep him down for a considerable time." It was then, as we resumed our stone-cold meal, that we changed our name from mining squadron to "Crowded-hour Club."

Through the day reports had been coming in by signal, showing that everywhere all had gone well, without casualty, and that each ship was prepared to undertake another operation upon receiving the mines. Our first excursion was unquestionably a decided success.

There were in all 13 excursions by our squadron and 11 by the British mine-laying squadron. Twice the two squadrons were joined to lay their mines in company. On the first occasion our Rear-Admiral Strauss went out in command of the joint force; the second time Rear-Admiral Clinton-Baker, R. N.

SEVENTY THOUSAND MINES LAID

On one of these joint excursions ten American ships planted 5,520 mines, the four British ships 1,300, making a total of 6,820 planted in four hours. This is the record for number. A few weeks later our squadron alone planted a field 7.3 miles long, making a record for distance.

The whole barrier contained 70,117 mines, of which 56,571, or four-fifths, were ours. The average was three excursions a month, though the intervals between were irregular. We steamed altogether 8,700 miles in 775 hours while on these excursions.

It might be expected that with so many features alike the excursions would soon have become monotonous, but such was not the case. Each one began, continued, and ended with almost the same zest as the first, and always some unusual event or circumstance brought in new interest.

The absolute necessity of *sustained* attention and care in details was well understood by all, so that every one was pretty well keyed up from start to finish. After 48 hours of that, scarcely losing consciousness for a moment, we would get a few hours' sleep—too sodden to be really restful—and then on rising feel an indescribable exaltation.

In this mood I would have the captains and my staff at a conference, followed by a lunch, most memorable and enjoyable mixtures of council table and festal board.

Coöperation with our Allies was mutually all that could be desired, and we formed most agreeable associations. The big squadrons, too, felt much interest in our work and enjoyed being detailed for our support.

PASSING THE GERMAN FLEET

On our way home, after the signing of the Armistice, our squadron passed through Scapa Flow, where the German fleet was interned. As our long column

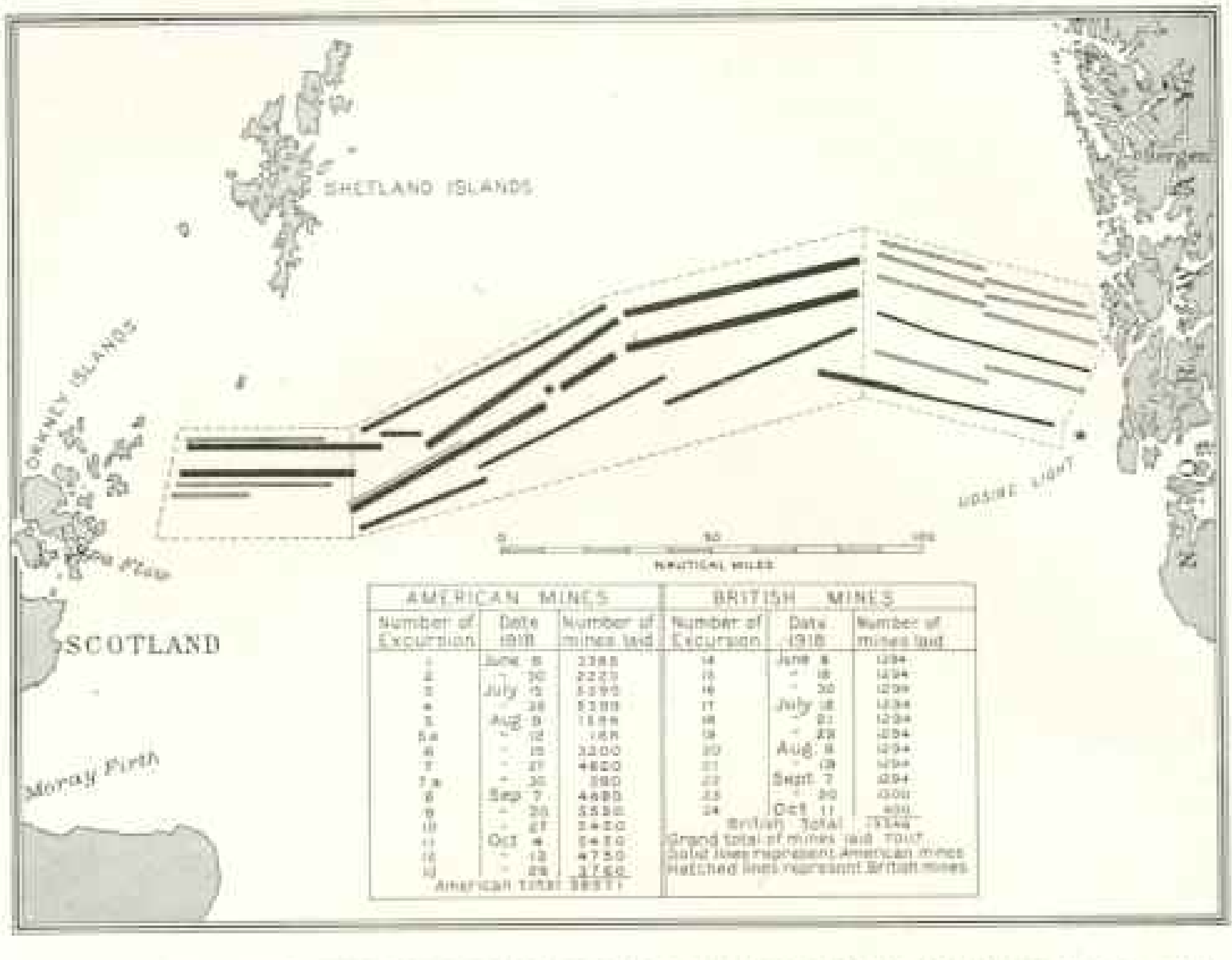


DIAGRAM SHOWING THE OVERLAPPING LINES OF MINES LAID IN THE NORTH SEA

Only by a miracle could a submarine have made its meandering way through such a mine field without encountering disaster (also see map on page 86).

wound in among the heavy British battleships and battle cruisers, their crews were massed on deck, cheering each mine-layer as she passed, our crews running from side to side to make response.

Admiral Madden, of the first battle squadron, signaled his wishes for a speedy return home and his "regret in parting with such a splendid force, such a brave bunch."

Upon nearing the Germans' anchorage our ships kept silent while we steamed by. On some of the German ships scarcely a man was on deck; on others the rails were filled, officers and men mingling together, to gaze on us, who had been their bait. In this way we had almost passed them, without a sound or a sign, when the British trawlers that were holding the nets on the opposite side—had been holding those nets, in fair weather and foul, for four long years—seeing our flag and knowing our work, broke out into loud and long blasts and toots of their steam whistles.

The *San Francisco* answered gravely by the customary three blasts of the whistle, and in succession the following ships did the same; but one of them blew her siren instead of her whistle, and that started them all off again.

Going on further, making toward the entrance, we passed the battle cruiser *Lion*, speeding back and forth like a sentry on post—a ready check on any German ship that might attempt a dash for liberty.

THE END OF THE SUBMARINE—THE END OF THE WAR

A parting message was flashed to us by the *Lion* from Vice-Admiral Pakenham, "You take with you not only my personal regards, but the gratitude and admiration of the battle-cruiser force."

Quite early in the summer, after only

the second excursion, our work began to bring results, and more and more reports came in of submarines damaged or lost in that vicinity, although the British policy of secrecy about submarine losses concealed the definite numbers.

The actual losses will probably never be fully known; but, according to report, the Germans admit the loss of 23 submarines there, and the British Admiralty staff have been quoted as holding that the surrender of the German fleet and the final armistice were caused largely by the failure of the submarine warfare, this failure being admitted as soon as the mine barrage was found to be effective.

Too much cannot be said of the fine spirit of the personnel. Their work was arduous and opportunities for diversion limited, but they made the most of both and backed their work with their money, of the Fourth Liberty Loan staking $5 on each mine in our mine fields. With the mines crowding their quarters so much of the time, the men's living conditions were very uncomfortable, but their baseball league, track athletics, and boat-racing kept them fit and keen, and their relations in the towns were most agreeable. As a visiting naval officer wrote, "The whole Mine Force is short on criticism and complaints, but long on work and results, and the Navy should be intensely proud of them."

How was it possible to navigate safely so many times through infested waters and close to mine fields, to steam so many miles together so steadily, to outdo the telephone in speed of signaling, and to handle and plant 56,000 mines, sometimes continuing through fog or darkness—all without accident?

Logical and thorough preparation, painstaking foresight, admirable coöperation, and able leadership undoubtedly paved the way; but these alone would not have made an achievement so clean. Something more was needed, and that something included two things: first, and all the time, unquenchable optimism, and next, it had been brought home to every individual that his work could be done by only one man in the world!

SARAWAK: THE LAND OF THE WHITE RAJAHS

By Harrison W. Smith

With Photographs by the Author

WITH the recent death of Sir Charles Brooke, G. C. M. G., the second of the white rajahs of Sarawak, there came to an end one of the most useful and unusual careers among the many that have done credit to British rule in the Far East. For nearly 40 years he governed, as absolute sovereign, a mixed population of Chinese, Malays, and numerous pagan tribes scattered through the villages and dense jungles of an extensive territory on the northwest coast of Borneo.

Constant solicitude for the welfare of his people won the sympathy and devotion which enabled this white man, supported by an insignificant army and police, to establish the peaceful occupations of civilization in place of barbarous tyranny and oppression.

Although Sarawak has been visited by a number of celebrated explorers and the general features of the country and its inhabitants are well known, there still remain vast areas of virgin jungle to invite the amateur naturalist, who can hardly fail to add some new specimens to the collections of those who have preceded him.

BIRDS, BEASTS, AND BUTTERFLIES PROTECTED IN SARAWAK

Here are found the argus pheasant, the leaf butterfly, and that most beautiful

NATIVE WOMEN SPRINKLING RICE AND PERFORMING OTHER CEREMONIES IN PREPARATION FOR THE HARVEST FESTIVAL

After setting aside from the rice crop the portion required for the year's food supply and enough more for trading purposes, the remainder is converted into a rice wine, and feasts are held in one house after another. The scattering of rice about the house is supposed to propitiate the evil spirits.

butterfly of all—the Brookeana. This last-named species is comparatively rare, and at one time brought so high a price that it might have become extinct were it not for the fact that the game laws of Sarawak protect even the butterflies. The collector is allowed to take only two specimens of any one kind, whether it be bird, beast, butterfly, or orchid.

Indeed, the Sarawak jungle is better protected than our forests. The jelutong tree yields a valuable gum, but if improperly tapped the tree is easily killed; therefore, inspectors have been appointed to regulate the tapping in order that this natural resource of the country may not be destroyed.

It was not the natural history of the country, however, that prompted the author to visit Sarawak; it was rather the opportunity to become acquainted with primitive and interesting people, still living the simple life of their ancestors in the primeval jungle, unspoiled by contact with the white man.

The author has been the honored guest in the houses of these people; he has received the best they had to offer. They are by no means free from serious faults, but these are disappearing, and they possess many homely virtues.

SEA DAYAKS, EARLY PUPILS OF PIRATICAL MALAYS

The Sea Dayaks, or Ibans, to use the native name, are the largest and most progressive tribe. Their love of adventure made them the ready pupils of the piratical Malays in the early days; but since their initiative has been turned into

SILVER HEAD-DRESS, BELTS OF SILVER COIN, AND NATIVE WOVEN SKIRT CONSTITUTE THE HOLIDAY COSTUME OF DAYAK WOMEN DURING THE HARVEST FESTIVAL SEASON

useful channels, they have shown much capacity for development. They are thrifty and industrious, building good houses, which are usually neat and clean.

As with most of the Sarawak tribes, personal cleanliness is the rule, and the Dayaks have been known to comment on a white traveler to the effect that, although he seemed to be otherwise all right, he did not bathe quite as frequently as they considered necessary. They are a fine race physically and delight in personal adornment, in which they show excellent taste in the use of colors for the *chawat*, or loin cloth, and for the bead necklaces and headdresses.

I had an opportunity of seeing them under the most interesting conditions by visiting at two of their houses on the occasion of the harvest feast. After setting aside from the rice crop the portion they require for the year's food supply and enough more for trading purposes, the remainder is converted into a rice wine and feasts are held at one house after another.

On the morning of the feast chickens are killed, rice is scattered about the house, and other ceremonies are performed to propitiate the evil spirits.

As guests begin to arrive from neighboring houses, the gongs are beaten, small brass cannon are fired, if gunpowder can be obtained from a white visitor, and live fowls, as a token of good-will and friendship, are waved about over the newly arrived guests.

The sacrifice of fowls plays an important part in many ceremonies, such as that of blood-brotherhood among the Kayans when a man is adopted into the family of another, the killing of the fowl serving as a means of conveying a message to the gods.

THE CEREMONIAL OF THE GREAT FEAST

On the evening of the feast, at one of the Iban houses, I witnessed a rather startling performance of the sacrifice of a fowl.

The great feast of the day was held at noon, and in the evening the different members of the house invited their particular friends to supper in their own

DAYAKS ENTERTAINING VISITORS AT A BANQUET DURING THE HARVEST FESTIVAL

Being a guest in Sarawak is not always an unalloyed joy to one with American tastes. The culinary masterpiece of the occasion is chicken à la Dayak. The fowl's larger feathers are pulled out and some of the remaining ones burned off over a fire. Nearly all that is left is chopped fine and stewed.

DAYAK WOMEN IN HOLIDAY COSTUME FOR THE HARVEST FESTIVAL

The lady with the sunshade and the Seventh Avenue dressing sacque looks as if she might be the duenna for this bevy of native belles. Many semi-civilized tribes wear anklets of brass, silver, and gold, but in Sarawak Dame Fashion seems to have decreed "calflets."

THE SARAWAK VARIANT OF THE AMERICAN INDIAN GIRL'S PESTLE AND MORTAR FOR GRINDING CORN

A girl stands at each end of the trough, giving alternate blows into the depression in the center. Each keeps one foot in the trough and frequently, with a rapid motion, the grain (which is rice in this part of the world) is pushed back to the center.

rooms, my companion and I being entertained in the room of one of the more prosperous members of the community, where we seated ourselves on the floor about a great variety of refreshments served by the daughters of the house.

We had not been long seated when a young man entered, and greeting another guest with good wishes for his health and happiness, held toward him with both hands a young chicken. The other, reciprocating the expressions of friendship,

grasped the head of the chicken, and between them they instantly pulled the neck in two.

As an ethnic curiosity, it would be interesting to inquire whether there is any relation between this custom and that which is practiced at dinner parties in polite society, where bonbons are pulled in two and the contents eagerly examined.

GOOD OMENS READ IN PIGS' LIVERS

At noon the most important event of the feast day takes place—pigs are killed and from their livers omens for the next year are read. During the morning the pigs have been decorated with beads and charms, charged with messages to the gods, and urged to show, by the markings on the under side of the liver, what the future has in store.

After the pigs are killed the livers are extracted and the learned men proceed with their interpretation of the omens.

As there are always enough pigs so that some of them are sure to have livers that give good omens, the feast then begins with great good cheer, the women bringing out delicious new rice—brown in color and nutty in flavor—cooked in neat little individual packages made from leaves; also various excellent vegetables from the jungle, such as the heart of several of the palms as well as the tender shoots of certain ferns, and, finally, slightly roasted pig and partly boiled chicken.

The method of preparing the chicken will indicate that participation in a Dayak feast is something of an ordeal. The larger feathers are pulled out, some of the remainder burned off over a fire, and nearly all that is left is chopped fine and stewed.

COCK-FIGHTING THE CHIEF PASTIME OF THE AFTERNOON

Cock-fighting is the chief event of the afternoon, and on these occasions the birds are armed with sharp knives, so that the fights are usually soon over. The cock-fighting is held outside the house, in the shade of the trees, in which the small boys who climb with hands and feet find an excellent point to view the sport.

Hugh Clifford, who has written most fascinating stories about the Malays, remarks that we must not too strongly condemn cock-fighting while fox-hunting continues to be recognized as legitimate sport. The game-cocks fight because they enjoy it; the fox participates from no desire of his own, and must experience the keenest agony of terror with a pack of howling hounds at his heels.

After the cock-fighting, rice wine begins to flow more freely, and boisterous merriment continues long into the night.

In the years gone by, the evening's entertainment might have ended with the "head dance," with the result that some young warriors would thereby be inspired to set forth in quest of new heads to decorate their homes.

The head dance is now prohibited, but it was demonstrated once for my benefit at the house of a pleasant little chief who wished to do me a special favor.

THE HUNT FOR THE GREAT APE OF BORNEO

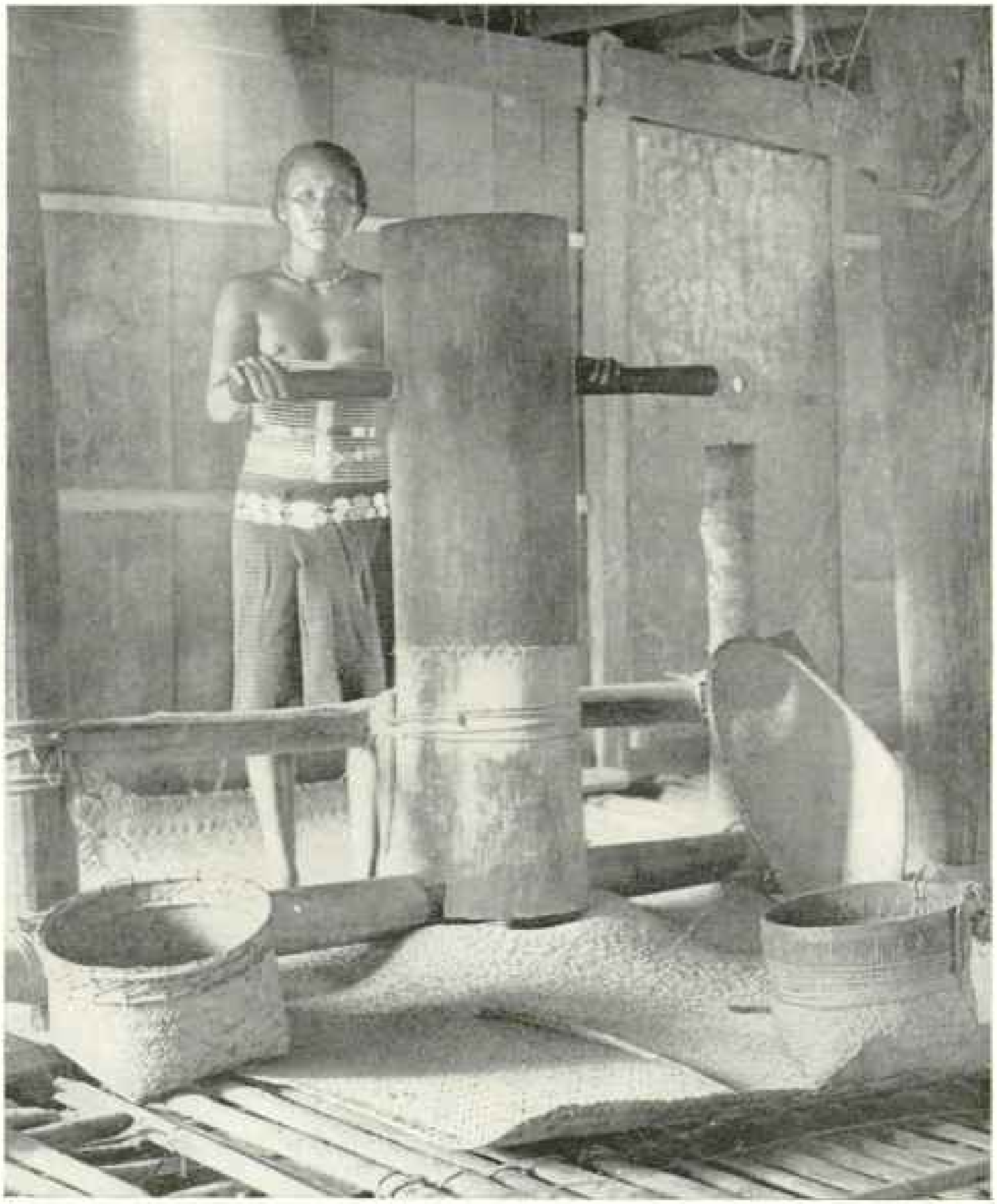
I had been spending several days in a vain endeavor to obtain photographs of the great ape, the *orang-utan*—the Malay name signifying the "Man of the forest"—corrupted into "orang-outang." Finally, my friend the chief assured me that if the young fellows who were going about with me couldn't find the *orang-utan*, he could.

So, one morning, we all set out under his guidance and ended an arduous and fruitless day's tramp by getting lost late in the afternoon in a rattan swamp—a swamp so thick and choked with the sharp tendrils of vines that progress could only be made by cutting a path through the thorns.

Thanks to my compass, we found our way out, but the little chief was doubly chagrined. To make amends, he entreated me so earnestly to accept the hospitality of his house that I could not refuse, although his was not a clean house and I was comfortably established in the shop of a Chinaman.

THE RITUAL OF THE "HEAD DANCE"

After my evening meal, supplemented with several delicious fruits, including the durian, which has so bad an odor that considerable courage is required when one first tastes it, and after all other



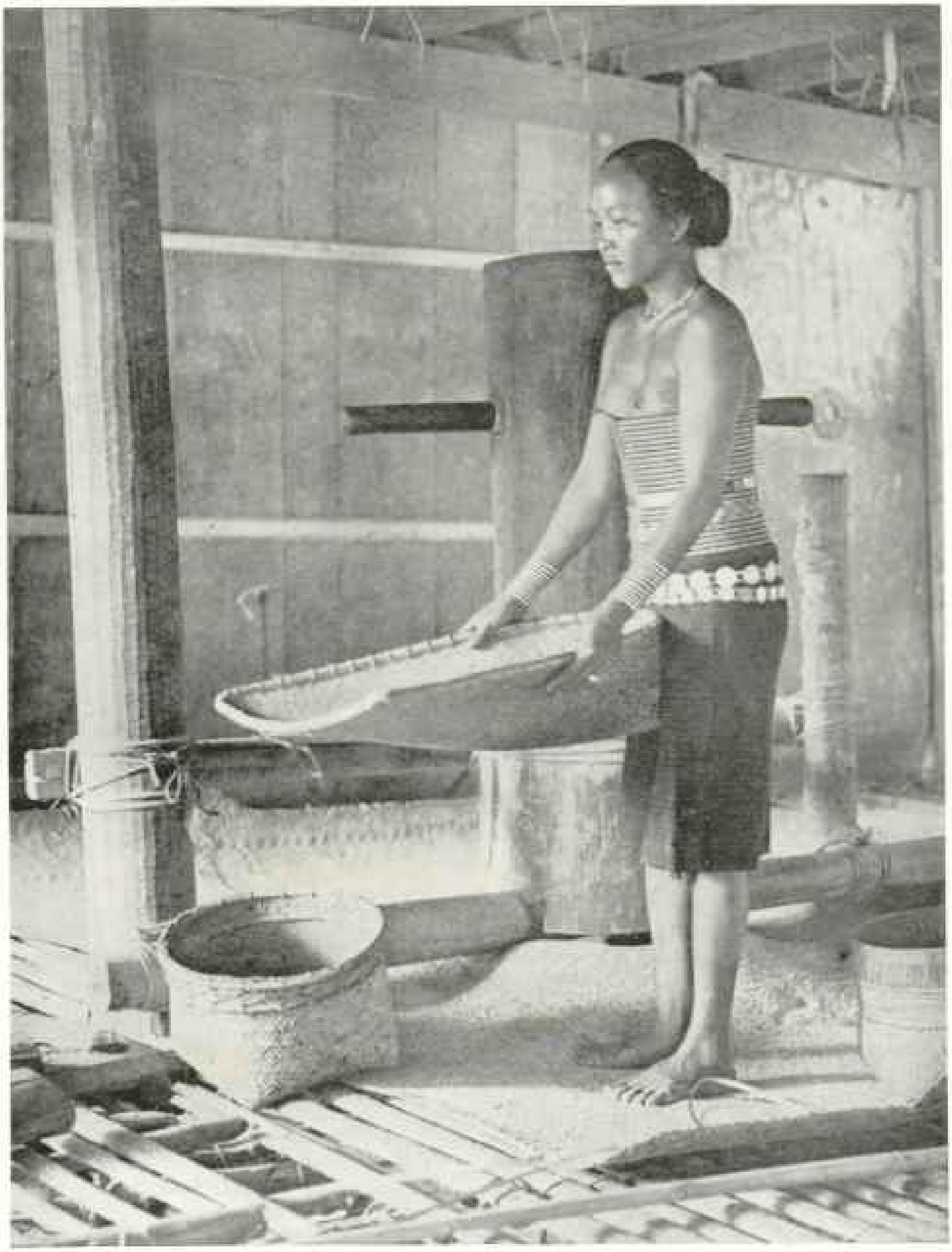
A DAYAK WOMAN OPERATING THE RICE-HUSKING MILL.

Rice is poured in at the top and works down through the grooves as the upper part of the mill is twisted back and forth.

resources of hospitality had been exhausted, the chief told me he was going to show me the head dance as it used to be done.

Two old women took one of the heads from the cluster hanging in the smoke over the fire. Then they placed some boiled rice between the jaws, with a lighted cigarette in one corner and a quid of betel-nut and siri in the other. The latter is chewed continuously by all people, giving the mouth and teeth a dark, reddish stain. In this way the spirit of the head was propitiated by giving it food, a cigarette, and betel-nut to chew.

The head itself was then carried by the two women up and down the long veranda of the house, swinging it to and



A DAYAK WOMAN WINNOWING THE RICE THAT HAS BEEN HUSKED AT THE MILL SEEN IN THE BACKGROUND

Ordinarily the native women do not wear their silver girdles or brass corsets when engaged in labor of this kind, but pride of appearance before the camera is a feminine trait of universal application. The Dayak girl and the American belle are equally anxious to look their best when posing for the photographer.

DAYAK COCK-FIGHTERS: SARAWAK, BORNEO

Note the elaborate head-dress and the remarkable tail-like decoration worn by the native in the left foreground.

fro in a stiff, awkward dance while they sang a monotonous song, calling upon the spirit of the head to bring blessings on the house. The photograph of the head, which I was able to obtain the following morning, after it had been restored to its place over the fire, shows the rice still within the jaws.

It has not been my experience that Dayaks make such good companions for any length of time as some of the other natives of Sarawak. On the Semundjan River, however, I became well acquainted with a Dayak who had served in the "Rangers," the Rajah's military force, but had resigned, preferring the comforts of his home, cultivating his own rice field and working industriously for his family. He was in all ways very attentive to me, of much assistance in my trips in the jungle, and very grateful for such remedies as I could give the ailing members of his family.

His name was Changkok. He quite liked to be the center of any gathering, doubtless feeling that his knowledge of military affairs gave him a certain position of importance in the community, and he insisted on interrupting the progress of a sword dance one evening to show his skill with an old musket.

He went through the manual of arms, calling out the orders: "Carry, arms"; "Order, arms," etc., but introducing numerous leaps and gestures from native dances, producing a very grotesque effect.

Changkok was immensely pleased with my recognition of the military orders as he rendered them in English, but my host, an old chief, was greatly bored and no little annoyed to witness such perversion of the customs of his people. Finally, Changkok appealed to me to confirm his statement that he was showing his unappreciative friends just how the war dance is really done in Europe.

DAYAK COCK-FIGHTERS: NOTE THE TATTOOING ON THE SHOULDERS OF THE MAN IN THE CENTER

If it is appropriate for the matador to adorn himself in raiment radiant as the sun before entering the bull-ring, why should not the cock-fighter of Sarawak festoon himself with beads, bangles, and bracelets before he tosses his bird into the pit!

The Dayaks live in long communal houses having a common gallery or passageway along one side, with the living rooms on the other. Each family occupies one room.

FINGERS AND TOES INDISPENSABLE IN DAYAK ARITHMETIC

Having occasion to ask Changkok the size of a particular house that I planned to visit, he began counting on the fingers of his right hand, calling off the name of the head of each family. He continued counting on the fingers of his left hand, then on the toes of his right foot, then, beginning on the big toe of his left foot, he paused in thought, holding the second toe. But the effort had been too much; he lost hold of the toe and had to count all over again.

Probably if the problem had required a computation above 20 Changkok, like many other natives, would have had to call in another man with more fingers and toes to count on.

It was an interesting demonstration of the origin of twenty as a unit in our system of enumeration—in English, a score; in French, une vingtaine. If Changkok had employed the fingers and toes of four

IN THE COCK-PIT: SARAWAK, BORNEO

Cock-fighting is the principal diversion among the Sea Dayaks, and, like the Spanish bull-fight, the contest is usually held early in the afternoon.

men he would have counted eighty, or fourscore—in French quatre-vingts, four twenties.

THE LAND DAYAKS

The Land Dayaks, as their name indicates, live inland, and they more frequently build their houses at a distance from the streams than is the habit with other tribes. In addition to the Malays, they are the natives of Sarawak proper—that is, the territory first ruled by Sir James Brooke—constituting the southerly division of the Raj of Sarawak.

They are more affected by contact with foreigners and are rather less enterprising and energetic than their neighbors, the Sea Dayaks, who occupy the Batang Lupar and Rejang rivers to the north. A few Land Dayak villages in the vicinity of the headwaters of the Sarawak and Sadong rivers near the Dutch border remain, however, little affected by foreign influence.

In common with the other tribes of Borneo, their houses are long communal dwellings built on posts 8 or 9 feet from the ground, a passageway on one side giving access to the rooms, each of which is occupied by one family.

The Land Dayaks, unlike the other tribes, also build a square house on very high posts, considerably above the level of the "long house." It is called the "head house" from the fact that in it are kept the heads which they have taken from their enemies (see picture, page 129).

The head house is the general place of meeting; it is there that the Resident on his visits meets the people, and there, also, that unmarried men and boys as well as visitors sleep. It is an interesting experience, when one for the first time lies down to sleep with a great cluster of blackened skulls grinning from the rafters overhead, even when they are very old skulls (see also page 131).

A GROUP ABOUT THE COCKING MAIN: SARAWAK

The man in the central foreground of the picture wears a mat made from a tiger skin; it is ornamental when he is standing and comfortable when he sits down.

Many of the young people of the Land Dayaks are finely developed physically, but the women deform their arms and legs with great coils of heavy brass wire, which must be exceedingly uncomfortable to wear (see pages 113 and 130).

PAIN GLADLY ENDURED FOR FASHION'S SAKE

One evening, in the head house, a girl sitting next to me had a bad sore on her arm caused by the chafing of the wire. To my query if the wire did not hurt, she replied that it did hurt very much; whereupon an old woman observed that the wire was nevertheless very beautiful and very much the fashion, intimating strongly that I might hold my peace and not interfere with matters that did not concern me.

Traveling through the Land Dayak country, as elsewhere, is by means of the rivers and jungle paths. In this district I was fortunate in being able to travel with two of the Residents on the occasion of their official visit, thus enjoying the opportunity of seeing the people at their best.

On our journey to the village of Tmong we found ourselves, as darkness was approaching, at the end of navigation on a little stream, with our destination an hour's walk distant through the jungle in the rain. We could have remained at a near-by village; but as great preparations had been made for our reception, it was decided, in order not to cause disappointment, that we must push on.

The prospect was not pleasant, for in twenty minutes it was impossible to see anything; one could only follow the noise of the man in front. Soon, however, we were met by parties of young men bearing great flaming torches of bamboo, who glided along the path, the red glare of the torches enhancing the physical beauty of smooth, brown skin and fluent muscles.

ONE OF THE SPECTATORS AT A COCK-FIGHT

The small boys climb with hands and feet and do not allow the adult population to interfere with their view of the "great Borneo game."

Sometimes the flaring light would reveal the trunk of a giant of the jungle towering free of branches into the blackness overhead, while all the time the night insects were droning and booming and ticking with the ceaseless clamor of the tropical night.

THE PHONOGRAPH IN SARAWAK

A phonograph that I carried for the purpose of recording native songs was a source of great amusement. Many natives who had traveled to the government stations had heard the ordinary records, but none had ever heard their own language.

It was at times difficult to persuade any one to sing into the rather formidable-looking trumpet, but when a song had been reproduced from a record made at another village there was usually no further difficulty in bringing forward the "artists" of the house. When finally they heard their own voices issuing from the little box, their wonder and amusement knew no bounds. It is a pity no photograph could have been obtained of the bank of faces surrounding our little party, with the phonograph in the center, when they first real-

SARAWAK SOCIETY OCCUPYING A RING-SIDE BOX AT A COCK-FIGHT

The onlookers are grouped on a platform at the end of a Dayak house, which is built high from the ground. The space beneath is utilized as a combination pigsty and chicken run. Note the family dog on the platform.

ized that a box was talking their own language in the voice of one of their own number.

The mechanism of the phonograph was fastened to the under side of the cover of the box that contained it, so that by inverting the cover and fastening it to the box a good stand was provided. One evening, when I had finished and was lifting the cover, an old man touched me on the shoulder, with the remark that he wanted to have a look inside, doubtless thinking that he was going to expose some trick on my part.

Another man, who had frequently been down the river to the government stations and heard ordinary European records, said that there was nothing so very extraordinary in a box that simply talks the language of the white man, but that a box should be able to talk their language was indeed wonderful. On another occasion I heard a young Dayak ask a stranger if he had ever seen the "box that talks." "No," replied the latter, "I'm only an up-river man."

A GENTLE, KINDLY PEOPLE

It is the general testimony of travelers in Sarawak that the Land Dayaks are a gentle, kindly people, easy to get on with, grateful and loyal to their friends. This was certainly my experience with Juni, a Land Dayak boy.

Juni was my cook and personal servant when I went up the Limbang River, and he was tireless in his devotion to my comfort, although, it must be admitted, sometimes a trifle careless; as on one morning when he packed my rice, raisins,

ONE OF THE EXPERTS IN THE SPORT OF COCK-FIGHTING EXAMINING THE LONG KNIVES WITH WHICH THE BIRDS ARE ARMED

When the cocks are so equipped, the fights are of short duration. The native in this photograph is wearing a coat of typical Dayak texture and design.

opened tin of milk, and biscuits in the bottom of an iron pail and then laid the kerosene lantern on top. He was much distressed when he discovered the oily condition of my lunch; but there is a phrase in the Malay language that solves all difficulties, "Apa buleh buat?"—What can one do?

As Juni had worked in the houses of some of the planters near Kuching, where he had learned both good cooking and dainty serving, he supplied my table with such delicacies as fried fish, pheasant stew, and salads of fern sprouts and the hearts of palms, but he did not at all approve of my coarse, agate plates; so, quite unknown to me, he bought a pretty blue China plate in order that the products of his culinary art might be served in a worthy manner.

His good humor was inexhaustible, even under inconsiderate treatment from one or two of my Sea Dayak boys, who, like the Prussians, regarded themselves as belonging to a superior race. The following incident shows that he possessed no small amount of intelligence.

