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THE NATIONAL GEOGRAPHIC MAGAZINE

THE CAPE HORN GRAIN-SHIP RACE

The Gallant "Parma" Leads the Vanishing Fleet of Square-Riggers Through Raging Gales and Irksome Calms 16,000 Miles, from Australia to England

BY A. J. VILLIERS

AUTHOR OF "ROUNDING THE HORN IN A WINDJAMMER," IN THE NATIONAL GEOGRAPHIC MAGAZINE

PARTLY because the low rates of freight offering were insufficient to attract steamers and partly because the trade will always suit the big Cape Horn sailing ship as long as there remain such vessels, no fewer than 20 square-rigged ships were chartered in 1932 to carry South Australian wheat from the outports of Spencer's Gulf, Australia,* to the English Channel. This trade goes to the sailing ships principally because the grain is loaded in small, out-of-the-way ports, often so lacking in facilities that no steamer can afford to lie in them long enough to stow a full cargo under her hatches.

If steamers were employed—with their insistence on a minimum daily delivery to the ship's side of 500 tons—the small ports could load only barges and similar vessels, to be sent to larger ports for transshipment of their cargoes. The sailing ship, with little or no overhead, no coal bunkers to deplete, no highly paid crew to keep, and also, since she generally lies at open anchorage, no dock dues to pay, can take as much time as necessary to load. Being able at her best to accomplish only one round voyage in the Australian trade annually, she may be two weeks loading or two months. The main consideration is to obtain a cargo.

WINDJAMMERS RACE AROUND THE HORN

The trade from South Australian outports has been handled by sailing vessels almost since the World War, and annually for more than 10 years there has been rather a keenly contested race among the various vessels. The race cannot, of course, be compared with those sailed by the fast old clippers of the China trade, and no one pretends that it can. The ships, all of them, big and old, are manned by youths before the mast and young men abaft it. Some of them, if truth be told, are not so safe as they might be for the Cape Horn pilgrimage, and others never were built to race and could not sail quickly if a torpedo were behind them. But they do their best and always have done so.

The spirit of their crews is the same as that of the clipper crews, and even in these days, when sail-propelled vessels in commerce are becoming rarer, almost without exception the masters, officers, and crews are men whose whole sea careers have been spent in sail. They know their job; they know their ships; they know their

* Place names may be located and the route of the voyage may be traced on The Map of the World which members received with the December, 1932, issue of the NATIONAL GEOGRAPHIC MAGAZINE.

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WAITING FOR A BREEZE

The *Parma* was in the doldrums, floundering in a swell that did not portend any wind. Under all sail, she lay waiting for a breeze while the author pulled around in the small boat, a dinghy from the forward skids, to photograph her beauty. Her bow was lifting and she looks high in the water.

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THE "PARMA'S" CREW WAS VERY YOUNG

These boys are all Germans, 15 to 17 years old. Fathers of nearly all of them had been killed in the World War. They all came from good families and included a baron (fourth from the left). Two of them were serving time in sail in order to assist them in later studies in advanced aeronautics. The pets are Kirri, the cat, and Romeo, the rabbit. Romeo died for the sake of his fur coat, which went to the lining of the chief mate's waistcoat, to keep out the Cape Horn cold. Boys of this age are not often found in American vessels, in which the age of seagoing is usually 18 or 19.

limitations, their trade, their chances, and take them.

They know it does not pay them to race in from the sea with their cargoes of grain; for the faster they come to Europe the longer must they lie idle there before it is time to go out for the next year's cargo. They know that being at sea costs nothing, and that being in port is expensive; yet the racing spirit cannot be defeated. So long as there remain two vessels in this trade, I am sure they will make a race of it.

THE FINNS DOMINATE IN SAIL

In former years many nationalities participated: French, British, Norwegians, Danes, Americans, Swedes, Finns, Belgians. But steadily the fleet dwindled until this year only three nationalities were represented: the Germans with one, the Swedes with two, and the Finns with 17 ships. Thus it was demonstrated clearly how the last of the ocean-going square-rigged ships have gravitated almost entirely into the hands of the Finns.

The "field" of 20 included the four-masted barks *Herzogin Cecilie*, *Olivebank*, *Lawhill*, *Ponape*, *Pommern*, *Pamir*, *Parma*, *Viking*, *Archibald Russell*, *Melbourne*, *Hongomont* (all Finnish and all save one the property of Capt. Gustaf Erikson, of Maarianhamina, in the Ahvenanmaa Islands), *Magdalene Vinnen* (German), *C. B. Pedersen* and *Abraham Rydberg* (Swedish); the barks *Winterhude*, *Killoran*, *Penang*, and *Favell* (with the exception of the *Favell*, all of these are also the property of Gustaf Erikson); the four-masted barkentine *Mozart* and the full-rigged ship *Grace Harwar*.

Of these the *Pamir*, *Parma*, and *Abraham Rydberg* had not previously sailed in the grain trade, the first two having been acquired recently from the famous German Laeisz Line of nitrate four-masted barks from the Chilean trade, and the *Abraham Rydberg* having been bought from the Alaska Packers Association (which had called her *Star of Greenland*) to replace the full-rigged ship *Seven Seas*.

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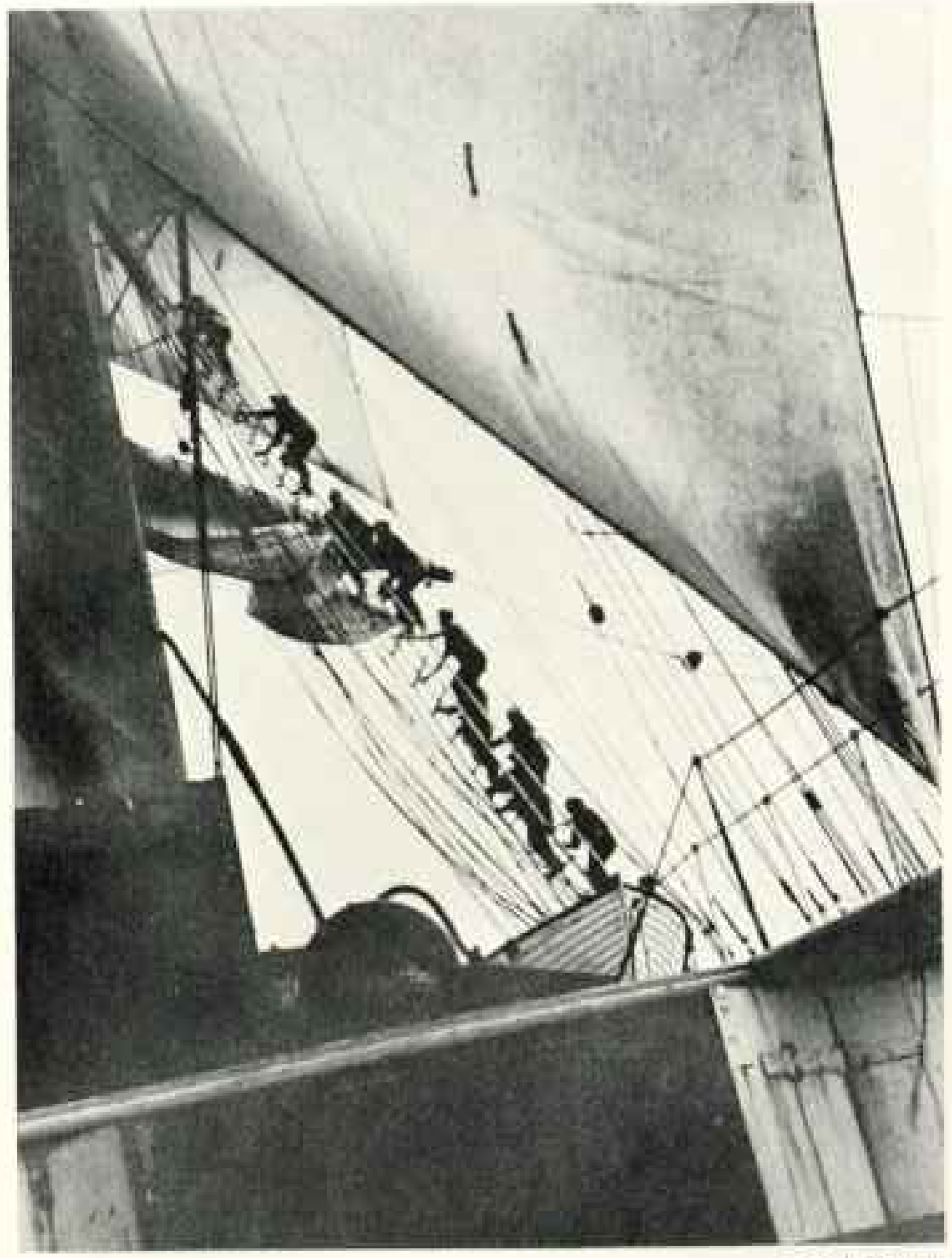
HOLD EVERYTHING WHILE SHE GOES!