FIGHTING MALARIA AND SMALLPOX

When planning to visit one of the coast stations where malaria happened to be unusually serious, I cautioned my seven native boys that they must all provide themselves with mosquito curtains to sleep under, explaining that it had been discovered that if one were not bitten by a mosquito he would not get fever. After thinking over my statement, Juni called attention to the fact, which I had failed to notice, that while we had been up river only those had had fever who did not have mosquito nets. He assured me solemnly that he thought there was something in what I said.

In this connection the natives' willingness to be vaccinated is worth mentioning. Smallpox epidemics occur frequently

CHANGKOK, SURROUNDED BY THE MEMBERS OF HIS FAMILY: AN INDUSTRIOUS, HOME-LOVING, APPRECIATIVE DAYAK (SEE TEXT, PAGE 118)

On his legs are numbers of fine rings braided from the fiber of the apin palm, much prized for ornamentation. The women's skirts are excellent examples of Dayak weaving. Changkok's head-dress is made of beadwork, decorated with the favorite feathers of the hornbill. Note the large handkerchief in, shall we say, Mrs. Changkok's hand. Among semi-civilized peoples one seldom sees the father of the family with a baby in his arms.

enough for the natives to remember the high mortality of the unvaccinated and the practically complete immunity of the vaccinated. Any one may obtain vaccination free at the government dispensary or on payment of 6 cents at the out-stations.

After several years of freedom from the disease, there is some opposition to vaccination, but as soon as deaths from smallpox begin to occur, the natives are very eager for the treatment.

Juni was a useful, agreeable, and trustworthy companion for a journey in the jungle. He had adopted the Malay name of Snail because of his intention to "enter Islam"—that is, to become a Mohammedan—but I prefer to remember him as Juni, a Land Dayak boy who is not likely to be improved by becoming a Mohammedan and trying to become a Malay.

THE KAYANS, A TRIBE OF UNKNOWN ORIGIN

Perhaps the most interesting tribe in Sarawak and one of those least affected by contact with foreigners is the Kayan, which occupies the head-waters of the Baram and Rejang rivers, in the northerly

THE NIPA PALM AND A FLOCK OF "PADI" BIRDS IN THE LOWER REACHES OF THE NIAH RIVER; THIS PALM GROWS ONLY WITHIN REACH OF THE SALT WATER: BORNEO

Roofing material is made from the leaves of this plant; also cigarette wrappers. Sugar is obtained from the sap and salt secured by burning the roots.

part of Sarawak, extending also into Dutch Borneo.

These people for unknown generations have lived almost entirely isolated in the interior of the island. There are many reasons for believing they are of Caucasic origin, having entered Borneo from southeastern Asia, where they received infusion of Mongol blood and separated from people of their own race, who were the progenitors of the present Karen tribes of Lower Burma.

It appears that the Kayans came to Borneo by the way of Tenasserim, the Malay Peninsula, and Sumatra, later penetrating up the rivers of Borneo. One notices the features of some Kayans that very strongly suggest Caucasic origin, this being particularly true of the upper or ruling classes, who would be most likely to preserve their racial stock uncontaminated by mixture with conquered tribes.

Many Kayans have very light skin, particularly those of the interior and those who have been little exposed to the sun. The tribe believes in a large number of deities, with one supreme being at the head, thus resembling the Greek mythology. Many of the details of the methods of taking omens among the Kayans by the flight of birds and the examination of the entrails of animals present extraordinary points of similarity with the Roman methods of taking the auspices.

While the Brunei Sultans held control of the mouths of the Baram and Rejang rivers they were able to exact tribute from the Kayans, who, in turn, terrorized the Dayaks living below them on the Rejang.

These raids against the Rejang Dayaks who had accepted the Rajah's sovereignty at last became so serious that in 1863 the late Rajah conducted a large expedition against the Kayans of the Rejang.

LAND DAYAK WOMEN IN ALL THEIR FINERY AWAITING THE ARRIVAL OF A GOVERNMENT PARTY

Many of the young people of this tribe are finely developed physically. The discomfort which the women endure by confining their arms, legs, and waists with great coils of heavy brass wire is the price which Sarawak femininity uncomplainingly pays to be in style.

and subdued them. In 1882 the Baram River was ceded to Sarawak, and thus the remaining Kayans came under the control of the government.

Next to the Rejang, the Baram is the largest river in Sarawak, but, unfortunately, it has a shoal bar at its mouth, exposed to the monsoon, which makes it unsuitable for schooners and open only to steamers of light draft. Two such steamers now carry on trade with Claudetown—or Merudi, the native name—about 60 miles above the mouth.

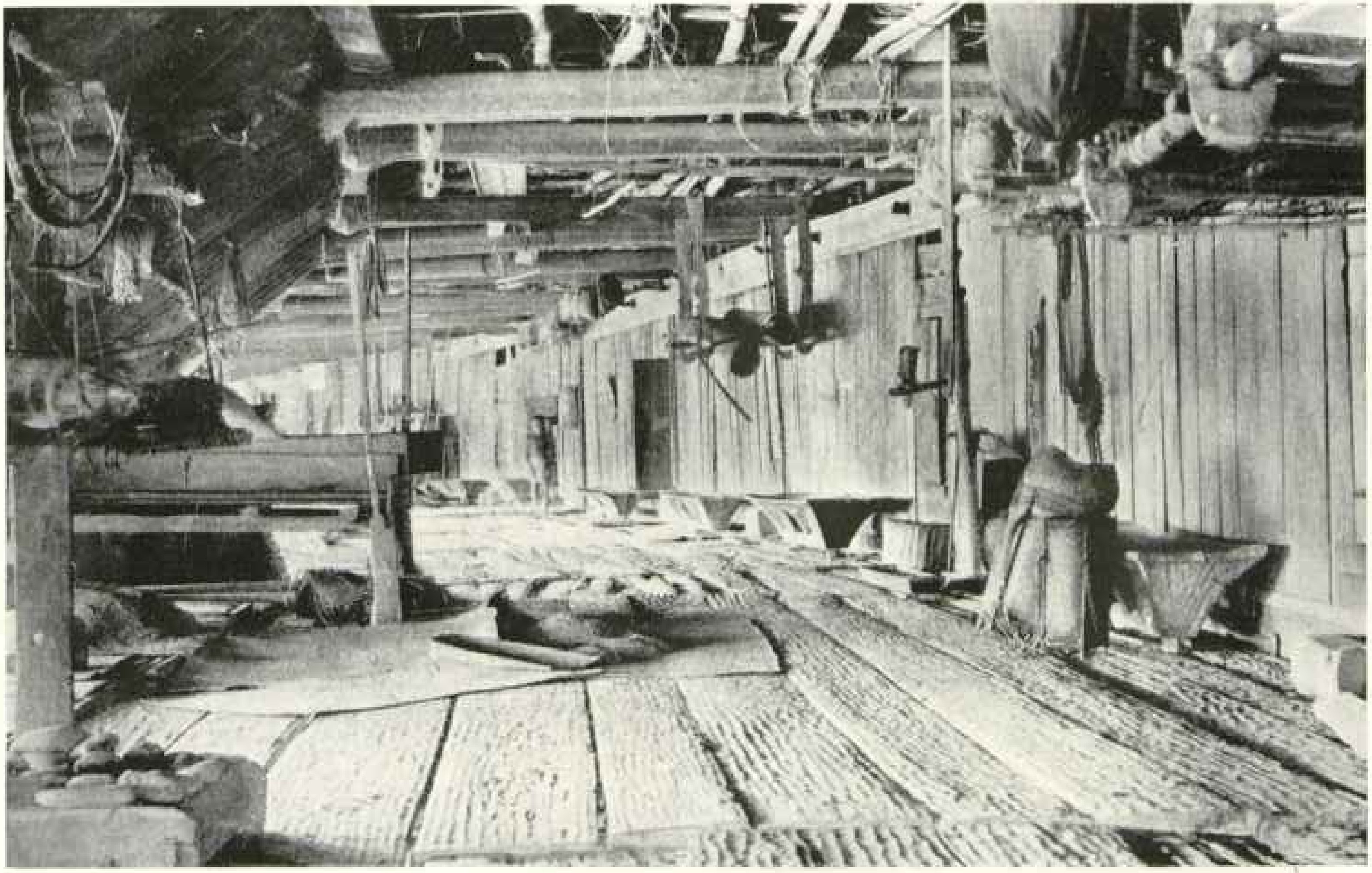
THRILLING PRACTICES OF NATIVE NAVIGATORS

Entering the Baram, especially during the bad weather of the monsoon, is an experience not always entirely devoid of excitement. It is not unusual for the little steamer to run aground on the bar and be washed over by successive waves into deep water on the other side—a method of navigation that does not appear to disturb the Malay pilots in the least.

Along the lower reaches of the Baram, as far as the sea water is carried by the flood tide, the nipa palm, interspersed with mangrove swamps, forms a monotonous and almost continuous wall on each muddy bank. For miles scarcely a tree rises above the high tops of the palms to break the monotony of the swampy, alluvial plain through which the river winds.

Before Claudetown is reached the nipa palm gives place to great jungle trees, the banks of the river are higher, and houses of Malays and Dayaks begin to appear.

Occasionally one passes the ruins of abandoned houses, whose former occupants have moved away in the search of



SARAWAK'S IDEA OF AN APARTMENT HOTEL: THE INTERIOR ARRANGEMENT OF A KAYAN HOUSE IN THE VILLAGE OF LONG PALEI

The floor is of hewn board. Near the middle is a rattan mat with a pile of rice to be winnowed, the rice having been previously pounded in one of the mortars along the wall. The rooms (one for each family) are entered by the doors on the right. The raised platform at the left is the sleeping apartment of unmarried men or boys and of any visitors.

THE OPEN GALLERY IN FRONT OF A LAND DAYAK "LONG HOUSE": SARAWAK

The platform is eight or nine feet from the ground. The higher building at the left is the "head-house," where heads captured from their enemies are kept, where, also, unmarried men and boys as well as visitors sleep and are entertained. To the clusters of poles at the right, which mark the entrances to the rooms, each of which is occupied by one family, are attached charms to protect the inmates from disease and evil spirits.

new farming lands. These ruins are almost invariably covered with vines, which conceal everything as if a great blanket of vegetation had been loosely flung over roofs and tree-tops.

When the river is in flood, great trees come sweeping down, washed away as the waters continually change their course, so that the beaches at the estuary are piled with huge logs.

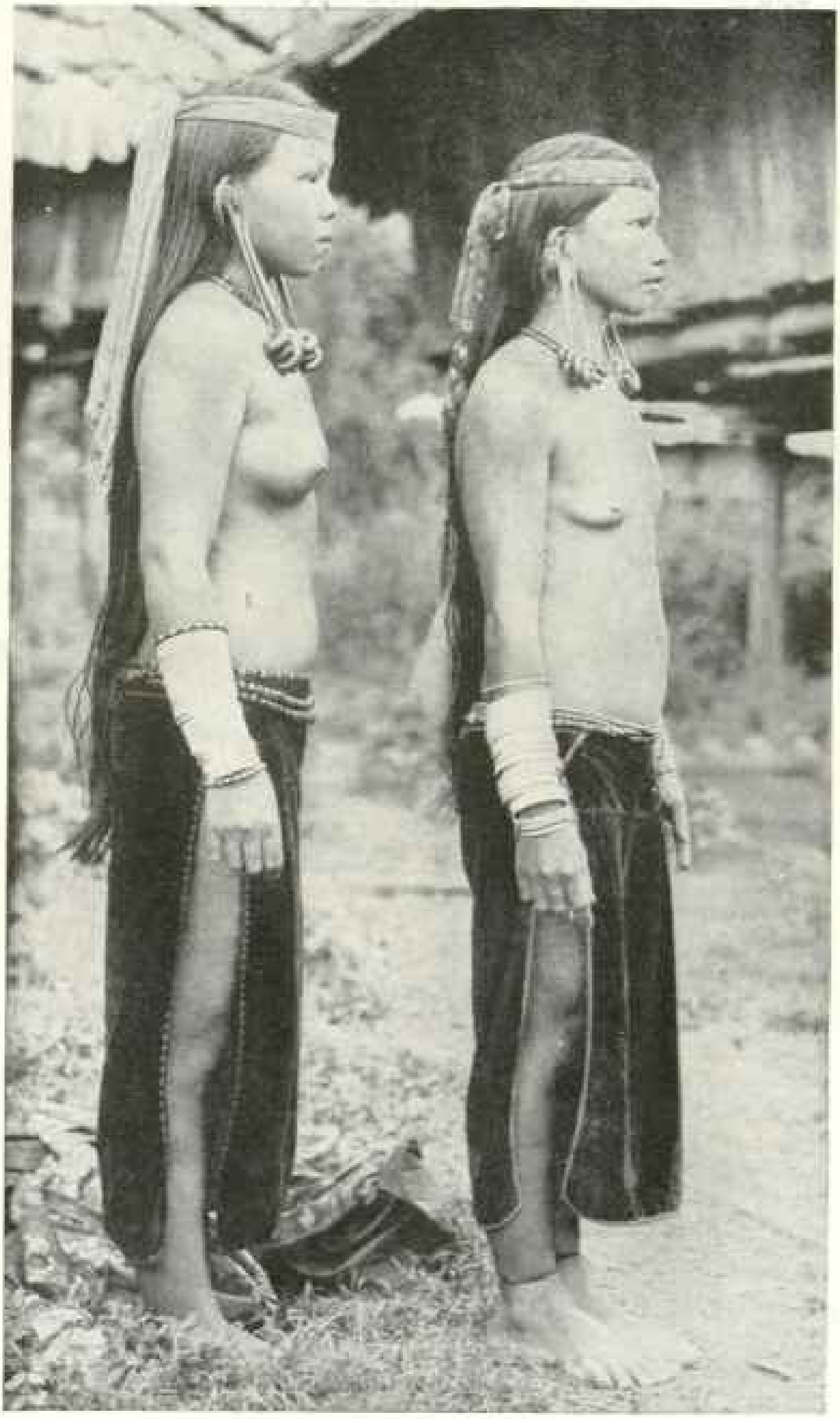
A JOYOUS WELCOME AT LONG PALEI

My first meeting with Kayans was on the occasion of a visit of the Resident of the Baram district to the village of Long Palei, about 130 miles from the mouth of the Baram River and about 70 miles from the government station at Claudetown. For this distance the river is navigable for steam launches, but a short distance above the rapids begin and native dugout canoes make slow progress paddling in the rapid current or poling and dragging up the rapids.

We spent two days making the journey from Claudetown, calling at villages on the way, and arriving at our destination, Long Palei, late in the afternoon, where we had no sooner anchored than many of the leading people of the house, including the young chief, came on board to welcome the Resident, who had been absent from his district for several months.

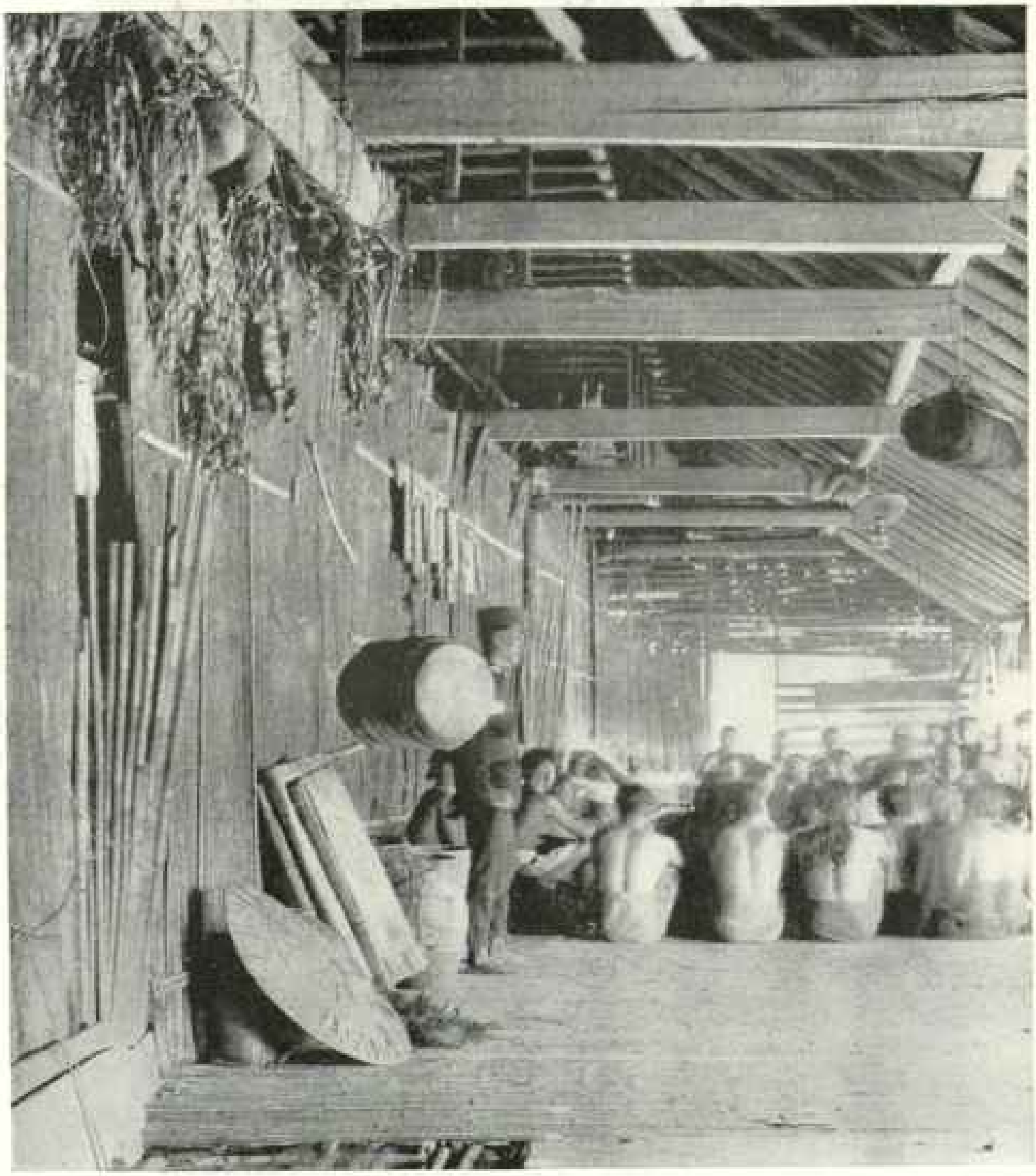
The unfeigned joy with which these people welcomed the return of their white ruler, whom they had learned by long association to recognize as their best friend, was a tribute of which any man could be proud.

When, after the hearty exchange of greetings on board the launch, we went on shore and climbed the steps leading into the long gallery of the house, a very old man came forward and, grasping the



THE SHEATH GOWN IN ITS PRISTINE LOVELINESS

Western civilization has borrowed the slit skirt from the Kayan modistes, but the elongated ear lobes loaded with miniature quoits have yet to make their appearance on the Champs Elysees, in Piccadilly Circus, and on Fifth Avenue (see page 143).



THE GALLERY OF A KAYAN HOUSE DURING A CONFERENCE WITH GOVERNMENT OFFICIALS. NOTE THE ROW OF SKULLS HANGING FROM THE BEAM IN THE LEFT FOREGROUND, NEAR THE TOP: SARAWAK

The formal welcome to visitors in a Kayan house is apt to be long and somewhat tedious, but the ceremony has one advantage over the customs of occidental civilization—when the guest's health is drunk the guest gets the drink (see page 133).

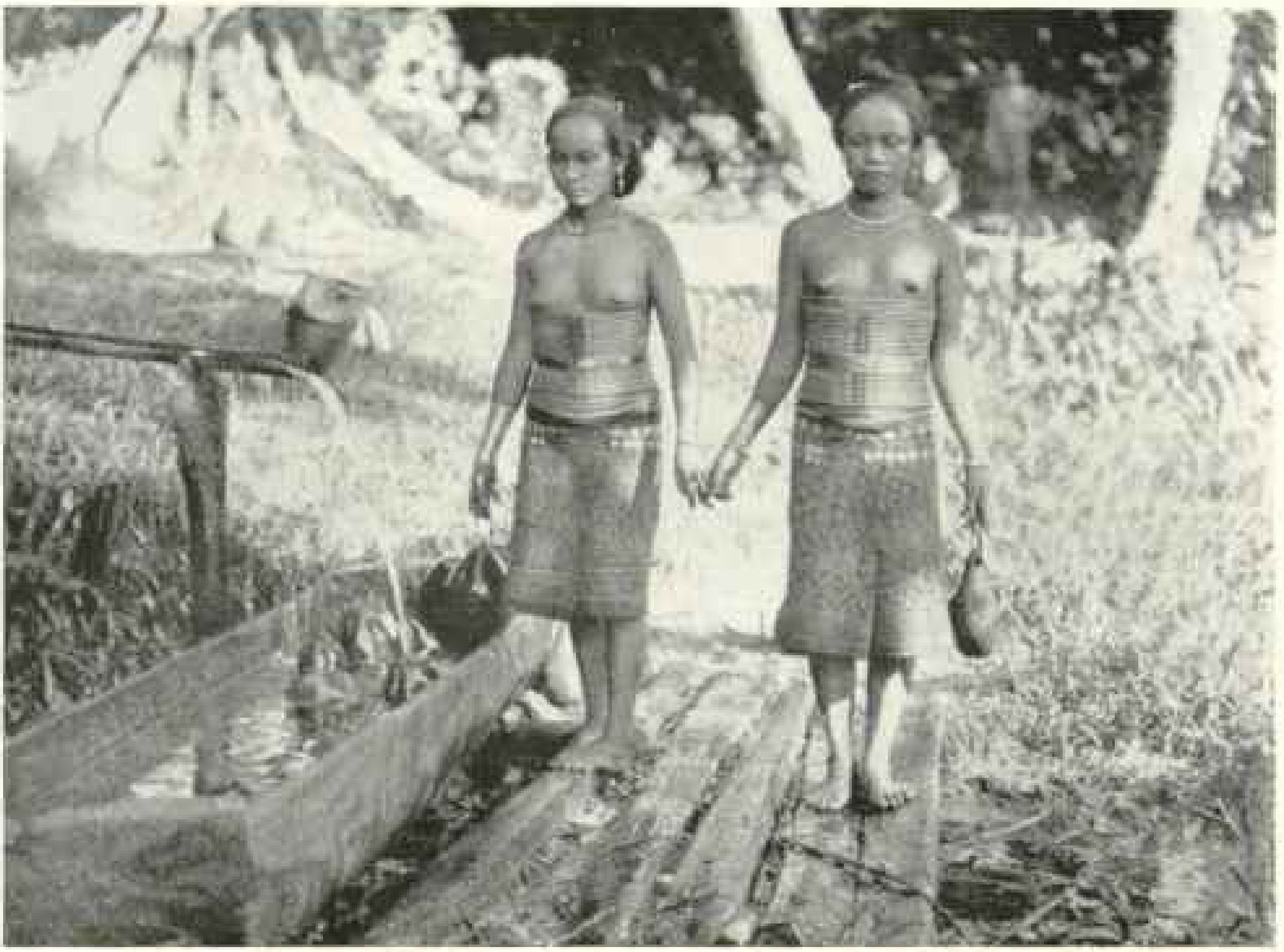
Resident by the arm, conducted him to the seat prepared for him in the middle of the gallery. Then the old chieftainess, Ulau, came forward to greet us.

A STATELY CHIEFTAINESS

The dignified presence and stateliness of the old lady gave me one of the greatest surprises I ever experienced. She maintains rigid discipline, which is characteristic of the Kayan household, from the chief of the house to the head of the family, and the fruits of discipline are apparent in the good manners and recognition of authority that, more than anything else, astonish the visitor, who is not

ALL TATTOOED UP AND NO PLACE TO GO

This Dayak dandy wears on each leg five silver rings and many small rings braided from the fiber of an indigenous palm; he has a fine bead necklace with silver buttons; his head is crowned with an elaborate millinery creation, in which is thrust a hornbill feather. Silver bracelets and a parang, or short sword, with a beautifully carved handle, complete his resplendent regalia.



WATER GIRLS OF DAYAK LAND

These demure Rebekahs of Sarawak are provided with gourds instead of pitchers of pottery, and their well is a bamboo trough fed by the waters of a near-by spring.

prepared to find such culture among Bornean "savages."

There are three fairly well-defined social classes in the Kayan house: the upper class, comprising the chief and his relatives, occupy rooms in the middle of the long house; the middle class, whose members are not related to the chief, occupy rooms on both sides adjoining, while the rooms at each end of the house are occupied by the slaves—that is, the descendants of those captured in war.

"Slave" is rather a misleading term, for in all that concerns the welfare and comfort of this third class they differ so little from the other inhabitants of the house that one without experience has difficulty in distinguishing them. Their daily occupations do not differ very materially from those of the upper classes, for almost all participate in the hard labor of planting and harvesting the rice crops.

The formal welcome to visitors in a Kayan house is apt to be rather long and tedious, but on this occasion a number of deaths had placed the house in mourning, so that our welcome was concluded with the drinking song, a unique and interesting performance.

HOW A GUEST IS RECEIVED IN A KAYAN HOUSE

After the guest is seated on the fresh rattan mats spread upon the floor, when the first greetings have been exchanged and the people of the house have assembled, squatting in a circle around the guest, the young girls bring jars of rice wine and cups, and one of the prominent men of the house, taking his place on the mat in front of the guest, fills a cup and begins the song.

In a monotone, the singer voices his esteem for the visitor and his good wishes for health and prosperity, pausing fre-

KAYAN WOMEN AND GIRLS OF TAMA APING BULIENG'S HOUSE ON THE UPPER TINJAR RIVER: SARAWAK, BORNEO

Obesity is a badge of feminine beauty in Turkey, small feet in China, and large ears among the women of Sarawak. Some of these youthful Borneo belles have suffered a permanent blemish to their charms by trying to grow beautiful in a hurry; their ears have been broken in the attempt to stretch the lobes rapidly by attaching weights greater than human flesh could bear.

quently to recover breath and ideas. At each pause the crowd drones out a chorus, "Ara Wi Wi Ara," and when the singer finally has exhausted his resources in complimentary phrases, he raises the cup to the lips of the guest, who drinks, while the crowd joins in a prolonged shout until the last drop is drained.

This ceremony possesses an advantage over our method of drinking a health in that among the Kayans the guest gets the drink. On certain occasions it is proper etiquette to spill a few drops of the rice wine over the rail of the gallery for the benefit of any spirits that may be lurking outside.

After the drinking song had ended the welcoming of our party, the talk turned upon the news of the country, the gossip of the household, and the disputes that had arisen among themselves or with neighboring houses since the Resident's previous visit.

Throughout the evening and well into the early hours of the morning, the Resident sat patiently listening to the troubles of his people, counseling and encouraging them and rendering his decisions in cases that were brought before him.

As I understood none of the Kayan language, I was glad to be excused and return to the launch, where I had been sleeping comfortably on the deck in the cool, tropical night for several hours before the Resident could leave the almost endless talk of his Kayan friends.

THE SOCIAL HOUR AT BARAM

The Residency at Baram is pleasantly situated on a grassy knoll overlooking the river, where about sunset we were wont to sit in the cool evening breeze, while the

CHILDREN INSURE DOMESTIC HAPPINESS IN SARAWAK

Many of the young girls of the Kayan tribe have their legs tattooed in a fine and intricate design, which, at a distance, strikingly resembles lace stockings. Although the Kayans are skillful in this art, the flesh frequently becomes badly swollen.

Resident received pleasant social visits from natives, some bringing news from up river; others calling for mere friendly gossip.

This was one of the most delightful hours of the day. There was the beautiful expanse of jungle and river glowing in the colors of the brief tropical sunset, with sometimes a native boat or raft of rattan drifting gently down to the Chinese shops or bazaar; the short silence that comes at dusk, when the birds and insects of the day cease their chirping and those of the night have not yet begun—all these things bringing a sense of peace that made the great world seem indeed very far away.

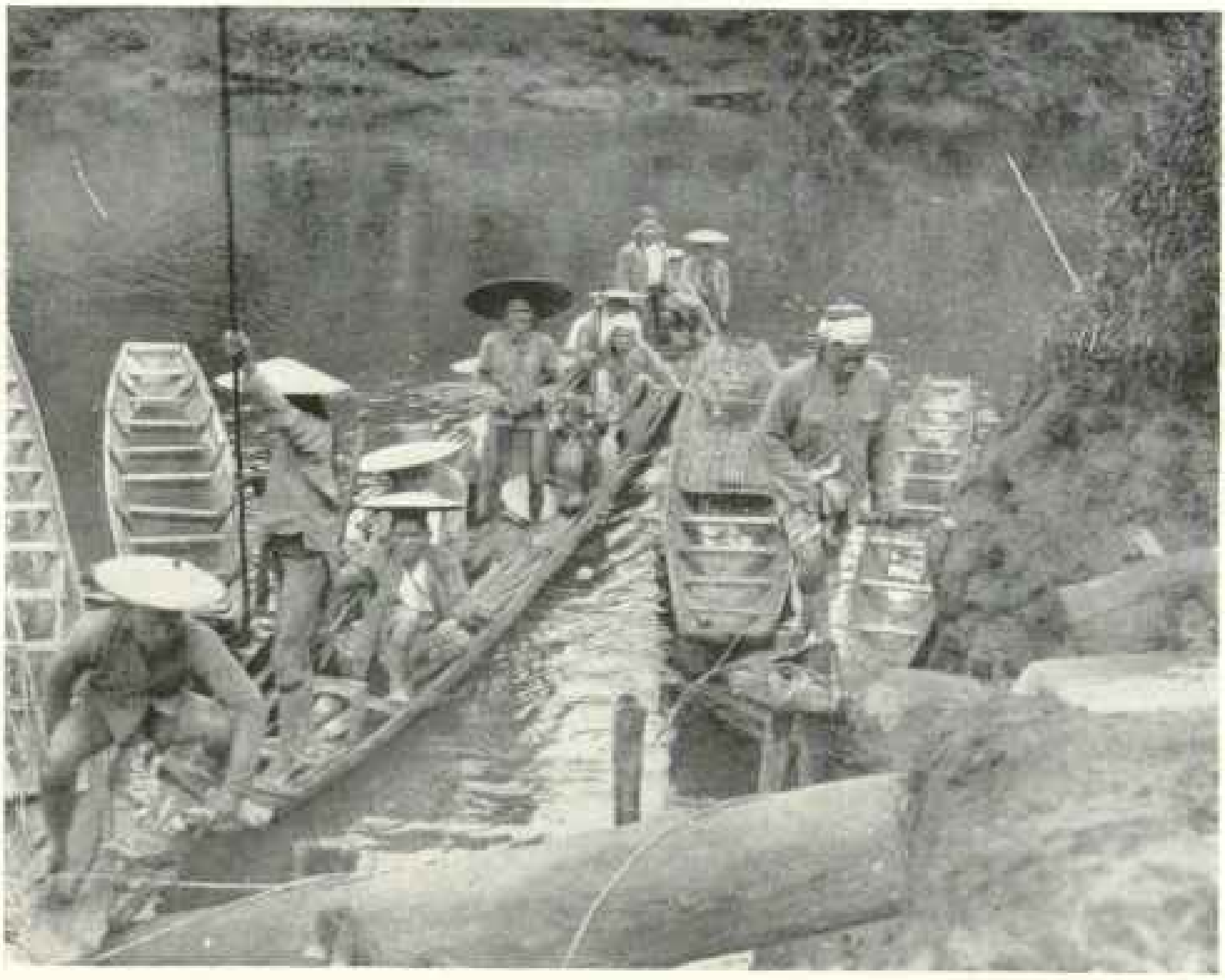
It was on such an evening, some weeks after the visit to Long Palei, that Tama Tijan, the young chief, and a number of his men came to visit, giving me the opportunity of returning their hospitality. They sang for my phonograph, and Tama Tijan, who is a good musician, played the *keluri*, a reed instrument fashioned from bamboo pipes set into a large gourd, resembling somewhat the bagpipe, but softer and more melodious (see p. 146).

One of the men gave the war dance, in which the dancer, springing lightly from side to side, guarding himself with a shield covered with tufts of hair, and brandishing his *parang*, or short Kayan sword, exhibits the skill with which he parries the thrusts of his enemy, and finally overcomes him and takes his head.

GIVING THE "AMERICAN WAR DANCE" BY NATIVE REQUEST

It was all very interesting until Tama Julan, a jolly old fellow, made the embarrassing suggestion that, as they had been showing me how the war dance was done in Borneo, it was only fair that I should show how it was done in America.

Instead of explaining, as I ought to



TAMA APING BULIENG, THE KAYAN HEAD CHIEF OF THE TINJAR RIVER, ARRIVING AT A GOVERNMENT STATION

have done, that we have no war dance in America, I was so foolish as to attempt, with a *parang* and shield, to imitate the war dance of our Indians. My determination to make up in energy what I lacked in grace only added to the absurdity of my performance, and I finished in that distressing silence which falls on a company when something unpleasant has happened.

For a moment no one could think of anything to say; but Tama Julan was equal to the occasion, exclaiming presently in Malay, with great apparent earnestness: "Well! if a man were to meet you in the jungle, he would run right away."

Mark Twain once remarked that the happy phrasing of a compliment is one of the rarest of human gifts and the happy delivery of it another, so I think Tama Julan had good cause for being very much annoyed when a young fellow spoiled his tactful compliment by pointing out that, nevertheless, while I was dancing I was all the time holding the *parang* with the cutting edge toward myself.

Tama Julan's desire to relieve me of the embarrassment of my indiscretion is typical of the Kayan's courtesy and consideration.

A COMPANIONABLE KAYAN BOY

When we returned from our visit to Long Palei, the Resident induced a 17-year-old Kayan boy, Kebing, who had not been well, to come down the river in the hope that medicine and a change would benefit him. For several weeks he was my constant companion, occupying with his little slave the room next to mine in the Residency, where he spread his mat on the floor to sleep.

Kebing is the stepson of Ulan, the chieftess of Long Palei, and the son of

ON THE BANKS OF THE BARAM, NEAR LONG PALEI, SARAWAK, BORNEO

The disk-shaped article which the youth holds in his right hand with his two spears is not a shield but a sun hat similar to the one on his head. His clothing is scarcely of such quality and quantity as would justify the precaution of carrying for its protection the roll of rain-proof *kadjang*, made of palm leaves, which he has under his left arm.

a celebrated chief of former days. He has always been a great favorite with his stepmother, who has trained him so well that few boys could surpass him in gentle manners.

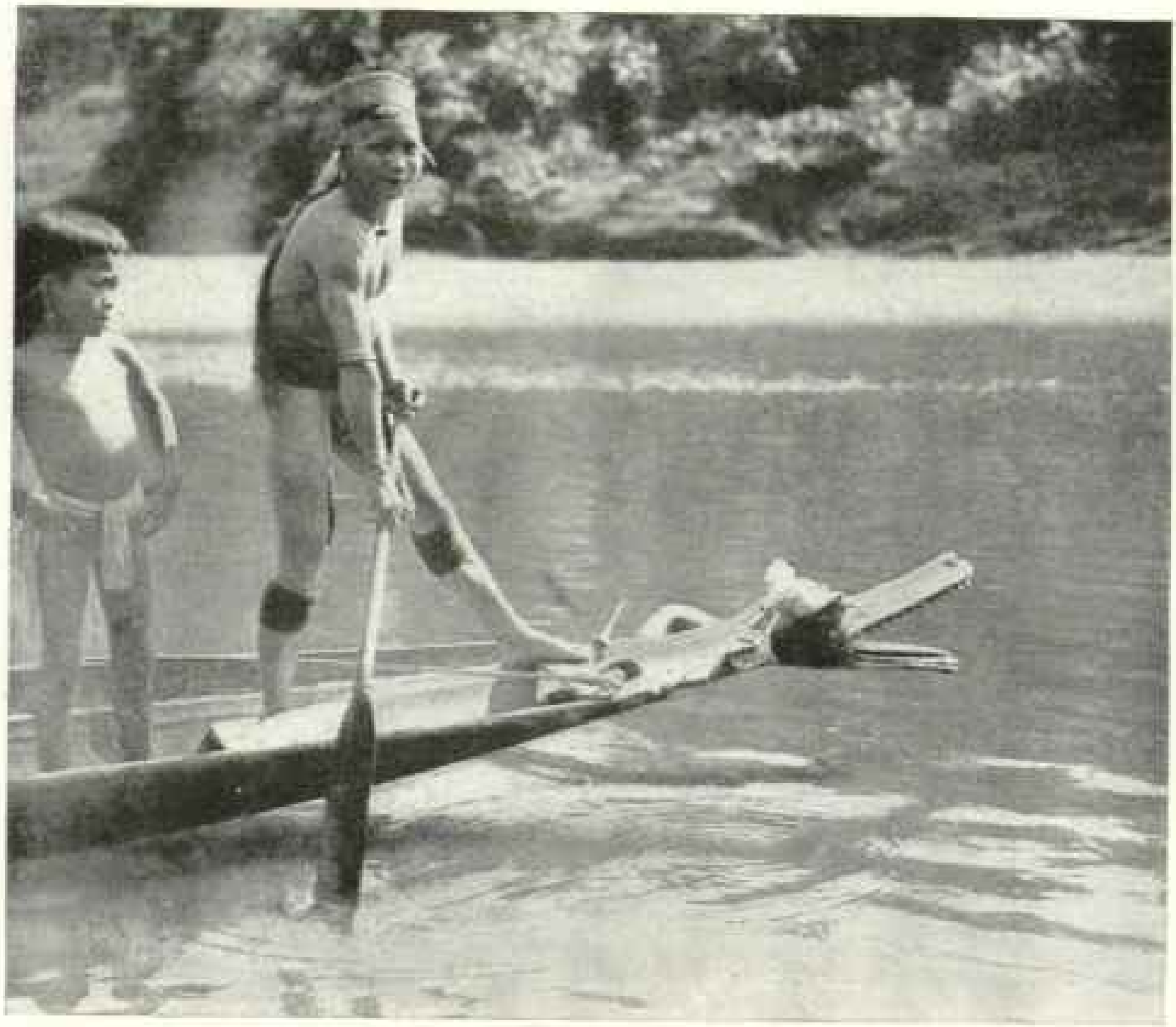
He was for me a constant joy, always keen to see the curious articles in my baggage but never obtrusive; always glad to hear my stories of my country or to tell me about his own. He speaks fluently two languages besides his own, and aided me much in acquiring a knowledge of Malay.

A Dayak less considerate than Kebing once took delight in pointing out to me, while I was floundering about in very bad Malay, that, of course, it's easy for the white man to learn a language, because he doesn't have to trust entirely to his memory; when he hears a word he can write it down.

The mystery of writing is naturally looked upon by the less intelligent up-river natives as a very wonderful thing, and a *surat*, or document, either written or printed, is an object of very great respect. Major J. C. Moulton gives a curious example. He had been traveling with an intelligent native named Belulok when the following incident occurred:

"Belulok asked my assistance in recovering a debt of one buffalo and a quantity of rubber from a Kalabit here, who, he said, had been owing him that for some time.

"Of course, I had no power to do anything of the sort and told him so; but he said he quite understood that and all he



KAYAN NATIVES IN A CANOE WITH A CURIOUS CROCODILE FIGUREHEAD

Aside from some poisonous snakes, the crocodile is the only dangerous living thing of jungle or stream which the natives of Sarawak have to fear, except enemies of their own kind.

wanted was an all-powerful *surat*—it didn't matter what—any scrap of paper with some writing on would do, he said, as the Kalabit could not read (nor could he, for the matter of that). So I gave him an old envelope which bore my name and address, and with this talisman he succeeded in recovering a certain amount of rubber ($10 or $15 worth) there and then! What wicked untruths he saw fit to tell about the power of the *surat* I did not inquire about."

Kebing was greatly interested in my sextant, and my attempts to explain the use of it led to many interesting talks. It is always a matter of interest to ask how far it is to the Tuan's "long house," *Tuan* being the Malay title of address for the white man, and the native conceives of the white man living on the banks of rivers in long communal houses, just as he does.

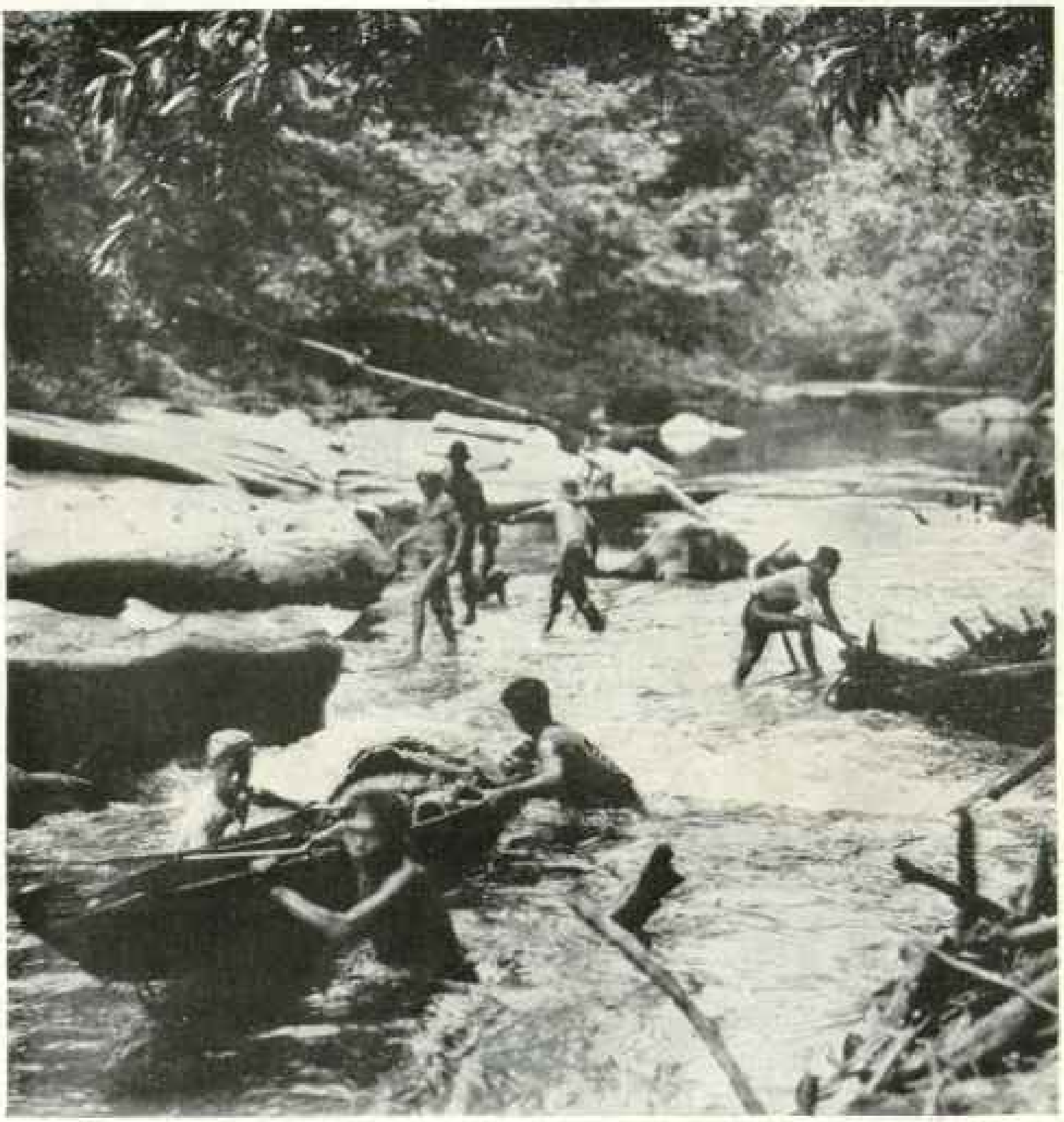
TRYING TO TEACH GEOGRAPHY TO A NATIVE

In an effort to give Kebing some idea of geography, I told him it was possible to go to America by traveling either in the direction in which the sun rises or the direction in which it sets, and to explain this incredible statement I scratched a map on the surface of a green orange, telling him that the sun stands still and the earth turns around.

"Once every day?" he asked.

"Yes," I replied.

"Well, why does it turn?" A rather difficult question.

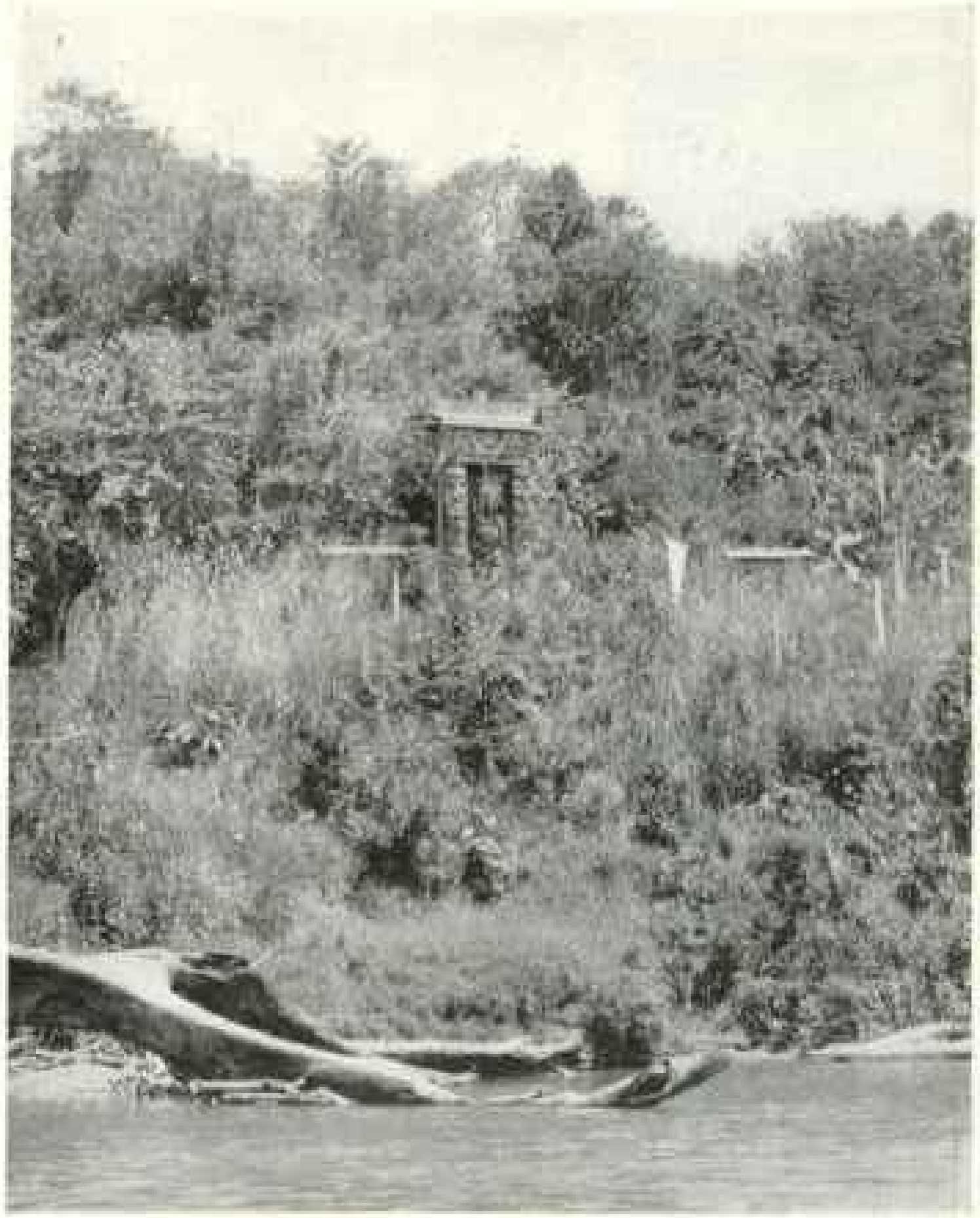


RAILWAYS AND DIRT ROADS ARE EQUALLY UNKNOWN IN THE JUNGLES OF SARAWAK: THE RIVERS ARE THE SOLE ARTERIES OF COMMERCE AND COMMUNICATION

Next to the Rejang, the Baram is the largest river in Sarawak. When the river is in flood, great trees come sweeping down, washed away as the waters continually change their course, so that the beaches at the estuary are piled with huge logs.

A former Resident once told Tama Bulan, a very intelligent chief, that the earth turns, but Tama Bulan protested that it could hardly be so, for one could see that it is the sun which moves; and the matter was not referred to again for several years, when Tama Bulan one day remarked that he had decided to accept the statement, for every white man he had asked said the same thing.

One evening, when I was taking sights on the stars, Kebing told me the names of the constellations, the Pleiades is "the bamboo clump" and Orion "the pig trap," which it certainly resembles as much as it does a sword, the pig trap being simply a sharp bamboo spike which is driven into the pig and sometimes, unfortunately, into the man who walks against the slender vine that releases the spring.



A KAYAN MORTUARY. THE BODY IS PLACED IN A COFFIN, WHICH IS THEN ELABORATELY DECORATED AND PLACED ON TOP OF HUGE, GROTESQUELY CARVED POSTS

The white rajahs have wisely recognized the danger of destroying the primitive customs and harmless occupations of the pagan peoples of Sarawak (see text, page 147).

PUNANS, ONE OF THE MOST PRIMITIVE RACES OF BORNEO, COOKING A PIG THEY HAD FOUND DEAD IN THE RIVER

It had apparently been dead three or four days at least. What they could not eat they hung by the river for their friends to find. The wind being right, it couldn't possibly have been overlooked.

Since the seasons so near the equator are not at all sharply distinguished by changes in the weather, it is necessary to make use of some astronomical means of determining the proper time for planting rice, for it must be growing during the rainy season.

THE STARS GUIDE NATIVES IN PLANTING

Some tribes make the determination by noting the day when the Pleiades is first visible just before the sun rises. Among other tribes the wise men make what amounts to an altitude measurement of the sun at noon. Two poles, decorated with carvings, are used; one is erected vertically in level ground; the other is used to measure the length of the shadow of the vertical pole at noon; when this shadow has attained a certain length, the proper time has come.

Still other tribes fix the day by the altitude of a particular star or constellation when it can first be seen after sunset; this altitude is indicated by filling a bamboo pipe with water, pointing it at the star, and observing the new level of the water when the bamboo is again held vertical.

Kebing once asked me what the sky is made of—if of rock—and was much disgusted with my rather inaccurate reply, that it wasn't anything. "But you can see there is something there."

One of the difficulties of the Resident is to keep familiar with the names of his Kayan people, for their names are always changing. For example, if Kebing marries and has a son whose name is Soring, his own name will become Tama Soring Kebing—"Tama" meaning "father of"—and he will be referred to frequently by the abbreviated title Tama Soring. If Kebing's wife dies, he will be known as Aban Kebing; if his first child dies, Oyong Kebing, and so on, with several other possible titles. He will end as Laki Kebing, grandfather Kebing. The difficulty is, that it is an important matter of etiquette always to address a man by his proper title.

THE EXCURSION TO MT. MULU

About 35 miles to the east of Claudetown the peak of Mt. Mulu, 9,000 feet high, lying between the basins of the Limbang and Baram rivers, can be seen on a clear day. On the sides of the mountain rise the sources of the Milanau River, which empties into the Tutau River, and thence into the Baram, and furnishes a means of approach to the mountain.

The sides of the mountain are formed of precipitous limestone cliffs, while not the least of the difficulties in making an ascent is to persuade any natives to accompany an explorer, for they believe that such places are the abode of the most malignant evil spirits. In 1858 Sir Spencer St. John attempted the ascent, but was prevented by impassable barriers from reaching an altitude of more than 3,500 feet (see pages 150-153).

The country about Mulu is very thinly inhabited and the jungle is old growth, so that it was with keen anticipation that I started one morning early in June for a visit to the headwaters of the Milanau River.

For the first day the Resident placed the launch at my disposal, which made it possible by towing my native boat, or *prau*, to make rapid progress up the Baram and Tutau rivers, spending the night comfortably at the house of a Malay trader.

The trader had fastened some logs together and moored them to the shore, forming a small landing stage with a little shed, where one could bathe without danger from crocodiles.

As the launch swung in toward the landing, the current caught the bow, and for a moment it seemed that we should strike the log with considerable force; whereupon a Malay on the landing cried out, "Don't run into the iceberg." Thus had the story of the *Titanic*, incredible to the tropical people, spread far into Borneo.

The next morning, bidding good-by to my Kayan friends from Long Palei, who were to be taken part of their journey on the launch further up the Baram River, I made an early start in the *prau*, accompanied by my Chinese cook, Ah Jun, two Malays, and three Dayaks to act as my boat crew.

One of my Malays was suffering from *korup*, a horrid skin disease that covers the body with dry, gray scales; he was

LAND DAYAK MEN OF SARAWAK

The bamboo boxes at their belts contain tobacco, matches, and betel-nut and siri to chew. Generally the loose end of the *chawat*, or loin cloth, hangs from the belt, but the young swell with the bead necklace has tucked the corner of his *chawat* into the belt, so as to be dressed a little differently from the others.

also afflicted with badly inflamed eyes, so common among the natives; but for the latter ailment I was fortunately able to give him considerable relief. He was a very good boy, however, anxious to assist me in every way. The younger Dayak, Migi, was a companionable, good-natured little fellow, with velvety brown skin, a laughing face, and handsome boyish figure—a constant stimulus to the good spirits of the party.

Our first day's journey was to have taken us to a Kayan house, but unfortunately the river was in freshet and the current so strong that progress was very slow. We did not reach the house, and one of the Malay boys, Bakut, a Mohammedan, took delight in teasing Migi, who had incautiously remarked early in the afternoon that he had seen an omen bird that assured him we should find the house just around the next turn.

A NIGHT OF DISCOMFORT

As darkness came on and it began to rain, we found ourselves compelled to seek an eddy in the current. Fastening the *prau* to the bank near an old clearing, three of my crew discovered a dilapidated hut, which they patched up for the night, while the remainder slept with me in the boat.

My unhappy Chinaman found a spot on the muddy bank, where, in the rain, with the help of an umbrella, he cooked an excellent supper, while I, under the shelter of the palm-leaf roof of the boat, collected many beautiful moths, attracted by the light of my acetylene lamp. A black, rainy night is the best possible time for the collector, for on a clear night the nocturnal insects seem to fly high.

Besides the moths, a swarm of tiny flies gathered in front of my lamp as dense as a little cloud of smoke, but fortunately mosquitoes and that worst-of-all

pests, the sand-fly, like our minges, were lacking.

It rained all night, the river rising about three feet; but the dawn came clear, enabling us to get breakfast and proceed in comfort. Less than an hour's paddling brought us to the large Kayan house of Tama Ding—a quiet, pleasant old man, who, I was sorry to learn, died a few months after my visit.

MINISTERING TO TATTOO VICTIMS

I found several people ill of fever, doubtless following the end of the rainy season, and I dispensed quantities of quinine pills, of which one must always take a large supply for the natives.

Many of the young girls had recently had their legs tattooed in a fine lace design, which gives the appearance at a distance of dark stockings; the Kayans are skilful in this art, but the flesh had swollen and my store of vaseline was much in demand.

One girl came to me with an arm badly swollen to the shoulder, clearly the result of infection. To my question if she had cut her finger, she first denied it, thinking it not worth mentioning, but finally acknowledged that she had done so, when I asked the reason for the piece of rag tied about it. She showed great amazement at my unaccountable knowledge, when I remarked that she had probably been cleaning a fish when she cut her finger.

As there was nothing, of course, that I could do, I contented myself with putting a little vaseline on the tiny cut, expressing the belief that the arm would probably be well in ten days or so. It was a very safe guess, for it is surprising from what wounds and infections these people can recover with no treatment whatever, while, on the other hand, a white man will find that insect bites and cuts become infected and make bad sores unless antiseptic precautions are continually employed.

When, a week later, I called at Tama Ding's house on my way down river, I

MIGI, A HANDSOME DAYAK YOUTH, WHO WAS ONE OF THE PARTY OF SEVEN ON THE TRIP TO MT. MULU

"Migi was a companionable, good-natured little fellow, with velvety brown skin, a laughing face, and boyish figure—a constant stimulus to the good spirits of the party" (see text, page 142).

A TYPE OF RIVER CRAFT MUCH USED IN SARAWAK: THE MEMBERS OF THE CREW SQUAT IN THE BOW AND STERN, REACHING OVER THE SIDE TO PADDLE

The roof, made of palm leaves, provides protection from rain and sun. A small dugout is fastened with rattan beside the log.

found that the girl's arm was nearly well, and that I had a reputation as the greatest Manang, or witch doctor, that had ever come up the river.

DISPENSING AMMONIA COCKTAILS TO NATIVE WOMEN

Every one, sick and well, wanted medicine, and when a bevy of cheerful old ladies, with nothing whatever the matter with them, came to me, I was somewhat at a loss. Finding, however, in my splendid little medicine chest an unopened bottle of ammonium bromide tablets, recommended as a nerve sedative, I decided that it was just the thing, and proceeded to administer small ammonia cocktails.

As the old ladies had been chewing the astringent betel-nut and siri all their lives, the pungent flavor of the ammonia gave them a new sensation in their tasteless mouths that pleased them immensely. They crowded around me for more, which I was obliged to refuse.

To one not skilled in the use of medicines, the simplicity of the medicine chest carried by Beccari, the explorer, makes a strong appeal; he dispensed only quinine, chlorodyne, or tincture of Worcestershire sauce, as the symptoms appeared to demand. The native is no homeopath—he wants his medicine strong!

THE BLACKSMITH WORKS IN SECRET

As I came away from Tama Ding's house, I noticed in a shed a man forging a *parang* blade and two others vigorously working a simple pump, made from large bamboos, for blowing the fire. With much interest in the making of these really fine blades, I started to enter, but was quickly told that I mustn't do so, but could watch from the outside.

The blacksmith's objections were prob-

A MALAY DWELLING ON THE SARAWAK RIVER: KUCHING, BORNEO

In the water the owner has built a pen of small poles in front of the steps from his house, so that his family may bathe without danger from crocodiles. When floating quietly in a small canoe, men have been known to be taken from it by a crocodile. Recently a little Malay girl rescued her brother by diving into the water and pressing her thumbs into the crocodile's eyes until the boy was released.

ably based on his fear that the arrival of a stranger at the critical moment would interfere with tempering the steel.

In the old days Kayans used to smelt iron and make their own steel, but now they buy European steel bars from the Chinese traders.

Leaving Tama Ding's house at noon, I arrived about 4 o'clock at the small house of Tama Tapan Semance, a Kayan, who, having been to a mission school, reads Malay in both Roman and Arabic characters and is an agreeable host, but a generally disreputable member of Kayan society.

As the river was rising rapidly and rain threatening, I was glad to make sure of a dry house for myself and boys rather than risk another uncomfortable night in the *prau*.

Three hours' paddling against a strong current brought us on the following morning to the farm house of Tama Saging. It was a small house built a few miles up river from his fine, large, permanent home for the purpose of working new farm lands.

To Tama Saging I brought a letter from the Resident, asking his assistance and, if possible, his own company for my trip further up river. Tama Saging himself cannot read, but a Malay living with him interpreted the letter, which also called upon him to appear at the government office on business twenty days from the date of the letter.

A KNOTTED STRING HIS ONLY CALENDAR

In order to fix the date, I carried with the letter to Tama Saging a *tebuku*—that is, a string with twenty knots tied in it. While I had the tebuku I cut off one knot each morning, and Tama Saging later did the same, so that when all the knots were gone he would know the appointed day had arrived.

THE KAYAN SWORD DANCE, SHOWING HOW THE WARRIOR ATTACKS HIS ENEMY AND FINALLY TAKES HIS HEAD

The man at the left is playing the *keluri*, a reed instrument of bamboo tubes, giving rather pleasant music (see page 135).

I noticed that Tama Saging had five other tebukus hanging from the bamboo box containing his tobacco.

Before I left Claudetown, word had been received from up the Baram River that the taking of omens for the planting of the rice fields was about to begin, and that in consequence the houses would be *malon*, or tabu, which meant that no stranger could enter them nor the occupants start on a journey during the next three or four weeks, while the ceremonies were in progress.

The Resident cautioned me to ascertain carefully before entering Tama Saging's house if such were the condition of affairs with him, for in that case I would have to content myself with the hospitality of a Chinese trader.

Upon explaining the situation to Tama Saging, he exclaimed that his people were not like those in other communities. He would only take two or three days for observing the omens and would not begin for ten days yet, anyway; so I was quite at liberty to enter his house, where he saw that I was comfortably settled, with my numerous impedimenta, in the veranda or gallery opposite his room.

Visitors are always quartered in the gallery, which forms, on the river side of the long house, a common passageway for entrance to the row of rooms on the other side. As the eaves are low, the gallery is well protected from the rain and is really the best place to sleep.

Tama Saging's hospitality was perfect; but he took his time to decide whether he could go up river with me, and I suspect that he wanted at least to make sure that I would not prove a burdensome traveling companion.

This precaution of finding out if Tama Saging's house were tabu before entering it, provided an interesting illustration of the care that Rajah Brooke has taken

A KAYAN MAN AND WOMAN OF THE TINJAR RIVER DISTRICT: SARAWAK

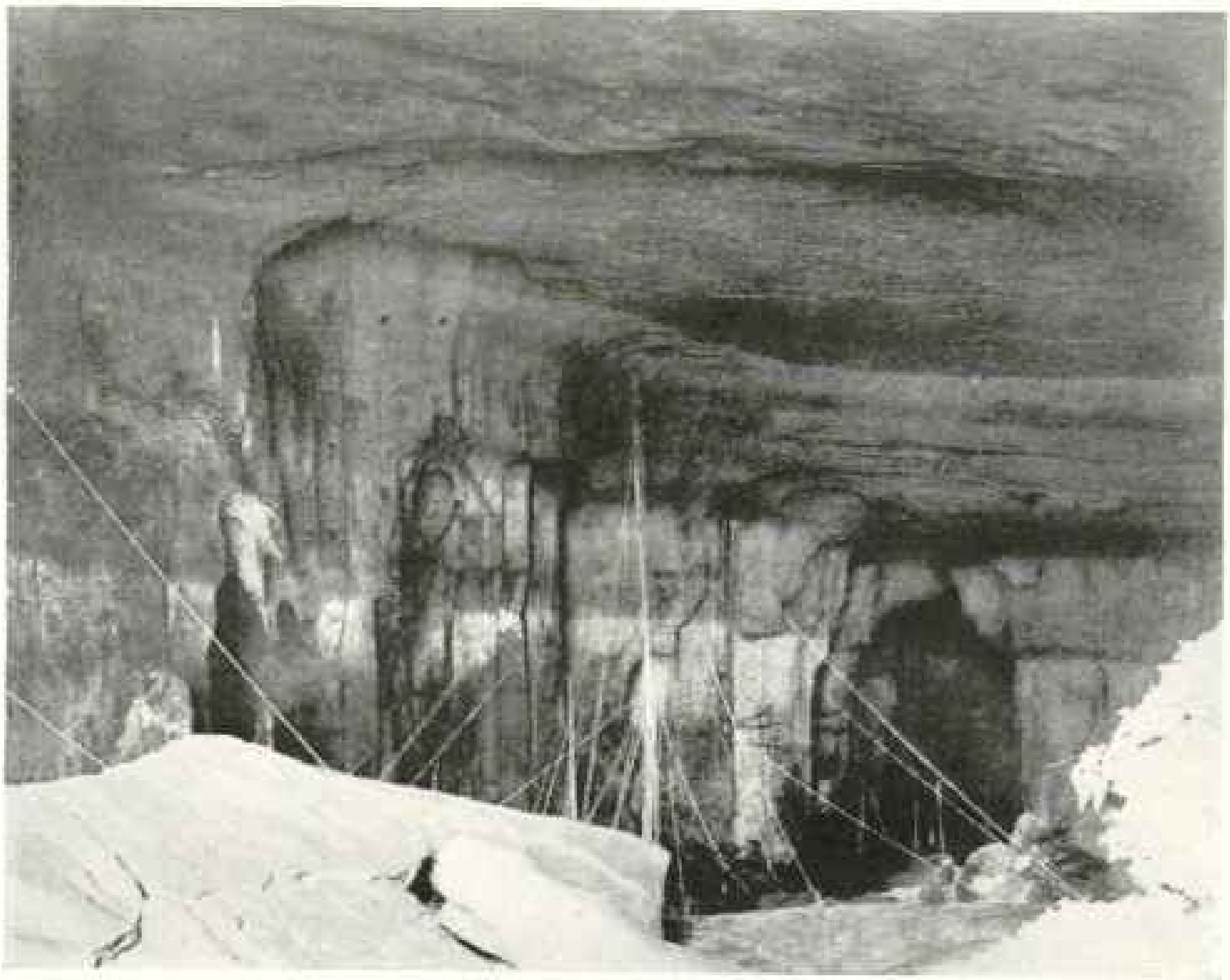
The lobes of the woman's ears are ornamented with the customary rings, but the upper parts of the man's ears are adorned with much more highly prized decorations—two tiger's teeth, which give him the appearance of having tusks growing out of the sides of his head.

not to interfere with harmless native customs.

WHY NATIVE CUSTOMS AND OCCUPATIONS ARE PRESERVED

It is difficult enough to abolish the harmful ones; and it is best for those people to spend days watching for favorable omens in the flight of birds and the cries of animals, until they have advanced enough to make it certain that a useful occupation can be substituted for that which the superior white man wishes to destroy. Thus the Residents carefully respect this and other "*tabus*."

The danger of destroying the primitive customs and harmless occupations of pagan races simply because the white man knows that he can employ his own time better has been recorded by Stevenson in his pathetic stories of the Marquesans. So many of their customs were



ONE OF THE GREAT LIMESTONE CAVES NEAR THE NIAH RIVER

The mast, supported by shrouds, is erected to give access to the nests of the swift on the under side of the roof of the cave. These edible nests are shipped in large numbers to China. The size of the cave is indicated by the man standing at the right near a shroud.

destroyed that no joy was left in life, and the Marquesans have almost passed away.

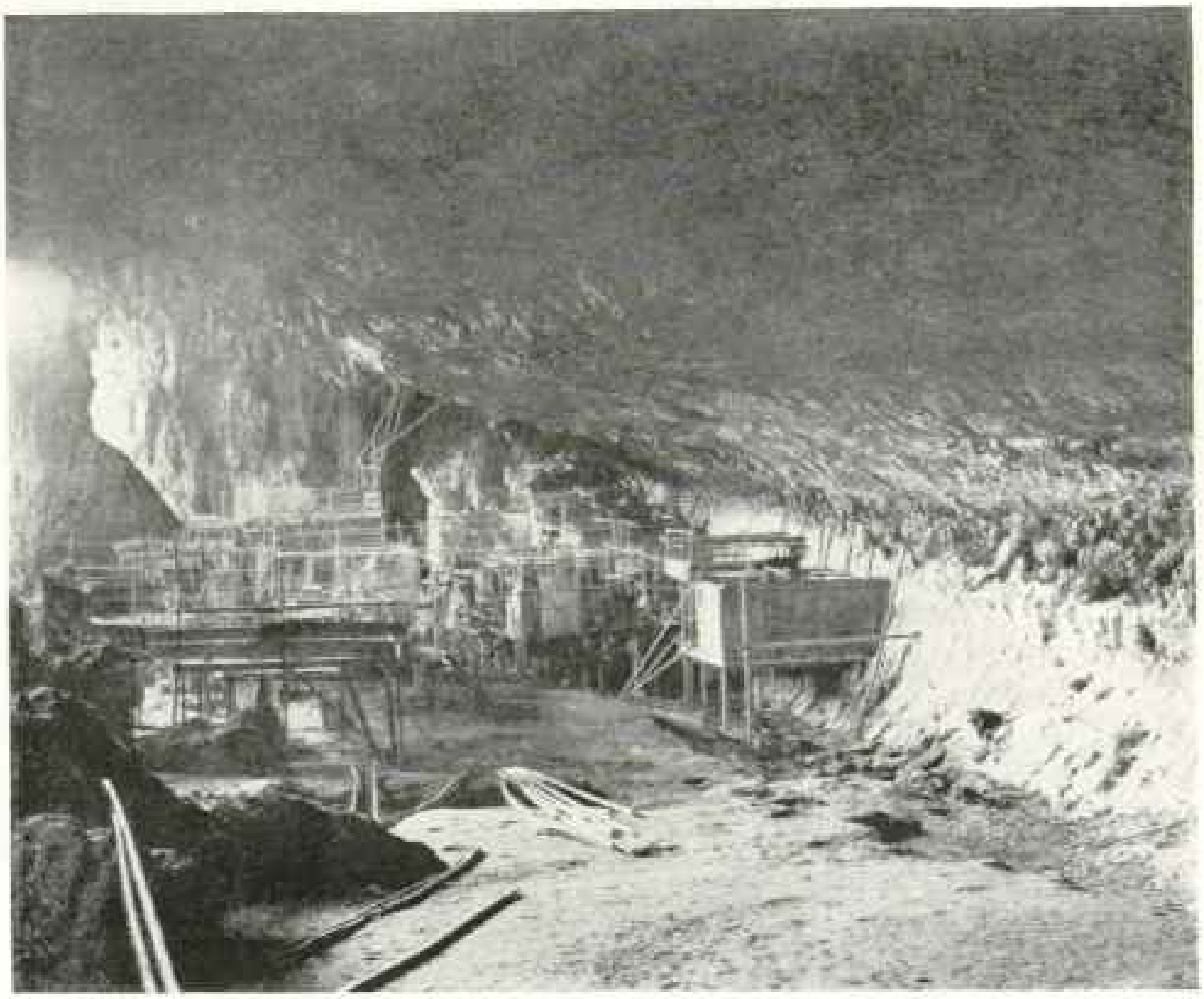
In the matter of dress, the early missionaries to the South Seas did great harm by requiring the natives to wear unnecessary clothing, which certainly injured their health and probably their morals as well.