The sailors, caught by breaking sea on the main deck, cling to life lines and ropes for their lives, but will be back at the job again as soon as the sea clears. It is much more dangerous in heavy weather to work on a sailer's decks than aloft.



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LIKE FLIES IN THE HEAVY RIGGING

Sailors are going aloft to make fast the foresail, seen above them hauled up smg in its gear. It was an old foresail, bent to replace a good one lost, and when some of the rotten seams gave trouble upon occasion the sail had to be made fast for repairs.

LOOKING AFT FROM THE JIB BOOM, AS THE "PARMA" MAKES 13 KNOTS

German law requires life nets to be kept beneath the bowsprits of all sailing ships (see illustrations, pages 14, 22, and 37). The stocks of the two bower anchors are seen by the catheads, with the light towers behind, while above is the bellying mass of the huge foresail. The smaller sails in the foreground are jibs. The ship ran 258 miles the day this photograph was taken.

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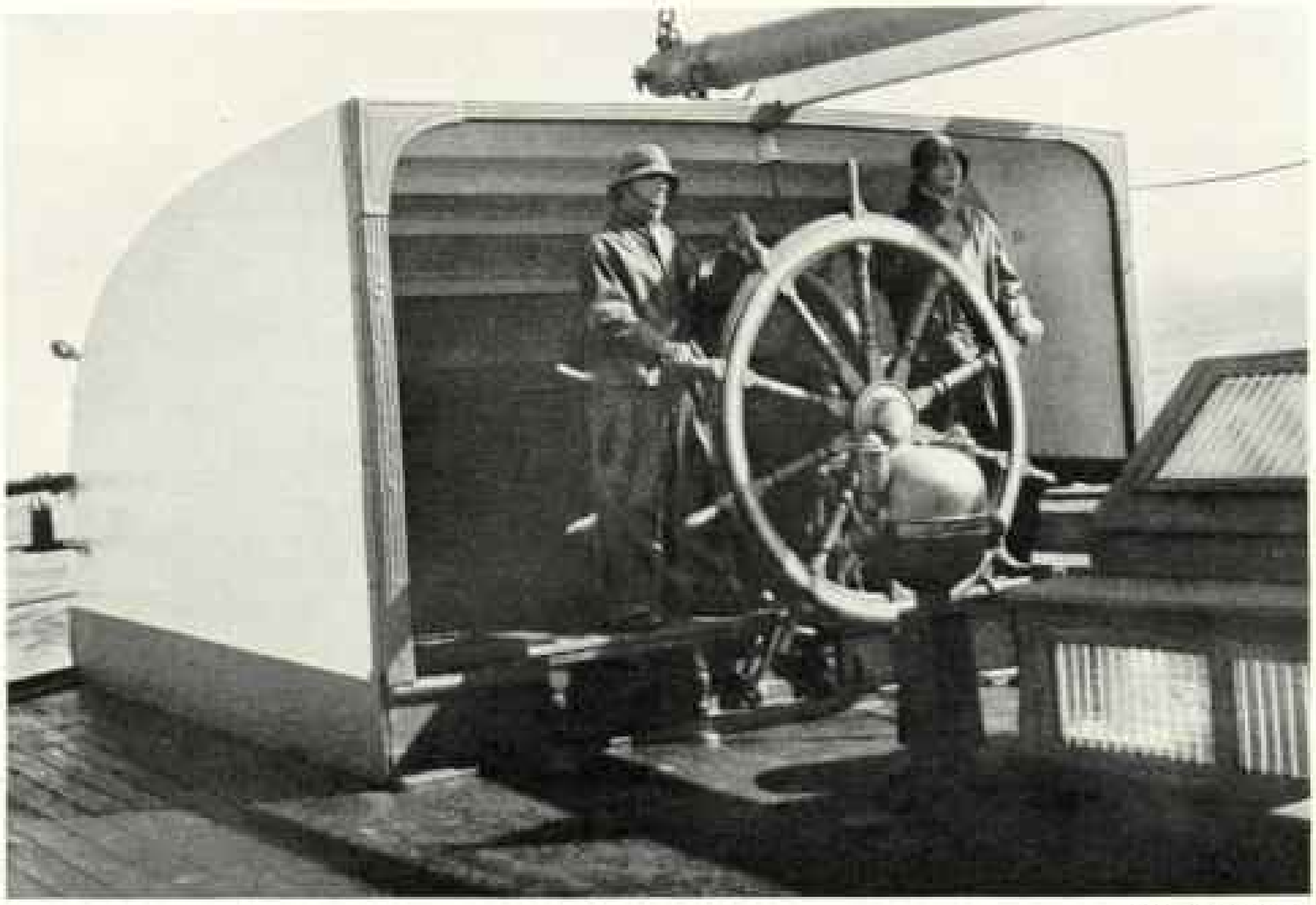
WALLOWING IN THE OILY SLICK OF A FLAT CALM

A prominent feature is the white-painted, whalebacked wheelhouse of steel, a necessary innovation that came late in sailing ships. When older types of ships ran heavily in bad weather, seas often came over the poop and washed helm, helmsmen, binnacle, and everything overboard. This disaster was impossible in such a ship as the *Parma*, because the steel wheelhouse will stand against anything (see opposite page). The oily slick on the water portended the beginning of another long calm, this time not in the doldrums, but farther north, by the edge of the Sargasso Sea. The ship was delayed eleven days (see text, page 34).



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TWO AT THE WHEEL

On the left is a Finn and on the right a Massachusetts yachtsman who sailed as A.B. (able-bodied seaman). They are well protected by the steel wheelhouse against any seas which may break over the stern, "pooping" the vessel—a protection which saved the helmsmen's lives on the night of April 5 (see text, page 16, and illustration, opposite page). The small ship's bell, discernible between the heads of the two sailors, is used for striking the time.