Indeed, it seems very difficult for the white race to believe that modest behavior and morality can exist among people where the body is not wholly covered. Yet Stevenson, writing of the Gilbert Islands, records the strict chastity of the women who "went naked until marriage," and Tylor, in "Primitive Culture," observes that clothes are the cause and not the result of a sense of modesty.

In contrast with the white man's ordinary attitude toward what he pleases to call the "naked savage," it is interesting to note that at the annual field sports conducted for the benefit of the Dayak soldiers at Kuching, Rajah Brooke distributes prizes for the "best dressed Dayak"—that is, the Dayak who is best dressed according to native standards and to as great an extent as possible with the use of native material.

It is well understood that the correct costume for a native upon official occasion is the *chawat*, or loin cloth, and the usual ornaments, unless he be a Malay, when he would wear the more elaborate Malay costume.

For two days I remained waiting at Tama Saging's farm house, for the river continued to rise, rushing past in a muddy torrent. The water was so muddy that a pail dipped full and immediately poured out would retain some of the mud



ONE OF SARAWAK'S LIMESTONE CAVES WHICH IS A FOOD MINE

While some of these caverns yield quantities of birds' nests, highly prized by oriental epicures, many of the recesses remain unexplored, such as the Wind Cave and the Tiger Cave, near the headwaters of the Miluan River.

settled in the bottom; yet, notwithstanding the mud, the water was pure and entirely satisfactory for developing photographs.

THE GOOD OMEN

On the third morning the weather came fine and clear and, although the river was not falling, I got away, accompanied by Tama Saging, eight of his men, and my own crew.

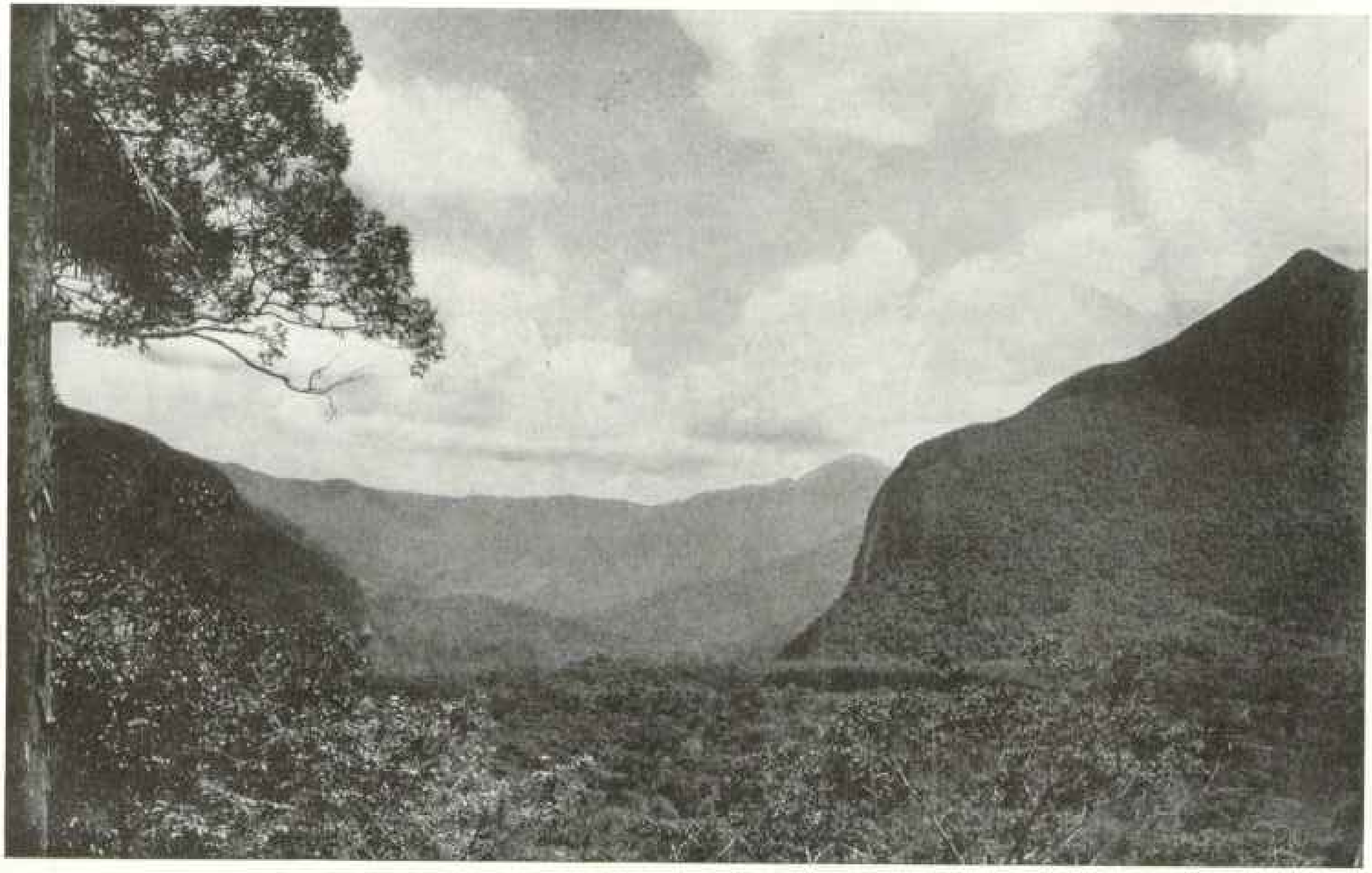
As we pulled away from the landing, a little bird flew singing across the bow, which Tama Saging assured me was a very good omen for our journey.

The flight and calls of certain birds are among the most important signs that the Kayans interpret as prophecy of the success or failure of an undertaking; so that when about to start on a journey it is very annoying to have a large flock of birds whose call is unpropitious make its appearance morning after morning.

In such a case the happy expedient is employed of starting in the dark, before daylight has awakened the birds to their warnings of evil.

At other times, when the cry of a bird of ill omen would be particularly unfortunate, as on the occasion of naming the son of a chief, the difficulty is overcome by beating gongs so loudly that no bird, or indeed any other sound, can be heard!

It was slow work paddling up the river, although we had left behind the large, heavy boat in which I arrived, using one of Tama Saging's that was lighter and better adapted to poling up the rapids.



THE EASTERLY END OF THE MULU RANGE, OVERLOOKING A SWAMPY PLAIN OF DENSE OLD-JUNGLE GROWTH: SARAWAK

As we passed a conspicuous tree on the bank, Tama Saging remarked that, after paddling a whole hour, we should again pass the same tree, but his people had never tried to cut a canal through the narrow neck of land because the ground was too difficult.

DISCUSSING CANAL-BUILDING WITH A KAYAN CHIEF

The Suez Canal was an old story for Tama Saging, but having heard nothing of the Panama Canal, he was much interested at the idea of cutting down a mountain that ships might pass. When I told him that the Frenchmen had tried to build the canal, but were forced to give it up because so many men became sick and died, he exclaimed:

"Ah, yes; very true, Tuan *Sebab hantu!*" (because of the spirits). Of course, one can't go to digging up the jungle without getting into trouble with the spirits.

After all, it is only a few years since we could have given no more useful explanation.

For three days we continued up stream, passing from the Tutau into the Milanau River, reaching on the second day the first of the rapids, where the water came rippling clear and cool over the gravel beds—a great relief from the muddy stream of the lower reaches—while each bend of the river gave some new view of the beautiful mountains or luxuriant jungle.

Coming to the mouth of a little stream, we took seven fine fish from a weir made by driving bamboo stakes into the bed of the watercourse. Later, one of the men saw a large turtle, over two feet long, dart into a hole under the bank, where it apparently made up its mind to stay, for no amount of prodding with spears would induce it to come out.

There followed a scene of great excitement, everybody telling everybody else how to get that turtle out, until Tama Saging in desperation finally went part way into the hole himself, pulling the turtle out after him, but not until one of his fingers had been badly bitten.

The Milanau River in its upper reaches is the most beautiful stream I have ever seen. At one point the limestone cliff rises vertical from the water's edge, decorated with fantastic stalagmites and every little crevice filled with delicate ferns. At another point, where great trees cast perpetual gloom on the sluggish waters of the stream, one sees, half concealed by vines and ferns, the entrance to the unexplored recesses of a cave in the limestone mountain. The natives call it the *lobong angin*, or wind cave, from the chilling current of air that usually issues from it.

When the river is low, it is pleasant to camp on a gravel bed in the river bottom, where the stream broadens out and falls noisily over the shingle, for the mosquitoes and other insects are not so bad as in the jungle; but one always runs the risk that he will be awakened by the rising waters to find boats and goods being swept off down stream.

NATURE'S BEAUTIES UNAPPRECIATED

One evening, while sitting out on the gravel watching the sunset and listening to the sounds of the jungle and of the river, I was joined by Migi, the pleasant Dayak boy, who wanted to know why the Tuan every evening sat looking into the sky. As he probably expected to get useful points on my method of observing the omens from the bats and hawks circling in the heavens, he was much disappointed when I replied that I like to watch the clouds at sunset; they are so beautiful—red and yellow and green.

He couldn't see the sense of that, protesting: "They are just the same every night." Then, with friendly interest, he questioned me about my home and country and the names of some of my friends, which he repeated very comically after me.

Our last camp on the Milanau was, indeed, a lovely spot, where a small stream joined the river, forming a delightful bathing pool of cool, transparent water. Great ferns grew about the camp, a splendid tree rose on the opposite bank, breaking into a ball of feathery foliage; beautiful birds flew over the stream and gorgeous butterflies seemed to fill the air.

Rajah Brooke's game laws are a model for all other countries. Since there are no destructive animals (except crocodiles, upon which a bounty is paid), all

MT. MULU, A 9,000-FOOT PEAK, SEEN FROM A CAMP ON THE MILANAU RIVER

One of the chief difficulties encountered in climbing this mountain is to persuade any natives to accompany the explorer; they believe that such heights are the abodes of the most malignant evil spirits.

game is protected, and the naturalist may take a license to collect only two specimens of anything, be it birds, butterflies, or plants.

JUNGLE ORCHIDS NEED PROTECTION FROM RUTHLESS COLLECTORS

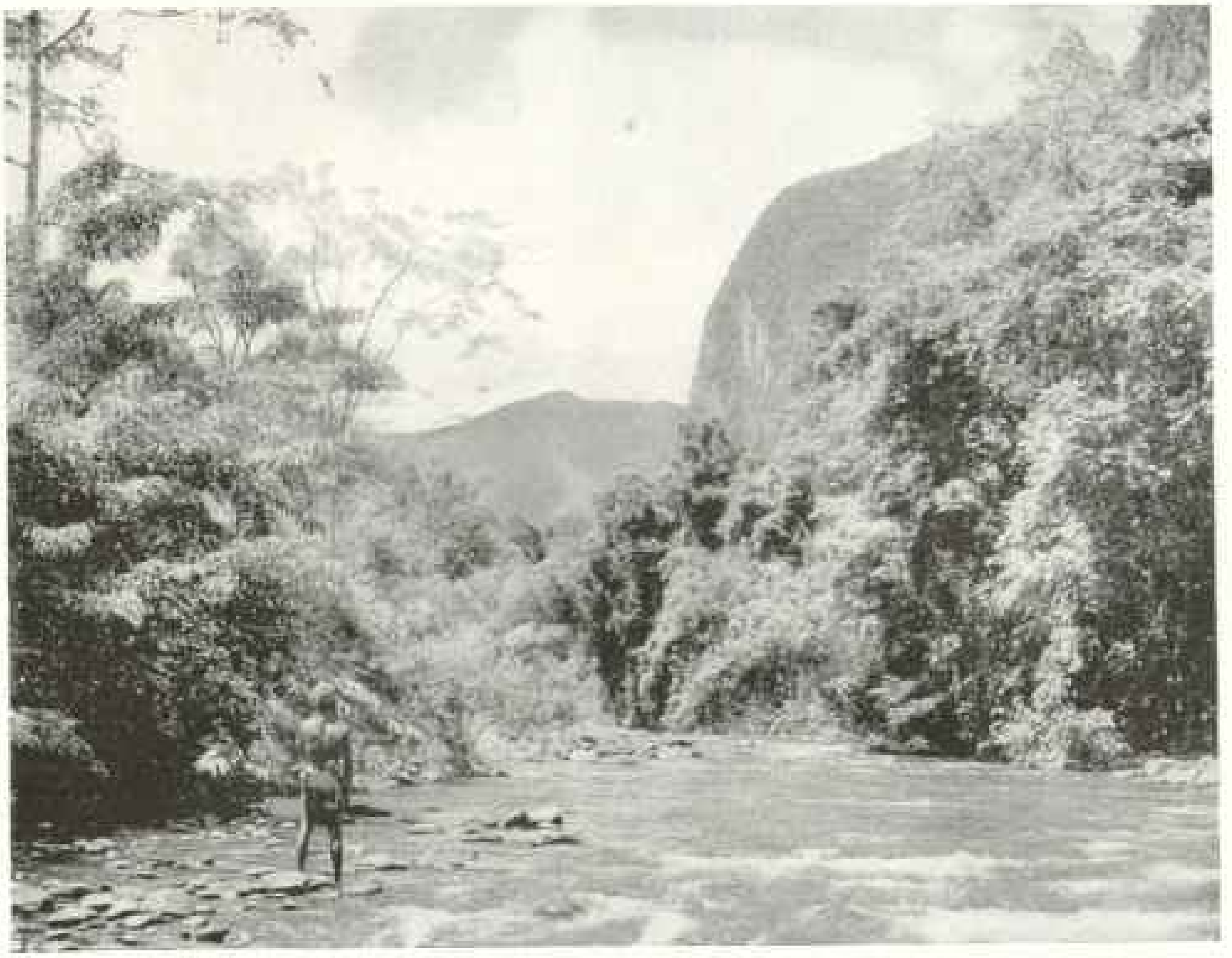
It may appear surprising that plants should need protection, but the occasion arose when a collector, having discovered a new species of orchid, gathered all he could and then attempted to burn the jungle in the small region where alone the species had been found!

So much time had been consumed in the trip up river that I was able to remain only two days at this delightful spot, where I would gladly have remained a month. One of the days was employed in a walk through the jungle to a point on the Milanau River where the stream comes rushing down, a mountain torrent, through a gorge between the mountains Mulu and Lobong Rimau, the latter meaning "Tiger Cave Mountain," being so named from an inaccessible cave on the side of the mountain.

Tama Saging expressed much concern about my undertaking the walk, telling me of the last *Tuan* who went there, and the very long time he required for the walk. He said so much about it the evening before that I became somewhat annoyed and started off the next morning stripped down for a warm tramp.

I fear now that I was a little inconsiderate of my short-legged friends, and I learned later that Tama Saging was suffering from rheumatism, although he never mentioned it the whole day. But he was a "good sport," remarking on our return that the Tuan was a strong walker.

The charm of the old jungle is to be found in the comparative absence of un-



WHERE THE MILANAU RIVER COMES RUSHING DOWN FROM ITS HEADWATERS AMONG THE PRECIPITOUS LIMESTONE CLIFFS OF MT. MULU

(SEE TEXT, PAGE 151)

"The Milanau River in its upper reaches is the most beautiful stream I have ever seen. At one point the limestone cliff rises vertical from the water's edge, decorated with fantastic stalagmites and every little crevice filled with delicate ferns."

derbrush and the abundance of the great lianas and other plants that grow too slowly to reach perfection on land that is frequently cleared.

Two of my boys climbed one of the large vines shown in the picture on page 158, where is to be seen, also, on the right the slender, graceful leaves of the rattan vine. The picture does not show the sharp spines by means of which this vine pulls itself up through the trees; but when one walks too close to the young shoots of the rattan, he will frequently find himself brought to a very sudden standstill, caught in their tenacious embrace.

THE WOOD-LEECH PEST

Swarms of wood leeches infest the country about Mulu. St. John records that his legs became so covered with sores from their bites that he was obliged to stop traveling, and in my walk of three hours I picked up 17 leeches on my legs.

If one stops in the path and examines closely the twigs and shoots near the ground, he will see these diabolical little creatures in all directions, waving violently to and fro on the tips of leaves, waiting to attach themselves to whatever object comes within their reach.

Nothing but puttees wrapped uncomfortably tight will prevent them from getting to the skin, for they will invariably find an entrance through canvas gaiters and khaki trousers. The best plan is to roll the trousers up to the knee and the stockings down to the shoe; then the leeches will stop where they find bare skin and can be removed as soon as dis-

A TREE ON STILTS IN A SARAWAK JUNGLE

Like the shepherd of southwestern France who follows his flock over marshy Landes mounted on tall stilts, this tree supports itself in the soft soil of the tropical jungle by growing tiptoe, so to speak, on roots spread wide apart.

covered by a drop of alcohol, which also sterilizes the wound.

We all enjoyed a refreshing bath in the mountain stream at the end of our walk; but soon after our arrival the precipitous sides of Muhu were obscured by black clouds, which began to roll down through the gorge, and before we were half an hour on the return trip the rain came down in torrents. But on a tramp through the jungle one must expect to be soaking wet anyway, and it may as well be with rain as with perspiration.

On reaching the camp, we found the little stream which we had forded ankle deep in the morning, now risen above our waists and the camp itself in a very damp condition. I had brought a heavy tarpaulin to spread over the leaf roof made by the natives, but the two roofs together had utterly failed to keep out the deluge.

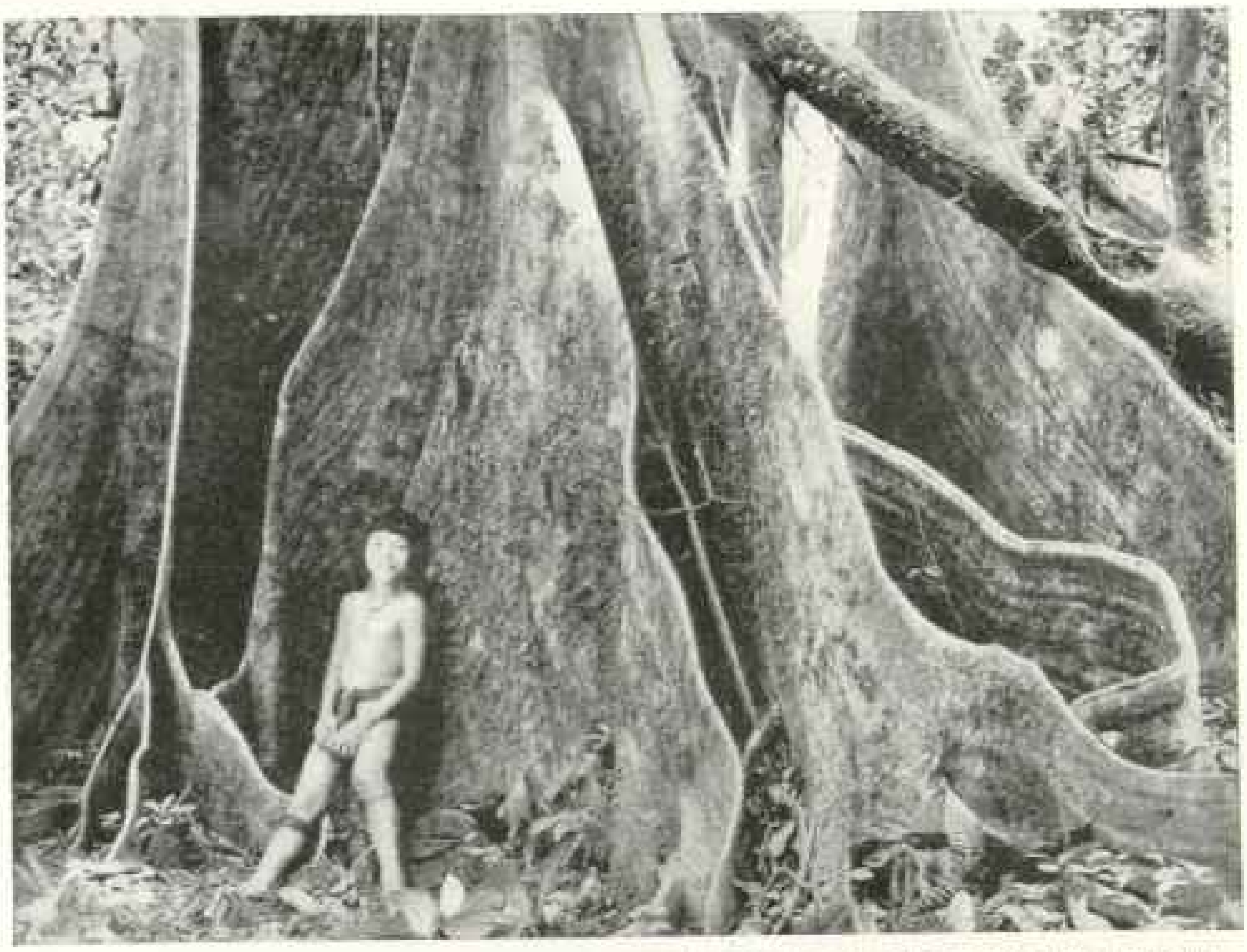
My boy, Ah Jun, or "Cookie," as the natives called him, had gathered everything in a pile under the best part of the roof and then perched himself on top, where we discovered him squatting under his umbrella—a very unhappy-looking Chinaman.

DAYAKS ON THE WARPATH

On my return to Claudetown, I learned that there had arrived from the Tinjar River the Kayan Penguitu, or leading chief of the Tinjar—Tama Aping Buliong.

His mission was to report the bad news that eight beastly Dayaks while working jungle products had come across a Punan house during the absence of the men and had killed 24 women and children and one old man, taking away with them 16 heads.

Tama Aping was a most agreeable companion for the few days he remained at the fort—gentle, soft-spoken, and with nothing of the haughty bearing that he assumed for his photograph. Being rather lonesome away from home and lacking, as he pointed out, the white man's resource in books, he spent much



LIKE SOME GIGANTIC SQUIDS OF THE SEA, THE TRUNKS OF MANY JUNGLE TREES IN SARAWAK WRITHE AND TWIST INTO WEIRD SHAPES

The monarchs of this paradise of tropical vegetation receive more watchful protection than those of many of our own forests. The jelutong tree, which yields a valuable gum, is a particular ward of the government, inspectors being appointed to see that it is not improperly tapped.

of his time at the fort, and was very fond of telling of the old days before the government came into the river.

His hands were tattooed, the indication that he had taken a head. Indeed, he said he had taken five when he was a young man, but I think he was bragging.

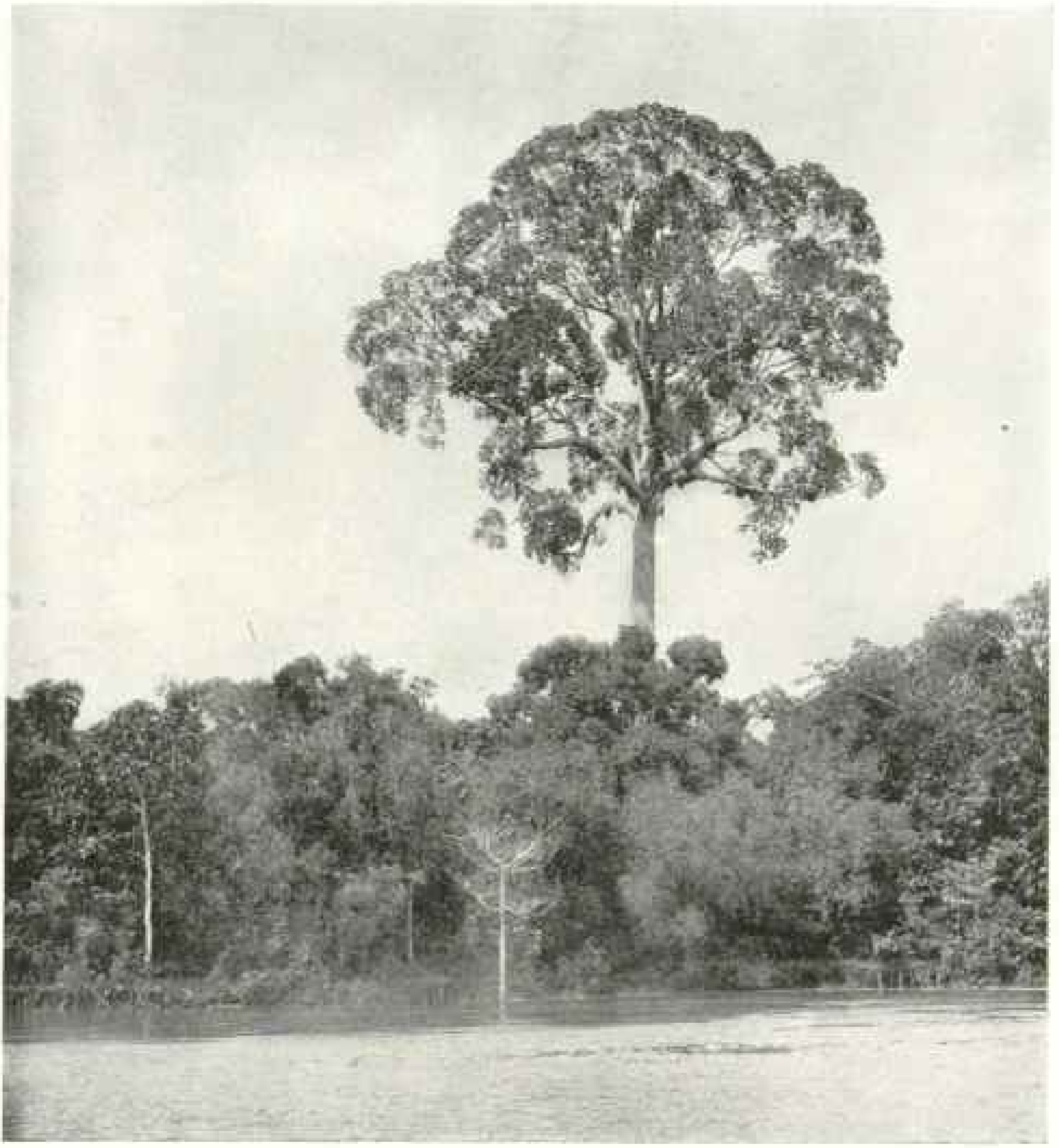
He was usually accompanied by eight or ten of the fine young fellows who had come down river with him. One evening, when they all arrived at the fort together, I gave a small Manila cigar to each; whereupon Tama Aping abruptly told the young fellows that they might go back down to the bazaar; that he had no further use for them there, and, turning to me, remarked that there was no need of my handing out my good cigars to all those youngsters when he was right on hand to smoke them.

After my return from Borneo, I learned that Tama Aping had become involved in a divorce suit, being summoned as a corespondent by another prominent Kayan chief. Such events are comparatively rare, the husband and wife among the Kayans generally remaining faithful to their marriage obligations.

DIVORCE PRACTICES IN BORNEO

Divorce is not infrequent before a couple have children; but this is not surprising, when one considers the very close association of husband and wife living continually together in a single room, where any incompatibility of temperament would prove a much more serious burden than in a more complex system of society.

On the other hand, one sees many families living together in the greatest happiness, with attractive little brown children, of whom they are very fond. I recall one couple, very prosperous, thrifty, and



A TAPANG TREE, ABOUT 175 FEET IN HEIGHT, ON THE BANKS OF THE BARAM RIVER: SARAWAK

Hanging on the under side of the branches may be seen black masses of honeycomb.

pleasant people, whose only sorrow was that they had no children; yet they were too happy and contented to separate, although lack of children is usually sufficient cause for divorce.

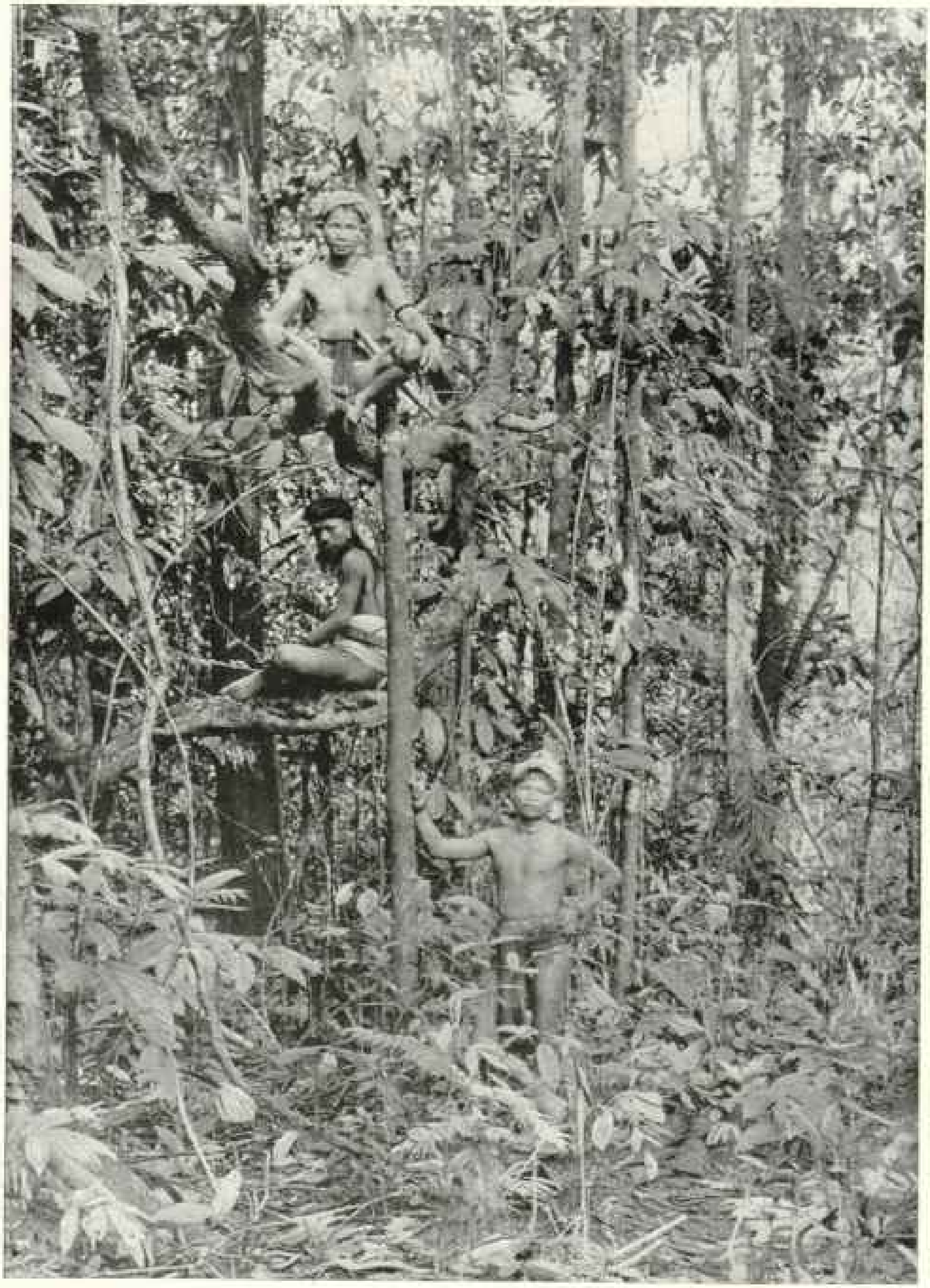
The Punans, about whose murder Tama Aping Buliong brought the news, belong to one of the most primitive tribes of Borneo. They are timid, harmless people, living in the jungle, usually away from the rivers, cultivating no fields, but getting their food from the wild sago and other jungle plants and from the small game, which they shoot with the *sumpitan*, or blowgun, in the use of which they are exceedingly skilful.

HOW THE BLOWGUN IS MADE

The blowgun is made chiefly by the Kayans, from whom the Punans purchase it. It consists of a hardwood pole about six and a half feet long, the hole

ONE OF THE GIANTS OF THE JUNGLE, THE TAPANG TREE: BORNEO

The native boy is climbing a ladder made by driving hard pegs into the soft trunk, thus gaining access to the bees' hives and honey in the upper branches. The buttresses of the tree are very hard, close-grained, beautiful wood.



THE BEAUTIFUL JUNGLE AT THE BASE OF MT. MULU: SARAWAK, BORNEO

Kubing and Gani have climbed up one of the great vines. At the right a rattan vine rises among the trees. The jungle here is infested with wood-leeches—a most disagreeable pest (see text, page 153).

being about one-quarter of an inch in diameter. The hole is drilled with a long iron rod and polished with a rough leaf—a sort of natural sandpaper.

The slender darts are made from the hard, straight fiber of the nibong palm, sharpened at one end, with a tiny groove cut around the dart below the point, for the purpose of carrying into the wound some of the poison in which the end of the dart is dipped.

This poison, made from the sap of the upas-tree, is so powerful as to cause the death of a man in two or three hours. A piece of pith on the lower end of the dart acts as a piston by which the dart is blown through the tube.

The blowgun that I brought home with me proved of so much interest that my supply of ammunition was speedily exhausted, so that I had to use small steel darts with a cork piston, but of the same weight and length as the native missiles. These are stiffer, but not much sharper than the native darts, and will penetrate a soft pine board fully one-quarter of an inch when blown without special effort from a distance of 40 to 50 feet.

The Punans live in the simplest form of houses—mere leaf shelters—moving from place to place as they exhaust their supply of food.

They are the real jungle people, following for days any other man without his in the least suspecting their presence. In this way they killed a Dayak not long ago who four years before had done them an injury, shooting him with a poisoned dart from a blowgun.

It was for the purpose of preventing, if possible, an outbreak between the Punan and Dayak tribes, as a result of the murder of their women and children, that, shortly after the arrival of the news of the murder, the Assistant Resident was dispatched up river to collect the survivors of the victims and to bring them down river, where they were to receive the heavy fine imposed on the households of the guilty Dayaks and the assurance of the Rajah that summary

THE FREAKISH GROWTH OF A JUNGLE VINE: SARAWAK

Both the fauna and flora of the Sarawak jungles are protected by law. A collector is allowed to take only two specimens of any one kind, whether the specimen be bird, beast, butterfly, or orchid.

LAND DAYAK WOMEN AT THE VILLAGE OF TMONG

Here fashion decrees coils of brass wire on the legs, but not on the arms, as in the village of Pichin (see pp. 111, 113, and 130). Fashion, however, does require the ladies to wear hats!

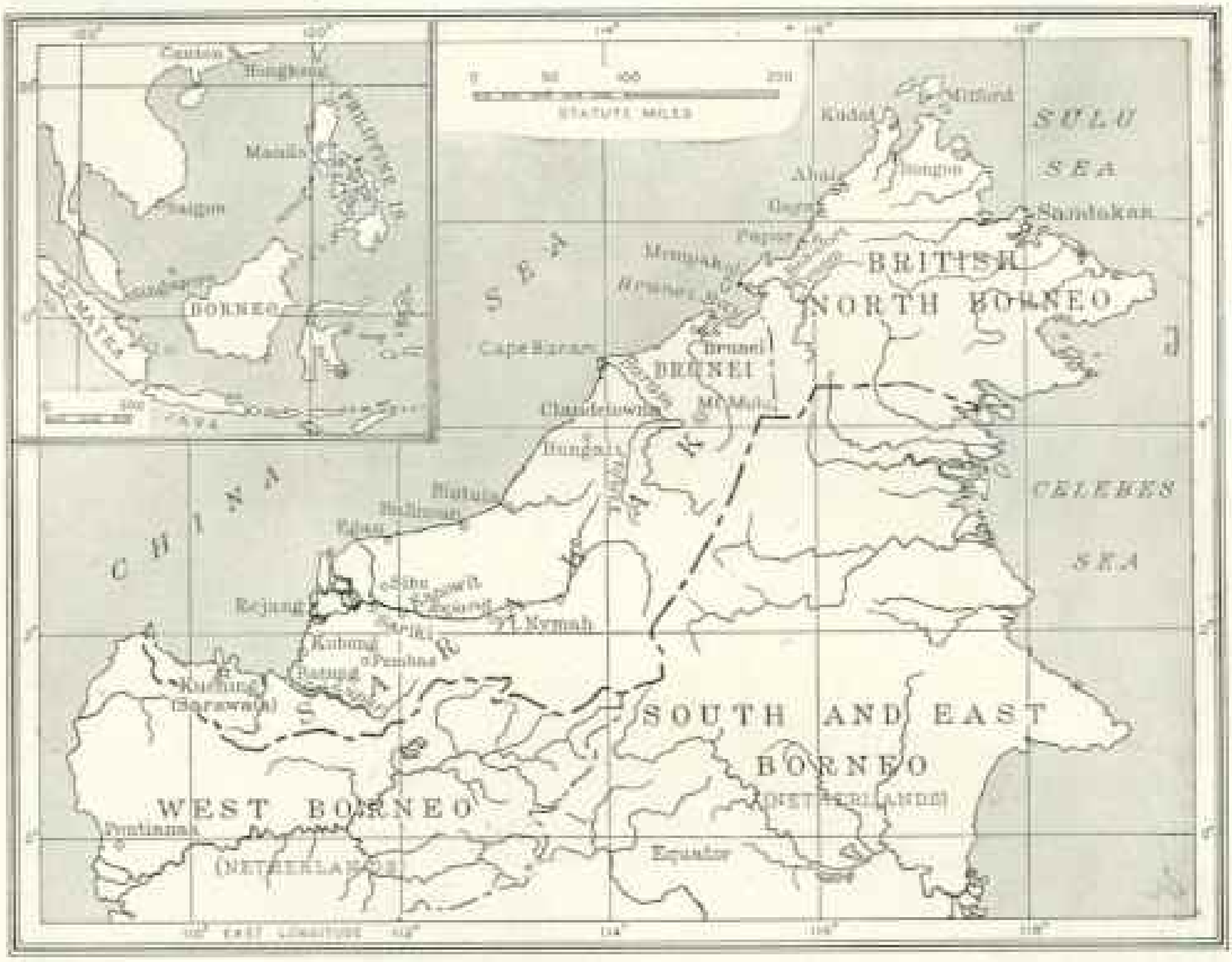
justice would be meted out to the particular Dayaks who were guilty.

It is gratifying to know that the murderers have now suffered the penalty, while their relatives and friends who countenanced the crimes have had to pay a round sum in fines.

The closing incident in this tragedy, after the payment of the fines and the promise that their wrongs would be avenged, was a peace meeting at the Baram fort between the Punans and the Dayaks of the Baram River, who, though not directly connected with the affair (since the murderers were from the Rejang River), were, nevertheless, of the same tribe.

According to the usual ceremony, a pig was killed and the liver examined to determine whether the omens indicated that the peace was to be lasting. The pig was placed on the lawn in front of the Baram fort and, when all were gathered about, Tama Aping Buliong, the Kayan Pengulu in whose district the Punans lived, began by addressing the pig, charging him with a message to Bali Penyalong, the Great Spirit, urging the pig, in effect, to have a nice liver and give true omens.

Lanting, the Dayak Pengulu, continued the exhortation and the Punan chief finished it; so that the pig had to charge himself with messages in three languages.



A MAP OF SARAWAK

During these harangues Tama Aping squatted by the pig, poking it in the ribs from time to time to make sure of its continued attention.

I think Tama Aping Bulieng felt a little sheepish at his share in the performance, and I am sure that the Dayak Penguhu, Lanting, had much doubt of the value of the ceremony, but the Punan chief took it all very seriously.

At all events, all agreed, when the liver was examined, that the omens were most favorable, for two lines on the liver that nearly joined clearly indicated that the Punans and Dayaks would draw near together and might even intermarry in the future.

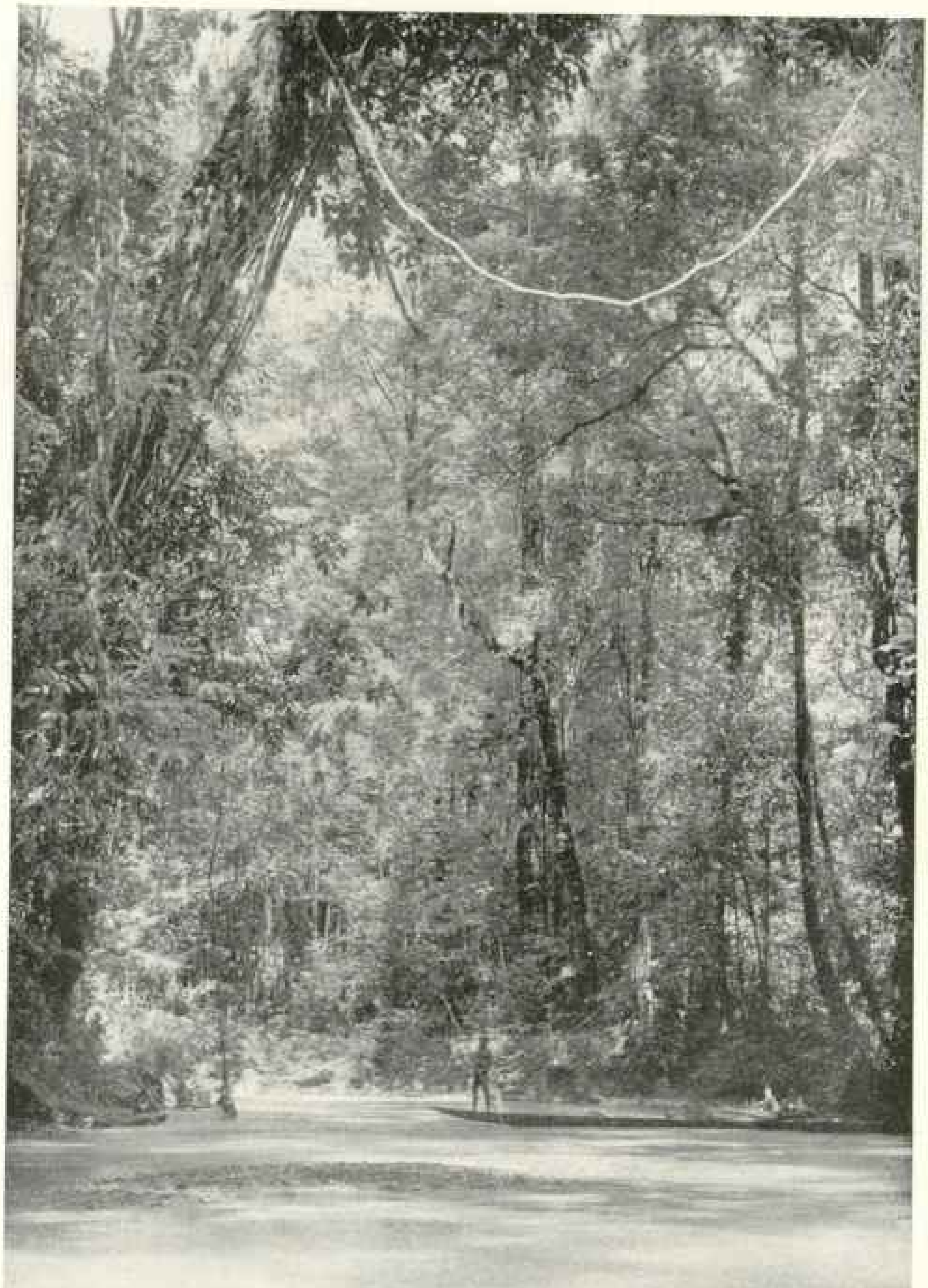
HOW THE WHITE RAJAHS CAME TO SARAWAK

Such are the habits of thought and life of this far-away people and such is Sarawak, the history of whose white rajahs began in 1839. At that time the Dutch occupied the southern portion of Borneo, while the northern part of the island was nominally under the rule of the Sultan of Brunei.

Many years before, Brunei had been one of the strongest kingdoms of the Malayan archipelago. Its Sultans had conquered a large part of Borneo as well as several of the southern islands of the Philippines, industry was encouraged, and an extensive trade with China was developed. But luxury and corruption had done their work until there remained only a degenerate Sultan, with a retinue of licentious Malayan nobles, whose sole occupation was to rob the people in order to cater to the pleasures of their master.

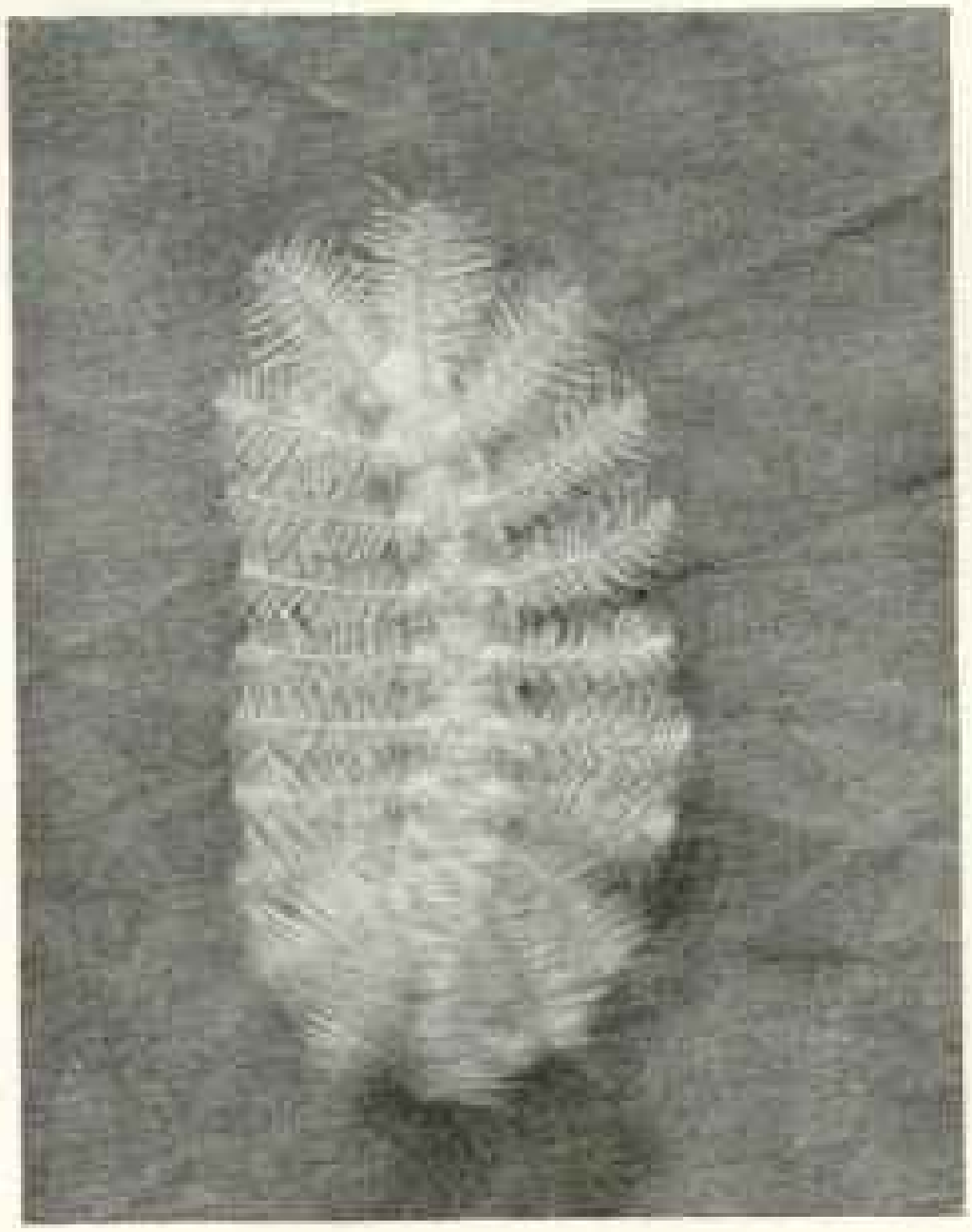
The Sultan's capital was, and remains today, the town of Brunei, about 200 miles from the northern extremity of Borneo.

In the days of its glory, when the surrounding hills were covered with pepper gardens and wealthy merchants came annually in fleets of junks laden with the riches of China, the town may have



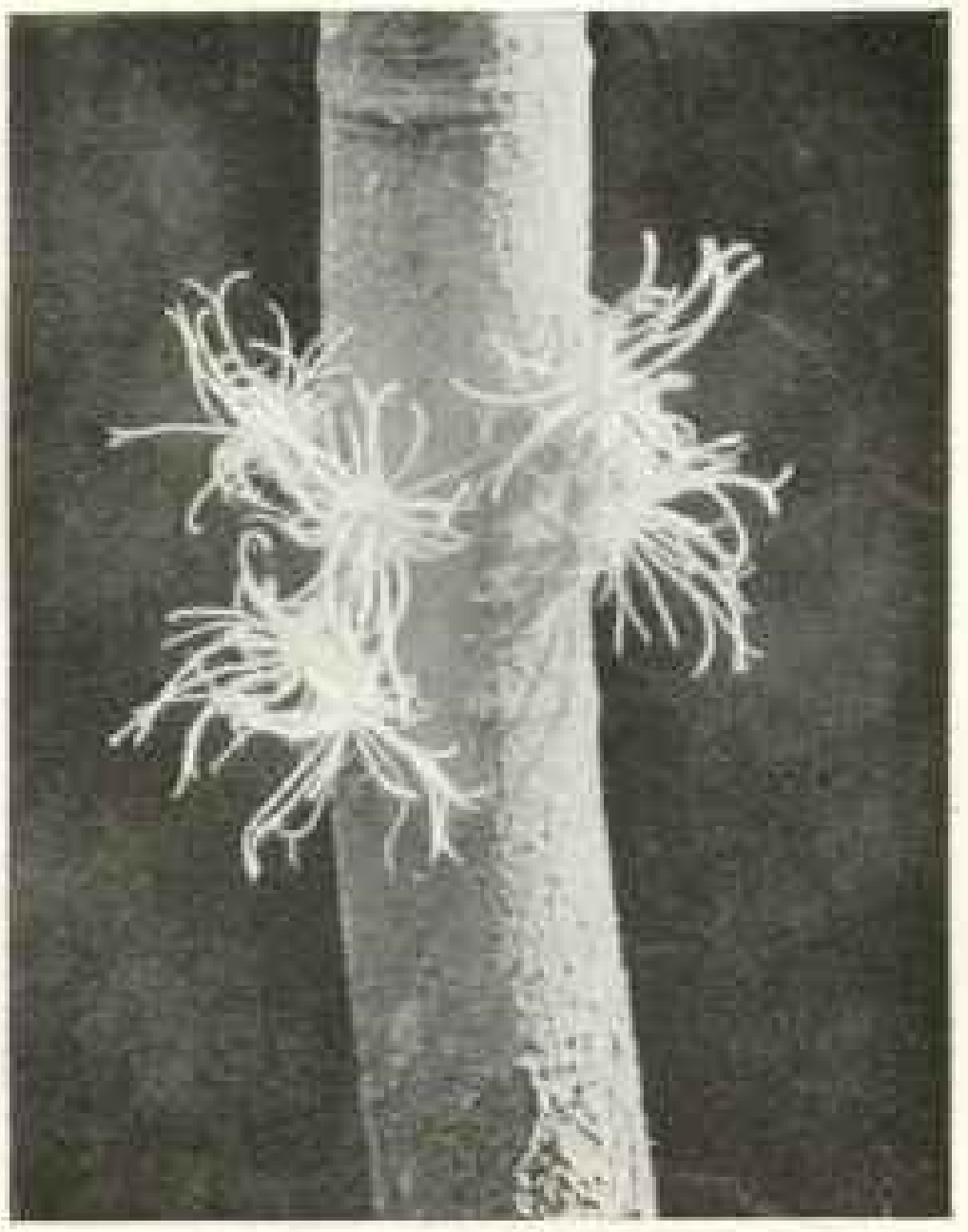
A SMALL STREAM IN THE SWAMPY JUNGLE: SARAWAK

Near this point the author's canoe narrowly missed brushing from the branch of a tree a small snake, called by the natives "ular brechar," whose bite is so deadly that the Malays say a man hasn't time to take off his coat before he is dead.



A GREEN CATERPILLAR ORNAMENTED WITH FEATHERY PLUMES

One of the many strange insects with which the jungles of Sarawak abound and which repay the entomologist for his journey half-way around the world to collect.



A CURIOUS INSECT THAT USES ITS ANTENNÆ AS A PARACHUTE

This tiny creature, which resembles a plant rather than an insect, springs from the branch of a tree and drops gently through the air, supported by its downy tentacles.

merited in some degree its appellation of the Venice of the East; but for the past century it has been nothing more than a few score of small wooden houses built on piles on a muddy bank which is bare at low tide, exposing an accumulation of refuse from which a stench arises that is a novelty even to one who has become accustomed to the varied odors of the East.

The Sultan's domains extended along the northwest coast nearly to the westerly extremity of the island, where the territory included in the basins of the Sarawak, Lundu, and Samarahan rivers constituted the province of Sarawak, with the town of Kuching, on the Sarawak River, for its capital.

Sarawak was inhabited chiefly by Malays, Land Dayaks, and Chinese, and had, at times, been independent under Malay rulers; but in 1839 its government was in the hands of a vassal of the Sultan, the Rajah Muda Hasim, weak and incompetent, but apparently an amiable man, not entirely devoid of humanitarian instincts; for he did, on one occasion, avail himself of an opportunity to render timely assistance to some shipwrecked English sailors. This event was the cause of James Brooke's first visit to Sarawak, which led to his great work there and the establishment of the white rajahs.

This action of the Rajah was so unusual that the Governor of Singapore and the Singapore Chamber of Commerce resolved to recognize his generosity by sending presents and a letter of thanks.

James Brooke, the son of Thomas Brooke, of the East India Company's civil service, was chosen to carry out this mission. He sailed from Singapore in July, surveyed parts of the coast of what was destined to become his domain, finding its position so much in error that he was "obliged to clip some hundreds of miles of habitable land off the charts."

On the 15th of August he anchored in the Sarawak River, at the town of Kuching, where he was well received by

THIS OLD MALAY FISHERWOMAN OF KUCHING WAS MUCH ANNOYED BY THE CHINESE "RIKISHA" COOLIE, WHOM SHE SUSPECTED OF HAVING DESIGNS ON HER FISH: SARAWAK

IN KUCHING ON CHINESE NEW YEAR'S DAY THE CHINESE CHILDREN, DRESSED IN THEIR BEST CLOTHES, ARE SENT RIDING IN "RIKISHAS": SARAWAK

A CHINESE PUPPET SHOW EXHIBITED IN FRONT OF THE CHINESE TEMPLE IN KUCHING, THE CAPITAL OF SARAWAK

Hasim, who gave him permission to visit the Lundu, Samarahan, and Sadong rivers, which were unknown to Europeans; but as the tribes of the interior were in insurrection, Mr. Brooke was not able to explore the country, and after six weeks he departed, greatly to the regret of Hasim, whose confidence he had won.

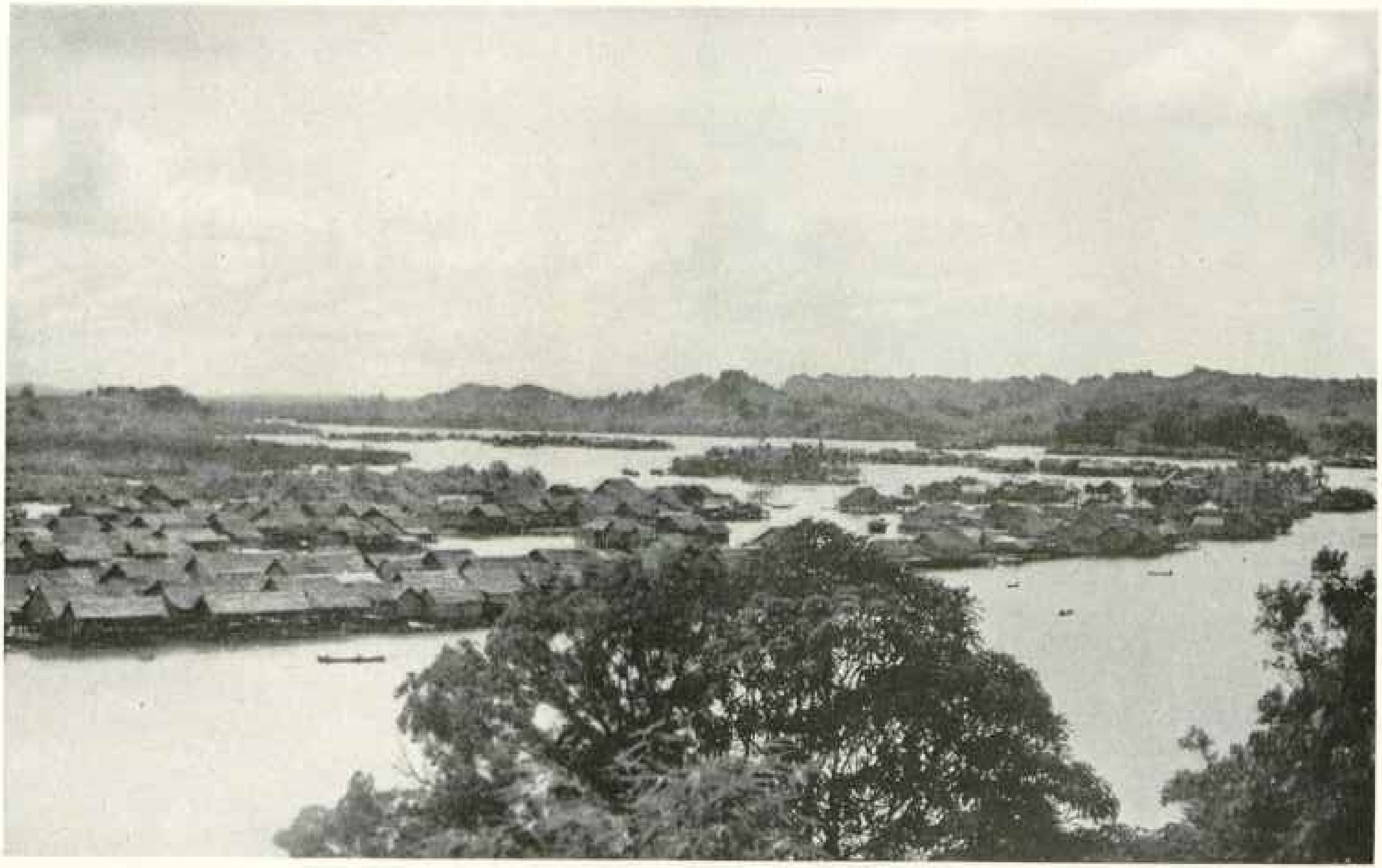
Mr. Brooke again sailed from Singapore on August 18, 1840, for Manila, intending to pay only a short visit to Hasim on the way; but he found his former friend distracted by rebellion in his country, which he was powerless to control. The visitor reluctantly consented to give assistance in restoring order.

In return for this service, Hasim agreed to give Mr. Brooke the government and trade of Sarawak, with the title of Rajah; for Hasim, who was heir presumptive to the throne of Brunei, foresaw his own prestige heightened if he could return to Brunei, leaving Sarawak pacified in Mr. Brooke's control.

But when Hasim saw his country at peace as the result of Brooke's efforts, he forgot his obligation to the visitor and connived in a plot against the latter. This failed, however, and he was obliged to fulfill his agreement and proclaim Brooke Rajah and Governor of Sarawak in September, 1841. The Sultan of Brunei confirmed the deed given by Hasim and presently also acknowledged Rajah Brooke's complete independence.

Rajah Brooke was recognized as an independent sovereign by the United States in 1850 and by Great Britain in 1863.

Sir James Brooke died in 1868, naming as his successor to the raj his nephew, Charles Brooke. Sarawak was made a British Protectorate in 1888.



THE NATIVE SECTION OF KUCHING, SARAWAK, THE CAPITAL OF THE LAND OF THE WHITE RAJAHS

The native portion of the town is divided into kampongs, or clusters, and is built on both sides of two reaches of the Sarawak River, about 23 miles from its mouth. The European section of the town occupies the heights on the left bank of the river. The principal buildings are forts, barracks, court-house, a museum, and the palace of the Rajah. The capital has a population of about 30,000.

Sir Charles Brooke, from the time when he entered his uncle's service in 1852 until his death, in his 88th year, was loved by his people, and in recent years almost worshipped by them, because of the constant interest he evinced in their welfare. While he endeavored to develop trade, he exerted great pains to protect his people against exploitation at the hands of foreigners, whether European or Asiatic.

On May 17, 1917, Charles Vyner Brooke (born 1874) succeeded his father as the third Rajah of Sarawak.

To this day the principle of the government has remained as the first Rajah stated it toward the end of his career, "to rule for the people and with the people, and to teach them the rights of freemen under the restraints of government. . . . The wisdom of the white man cannot become a *hindrance*, and the English ruler must be their friend and guide or nothing. . . . They are *not* taught industry by being forced to work. They take a part in the government under which they live; they are consulted about the taxes they pay; and, in short, they are free men."

The success of the Rajah's efforts was quickly indicated by a large increase in the population through immigration from Dutch and Brunei territory.

From Kuching there is a short railroad that is gradually being extended up country, but there are few roads, so that travel and trading are mostly confined to coastwise and river journeys. Jungle produce—various gums, rattans, etc.—comes down the rivers from the interior, while near the capital are many Chinese pepper gardens and some rubber plantations. Gold, coal, and a few other minerals are produced, and in recent years petroleum has been exported in considerable quantity.

Only men of culture and refinement can win the confidence of the native; for well-bred Malays are noted for their courtesy and good manners, and many of the pagan tribes possess to a remarkable degree the instincts of the gentleman. The Kayans in particular are very quick to resent bad manners, and a gruff, uncivil bearing will produce the same results in a Bornean house as in other parts of the world.

CHINESE NEW YEAR'S: SARAWAK

A YOUNG KAYAN BEAU

The hairs of his eyebrows have been pulled out with brass tweezers by the lady whom he loves, thus signifying her deep attachment to him and making him very beautiful. The practical advantage of this detail of courtship appears when one considers how long it will be before Lopit can tell some other girl that she is the first one he has ever loved.

AMERICAN BERRIES OF HILL, DALE, AND WAYSIDE

In the accompanying illustrations the National Geographic Magazine *reproduces in natural colors a beautiful series of paintings of 29 species of American berries and their blossoms by the gifted artist-naturalist, Miss Mary E. Eaton. This is the fourth of* The Geographic's *series of matchless color pictures of American Wild Flowers. The first series was published in May, 1915, followed by those of June, 1916, and Our State Flowers in June, 1917. The series comprise 64 pages in full color, depicting 105 species, each accompanied by a concise and interesting description of the plant's habitat and its habits.*

SPICEBUSH

Benzoin æstivale (L.) Nees [Plate I]

Dwelling in deep, damp woods from Maine and Ontario to Kansas and Carolina, the spicebush, with its dainty yellow flowers and its seductive odor, is a real harbinger of spring. Flowering from March to May, its blossoms arrive even before the pussy-willow wakes up, and vie with the shadbush in the promptness of their advent. When they first appear, the flowers nestle close to the bare branches.

One species of the spicebush is found in abundance in eastern Asia. On account of the toughness of the wood and its aromatic fragrance, natives prize it for toothpicks. A new perfume, called Kuromoji, made from the essential oil of this plant, is now much in demand.

This shrub has several aliases—"Benjamin-bush," "wild allspice," and "fever-bush."

The sassafras is closely related to the spicebush, both playing host to the caterpillar of the swallow-tail butterfly.

The spicebush played its rôle in the Revolutionary War. Allspice was kept out of the American market, and the women of the times used the powdered berries of this plant as a substitute. During the Civil War its leaves were used in making a brew that took the place of tea.

BLACK ALDER

Ilex verticillata (L.) A. Gray [Plate I]

Flowering in June and July, from Nova Scotia to Florida and westward to Missouri, the black alder, a member of the holly family, so gladdens the months of snow and ice with its bright fruit that it is often known as the "winter-berry." Long after the frost has turned the leaves black and sent them away to enrich the soil for another summer's coming, its abundant red berries, clinging to leafless branches, dissipate the desolation of many a winter scene.

The black alder is a handsome shrub, growing from 5 to 10 feet high, with dull, warm gray bark and nearly vertical stems and branches. It flourishes especially in low, swampy ground, in Virginia sometimes reaching a height of 25 feet.

This species has qualities that have won for it a place in materia medica. The bark is dark, cloudy gray in color, bitter to the taste, and astringent in its action. An infusion made from it, or even from the leaves, has been found to possess tonic and alterative properties. The berries are purgative in their action and serve as a vermifuge, forming one of the pleasantest adjuvants in children's remedies.

During the Civil War the Southern people were hard pressed for medicines. A survey of the herbal resources of Dixie was made, and the berries and bark of the black alder were especially commended. They were used in the treatment of intermittent fevers and diseases which developed as a result of debilitated constitutions, especially gangrene and mortification, and as astringents for ulcers and chronic cutaneous diseases.

Just now the black alder is making a strong bid for favor as a cultivated plant. Showing a great mass of color, holding its berries longer than almost any other species, possessing attractive foliage that never grows shabby, it is ideal for decorative purposes.

AMERICAN MOUNTAIN ASH

Sorbus americana Marsh [Plate I]

The outstanding fact about the mountain ash is that it is really not an ash at all, but belongs to the rose family. That family is not less famous for its fruits than for its flowers; for blackberries, strawberries, and raspberries are as delightful to the palate as roses, or cinquefoils, meadow-sweets, hardhacks, avens, or silver-weeds can be to the eye. Goatsbeard and ipecacs are likewise members of the same versatile family, as are also queen-of-the-prairie and the agrimony.

There are about thirty species of ash of the Sorbus group. Flourishing from Labrador to Manitoba, and reaching south of the latitude of New York and the Great Lakes only where it can find mountains, the tree grows on rocky bluffs with wild plums and straggling beeches, attaining a height of from 20 to 40 feet.

The flowers appear in May and June in great masses or panicles of white. The leaf turns a bright, clear yellow in the fall. The berries, to which many a bird has flown for salvation in a snowy spell, remain on the trees

all winter. They are sometimes used in making astringent home remedies and occasionally are eaten raw, though said to be harsh in flavor, with a nauseous undertaste, which very few people relish. Infused with water, they furnish a pleasant subacid beverage, and by distillation a powerful spirit.

The aliases of the mountain ash are as numerous as those of a yeggman and as suggestive as those of a hobo. "Dogberry," "fowler's service," "Indian mozemize," "round wood," "witchwood," "quickbeam," "Rowan tree," "wichen," "whistle-wood," and "wild ash" are a few of the names assigned to it in the vernacular.

The fruit of the mountain ash is not, strictly speaking, a berry. Rather it is a pome, or apple-like fruit.

SMOOTH SUMAC

Rhus glabra (L.) [Plate I]

Belonging to the cashew family, which includes such diverse denizens of flowerland as the vinegar tree and the smoke bush, the poison ivy and the cadju tree, the smooth sumac is one of about 120 species widely distributed throughout the warm and temperate regions of the earth. Some authorities claim that it has a geographic range wider than that of any other tree or shrub. Of all the sections of the United States, the California floral region alone seems closed to it.

Environment works such changes in it, however, that a description which would fit in one section would not necessarily apply elsewhere.

The smooth sumac often grows to feet high, usually in colonies, seldom singly. Frequently confounded with the larger stag-horn sumac, sometimes called the vinegar tree, it thrives in almost any kind of soil and multiplies by stems that travel—like Hamlet's ghost—underground. One of the most inoffensive of plants, so many people have had such sorrowful experiences at the hands of its cousin, the poison sumac, that the innocent *Glabra* has suffered from the evil reputation of the wicked *Venenata*.

In early summer the sumac is a symphony of greens. Its large, fern-shaped leaves suggest some rank, tropical growth, and dense panicles of greenish white flowers thrust themselves above the foliage. Long before the other trees and shrubs of forest and field begin to dress up for the final color carnival of the year, the sumac attires itself for the splendid pageant. Deep in the shady recess of some jungle of brier or fern, suddenly a blood-red dagger appears—one solitary leaflet, perhaps—but suggestive of the glory that is to be. Soon entire leaves are stained with the scarlet dye that Jack Frost concocts in the leaf laboratory, and before long Nature, impatient at the slower processes, upsets her paint-pot, leaving streaks and splashes over wood and dale and field.

The berries cluster on large, rigid stems, making them veritable torches of cardinal-colored fruit.

The berries have a sour, astringent taste, and are said to make a cooling drink when infused in water. Such an infusion yields a black dye particularly adapted to the coloring of wool. The leaves are rich in tannic acid, and are sometimes used as a substitute for oak bark in tanning leather. The bark is used often as a mordant for red dyes—a mordant being a preparation that will cause a fiber to absorb and hold fast a given color.

BLUE COHOSH

Caulophyllum thalictroides (L.) Michx. [Plate II]

Strange in structure as in habit, shunning the roadside and the haunts of man with all of the timorous traits of a hermit thrush or the fearsome nature of a wild deer, the blue cohosh hides in the deepest recesses of thick forests. Its structural cells contain substances that have not yet yielded their secrets to the test tube of the chemist.

The habitat of the blue cohosh is extensive. It occurs throughout southern Canada and far down in Dixie. Only where the leaf mold is thick does it reside, being a rich liver. A native of America, it is variously known in the provincial tongue as "pappoose root," "squaw root," "ginseng," "blueberry root," "yellow ginseng," etc. It is an inconspicuous herb in spring, but in the fall attracts attention by its graceful aspect and brilliant coloring. When young the whole plant is covered with bloom.