The *Herzogin Cecilie*, famous for many years as cadet ship for the Norddeutscher Lloyd Company, was the favorite in the race, which she had won four times in the five preceding years; but among sailors there was a great deal of speculation on the chances of the *Pamir* and *Parma*. These were known to be good ships and, having so lately come from the German flag, were in first-class condition.

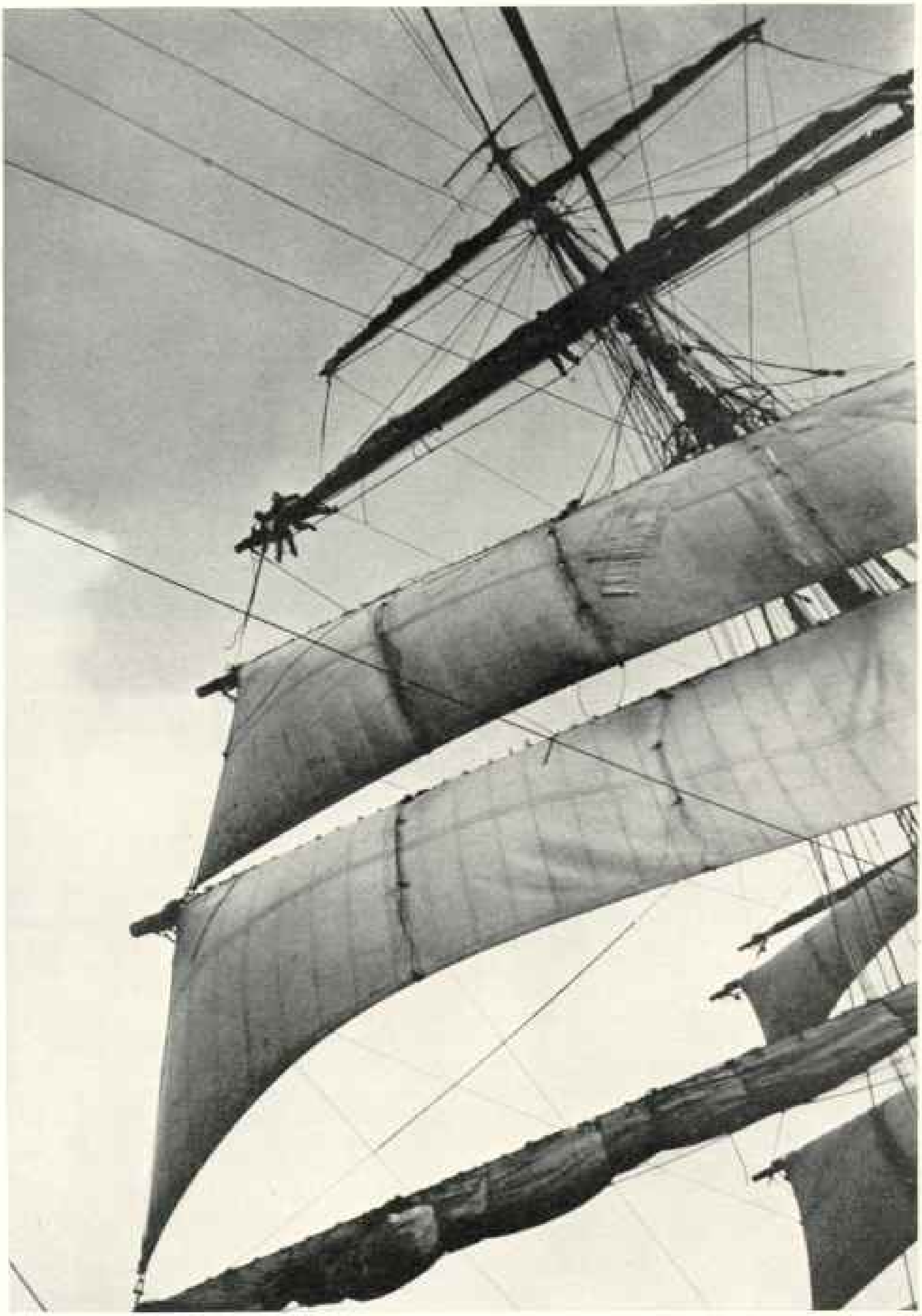
They were commanded by able officers, the *Pamir* by Captain Sjögren, one of the ablest of the Erikson masters, and the *Parma* by the famous Ruben de Cloux, best known of all the Cape Horn master mariners of to-day.

DE CLOUX HAS A HEROIC RECORD

It was Ruben de Cloux (despite the French ring of his name, he is a Swedish Finn) who had sailed the *Herzogin Cecilie* on all her winning voyages. He had built up the Erikson Line from a handful of old ships to a score of splendid sailers; had sailed the venerable and by no means clip-perish four-masted bark *Lawhill* on her remarkable consecutive passages of 78, 74, and 70 days between the Bay of Biscay and Australia; had saved the *Herzogin Cecilie* when her ballast shifted in a howling gale north of Scotland and she fell on her beam ends with her lower topgallant yardarms in the water, which was stark tragedy for a sailing ship.

He led the crew into the hold himself to restow the ballast, and though some were afraid, none hung back where he led. In four days, working almost foodless day and night, they had their ship on her keel again and sailed on.

And now Captain de Cloux, as well as being master, was the principal owner of the *Parma*, which he and I had bought as she lay in idleness in the Hamburg docks toward the end of 1931. Against him were the 15 ships of the Erikson Line, all as determined as they could be that his lone ship should not win; against him were 15 younger masters, eight of whom he had trained.



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THREE SAILORS ON A TOPGALLANT YARD

For all the improvements in sailing ships, sail handling remains a matter of brawn and muscle. The whole watch is required to handle any square sail, at least in the clewing up from the deck, and for the larger sails (courses and topsails) all hands are required. With frequent sail drills on the way to Cape Horn, the youthful crew did not get much sleep. The mainsail, furled, is to be seen on the lowest yard, in the foreground. The author avers it usually was furled better than this.

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ALOFT AND FURL IT!

The crew are going up on the run to make the crossjack fast. They always go aloft on the weather or windward side, which is the safer, as to go alee would mean that they were being blown *from* the rigging instead of onto it. The full sweep of the long main deck discloses the railed "catwalk" and the bulk of the mainsail shows up clearly. In a howling gale by night each heavy-footed step aloft is a battle, while the ship writhes and contorts with wild motion and hail lashes the sailors' faces.

© A. J. Villiers

CHANGING TROPIC SAIL,—A TRADE-WIND JOB

The boys, balanced like flies high aloft, unconcernedly carrying on with the humdrum job, to them, of changing sail. Most of them are wearing light linen tropic caps, bought from the ship's slopchest, the store that sailing-ship masters carry for their crews.

We very well knew when we started out that both the *Pamir* and the *Herzogin Cecilie* were better ships and had better chances. Well, we were not dismayed about that. We would do our best, pleased enough to bring our big ship home without loss of life and without accident, fit and strong to set forth on one voyage more.

The *Pamir* and the *Herzogin Cecilie*, and all the other ships, could do what they liked; we would do what we could with our ship and the winds. Whether we won or lost, we hoped that at least we should have what peace of mind comes from reflecting upon a hard voyage well sailed. And so we put to sea, late on the evening of March 17, 1932, from an anchorage in Spencer's Gulf, outside tiny Port Broughton, north of Wallaroo, and stood down the gulf with a light land breeze humming softly in the rigging.