The flowering time of the blue cohosh is April and May. Its blossoms are purplish, or yellowish green, and scentless. The berry, literally a seed, as large as a pea, resembles a pitted fruit. When roasted the seeds make a fair substitute for coffee.

The family relationships of the blue cohosh are numerous and versatile. It belongs to the barberry family, which includes the barrenwort, the Oregon grape, the May apple, and the twinleaf.

ROUNDLEAF GREENBRIER

Smilax rotundifolia (L.) [Plate II]

The common names of this brier are as numerous and as varied in their etymology as its relatives are numerous and varied in their attributes. "Bamboo," "bread - and - butter," "rough-bindweed," "wait-a-bit," "dogbrier," "biscuit-leaf," and "Devil's hopvine" are some of its pseudonyms. It is a member of the lily family, and is so widely known that it figures in the geography of the eastern section of the United States, lending its name to mountains, rivers, counties, and summer resorts. Although a cousin of such diverse species as the wild garlic and the Indian poke, it bears no relation to the florist's staple vine, called "smilax," which belongs to an entirely different family and originated in South Africa.

The roundleaf greenbrier is a great climber, its tough tendrils laying hold upon any object in their path. It possesses all the attributes of

a barbed-wire fence, and woe betide the trespasser within its precincts. Its prickles are so sharp and so hard to break away from that most of the creatures which disturb birds' nests give them a wide berth.

The leaves of the greenbrier are usually heart-shaped, or nearly round, with a puckered appearance. About the last in the thicket to fall, the mottled foliage of the frost-painted greenbrier still flutters in the breeze long after the woods are brown and bare. The flowers come from April to June, but they are insignificant little blossoms which invite countless flies to their board rather than gaudy-winged butterflies and long-tongued bees.

BLACK GUM

Nyssa silvatica Marsh [Plate II]

The black-gum tree occurs between Maine and Michigan on the north and Florida and Texas on the south, preferring a rich, inclined-to-be-swampy soil. Its highest development is reached on the slopes of the southern Appalachians, where it sometimes attains a height of a hundred feet and a stump diameter of five feet. It usually is found in association with the white oak, the tulip tree, the sugar maple, the cucumber tree, the wild cherry, the ash, and the buckeye.

The shape of the tree is variable. Some are tall and graceful; others are broad and squat. When it grows in the forest, the trunk is usually straight and free from defects of any sort. But out in the open the branches are often broken by storms, causing the heart of the tree to decay, thus making it hollow.

Wide of distribution, the black gum is also a tree with a variety of local names, such as "sour gum," "tupelo," "hornbeam," "old-man's beard," "upland yellow gum," etc. The South calls it the "sour gum," the West the "pepperidge," and New England the "tupelo."

The bark is thick, light brown, often tinged with red. In the fall every leaf assumes a rich scarlet hue, making the blazing crown of a hardy tree a notable element in the landscape it graces.

The flowering season of the black gum is April and May. The blossoms are inconspicuous, the petals forming no prominent corolla. The berries of the black gum are drupes, with a pit inside, and are meaty like a cherry. They are rather bitter until frosts have set in, after which the birds are very fond of them.

The black gum has been called the King Lear of the forest—an apt designation to any one who has observed a fine tree overtaken by the decay of age. Preyed upon by more than fifty species of fungi, it usually begins to die at the top, which gives it a melancholy aspect as death creeps down toward its lower branches.

WILD BLACK CHERRY

Prunus serotina Ehrh. [Plate III]

Beautiful alike in the texture of its wood and in its appearance both in flowering and fruiting time, the black wild cherry occurs from Nova Scotia west to the Rocky Mountains and as far south as Peru. It thrives either in rich, moist soils or on rocky cliffs; and while nowhere abundant, in favorable localities numerous groups are found.

The tree grows from 50 to 100 feet high, with reddish brown bark marked with horizontal lines and rough excrescences. In old trees the bark becomes blackish brown; in saplings it is either purplish brown or tinged with green. Of rapid growth, it dies young, but serves well as a nurse tree in forest plantations where luxuriant foliage is desired. The leaves are from two to five inches long, usually turning pale yellow or orange in the fall, although younger growths frequently take on a garnet hue.

The flowering season of this tree is April to June. The pure white blossoms convert the whole crown into a snowy, fragrant cloud. The bark and leaves are aromatic but bitter, owing to the presence of hydrocyanic acid. The same property occurs in the flowers, which on wilting give off a cyanogenetic odor that is quite objectionable to many people, causing severe headache. Cattle have been killed by eating the wilted leaves, and children made ill by eating too many of the cherries.

Few trees figure more in the pharmacopoeia than this one. Chemical analysis of the bark reveals starch, resin, tannin, gallic acid, fatty matter, lignin, red coloring matter, salts of calcium, potassium and iron, a volatile oil, and prussic acid. The bark is widely used in preparations employed in the treatment of hectic fevers, scrofula, and tuberculosis.

The fruit ripens in August and September. The cherries, which are dark purple or black, have a thick skin, dark flesh, and abundant and slightly astringent juice. They are a much-prized food in birdland. The fruit is used extensively in making jellies and as a flavoring for alcoholic liquors; hence its popular names: "whiskey cherry," "rum cherry," etc. Cherry brandy, cherry bounce, cherry cordial—these are but a few of the nectars manufactured from wild black cherries.

SWEET CHERRY

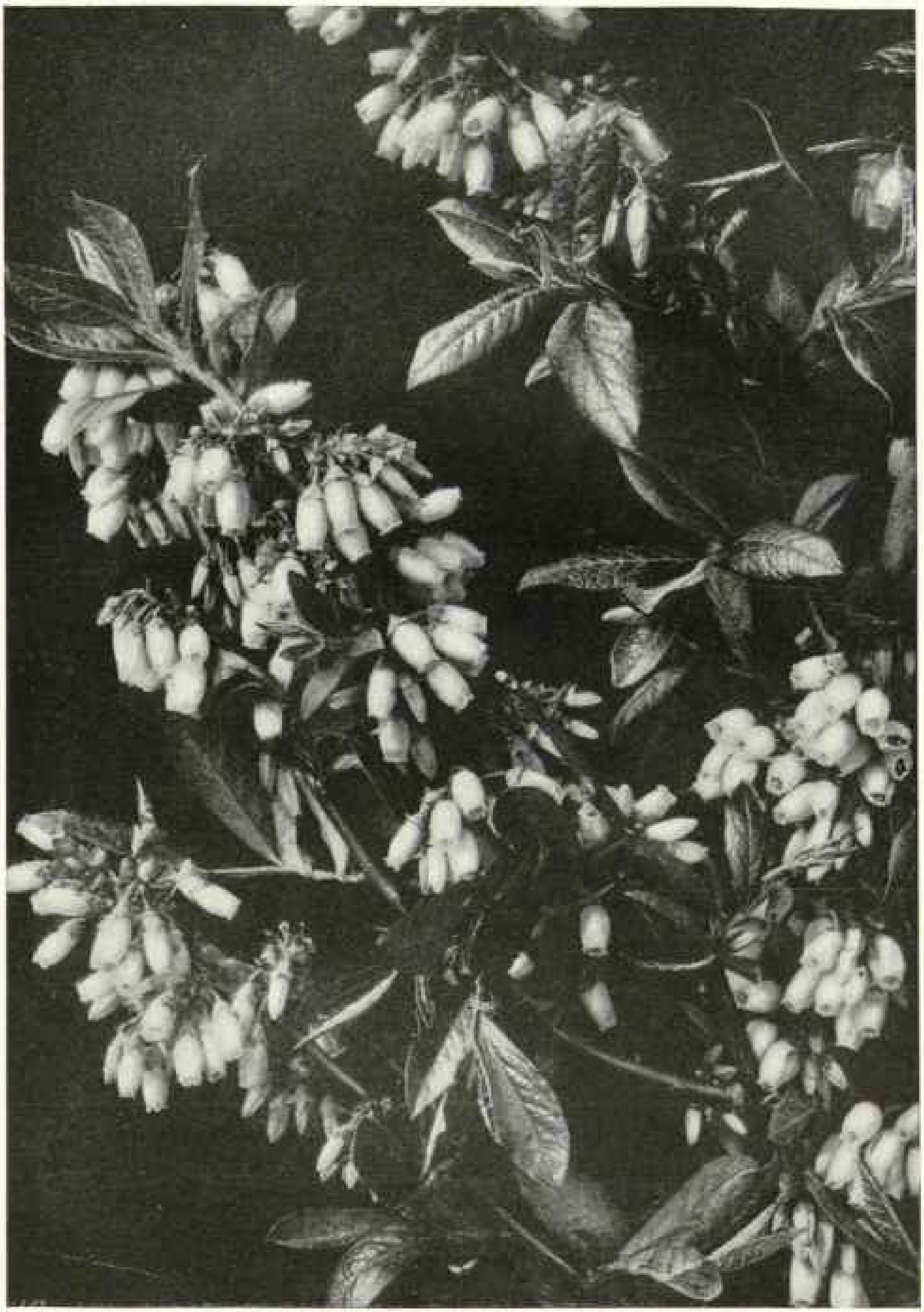
Prunus avium L. [Plate III]

The sweet cherry is an immigrant from the region of the Caspian Sea and Euphrates River. Just when the sweet cherry landed in America is not recorded. Its naturalization papers have never been located. But it has been thoroughly Americanized.

The tree has a long list of local names—among them, "bird cherry," "brandy mazzard," attaining a height of 75 feet, it has a fine, rounded, pyramidal crown when young, but as it grows older it acquires more portliness, spreading out like a field oak.

Itself a wild growth, it has a distinguished progeny that acknowledge and enjoy domestication—the delicious blackheart, the splendid honeyheart, the fine wax, and the acid sour cherry, all tracing their lineage to the wild sweet cherry or its cousin, the wild sour cherry.

The flowering time of the sweet cherry is



Photograph by Edwin Hale Lincoln

A HIGHBUSH BLUEBERRY LOADED WITH BLOSSOMS

Crossed with the lowbush blueberry, this plant in cultivation produces a hybrid which yields blueberries as big as Concord grapes. A single bush has been known to yield half a gallon of berries (see "The Wild Blueberry Tamed," by F. V. Coville, NATIONAL GEOGRAPHIC MAGAZINE, June, 1916).

April and May. With their reddish white and pink petals in rich and fragrant profusion, the blossoms have a world of insect visitors who dance and feast away the day amid the abundance of nectar and pollen.

Japan is par excellence the cherry country. It has a hundred or more varieties, with white, yellow, pink, and rose-colored blossoms. They grow throughout the length and breadth of the empire and are planted in vast numbers everywhere—in temples, castle grounds, parks, gardens, along streets and highways, and by ponds and rivers. A three-mile avenue of cherries planted nearly two hundred years ago by the Shogun Yoshimune, in the vicinity of Kogenal, some ten miles from Tokyo, forms a sight never to be forgotten by the visitor. Some of the trees are 70 feet tall, with crowns having a spread equal to their height, and with girths of trunk up to 12 feet.

When William Howard Taft visited the Orient on his tour of the world before becoming President, the Japanese gave Mrs. Taft a wonderful collection of flowering cherry trees. These have been planted along the Speedway in Washington, and a century hence that wonderful driveway will rival the great Shogun avenue at Kogenal.

HIGHBUSH BLUEBERRY

Vaccinium corymbosum L. [Plate III]

Who that has eaten a real blueberry roll or partaken of a piece of genuine, unadulterated, well-baked blueberry pie can doubt that Frederick V. Coville was right when he declared that the blueberry had the cranberry beaten, because "you can't use cranberries without buying a turkey to eat with them!" This eminent authority has written about the blueberry in previous issues of THE GEOGRAPHIC (see the NATIONAL GEOGRAPHIC MAGAZINE for February, 1911, May, 1915, and June, 1916).

THE EARLY HIGHBUSH BLUEBERRY

Vaccinium atrococcum (A. Gray) Heller [Plate III]

The early highbush blueberry has practically the same range as its cousin mentioned above. It flourishes from Maine and Ontario to North Carolina and westward. The shrub has shreddy bark and its green branches are covered with minute warty excrescences. The young twigs are downy, as are also the under surfaces of the leaves. The foliage does not develop until after flowering time. The blossoms are yellowish or greenish white, tinged with red; they are small and appear about ten days earlier than those of *Vaccinium corymbosum*. The fruit likewise ripens earlier. The berries are black and shine like beads, but are without the waxy bloom that serves as a natural mackintosh for so many plants.

AMERICAN BITTERSWEET

Celastrus scandens L. [Plate IV]

Member of the staff-tree family, the American bittersweet is less a tree and more a vine, with numerous common names, including "climbing orange root." The fruit, which is a capsule and not a berry, bursts in the frosty days of fall, and, crinkling back, thrusts forward the bright scarlet arils inclosing the seeds.

Not content to twine itself around other vegetation, this vine often outdoes the kitten that plays with its own tail, twisting its own stems together, frequently into a rope of great strength. It does not cling like the friendly ivy, but, with the constricting power of the python, it winds and twines about a sapling with such persistent strength that the young tree is often killed.

The range of the American bittersweet is from eastern Canada to South Dakota and from North Carolina to New Mexico, the shrub being especially abundant in the Middle West. The flowers put in their appearance in June. They are creamy white, small, inconspicuous, and scentless. The berry-like capsules reach their full development in September. They remain on the stems all winter, unless eaten by the birds. If gathered and dried on the branches before frost, they become hard and durable and will retain the bright freshness of their coloring for several years.

If one may judge from the use made of this plant by the primitive Indians, it has a right to be called the staff tree. When their little patches of maize and other crops failed and famine threatened, the red man resorted to the use of the American bittersweet.

SILKY CORNEL

Cornus amomum Mill [Plate IV]

The dogwood family, to which the silky cornel belongs, is one of ancient lineage and distinguished associations. Virgil refers to the javelins made of myrtle and cornel wood which pierced the body of Polydore. Pausanias mentions a festival celebrated in honor of Apollo at Lacedæmonia, which was instituted by the Greeks to appease the wrath of the god at their having cut down the cornel trees on Mt. Ida. Romulus, wishing to enlarge the boundaries of Rome, hurled his spear to mark the extension permitted by the gods. It stuck into the ground on Palatine Hill, and from the handle, made of cornel wood, grew a fine tree—an event held to foreshadow the greatness and strength of the Roman State.

The silky cornel is one of the aristocrats of the family. It prefers swamps and low, damp ground, and grows almost exclusively amid such surroundings. In territorial limits it is a little less restricted; for it is found from New Brunswick to Florida and wanders as far west as Nebraska. Indigenous to North America, it is usually found in company with the true arrowwood. In the North a shrub that seldom grows over 10 feet tall, in the South it becomes a fair-sized tree. It flowers in June and develops fruit before frost time. The berries are a beautiful pale blue with a silvery sheen.

Among the common names by which the silky cornel is known are "blue-berried dog-

SPICEBUSH
Benzoin aestivale (L.) Nees

AMERICAN MOUNTAIN ASH
Sorbus americana Marsh.

BLACK ALDER
Ilex verticillata (L.) A. Gray

SMOOTH SUMAC
Rhus glabra L.

ROUNDLEAF GREENBRIER
Smilax rotundifolia L.

BLUE COHOSH
Caulophyllum thalictroides (L.) Michx.

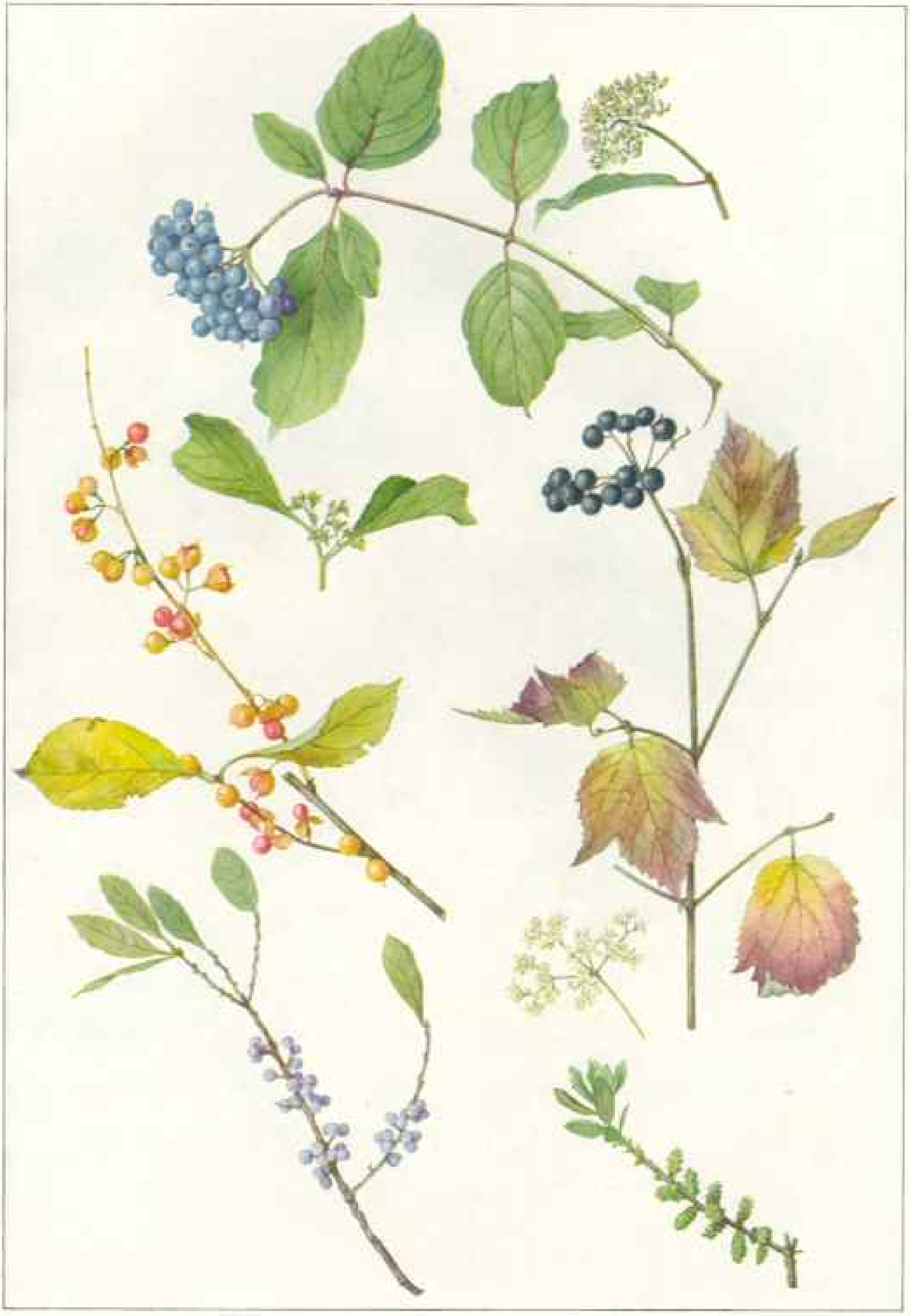
BLACK GUM
Nyssa sylvatica Marsh.

WILD BLACK CHERRY
Prunus serotina Ehrh.

HIGHBUSH BLUEBERRY
Vaccinium corymbosum L.

SWEET CHERRY
Prunus avium L.

EARLY HIGHBUSH BLUEBERRY
Vaccinium atrococcum (A. Gray) Heller



American Bittersweet
Celastrus scandens L.

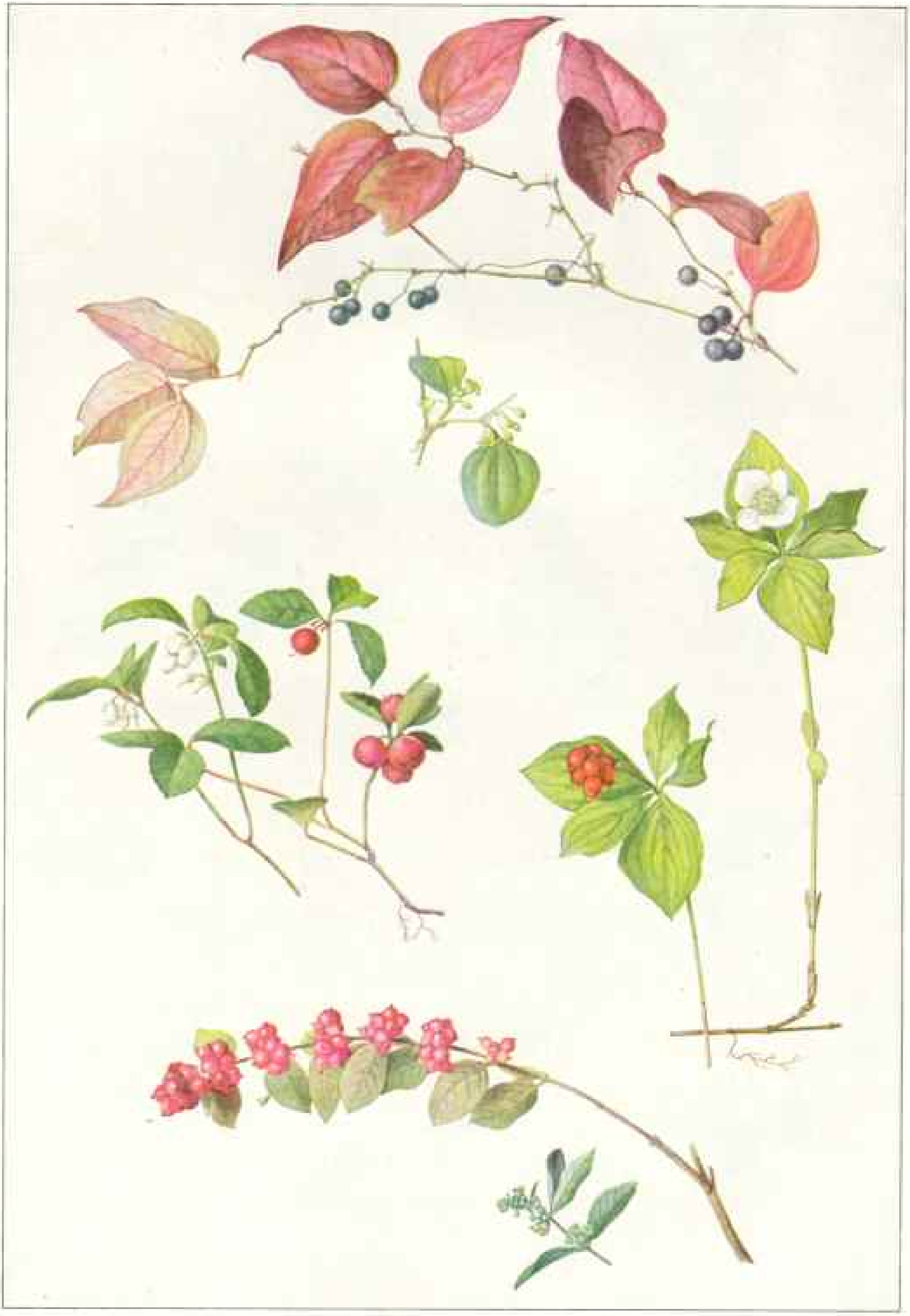
Silky Cornel
Cornus amomum Mill.
Bayberry
Myrica carolinensis Mill.

Mapleleaf Arrowwood
Viburnum acerifolium L.

American Cranberry
Oxycoccus macrocarpus (Ait.) Pursh

Shadbush
Amelanchier canadensis (L.) Medic.

Sweet Elder
Sambucus canadensis L.



WINTERGREEN
Gaultheria procumbens L.

BLUELEAF GREENBRIER
Smilax glauca Walt.

CORAL BERRY
Symphoricarpus orbiculatus Moench

BUNCHBERRY
Cornus canadensis L.

SNOWBERRY
Symphoricarpos albus (L.) Blake
LONGSPINE THORN
Crataegus succulenta Schrader

AMERICAN HOLLY
Ilex opaca Ait.
HIGHBUSH CRANBERRY
Viburnum americanum Mill.

Black Chokeberry
Aronia melanocarpa (Michx.) Britton
Purple Chokeberry
Aronia atropurpurea Britton

Red Chokeberry
Aronia arbutifolia (L.) Ell.

wood," "red brush," "kinnikinnik," "squaw-bush," "swamp dogwood," etc.

This species has often served as a substitute for quinine, decoctions being made from the bark and tender twigs. The fresh bark is chopped, pounded, mixed with alcohol, and filtered. The resulting tincture is of a beautiful madder color and possesses an odor like that of the sugar cane when its juices are slightly soured. The Indians scrape the inner bark and smoke it in their pipes when tobacco is scarce.

BAYBERRY

Myrica carolinensis Mill. [Plate IV]

Belonging to the Myricaceæ family, the bayberry is a cousin of the sweet fern and the sweet gale. It is known also as "bay myrtle" and "tallow shrub." Its favorite place of abode is sandy soil, and its habitat extends from Alaska and Nova Scotia to Florida. It owes its names "waxberry" and "tallow shrub" to the service which it rendered to the colonists in America. Animal fats were not overplentiful in those days; but the farmer had a large family of children, and he believed that they could gather berries for making candles with more edification than they could play—according to the stern Puritan views of the times.

Candles made from bayberry wax are more brittle and less greasy than those made from tallow. They are a curious, almost transparent green, and when the flame is put out the resulting odor is as sweet and pungent as incense.

The bark and roots of the bayberry possess medicinal properties. The roots, when boiled, yield a tea reputed to be a specific for headache; to the bark are attributed properties valuable in the treatment of jaundice and in making soothing poultices for sores and ulcers. The Scotch Highlanders use the leaves, which are bitter and aromatic, as a substitute for hops in the brewing of beer, it being alleged that they increase the intoxicating effect of that beverage.

The Highland clan Campbell wears the sweet gale, the Scotch edition of the bayberry, as its family badge.

MAPLELEAF ARROWWOOD

Viburnum acerifolium (L.) [Plate IV]

The mapleleaf arrowwood is a member of the honeysuckle family, having as cousins the elders, the hobble-bushes, the sweet viburnums, the black haws, the bush-honeysuckles, the coral-berries, the snowberries, and the horse gentians. It is a shrub, from three to five feet high, and, except for its flowers and fruit, would pass almost anywhere as a young maple shoot.

With dense, spreading foliage, the bush has a preference for the shade of woodland thickets. Ranging from New Brunswick and Minnesota on the north to Kentucky and Georgia on the south, it prefers rocky, broken ground rather than damp soils. The heights back of the Palisades of the Hudson are favorite haunts of the viburnum.

The bayberry grows in almost sterile soil.

A close relative of the snowball tree, this species bears profuse clusters of small, white, scentless blossoms. The fruit is a dark, purplish berry the size of a pea.

AMERICAN CRANBERRY

Oxycoccus macrocarpus (Ait.) Pursh. [Plate V]

Together with blueberries, huckleberries, snowberries, trailing arbutus, and wintergreen, the cranberry belongs to the heath family, which also embraces the azaleas, the lilacs, the laurels, the rhododendrons, the heathers, and some of the roselays and rosemaries.

The plant is a trailing evergreen, with a rather stout stem, growing from one to four feet long. It is very tough, in spite of its delicate proportions, and is found in open bogs and swamps from Newfoundland to western Wisconsin, with scattered colonies as far south as the Carolinas and Arkansas. Its favorite haunts, however, are in Massachusetts, New Jersey, northern Michigan, and Wisconsin. June time is blossom time in cranberry land, and its flowers are as pink and pretty as its berries are round and red. The former are tube-shaped and pendant from slender, swaying stems.

First domesticated about 1810, not until some four decades later did its merits become widely known and its berries find their way into the homes of the people of the nation. Today the estimated production is around fifty million quarts a year—a pint for every human being in the United States.

SWEET ELDER

Sambucus canadensis (L.) [Plate V]

Ranging from Nova Scotia to Manitoba and from Florida to Texas, with colonies in the West Indies, the sweet elder climbs mountains and gladdens valleys alike.

The brittle twigs and young sprouts are full of pith, while the older stalks are nearly solid. The hardy leaves are often seen unchanged in hue, frozen stiff on the stems, in December. So repugnant to insects is the odor of the sweet elder that an eighteenth century gardener recommends that cabbages, turnips, etc., be whipped with young elder twigs to preserve them from insect ravages. An infusion of elder leaves is often used today to keep bugs from vines.

The clustered flowers of the elder remind one of mellow old lace. They give off a heavy, sweetish, and to many people a rather sickening odor. The flowers appear from June to August. Elder flower water is much used by the confectioner. A perfume made with the flowers, distilled water, and rectified spirits serves to flavor wines and jellies. The young buds are sometimes pickled like capers. The dried flowers contain a volatile oil, resin, wax,

tannin, etc., and possess stimulating medicinal properties.

The juice of the elderberry was used by the Romans to paint the statues of Jupiter red on festive occasions, and in convivial history has been rather widely used as an adulterant of grape juice.

Its specific name is supposed to be derived from *sambuke*, an ancient musical reed instrument—the prototype of the crude hollow-stem elder whistle of the bare-foot country boy.

These same hollow stalks of the elder play an important rôle in every maple-sugar camp. Cut into appropriate lengths and inserted in the incisions of the tapped trees, they serve to conduct the rising sap into the waiting pail or sugar trough.

No shrub is more generous with its fruit than the elder. Other crops may fail, but this plant always produces a full harvest, never yielding to the caprices of the season, be it wet or dry, hot or cold.

SHADBUSH

Amelanchier canadensis (L.) Medic. [Plate V]

The shadbush belongs to the rose family and is a cousin of the chokeberry, the apple, and the hawthorn. With green, toothed leaves, gray and sepia brown twigs, and red and pink fruit, it is a beauty in the fall, just as it is in the spring, when the white, pink-trimmed blossoms appear. Among its local names are "boxwood," "Canadian medlar," "Juneberry," "sand cherry," "service-berry," "sugar-berry," "sugar pear," "bilberry," "shadblow," "snowy mespilus," and "May cherry."

This species is a shrub or small tree varying from 8 to 25 feet in height, usually attaining its maximum growth in swamps and along river courses. Its habitat extends from Newfoundland to the Gulf of Mexico and throughout the Middle West. The fruit forms in June and July, the berries varying in size from that of a currant to that of a morello cherry. When they are in season, boys, robins, and bears alike feast upon them. The color of the fruit varies from crimson, through magenta to purple or black.

The wood of the shadbush is known as "lance-wood," and many a fishing pole and umbrella handle has been fashioned from it. The Indians often made bows and arrows from it, and it is in considerable demand for tool handles.

In some communities the shadbush is cultivated, being propagated from seeds as readily as apples. It has been found a satisfactory stock upon which to graft the pear and the quince, both of these fruits maturing earlier when so grafted and the resulting trees enduring the winter more easily.

The pemmican of the Indians was composed of deer or buffalo meat dried and pounded to a powder, to which was added dried Juneberries or blueberries, the mixture being then stirred into boiling fat. When cooled, the mass was molded into cakes. When the Lewis and Clark expeditions made the first overland journey to the Pacific Ocean, their provisions ran short while in the region of the upper Missouri River, and it was one of the Amelanchier species, *alnifolia*, that came to their rescue with a bountiful supply of luscious berries.

WINTERGREEN

Gaultheria procumbens L. [Plate VI]

The wintergreen, with its warm-hued berries, has many names: "checker-berry," "boxberry," "deerberry," "groundberry," "ivy-berry," "ginger-berry," "grouseberry," and "spiceberry," "mountain tea," "Jersey tea," "Canadian tea," and "waxy plum." Its tender leaves are known as "little Johnnies," "pippins," "drunkards," and by other names of like import, though they have naught whatever about them to suggest stage entrances, or gaiety, or inebriety.

The wintergreen is a woody vine with an underground creeping stem, from which spring erect flowering branches from three to five inches high. These branches bear at their tops crowded groups of aromatic leaves.

The habitat of the wintergreen is the quiet solitude of damp woods, extending as far north as Newfoundland and Manitoba. Its real headquarters are the Andes Mountains, on whose slopes it appears in nearly a hundred different species. A few species are found in Asia, but wherever it grows it will usually be found under the shade of the pines. Blossoms appear any time between early spring and late fall, and the bright-red berries seem to have all seasons for their own. They are so plentiful in southeastern Massachusetts that they are sometimes seen on the fruit stands in the Boston markets.

The spicy aromatic flavor of the wintergreen appears equally in leaf and flower and fruit. It is the active element in oil of wintergreen, used widely as a scent for soap, a flavor for chewing gum, candy, etc., and as a camouflage for bad-tasting medicines.

One of the strange tricks of nature appears strikingly in the analysis of the oil of wintergreen. How a little creeping plant can take substances from the soil and air and manufacture them into a compound that is exactly like another preparation compounded in the laboratory of a big, deep-rooted tree, is passing strange. Yet the only difference between the oil of the wintergreen and that of the sweet birch is a slight variation of their boiling points. Well may Newhall ask, "By what alchemy can the little checker-berry vine and a tree—the unrelated black birch—both elaborate from the elements around them the same most pleasant scent and flavor?"

BLUELEAF GREENBRIER

Smilax glauca Walt. [Plate VI]

Cousin alike of the evil-odored carrion flower and the fragrant lily-of-the-valley; sharing its family relationship impartially with the graceful Solomon's seal, the handsome wake robin,

the charming painted trillium, and the dashing tiger lily, the blueleaf greenbrier is a rustic member of the aristocratic lily family, which has its full share of worthy scions as well as its quota of black sheep. It is commonly known by such names as "saw brier," "false sarsaparilla," and "bull bay." Sometimes it is confused with the "cat brier."

The blueleaf greenbrier may be found from Maine to Florida and as far West as Texas. Gregarious in its tastes, it grows in thickets, where it adds much to the impenetrability of the brushy mass. The plant is a persistent climber, with many irregular branchlets, and with tendrils of astonishing strength.

The vine is woody, but usually is armed with slender prickles that make up in sharpness what they lack in sturdiness. In the summer, the leaves are a bluish green with a powdery bloom on their under surfaces. They are beautifully crimsoned by the cold of the late fall. The berries are black, each having two or three seeds.

CORAL BERRY

Symphoricarpus orbiculatus Moench
[Plate VI]

The coral berry is another member of the series pictured here that belongs to the honeysuckle family, in which are included the elder, the viburnums, the snowberry, etc. It is variously known as "Indian currant," "low woodbine," "buck bush," "turkey berry," and "snapberry," and is an erect shrub, growing from two to five feet high, with purple or madder-brown branches, slightly hairy in their younger days.

The region gladdened by the presence of this shrub is bounded by New York and North Dakota on the north and by Georgia and Texas on the south. It is a native of the Mississippi Valley.

With a preference for a normal loam or clayey soil, the coral berry thrives best in some grove-like wood where the rivalries of the undergrowths do not make life too hard a struggle. In the summer the delicate short-stemmed leaves are a soft, neutral gray green. In the fall the bush is transformed: each branchlet, bending beneath its weight of fruit, becomes a wand of delicate red. And as each branch has many spray-like twigs, the whole forms a complex profusion of color, making it deservedly one of America's favorite decorative shrubs.