We were very deep-loaded and had to sound our way along, the waters of the gulf there being narrow and shallow. We went to sea from our anchorage with no tug to help us and no pilot to point the way. We were our own pilots, and the wind in our sails gave us way. We loaded our cargo and sailed quietly, unnoticed and unsung, a tall and powerful Cape Horn sailing ship going gently on her way to the sea under the Australian moon.

THE RACE BEGINS

Many of the other ships had sailed before us, some of them with more than a month's advantage. The *Herzogin Cecilie* had been gone six weeks; the *Abraham Rydberg* had two months' start. The *Viking*, *Ponape*, *Pommern*, *Lawhill*, *Winterhude*, *Killoran*, *Magdalene Vinnen*, *Mozart*, and *Penang* were all well on their way toward Cape Horn before we tripped our anchor. That did not matter; the race is not to the first ship in, but to the ship making the fastest passage.

The ships sailing earlier had an advantage, in that they should have been able to make the English Channel before the midsummer months descended on the North Atlantic, with their maddening calms round the Azores. Sailing in the middle of March, we should have early winter off the Horn, with probably easterly winds,

and June in the North Atlantic, the worst month. January and February are the best months to run eastward for Cape Horn; April, May, and June are the worst.

Earlier on the same day, March 17, the four-masters *C. B. Pedersen* and *Melbourne* had sailed together from the anchorage off Port Victoria, south of Wallaroo and a hundred miles nearer to the sea; five days previously the *Archibald Russell*, which was considered a fast ship, had sailed from Wallaroo, where the *Pamir* was also loading.

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ALL DRESSED UP AND NOTHING TO DO

Three apprentices sit on a topsail yard in the sun, wearing clean shirts, in a happy and unusual state of Sunday afternoon leisure. The *Parma* is in the trade winds of the South Atlantic after two months at sea. The glint of the sun is strong on the water, as the ship goes quietly and steadily along.

THE "PARMA" AND "PAMIR" GET OFF NECK AND NECK

Dawn on March 18 found us off Wallaroo, and as we were wafted gently by on the morning breeze we saw the *Pamir* come out to sea behind us. Together we left Spencer's Gulf in a rain squall, two great rivals bound on a 16,000-mile voyage.

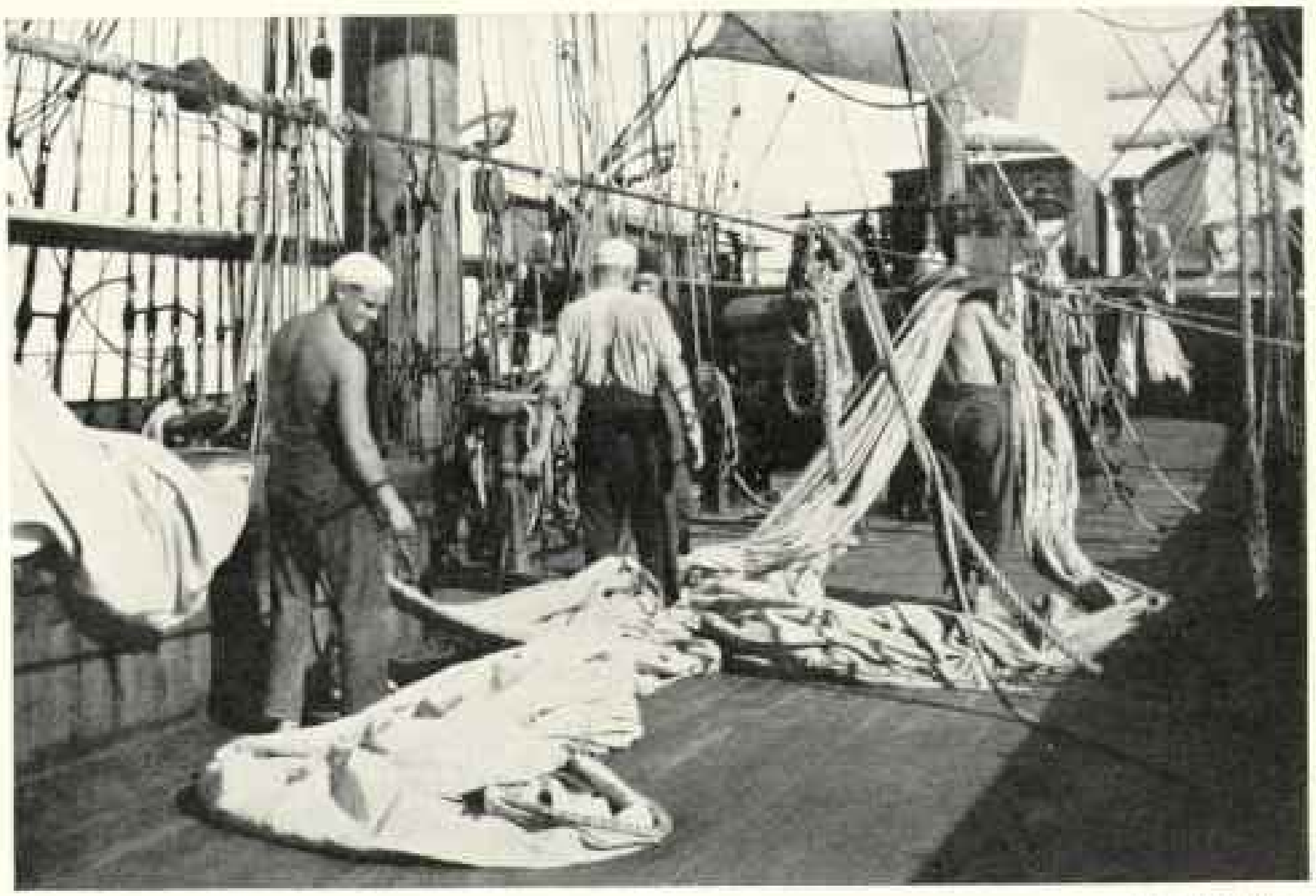
The long, low, powerful hull of the *Pamir* gleamed wet in the rain beneath her high towers of canvas; she heeled over in the breeze and smoked along, making a good 12 knots without any commotion. The last we saw of Australia was a glimpse of the Cape Borda Light, on Kangaroo Island, with the graceful *Pamir* flying along beside it. The squall came down more heavily then, and ship and land were blotted out of sight.

We saw no more land until we came to the islands of Diego Ramirez, 55 miles southwest of Cape Horn; and the *Pamir* we did not see again for more than 80 days.

The first day in the open sea was stormy, and the wind hauled ahead so that we could not hold on our course toward Tasmania. We were headed in a southeasterly direction to pass south of Tasmania, and so carry on eastward for Cape Horn, running down there before the strong westerly gales that blow on "fifty south." But we were not able to hold our course. We had instead to make for Bass Strait, between Tasmania and the Australian mainland, reaching the open waters of the Tasman Sea in that way and then heading southeast to clear the south of New Zealand.

WATCH BELOW AND WATCH ON DECK

Sailmakers of the deck watch are at work repairing a sail, while some apprentices from watch below rest upon part of the same sail, in the sun. In the background other toilers are heaving on a capstan, of which the *Parma* had seven. The sailmaker kneeling at his work has cut some old cloths from the clew of the torn sail and will sew in new ones.



CLEARING THE DECKS AFTER THE DAY'S WORK

The boys are putting away unbent sails after a day of sail shifting in the trade winds (see pages 10, 32). There is no use keeping the ship's best sails aloft in fair weather, when any rags which are still whole are good enough to keep the wind.

THE MORNING AFTER THE GREAT STORM

The blowing out of the foresail, the rags of which flap from the foreyard, helped materially in saving the ship on April 5, when the *Parma* was beset in a hurricane and broached to. If this sail had not blown out, the ship would probably have gone right over. The foresail was sewn of the very best hemp canvas (see text, page 20).

We safely reached the entrance of Bass Strait and were then becalmed. Later, trying to get out by way of Banks Strait, a narrow passage between the northeastern coast of Tasmania and the Furneaux group of islands (Flinders, Cape Barren Island, and others), lying at the eastern end of Bass Strait, we were astonished to see another sailing ship ahead. At first we thought it was a coastal topsail schooner bound from Melbourne to Hobart; but as we drew up we made the stranger out to be a big Cape Horn four-masted bark like ourselves.

"PARMA" AND "C. B. PEDERSEN" AT GRIPS

At this there was great excitement among our crew, especially as we knew most of the other ships avoided going near the land as much as possible and would seldom be found using such a congested and narrow strait. We had indeed been thinking to ourselves that this was our own private "short cut" out into the Tasman Sea, and it was a surprise to see another vessel.

The wind was dead ahead, coming right out of the strait instead of blowing into it, and all day we beat there with the other ship for company. Soon, as we came closer, we made her out to be the Swedish school ship *C. B. Pedersen*, whose master was a good friend of ours. She had shortened down in the head wind and was beating about, waiting for a "slant," or a favorable shift of wind, to get through the strait. We kept every stitch on our vessel, determined that we would lead her through, whether we had a slant or not.

In this way we gradually closed on her, to the excitement and intense gratification of our crew, and when, in the evening, a fair wind came we were already ahead of our Swedish rival.

The rising moon, blood red, found the two four-masted barks within two miles of each other, making a fair wind of it through Banks Strait, with the *Pedersen* now crowding on all sail to pick up her lost distance.

All night we sailed so, and all the next day out in the gray, open waters of the Tasman Sea, with our rival going along bravely, away on our weather quarter, a cloud of spume and wet canvas.

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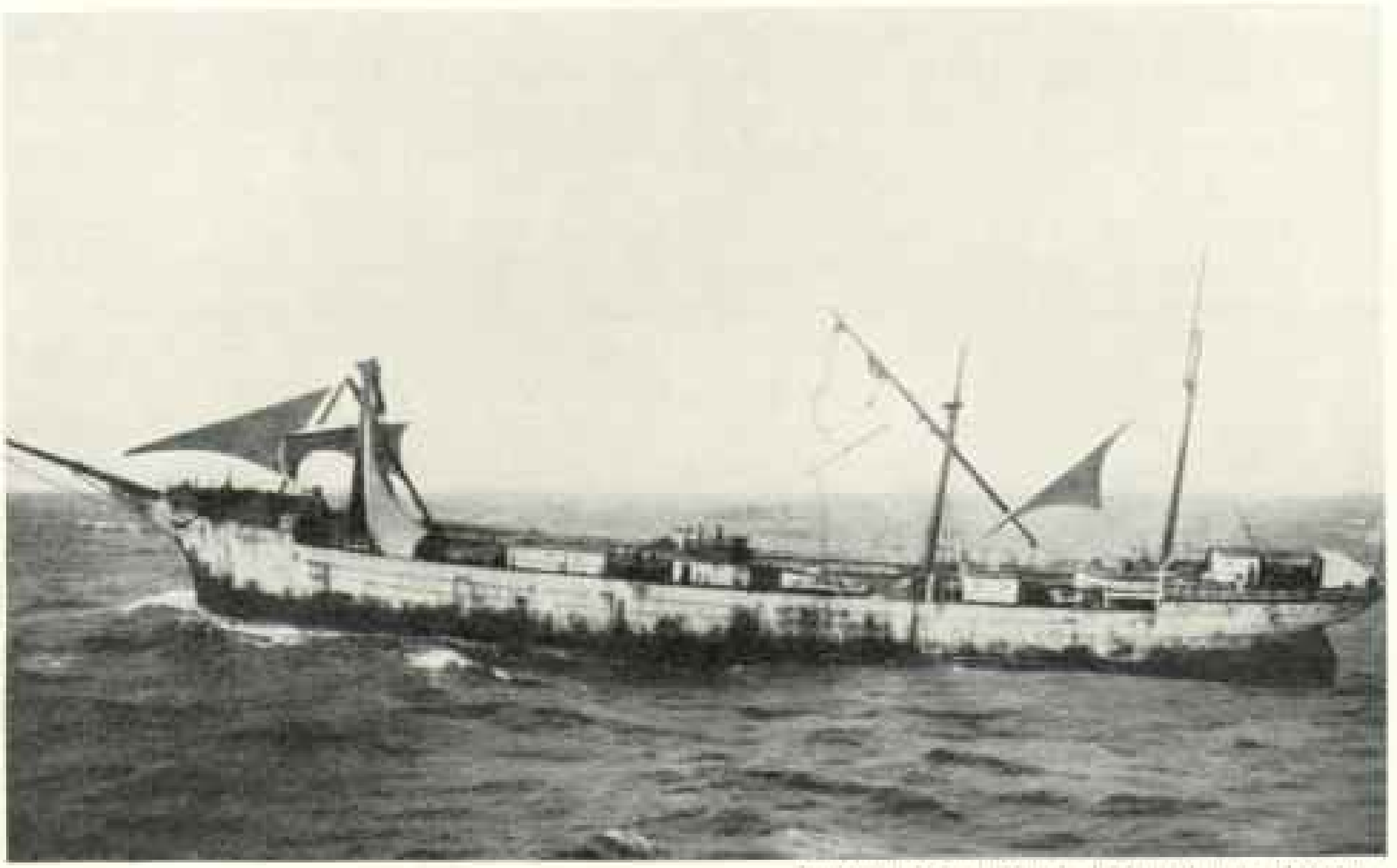
HEAVE AND SHE MUST, MY BULLIES!

The boy crew of the *Parma* hauls the heavy bulk of a new foresail aloft before laying into the rigging to bend it to the yard. The sail is as heavy as a circus tent and about the same size, though made of better canvas. The bowsprit, with its protective netting, looks like a hanging fish net from this angle (see page 37).



Photograph from Nautical Photo Agency, London

DON'T GIVE UP THE SHIP!

The grain-racing four-masted bark *Hougomont*, dismasted near the Australian coast, sailed into port in this condition. The photograph, taken from a passing steamer which offered assistance (offer not accepted), shows the vessel with only three stumps of lower masts still standing. No lives were lost, though some of the crew were aloft when the masts began to go. They hastily reached the deck by sliding down backstays. Although she reached port safely, the *Hougomont* will never go to sea again (see text, page 30).

How splendid she looked! She hung there gamely for two days, gradually dropping astern; and then, on the morning of the third day, she was gone. We had shaken her off and did not see her again throughout the voyage.