The Ojibwa Indians call the coral berry "gussigwaka-mesh" and use a decoction of it as a remedy for sore eyes.

BUNCHBERRY

Cornus canadensis (L.) [Plate VI]

This species is the smallest member of the dogwood family, attaining a height of less than a foot. It is an immigrant, a native of Eastern Asia that came as a stowaway to America, where it has spread over a considerable area. Never flaunting itself in profligate profusion in the haunts of men, it is timid as a wild turkey, seeking the cool quiet of damp, deep woods, where it lives a modest life in company with the partridge vine, the golden thread, the fern, and the twin-flower, forming a carpet that matches in color and design the rarest rugs of Kermanshah or Bokhara. The bunchberry is equally at home in Labrador and Alaska, and in New Jersey and California, which broadly mark the four corners of its irregular range.

The leaves appear reasonably early, but its delicate little greenish white flowers, with their four surrounding bracts of white that pass for petals, do not come until May. They usually remain until July, after which the plant, tired of debutante days, settles down to the duty of rearing a family of berries. These begin to appear in August, in compact clusters, dressed in as vivid a scarlet as can be imagined. They are as insipid to taste as they are glorious to sight, so far as man is concerned, but for the birds the berries seem to be "done to a turn" in the kitchen of Nature.

SNOWBERRY

Symphoricarpus albus (L.) Blake
[Plate VII]

The snowberry is a member of the honeysuckle family and is variously known as "snowdrop," "waxberry," "egg-plant," etc.

The snowberry seeks dry limestone ridges and rocky banks. It is a native of North America, but finds a home almost anywhere, spreading across the continent from Quebec to Alaska and from central Pennsylvania to California. The green, short-stemmed, elliptic-oblong leaves are downy underneath. The bell-shaped flowers, which come in May and June, are pink, but so small as to be inconspicuous.

The berries, which are inedible, form in clusters along the slender branches from late June until after early frosts. Their size ranges from that of a pea to that of a marble, as a substitute for which children often use them.

This species is easy to cultivate. It spreads rapidly from suckers. Often it is planted with its cousin, the coral berry, and a fine green dooryard studded with snowberry pearls and coral-berry beads is a sight fair to behold.

LONGSPINE THORN

Crataegus succulenta Schrader
[Plate VII]

This plant, growing as a low shrub in some localities and as a small tree in other regions, has a range extending from Nova Scotia through Quebec and Ontario to Minnesota, and thence southeastward to the mountains of Virginia. It has a preference for rich uplands and limestone soil.

The weapons that give the longspine thorn its name are numerous and grow from 1½ to 3½ inches long. They are slender, shining chestnut-brown spines, almost as sharp as nee-

dles. The flowers appear in May, form in white clusters, calling the insect host with both appeal of beauty and the allurement of fragrance. They have a great many visitors, the bees coming more frequently than the butterflies.

The berries develop in September. They are garnet-colored and translucent, with a shiny, polished appearance. They are not berries, from a scientific standpoint, but belong to the apple type of fruits. They fall off when the frosts become frequent, while the leaves gradually assume that variegated coloring where red and green and yellow are mixed in varying proportions and with gorgeous effect.

Longspine thorns are sometimes used as a stock upon which to graft apples and other pome fruits. They are rapid growers, the shoot of a single year being sufficiently large to serve as a walking stick. The species is one of a large group known as the hawthorns. Prior to 1899 there were about 65 species of hawthorns known, of which some 25 were in North America. At present about 600 species have been described.

AMERICAN HOLLY

Ilex opaca Ait. [Plate VII]

The American holly occurs from Massachusetts to Florida and from Indiana to the Gulf of Mexico, reaching its greatest abundance in the coast regions, its greatest size in Texas, and its greatest beauty in the Carolina mountains. While in Texas and Arkansas holly trees often attain a height of 45 feet and a diameter of four feet, in the North they are rarely more than 10 feet high or more than a few inches in diameter. The holly leaves sometimes hold fast for three years, usually staying until driven off by some ambitious successor. They are stiff, leathery, and spine-tipped.

Few plants are less subject to insect trespassers than the holly, although the leaves are a favorite food of the caterpillar of the pretty azure-blue butterfly (*Polyommatus argiolus*).

The tree usually blooms in May or June, the flowers being small and greenish white in color.

The fruit of the holly is eaten with impunity by birds, though considered poisonous to man. The rare combination of these bright, cheery berries with the shiny green leaves makes the holly much admired. Its beauty, however, is proving, as usual, a somewhat dangerous gift. Unless protected from the axes of the foliage and shrubbery gatherers, there is grave danger that it will disappear in half a century.

The wood of the holly is fine-grained and is employed extensively in cabinet-making, inlay work, and the manufacture of musical instruments. It is also used for engravers' blocks and for rollers for printing cotton goods.

There are about 175 species in the holly group of plants, a dozen or more being found in the United States, including some that bear black berries and others that yield yellow ones.

The holly's use as a decoration is thought to be a survival of the usages of the Roman Saturnalia. It was the custom, before that celebration in commemoration of the blessings of agriculture degenerated into a period of unbridled license, to send a sprig of holly with a gift, as a token of good wishes. The Christian custom of decorating houses at Christmas seems to have come from the pagans. The Council of Bracara forbade such decking of houses with all green things, alleging it to be a pagan observance.

HIGHBUSH CRANBERRY

Viburnum americanum Mill. [Plate VII]

The highbush cranberry belongs to the honeysuckle family and has a fruit of the peach rather than of the berry type.

This shrub grows from three to fourteen feet tall, with smooth stems and gray brown or buff branches. It is a native of Siberia, and in North America has a range reaching from Newfoundland and British Columbia to New Jersey and Iowa, being variously known as the "American guelder rose," the "cranberry tree," etc. It thrives best in upland soils, where the true cranberry cannot live.

The familiar snowball tree is a sterile form of the highbush cranberry.

The flowers of the highbush cranberry appear in May and June and consist of masses of small, white blossoms.

The berries of the fertile plant come in early summer. They remain on the bush all winter, their flavor being too sharp even for the bold appetite of a hungry bird.

THE CHOKEBERRIES

Aronia melanocarpa (Michx.) Britton

Aronia atropurpurea Britton

Aronia arbutifolia (L.) Ell.

[Plate VIII]

Botanists are not agreed as to the classification of the black, purple, and red chokeberries shown in plate VIII. Some assign all to a single species; others regard the red as a distinct species and the purple and black as variations of another. Some say all belong to the *sorbus* group of plants, to which the mountain ash belongs, while other include them in the *pyrus* group, to which the berry crabapple and the Japan quince belong.

The berries of all three have the common quality of astringency, their every-day name being a tribute to their power to constrict the throats of those who eat them. They occur in moist thickets and swamps from New England and Minnesota to the Gulf of Mexico, growing from two to six feet high.

The black species is found in altitudes as great as 6,000 feet. Its flowers appear in early summer and its berries in August, shriveling and dropping early. The purple species blossoms from April to June and its berries mature in September. The seasons of the red variety are but little different.

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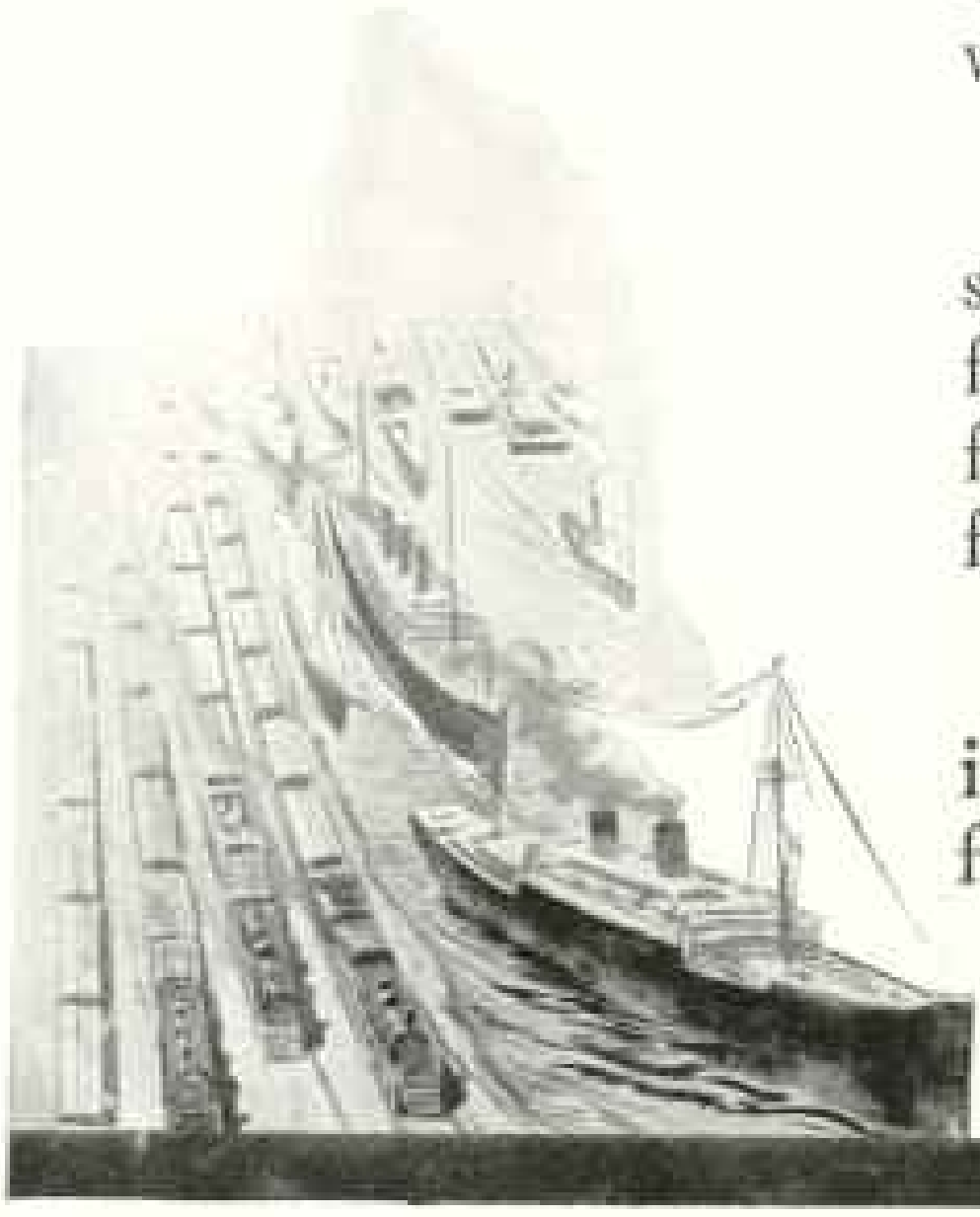

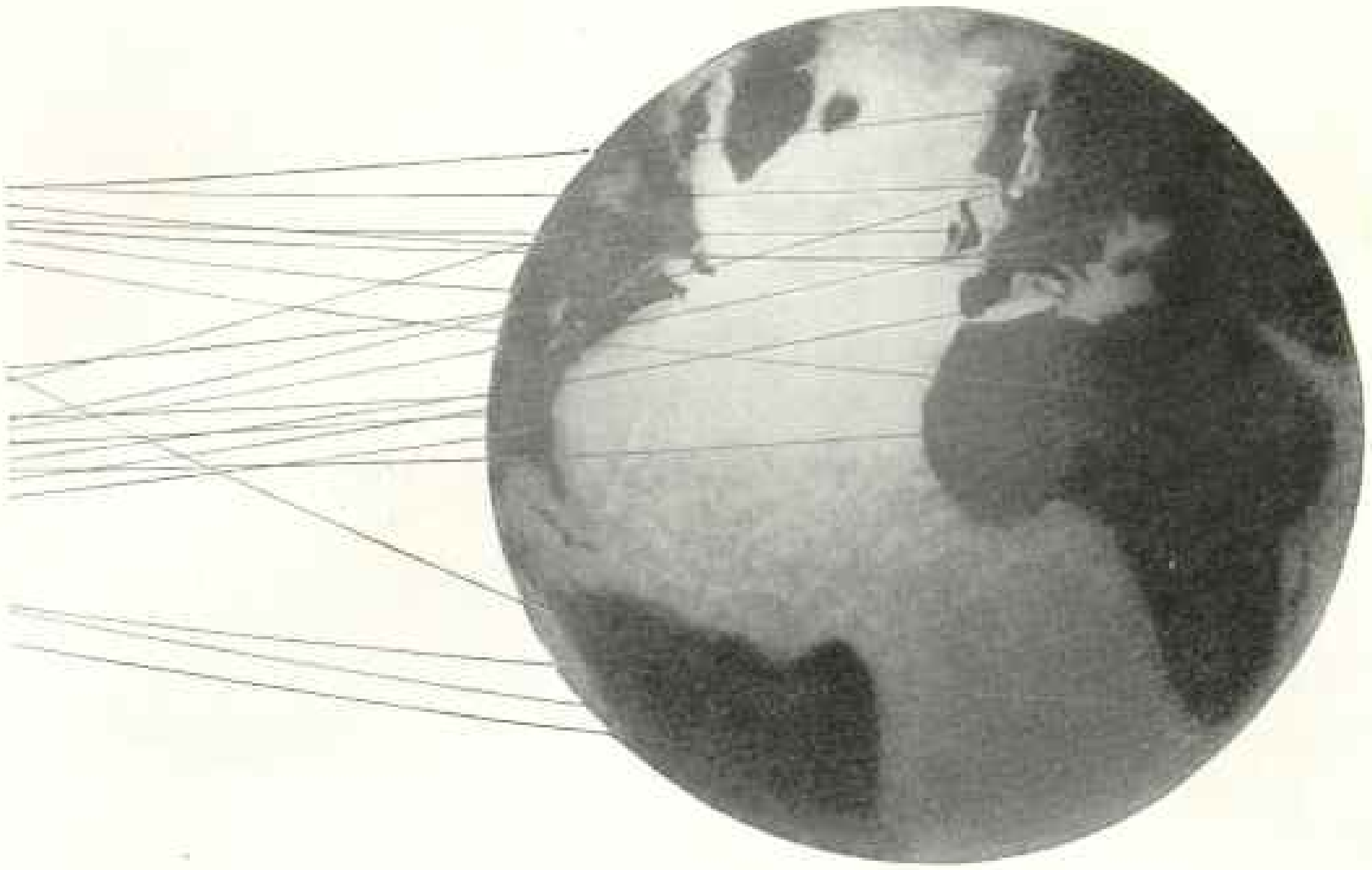

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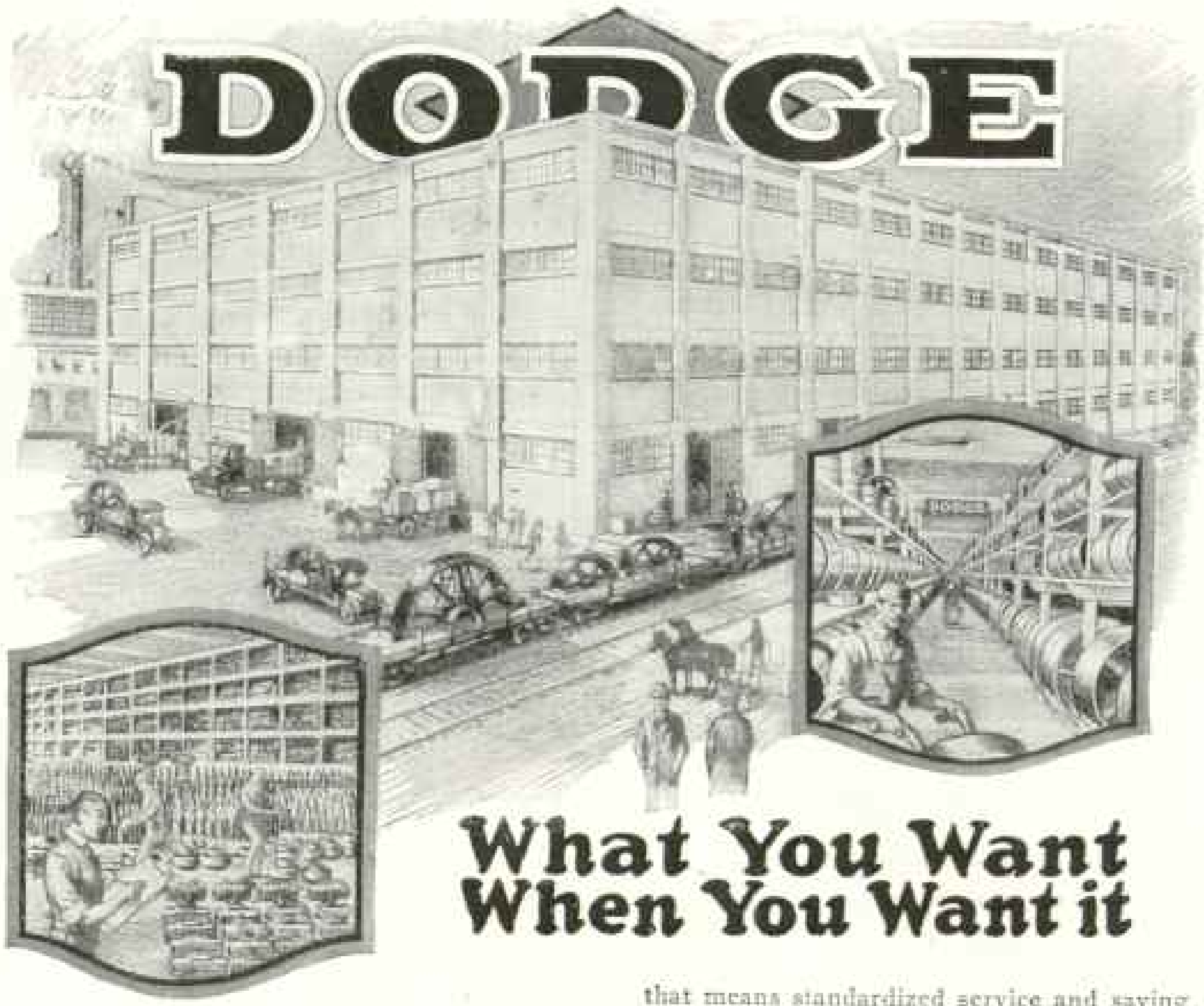

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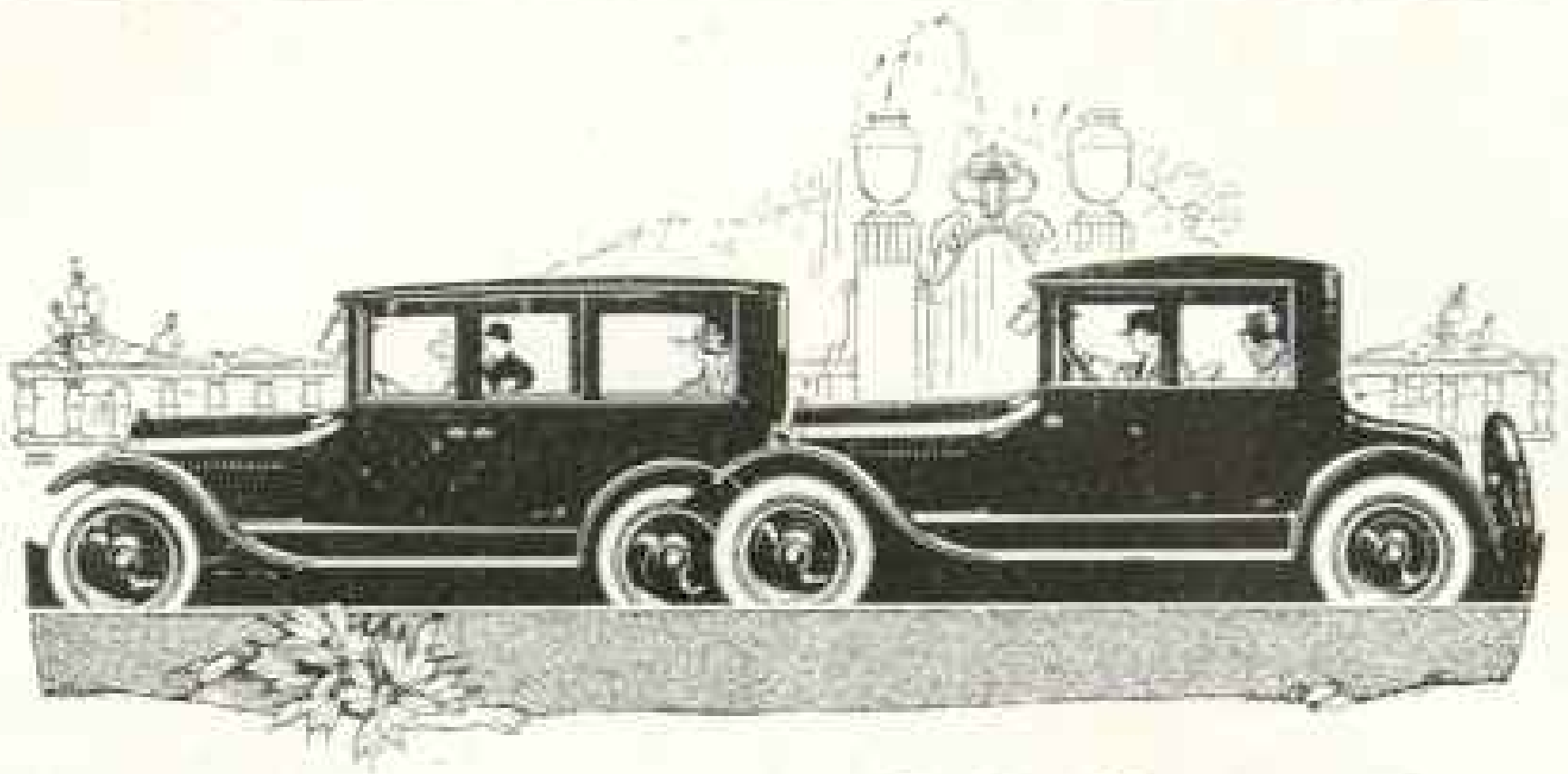

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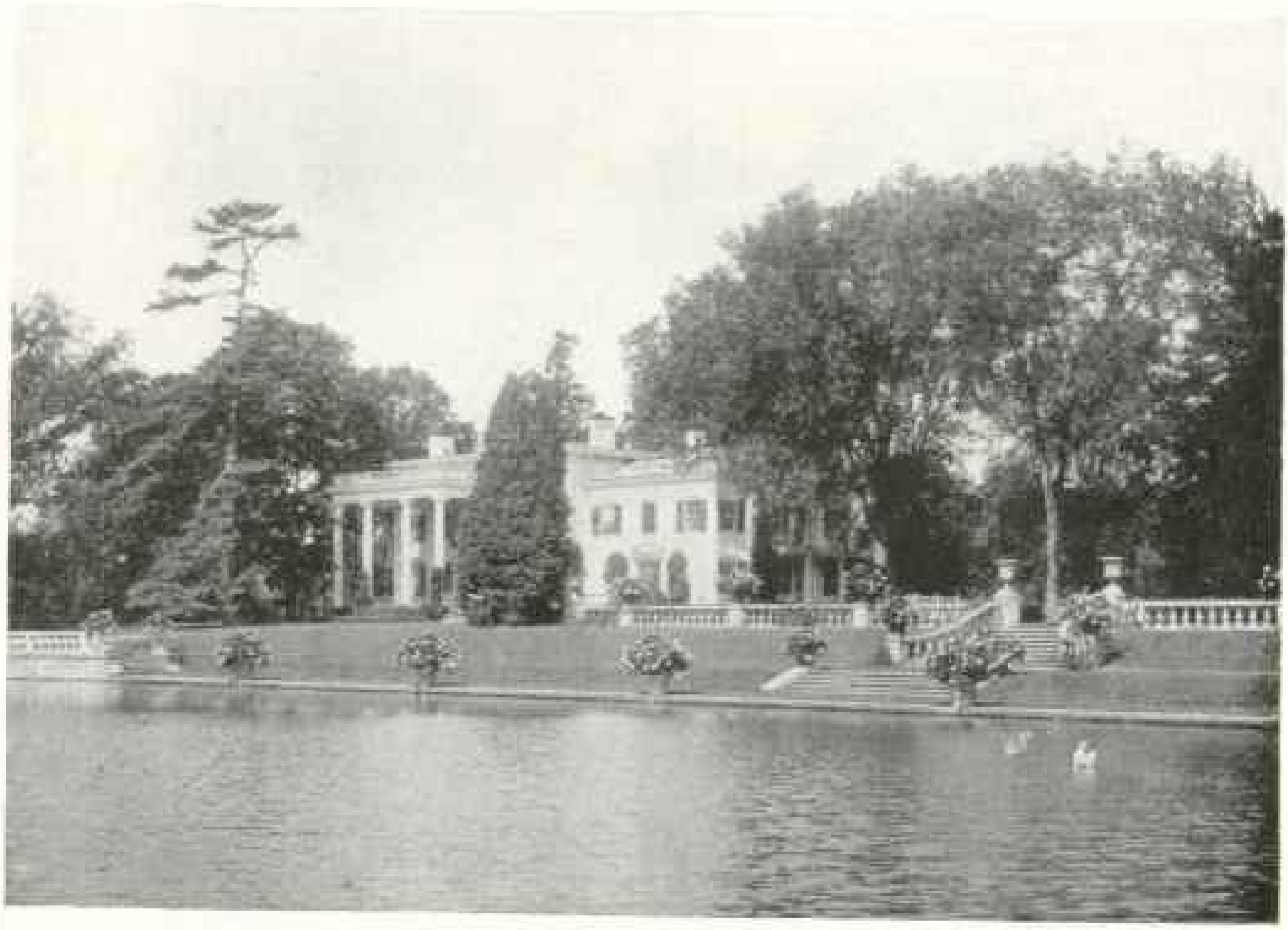

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FINE old trees can not be replaced at any price. No amount of money spent with a lavish hand can place in a desired spot and in full health and vigor a majestic monarch of tree life. You can make new lawns, plant new shrubs, construct new drives, build a new house. You can even plant new *small* trees—you can not replace the old ones in your lifetime.

The tree is a living, breathing organism, having a real circulation, organs of assimilation, power of growth, and definite sexual processes. Most trees require some care—certain ones demand extensive treatment. Neglect takes an astounding toll of fine trees every year. For your priceless trees you will require Tree Surgeons of unquestioned skill and demonstrated stability. Davey Tree Surgeons will satisfy your highest expectation of finished skill and honest service, just as they have thousands of America's estate owners. A careful examination of your trees will be made by appointment.

THE DAVEY TREE EXPERT CO., Inc.
1502 Elm St., Kent, Ohio

Branch Offices with telephone connections in New York, Philadelphia, and Chicago. Write nearest office.

Permanent representatives located at Boston, Newport, Lenox, Hartford, Stamford, Albany, Poughkeepsie, White Plains, Jamaica, L. I., Newark, N. J., Harrisburg, Baltimore, Washington, Buffalo, Pittsburgh, Cleveland, Detroit, Cincinnati, Louisville, Milwaukee, Minneapolis, St. Louis, Kansas City. Canadian Address: 232 Longueuil Street West, Montreal.

DAVEY TREE SURGEONS

Every real Davey Tree Surgeon is in the employ of The Davey Tree Expert Co., Inc., and the public is cautioned against those falsely representing themselves

"Mention the Geographic—It identifies you."

There's a Film on Your Teeth

Which May Wreck Them if You Leave it

All Statements Approved by High Dental Authorities

Brushing Doesn't End It

That slimy film which you feel on your teeth is the cause of nearly all tooth troubles.

It gets into crevices, hardens and stays and resists the tooth brush. That is why brushing fails to keep teeth safe and clean.

That film is what discolors. It hardens into tartar. It holds food which ferments and forms acid. It holds the acid in contact with the teeth to cause decay.

Dentists call it bacterial plaque, because millions of germs breed in it. Those germs, with tartar, are the chief cause of pyorrhea.

Must Combat It

Scientists have long sought some way to combat that film. A dentist removes it when he scours your teeth, but it comes right back. So millions of teeth brushed daily still discolor and decay.

Now a film remover has been found which seems to solve this problem. Able authorities have proved it by four years of clinical tests. A very large number of leading dentists have now tried it and approved it. It is evident now that this invention means much to every one. In every home it should displace the inefficient tooth pastes. So we offer you a One-Week tube to show you what it does.

Based on Pepsin

This new-day dentifrice is called Pepsodent. It is based on pepsin, the digestant of albumin, for the film is albuminous matter.

The object is to dissolve the film, then to constantly prevent its accumulation. It long seemed impracticable to combat the film in this way. Pepsin must be activated, and the usual agent is an acid harmful to the teeth.

But science has found a harmless activating method. Five governments have already granted patents. That method has made possible this ideal pepsin dentifrice.

A Test Is Free

We send to any one who asks a One-Week tube of Pepsodent, and let it prove itself.

Send the coupon for it. Use it like any tooth paste. Note how clean your teeth feel after using. Note the absence of the film. Note how teeth whiten as the fixed film disappears.

You will know in one week that Pepsodent does what nothing else has done. You will know what clean teeth mean. And you will want your teeth kept that way, we believe.

CUT OUT COUPON NOW

(118)

Pepsodent REG. U.S. PAT. OFF.

The New-Day Dentifrice

A Scientific Product—Sold by Druggists Everywhere

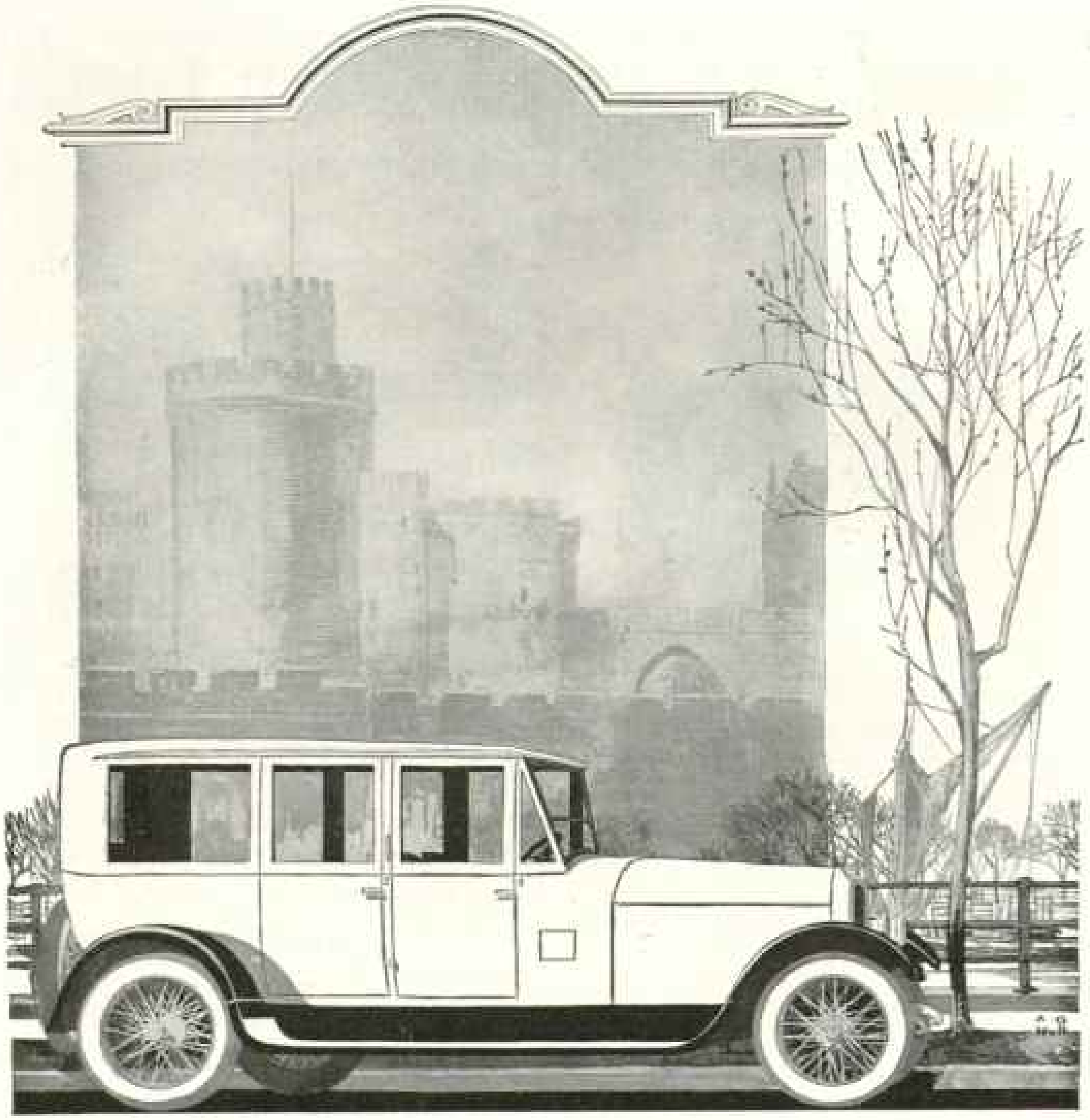
One-Week Tube Free

THE PEPSODENT CO.,
Dept. 394, 1104 S. Wabash Ave., Chicago, Ill.

Mail One-Week Tube of Pepsodent to

Name _____

Address _____



An Example of THOMPSON Custom Coach Work—*The Thames Sedan*

IN the creating of Thompson custom-built Coach Work are encompassed the mature judgment of designers, decorators and artisans, whose technique and skill have been developed in the master work shops of America and Europe.

The Thompson method of designing each body individually allows the purchaser freedom in the choice of accessories, interior decoration, finish and seating arrangement.