THE "FORTIES" REFUSE TO ROAR

Now the strong wind left us and we wallowed on in dull calm for a while. Instead of the westerly gales which we sought, we had fog and light wind, with little progress. The Cape Horn sailing ship is built for gales and is not afraid of storm; light winds and calm are very much more annoying. Over the whole of its length the Tasman Sea was about as windy as Long Island Sound on a day in June. The "Roaring Forties" refused flatly to roar for us, and the red-bearded mate remarked disconsolately that world economic conditions had frightened even the wind until it was so depressed it wouldn't blow.

"Nothing is the same since the war," he said, "not even the west winds."

Our best day's run on this section was 166 miles; our worst, 71. So we came to the end of March and April began.

No longer did we sigh for wind! The westerly gales found us at last, and, having found us, roared and screamed in the rigging ceaselessly and drove us on. We had gone down to 53 south then, where the westerly storms encircle the world.

THE WARNING OF THE GLASS UNHEEDED

Day after day the story was the same—the ship running heavily before the gale, and rolling, with rain and the strong wind crying in the rigging. We held to as much canvas as we could, determined to drive the ship, now that we had the chance. The barometer dropped and kept on dropping; the gales increased and kept on increasing; the sea rose high; and the ship, wallowing onward, began to stumble a bit in her stride, rolling both rails under as she ran on. The sky was gray and threatening; the weather daily grew colder; and the boy crew, shivering at the great wheel, was glad of the protection of the wheelhouse.

We did 210 miles on April 2, 206 on April 3, 239 on April 4, and then, on April 5, we very nearly lost the ship. The day, our 19th at sea, began with a threat, with hard squalls of sleet and snow, and the glass down almost as low as the graduated scale would show. Still she ran on steadily with two men standing at the wheel and the South Pacific Ocean making a playground of her decks. The glass had been low for a long time and nothing very serious had come of it. We were holding to good driving sail, wishing to make the most of the strong wind, running eastward on the short degrees of longitude, storming onward along the road to Cape Horn.

The more we drove our ship down there, the more quickly would we sail to kinder latitudes; besides, we were well aware that both the *Pamir* and the *Herzogin Cecilie* here had the advantage of us, not having such open main decks as we, and therefore not shipping so much water. The former had a built-up midship section, in the German nitrate trader style; the latter had a long poop extending forward of her mainmast and only the foremast stood in the open well deck.

We had a main deck, open to the sea, nearly 100 yards long; stout life lines of heavy wire were stretched fore and aft to give the boys some hold, as they struggled at their work; and above the steel bulwarks from rigging to rigging we had stretched heavy nets to keep the boys aboard as they were washed around. Sometimes the big ship scooped up the sea with her whole side immersed, nets and everything. Beneath the wet jib boom, pointing out ahead, a stout net was lashed to save the boys (see illustrations, pages 5, 14, and 37).

THE STORM GATHERS FURY

The *Pamir* and *Herzogin Cecilie* were smaller-hulled than we, but had a greater sail area. Therefore they would still be at an advantage in the light weather. We had to drive on through the storms to have a chance at all.

Our big *Parma* shipped seas heavily, of course; but all big steel sailers will do that, running their easting down. She was doing herself no damage. We let her go. We lashed the wash ports open, and daylong the sea gushed aboard and out again through every wash port and scupper hole, and green waves came over the rails.

Sea and wind increased steadily as the day waxed, with a low, bad sky. As the day waned, our enemies still mounted in their fury. We took the mainsail from the *Parma* then, thinking she had carried this big sail long enough, and after that we shortened her down to the foresail and the six topsails. The canvas came in without undue trouble, with all hands on deck, though the hail cut our ears and the wet sails fought a little. Eased of this canvas, she still ran a steady 11 knots, not now taking such heavy seas constantly aboard.

Still the weather showed no signs of improvement. We had expected that the wind would ease a little with the passing day. It did not, and we took in the fore and mizzen upper topsails, with all hands to each of them. Now the ship staggered on under real Cape Horn canvas. We passed a stout manila line round the two boys at the wheel. She began to run hard and to steer a little worse.

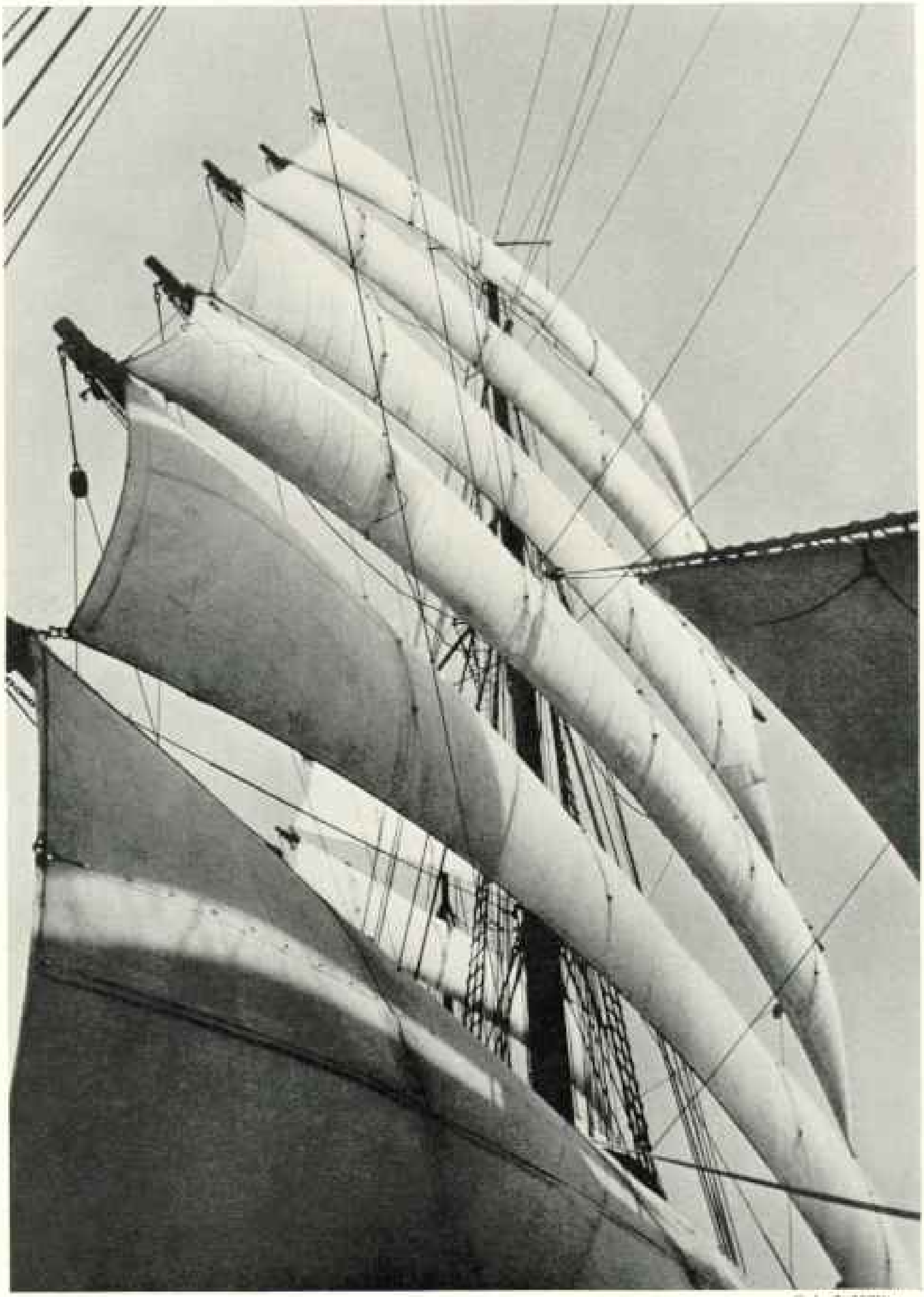
NO LET-UP IN THE GALE

With the coming of night, Captain de Cloux, who had been on deck throughout the day, anxiously awaited some abatement in the weather. Outward bound, the ship had been in ballast; no one knew how she behaved deep-loaded in a hard gale. No one had previously sailed in the ship. With the exception of the officers and two sailors from the Laeisz Line, no one had previously been round Cape Horn.

The gale continued to increase, freshening alarmingly in squalls of bitter hail, which grew in number and duration until the night became one screaming squall. The sea mounted higher and yet higher, the great graybeards racing by foam-streaked and ugly, while the ship, lurching wildly, rolled rails under as she staggered on. Green seas came over the length of her, pinning her down.

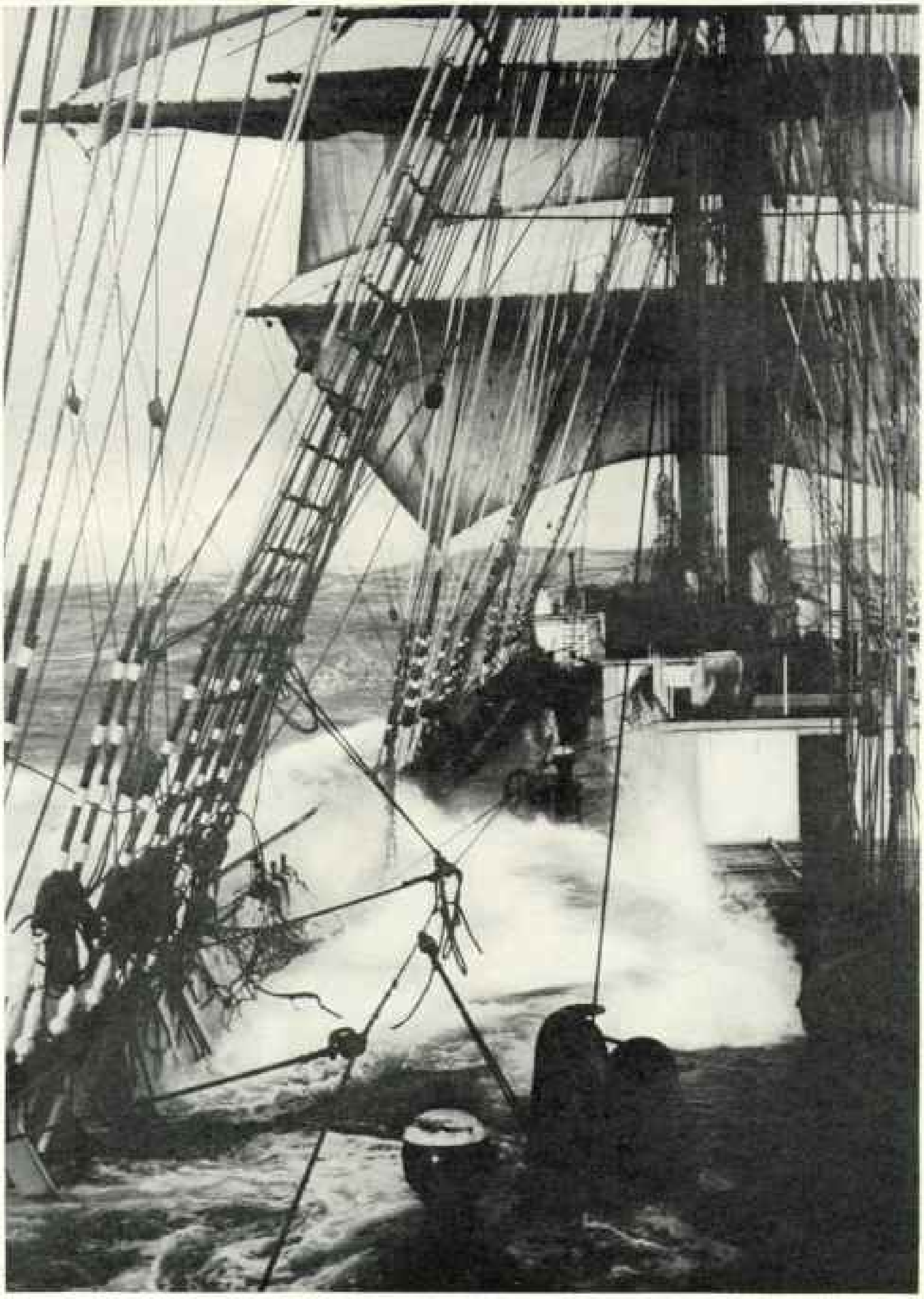
It was no longer safe to venture out on the main deck, though we had to work there constantly. The weather life net from main to mizzen rigging was washed away. There the ship was openly exposed to the whole ocean; and the enormous seas, rearing their great glinting heads as they tore past, were terrifying to behold. They looked so brutal, so evil, so intent upon our destruction. Still there came no let-up.

We should have taken the foresail in while we had time; the foresail and the



SQUARE SAILS AND EERIE SHADOWS

Looking aloft on the mainmast from the deck to the truck, the sails seen, starting at the bottom and going up, are mainsail, main lower topsail, main upper topsail, main lower topgallantsail, main upper topgallantsail, main royal, with the wireless antennæ just visible above, a German innovation the ship did not use. The fore-and-after, the triangular sail partly visible in the foreground, is the main topmast staysail.



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SQUARED YARDS AND THE SEA BREAKING ABOARD

Looking forward along the main deck, the heavy sea may be gauged by the crest of the lofty wave just ahead of the ship. No horizon is visible; the skyline is the jagged crest of the heavy sea. During the whole of the run to Cape Horn the seas broke heavily aboard and the decks sometimes were pressed down by as much as 500 tons of water (see text, page 16). Careful watch is kept on the hatches in such weather, for a stove-in hatch easily may mean the end.

"AFTER THE LONG PULL WE CAME UP WITH 'PAMIR' IN THE EVENING"

The *Pamir* is shown hove to, with her courses (lowest sails) hauled up in their gear and the mainyards backed. This is an easy method of taking the way off (or slowing up) a sailing ship in good weather, since the wind blowing on the fore side of the sails on the mainmast (second from the bow) almost offsets that blowing on the after sides of the other sails, and the ship is virtually stopped (see text, page 34).

main upper topsail, too. The ship had too much canvas; she was hard-mouthed; she was not steering well. She was wallowing a little sluggishly; she could not clear her decks of one sea before another fumed and roared and screamed aboard, filling her long main deck flush almost from pinrail to pinrail with murderous green water.

THE SHIP STAGGERS UNDER MIGHTY BUFFETING

Under the sea, hatches, capstans, brace winches—all were lost in a smother of water and spume. The thud-thud-thud of the roaring seas, as they broke aboard and shook the whole of the 3,000-ton wind ship's mighty frame, spoke unmistakably of the strain. She trembled sometimes and shook in all her mighty ribs. With an ear to the deck aft, one could hear her vibrating and shuddering with the shocks.