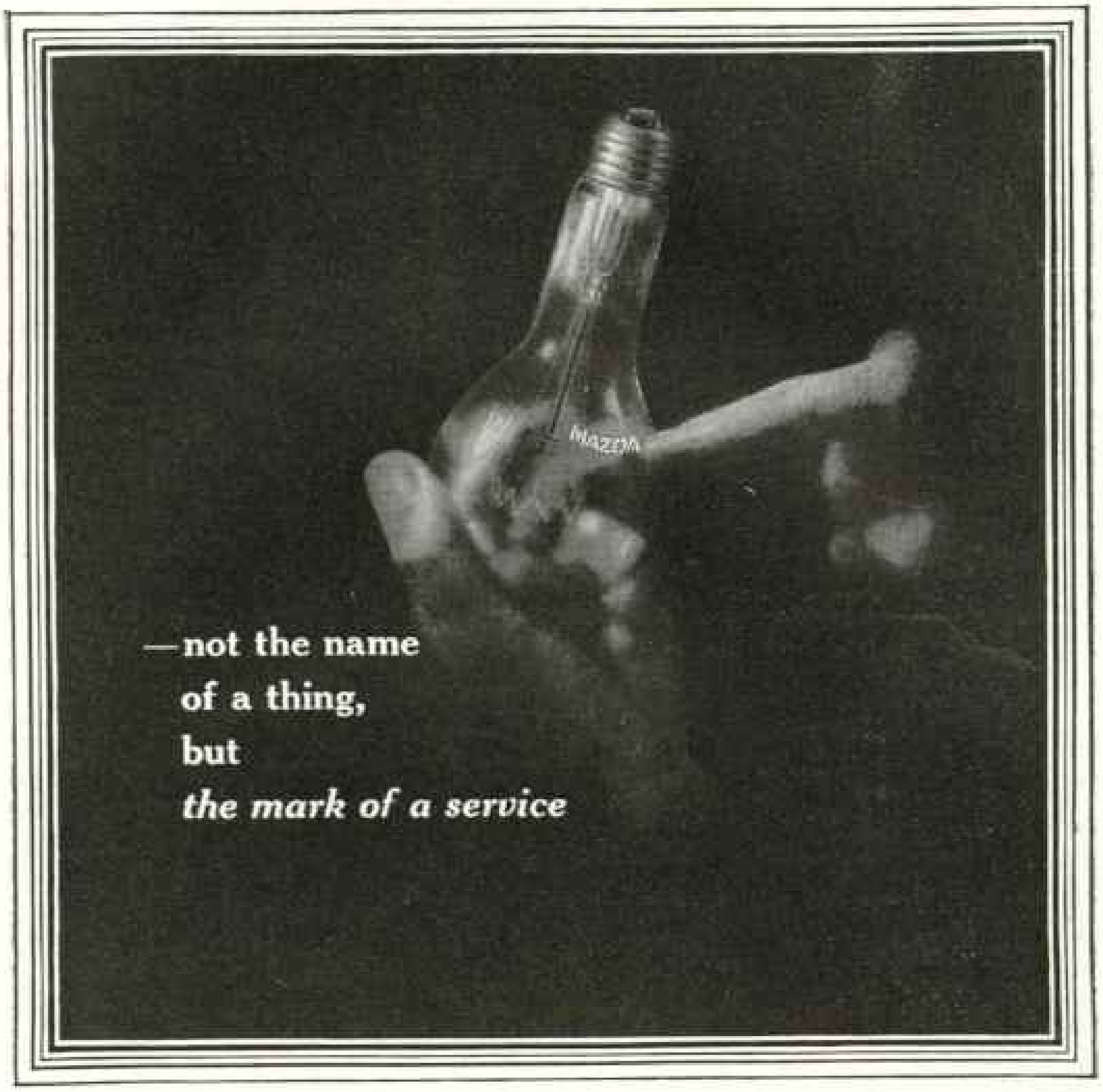
THE painstaking methods that characterize the creation of Thompson Coach Work necessitate orders being placed several months before delivery is desired.

Those contemplating the purchase of individually designed Motor Car Bodies are, therefore, urged to communicate their wishes to us without delay.

Upon request, a portfolio containing illustrations, specifications, prices and other details of interest will be forwarded.

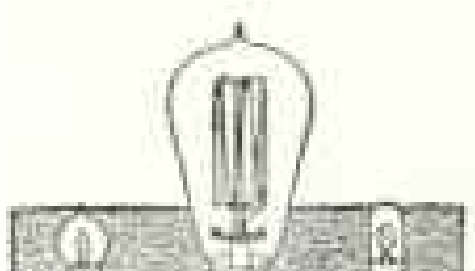
E. J. THOMPSON COMPANY— —MOTOR CAR BODIES

FORBES FIELD, PITTSBURGH, PENN.



MAZDA

"Not the name of a thing, but the mark of a service"



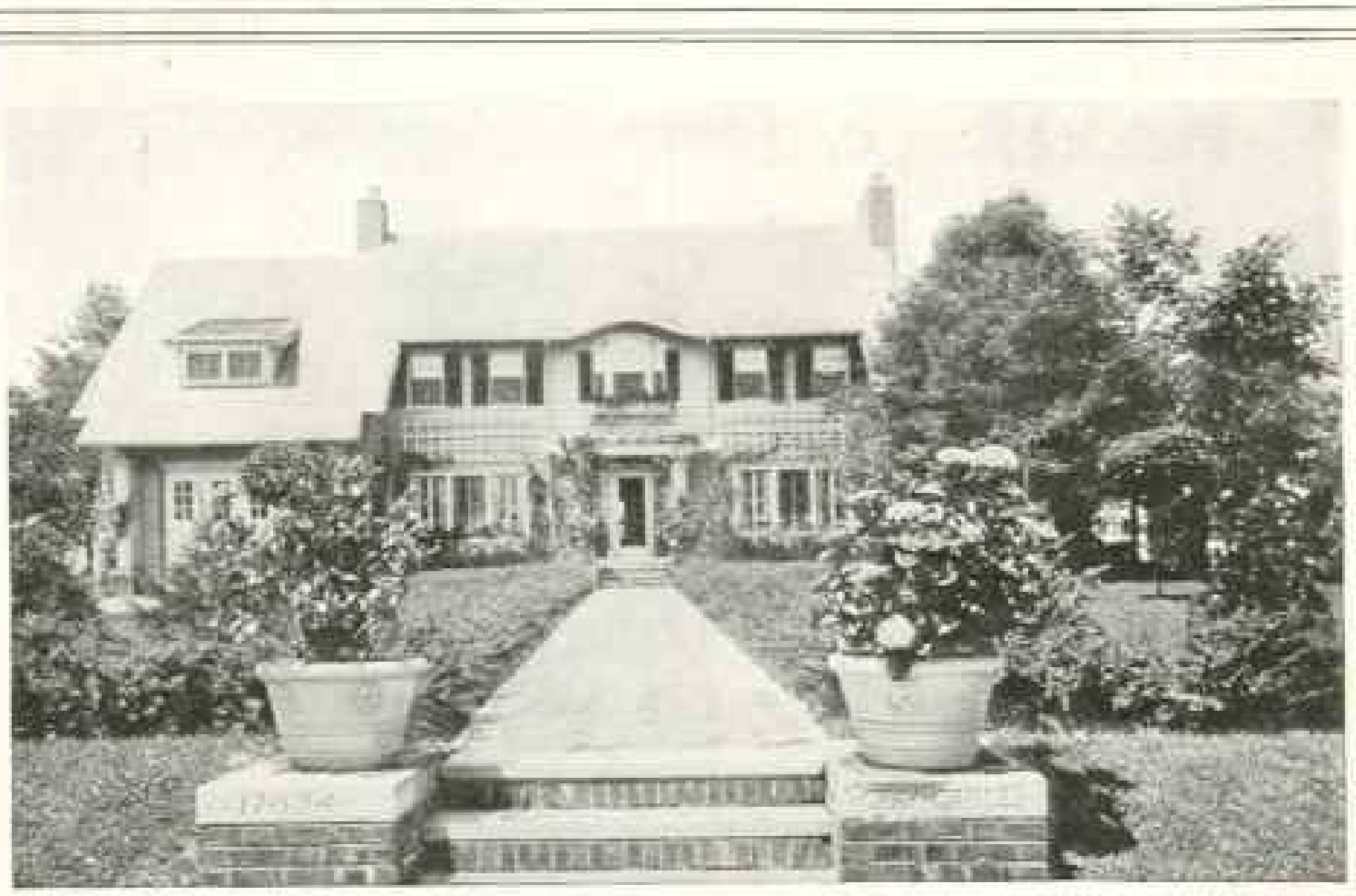
A MAZDA Lamp for every purpose

MAZDA is the trademark of a world-wide service to certain lamp manufacturers. Its purpose is to collect and select scientific and practical information concerning progress and developments in the art of incandescent lamp manufacturing and to distribute this information to the companies entitled to receive this service.

MAZDA Service is centered in the Research Laboratories of the General Electric Company at Schenectady, New York. The mark MAZDA can appear only on lamps which meet the standards of MAZDA service. It is thus an assurance of quality. This trademark is the property of the General Electric Company.

4544

RESEARCH LABORATORIES OF GENERAL ELECTRIC COMPANY



House of J. H. Wood, Esq., Lakewood, Ohio. Frank B. Meade and James R. Hamilton, Architects, Cleveland, Ohio.

TO that growing class of discriminating American home-builders who judge building-material values in terms of service, White Pine makes a strong appeal.

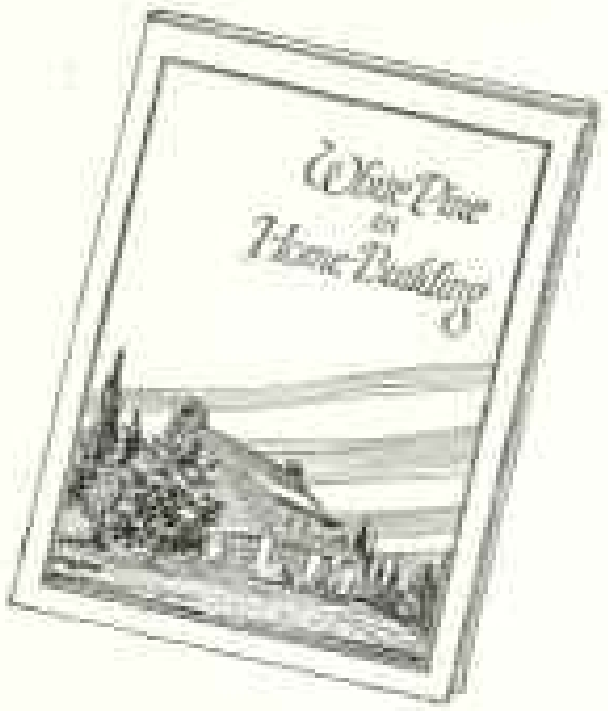
Despite a slightly higher first cost, it is for certain uses the most economical of all woods. Cheaper woods prove satisfactory in protected places. But nature has endowed

WHITE PINE

with distinctive qualities which make it the longest-lived and most satisfactory wood under exposure to the weather.

White Pine stays where you put it without opening at the joints. Through all changes in temperature and weather it endures without warping, splitting or decaying.

These facts are borne out in the many White Pine houses which have withstood the rigorous climate of New England since Colonial times.



"White Pine in Home Building" is beautifully illustrated with old Colonial and Modern homes, full of valuable information and suggestions on home-building, and gives a short, concise statement of the merits of White Pine. Send for it now. There is no charge for it to prospective home-builders.

WHITE PINE BUREAU,
1206 Merchants Bank Building, St. Paul, Minn.

Representing
The Northern Pine Manufacturers' Association of Minnesota, Wisconsin and Michigan, and The Associated White Pine Manufacturers of Idaho

The Monarch

That Defeats King Coal

Some Geographic readers will soon be making contracts for more next winter's coal than they need.

For a quarter to a third of their Coal Cash will waste out through their apparently closed windows.

The price of several such years of recklessness would install Monarch Metal Weather Strips—and protect your pocket-books now from fuel leakage as long as your home or other building endures.

Don't Be One of These

"Year-Wise" and "Life-Foolish" Buyers

Most home expenses anticipate dividends only in satisfaction, not money. But investment in the Monarch part of a home also **pays for itself** in what it saves.

Why not make us prove to you, by the experience of thousands of others, how Monarch Metal Weather Strips are continuously dethroning Old King Coal.

Licensees most everywhere will call by appointment and give estimate without obligating you. If he's not in your telephone book write us today.

Monarch Metal Weather Strip Co.

4100 Forest Park Blvd. St. Louis, Mo.

"Weather Strips Are 100% Fuel Conservation"
P. S. NOYES, *Director of Conservation*
U. S. Fuel Administration

Patent Applied for

"Cado" $1.50 Dater

THIS GREAT TIME-SAVER

Should be on every busy man's desk. No guessing, no errors; imprints the date clearly—thus:

MAY 20 '19

Re-inks automatically before each impression. Richly nickeled, all metal; nothing to get out of order. Will last years.

$1.50

Ask your dealer, or send for one at our risk. Money-back guarantee.

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NEW YORK

DEAF? "I Now Hear Clearly"

You, Too, Can Hear!

Inasmuch as 325,000 users of the "ACOUSTICON" have had the same results from it as Mr. Garret Brown, whose photo appears above, we feel perfectly safe in urging every deaf person, without a penny of expense, solely and entirely at our risk, to accept the

1919 Acousticon DICTOGRAPH

For 10 Days' FREE TRIAL

NO DEPOSIT—NO EXPENSE

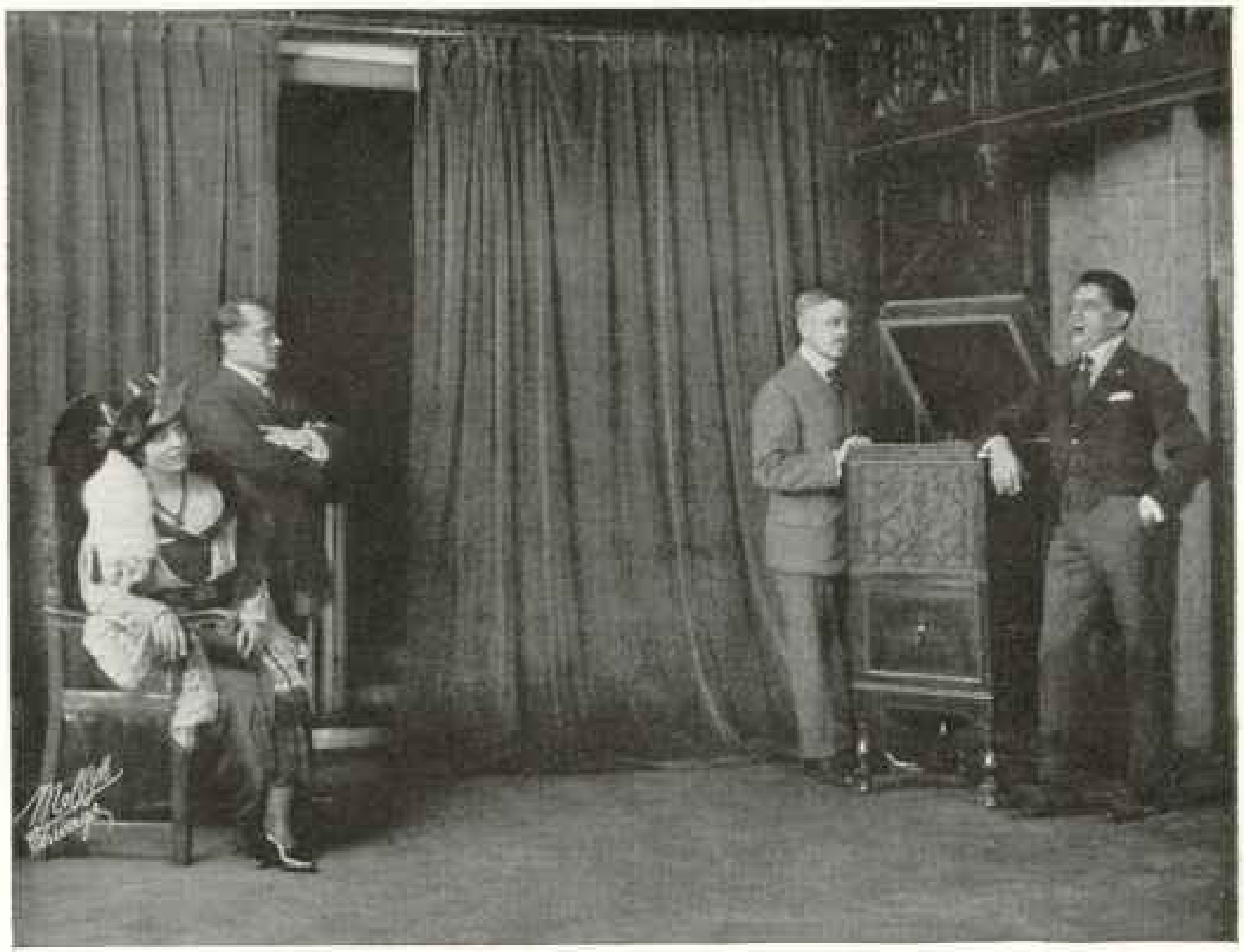
Since the perfecting of our new 1919 "ACOUSTICON," it is smaller, better, and just as strong as ever.

All you need do is to write, saying that you are hard of hearing and will try the "ACOUSTICON." The trial will not cost you one cent, for we even pay delivery charges.

WARNING! There is no good reason why every one should not make us liberal a trial offer as we do, so do not send money for any instrument for the deaf until you have tried it.

The "ACOUSTICON" has improvements and patented features which cannot be duplicated; so no matter what you have used in the past, send for your free trial of the "ACOUSTICON" today and convince yourself—you alone to decide. Address

GENERAL ACOUSTIC CO., 1311 Candler Bldg., N. Y.
Canadian Office, 621 New Birks Bldg., Montreal



CHICAGO OPERA STARS HEAR CICCOLINI TEST EDISON'S $3,000,000.00 PHONOGRAPH

GUIDO CICCOLINI scored a great triumph as Alfredo in "Traviata" at the opening performance of the Chicago Opera season. Scarcely less happy than he, over his success, were Carolina Lazzari, leading contralto, and Virgilio Lazzari, the brilliant basso, of the world famed Chicago Opera Association. To them, on the following day, Ciccolini said: "Last night two thousand people heard me on the stage of the Auditorium. Every day two hundred thousand hear me on the New Edison. It is the same voice—listen and tell me if you observe even the slightest difference."

As shown in the photograph, Ciccolini stood beside the New Edison and sang for his friends in comparison with its RE-CREATION of his voice. Their critical ears could discover no quality in Ciccolini's wonderful voice that was not also present in the RE-CREATION.

Similar tests have been made by thirty different artists before audiences aggregating two million people. The results of these astounding comparisons are described in the news columns of America's principal newspapers. May we send you the booklet "What the Critics Say"?

Mr. Edison spent more than three million dollars in research work to develop

The NEW EDISON

"The Phonograph with a Soul"

He did this so that you may have in your own home all the ear can give you of the art of the world's greatest artists. You owe it to the music loving side of your nature to hear this wonderful instrument.

Let us send you a complimentary copy of our musical magazine "Along Broadway."

THOMAS A. EDISON, INC., ORANGE, N. J.

"Mention the Geographic—It identifies you."

HARRISON MEMORIALS

are based upon those master motifs which, despite the fads of this or that generation, have set the true artistic standards of the centuries.

Our balanced judgment in design and craftsmanship in execution are the result of 74 years of specialized experience.

Write for Booklet 3

HARRISON GRANITE CO.

200 Fifth Avenue, New York
Offices in Principal Cities
Works: Barre, Vt.

Gum decay causes tooth decay

HEALTHY teeth need healthy gums to hug them. Else they will loosen in Pyorrhea. Tiny openings will come in the gums to act as the gateways of disease germs, which infect the joints or tonsils, or cause other ailments.

Forhan's prevents Pyorrhea, if used in time and used consistently. No mere tooth paste does. Are *your* gums tender gums? Are they bleeding gums? If so, you are certain to have Pyorrhea (Riggs' Disease). Four out of five people who are over forty have it.

To you we earnestly recommend Forhan's. It preserves the gums, which hold the teeth secure.

Brush your teeth with it. Forhan's cleans the teeth scientifically—keeps them white and clean.

If gum-shrinkage has already set in, start using Forhan's and consult a dentist immediately for special treatment.

30c and 60c tubes
All Druggists

FORHAN CO.
220 6th Avenue, N. Y.

Dodson Bluebird House
4 compartments, 21 in. high, 10½ in. in diameter.

Price $5

The Birds Are Coming —Heralds of Spring!

Like a flash of sunshine the first courageous little bluebird arrives; others appear; building happiness and promising glorious nesting days to follow. Spring will disappear, but you can keep these little feathered friends if you properly welcome and prepare for their comfort.

Dodson Bird Houses

will bring them and keep them all summer. These houses, scientifically built by a bird-lover, whose knowledge and understanding of birds is unlimited, offer sheltered, inviting homes for the little songsters. Dodson Bird Houses are an investment, paying invaluable dividends—protection of crops and shrubs from insects, and assurance of a cheery, artistic environment.

Order Now—let the houses weather, blending into the foliage and assuming an appearance of habitation. Free Bird Book sent on request, illustrating Dodson line, giving prices; also beautiful bird picture free.

JOSEPH H. DODSON *Pres. American Audubon Association*
702 Harrison Ave. Kankakee, Ill.

Dodson Sparrow Trap guaranteed to rid your community of these most pernicious pests. Price $7.50.

ALASKA

ATLIN AND THE YUKON

The land of inexpressible scenic grandeur. Truly the trip incomparable. High class steamers. Via the "Inside Passage." Excellent service all the way. Plan your trip now. Interesting literature, map and full information on request.

Special Midnight Sun Trip
Sailing About June 15th

HERMAN WEIG, G. P. A., 119 W. Washington Street, CHICAGO
J. L. BURNSIDE, Gen. Agent, 615 Second Av., SEATTLE, WASH.

WHITE PASS AND YUKON ROUTE

Lantern Slides from Photographs in National Geographic Magazine

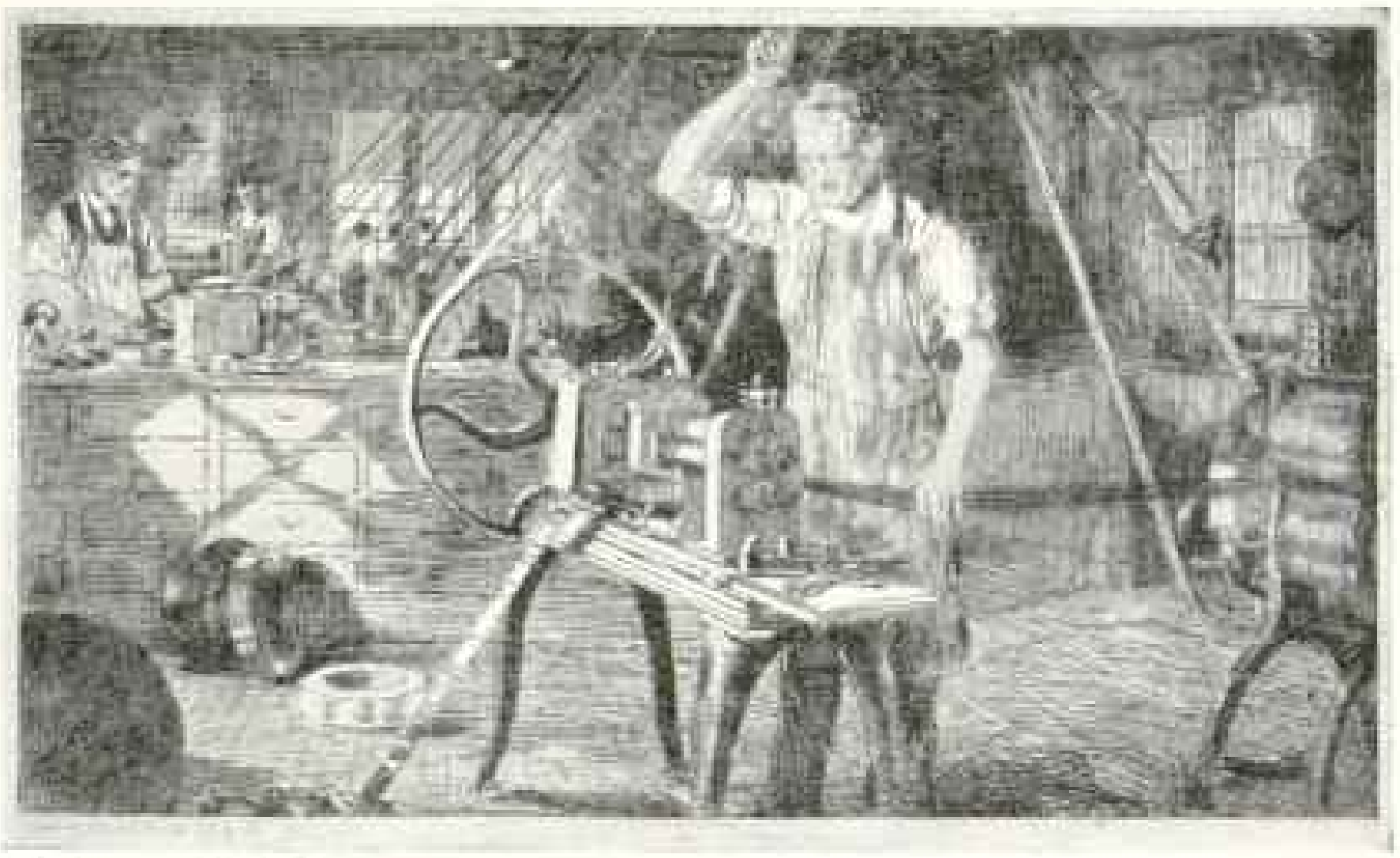
So many requests are being constantly received regarding lantern slides from the copyright photographs in the Geographic that arrangements have been completed to supply them to members of the Society. Slides are not kept in stock, each order being made up as received, and will be delivered within two weeks after receipt of order, unless otherwise advised.

The copyright notice must appear on each slide. The purchase of lantern slides does not carry with it the authority to publish the pictures and they cannot be used for advertising purposes.

Slides cannot be sent upon approval and a remittance must accompany each order. The slides will be carefully packed and sent by express collect. Prices in the United States (standard size), black and white, 75 cents each; colored, $1.50. Address,

DEPT. L,
NATIONAL GEOGRAPHIC MAGAZINE
WASHINGTON, D. C

WALTHAM THE SCIENTIFICALLY BUILT WATCH



AND THE FOREIGN BUILT WATCH

The Main Spring

THE watch presents the same elements of mystery that once surrounded the automobile. Now, nearly every one knows something about a motor car's mechanism. It is to make the "works" of the watch an "open book" that these Waltham advertisements are designed — to instruct and protect you in buying a watch.

The mainspring is the power of a watch. It is a piece of specially hardened and tempered steel, about twenty inches long, coiled in a barrel between the upper and lower plates of the movement.

It is subjected to varying conditions of service in temperature and tension. The variation in thickness of two one-thousandths of an inch, or lack of uniformity in hardening and tempering, will decide the time-keeping quality of your watch.

The Waltham Watch Company produces fourteen tons of mainsprings every year. It is the largest mainspring maker in the world. The Waltham mainspring is cut from long rolls of steel of uniform and special quality, then tempered *in resilient form* by a secret process, and is placed in the watch coiled into a hardened and tempered steel barrel. This is exclusively a Waltham practice.

The *foreign* mainspring is not only cut *in short lengths*, but hardened and tempered *in short lengths* — therefore every foreign mainspring is an individual spring of uncertain temper, making the watch a liability.

The foreign maker of watch movements buys his springs in the open market. That is one reason why the imported watch gives such varying service. An inferior mainspring means an inferior watch — no matter how much you pay for it.

The uniform superiority of the Waltham mainspring is one of the reasons why the horological experts of the leading nations of five continents chose Waltham in preference to watches of any other make.

Pendant and Bow Formed

Colonial A

Extremely thin at no sacrifice of accuracy. 21 and 19 jewels

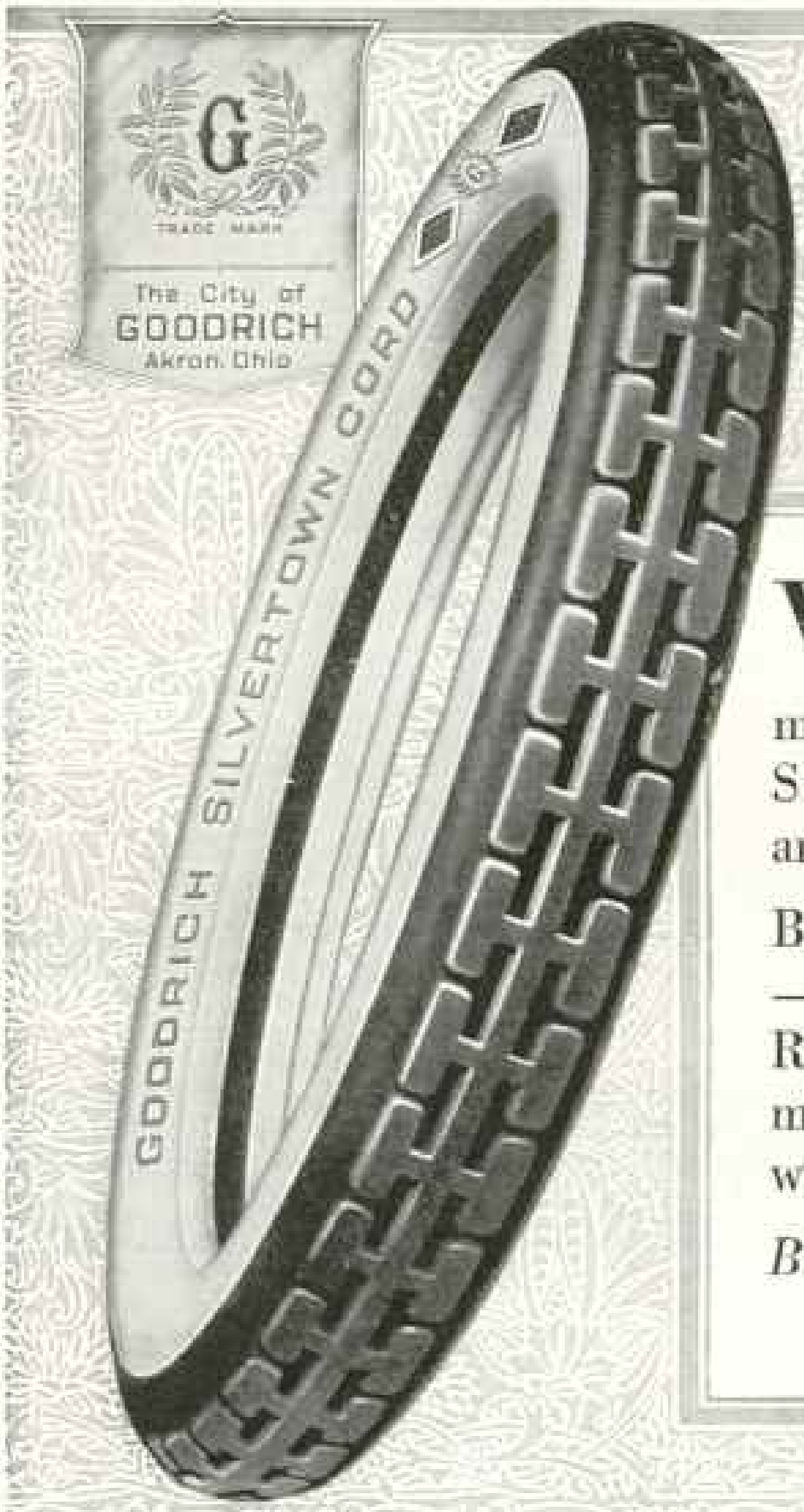
$125 to $240

or more, depending upon the case

WALTHAM

THE WORLD'S WATCH OVER TIME

"Mention the Geographic—It identifies you."



Quality First

WHAT white, flawless diamonds are to gems, Silvertown Cords are to tires.

Beyond the others—the tires with the Red-Double-Diamond on the sidewall.

Buy Goodrich Tires from a dealer

SILVERTOWN CORD TIRES

·BEST IN THE LONG RUN·

The Sheaffer Pen for writing men

is first and most of all, a perfect writing instrument. It *always writes all ways*, at all angles, all places, all times. It does not blot, blob, splutter, stutter or skip.

It writes with a facile *willingness* distinctive to the Sheaffer. A touch and it's going—smoothly—flexibly—fluently. It catches the idea—and records it—*pronto!*

The Sheaffer *special* features are: the Sheaffer lever-filler which really *fills* the ink reservoir full—jiffy-quick; the Sheaffer leak-tight vacuum cap that keeps the point always moist; the Sheaffer one-piece pure iridium tip—for smoothness—and *the Sheaffer Pen always writes all ways.*

W. A. SHEAFFER PEN COMPANY
142 Sheaffer Building, Fort Madison Iowa

Service Stations:
New York City, 203 Broadway
Chicago, 304 Consumers Building
Kansas City, Gateway Station
San Francisco, Monadnock Building

SHEAFFER'S
SELF FILLING
FOUNTAIN PEN

THIS pen on the desk is No. 5, price, with clip $5.00, a style that men are strong for. Dainty styles for dainty women, too.

Other styles $2.75 and up with clip-cap. Sold by good dealers everywhere.

Sheaffer's Sharp-point Pencil—"as good as the pen." The new lead pencil. Handsomest, handiest, simplest of all. $1.00 and up with clip.

Style Illustrated is A. R. Price, silver filled, $3.00.

Plain Sterling silver, Style S-D. Price $3.50.

Plain gold filled, Style G-A. Price $3.00.

PRESS OF JUDD & DETWEILER, INC.
WASHINGTON, D. C.

COLGATE'S

"HANDY GRIP"

PATENTED 1917

SHAVING STICK

Mr. Jones writes a letter

—and his communication is interesting to every man who shaves himself—and wishes comfort in so doing.

"My children chanced to give me a stick of your shaving soap," says Mr. Jones. If you do not have one given you—give yourself a "Handy Grip."

"In the directions was an admonition not to rub. I thought this extremely silly," says Mr. Jones. But he found true the original Colgate phrase used since 1806—"needs no rubbing in with the fingers."

"I am, from now on, a firm champion of Colgate's Shaving Stick. It beats anything I have ever used," says Mr. Jones. You will think so after you have tried Colgate's "Handy Grip."

New York, April 6, 1918.

Colgate & Co., New York City.

Gentlemen:

Some months ago my children chanced to give me a stick of your shaving soap, and I am writing to you to tell you what a delight shaving now is with it, instead of the nightmare I formerly experienced whenever I shaved. The lather is wonderful, smooth as velvet, leaves the skin without any irritation, and in short, your shaving stick is ideal for the purpose.

In the directions that came with the shaving stick was an admonition not to rub the beard with the hand after applying the lather. I thought this extremely silly, but on trying it I found that your experts had solved another important element in successful shaving and I shall never again do anything but follow the advice given. The brush, applying the lather with the proper degree of moisture in it, is sufficient. The new method is vastly superior to the old.

I am, from now on, a firm champion of Colgate's Shaving Stick. It beats anything I have ever used, and I've been shaving myself for 35 years.

None of your agents have solicited this testimonial from me but I send it merely as a deserved recognition of the makers of the best shaving soap in the world.

Very truly yours,

(Signed) Edwin J. Jones*

*Mr. Jones is Associate Editor of The Financial World.

The "HANDY GRIP" is the thrifty Shaving Stick. It saves you to shaves below the "Waste Line," and more: you can buy a Refill Stick for the original metal Grip.

A DOUBLE ECONOMY WITH COLGATE'S

Unscrew ¼ inch of soap from the Grip (enough for 50 shaves)—

and press it, wet, to a new Stick. It adheres, to be all used.

And the Refill Stick costs less than the complete Grip, and serves in