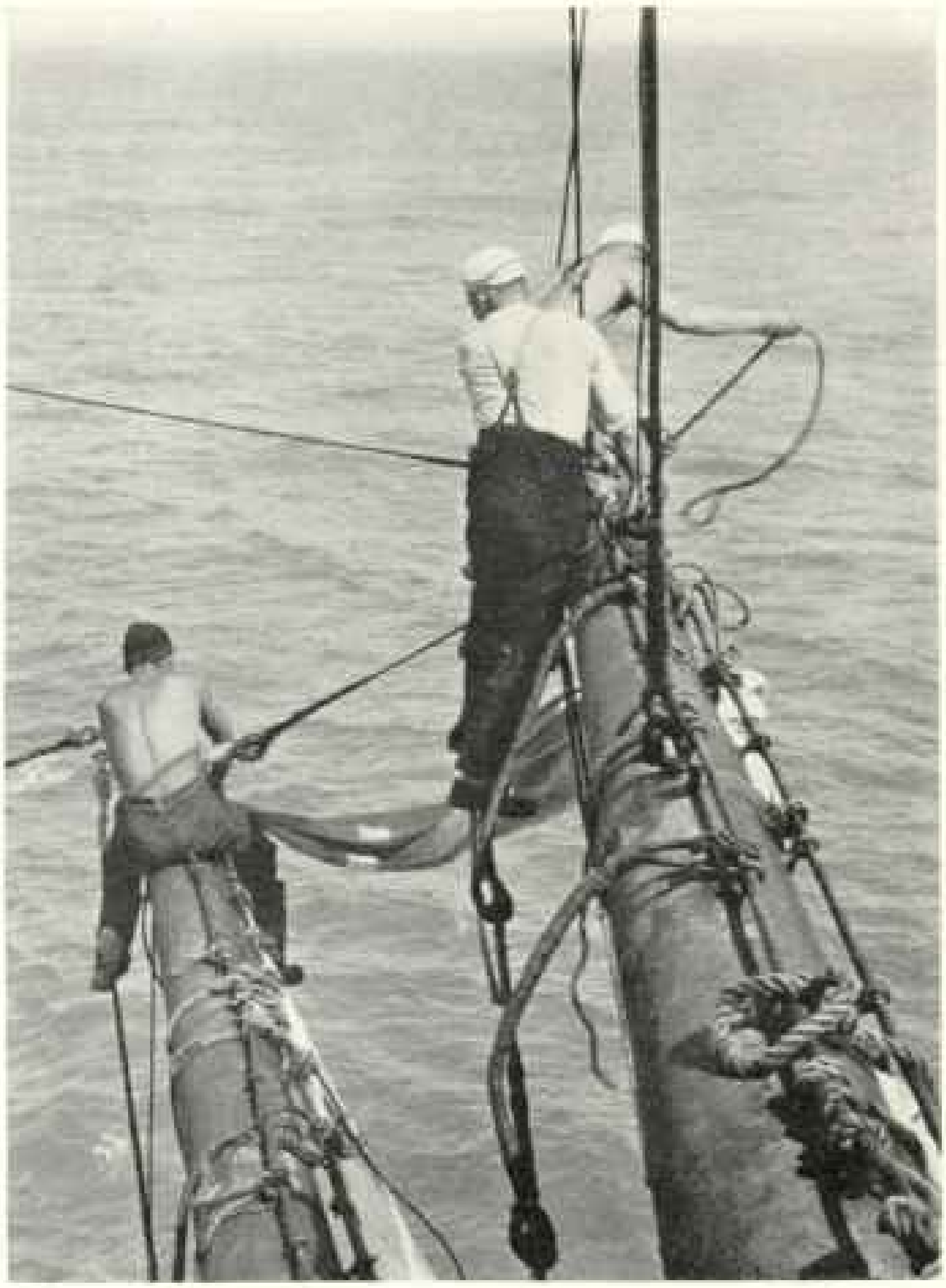
So onward we raced, the captain tight-lipped and anxious, all hands standing by aft, waiting for a let-up, hoping for the morning.

About 7 o'clock in the evening, two hours after sunset, a mighty squall struck us with a ferocity that, for the moment, seemed to frighten even the sea. There were four at the wheel then, but they could not get the helm up. The ship could not be got off in time, and green seas smashed dangerously over the length of her.

Before she had a chance to clear herself of the first inrush, other great seas came roaring at her, converging upon her, thundering over her. Astern, the mighty graybeards raced at us in murderous procession, while the ship, borne on by her overpress of sail, lay there trembling and panting, trying to clear the water from her decks.

In that we could not help her. She could not do it. The sea gave her no chance. With much of her buoyancy gone from the weight of green water lying on her decks, she could not lift to clear the seas.

First she put her forecastle head right under, until some boys who were sheltering in there said that they seemed to be



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A COAT OF TAN IS ALL IN A DAY'S WORK

Two of the sailors work on the upper topgallant yard, while a third sits at his ease over the lower topgallant yard shackling in the sheet of the upper topgallantsail. The strength of the steel-wire footropes is evident, as well as the steel bars known as jackstays, to which the head of the sail is bent, which the boys use as a grip when going out along a yard.

"inside the bottom of Niagara Falls, looking out." Then she slewed her poop high into the air; and a giant sea, catching her so, flung her round into the trough before anything could be done to save her! Now down she sank, poop under!

WAITING FOR THE FINAL PLUNGE

The seas broke over her from astern and ran forward, taking everything movable in their paths. She rose again—we feared for a moment that she would not—and fell off into the ghastly trough, over on her side. Over, over she lay, until she was all but on her beam ends. Surely she must go right over!

We knew that we were trapped like rats. If she went, it was the end—the end of the *Parma* and us all. We should be another on that long list of names of missing sister ships that had sailed this way and been lost under these and similar circumstances. It needed only one thing to go, one hatch to start, one stay to break. We were 31 souls all told.

We lay there in the trough and waited. We did not know that in the first wild roll half our boys might have been swept overboard. Many had been drowned in other ships. Always the great grain race was sailed in tragedy—lost ships and lost boys, ice hazard and gale hazard, and broaching to in Cape Horn hurricanes.

Nothing started. Nothing gave. She went over until the lee sides of the hatches were beneath the sea, until the level of the sea was high above the lee bulwarks, still with her yards squared as they had been racing before the storm.

Now we heard the mighty cannonadings of blown-out canvas, roaring and thundering aloft. Along the foredeck we could see that the foresail had gone, blowing itself into ribbons and writhing its wire gear and its chains through the storm-maddened air, showering sparks where they thrashed the steel rigging (see illustration, page 13).

Still nothing serious carried away; her masts stood and her hatches held. She began slowly to raise her immersed side again. Promptly now she immersed the

other side, and in the trough she lay, rolling.

It was now madness to go on the main deck. The pooping seas, sweeping everything in their path, had tossed the steering compass overboard, though the steel wheelhouse had saved the helmsmen's lives. The sea had rushed into the saloon, flooding everything.

My wife was down there alone, with the heavy chairs and the saloon table torn from their fastenings, wildly careering around. She clung for her life to the handrail. Next morning she counted 72 bruises on her body.

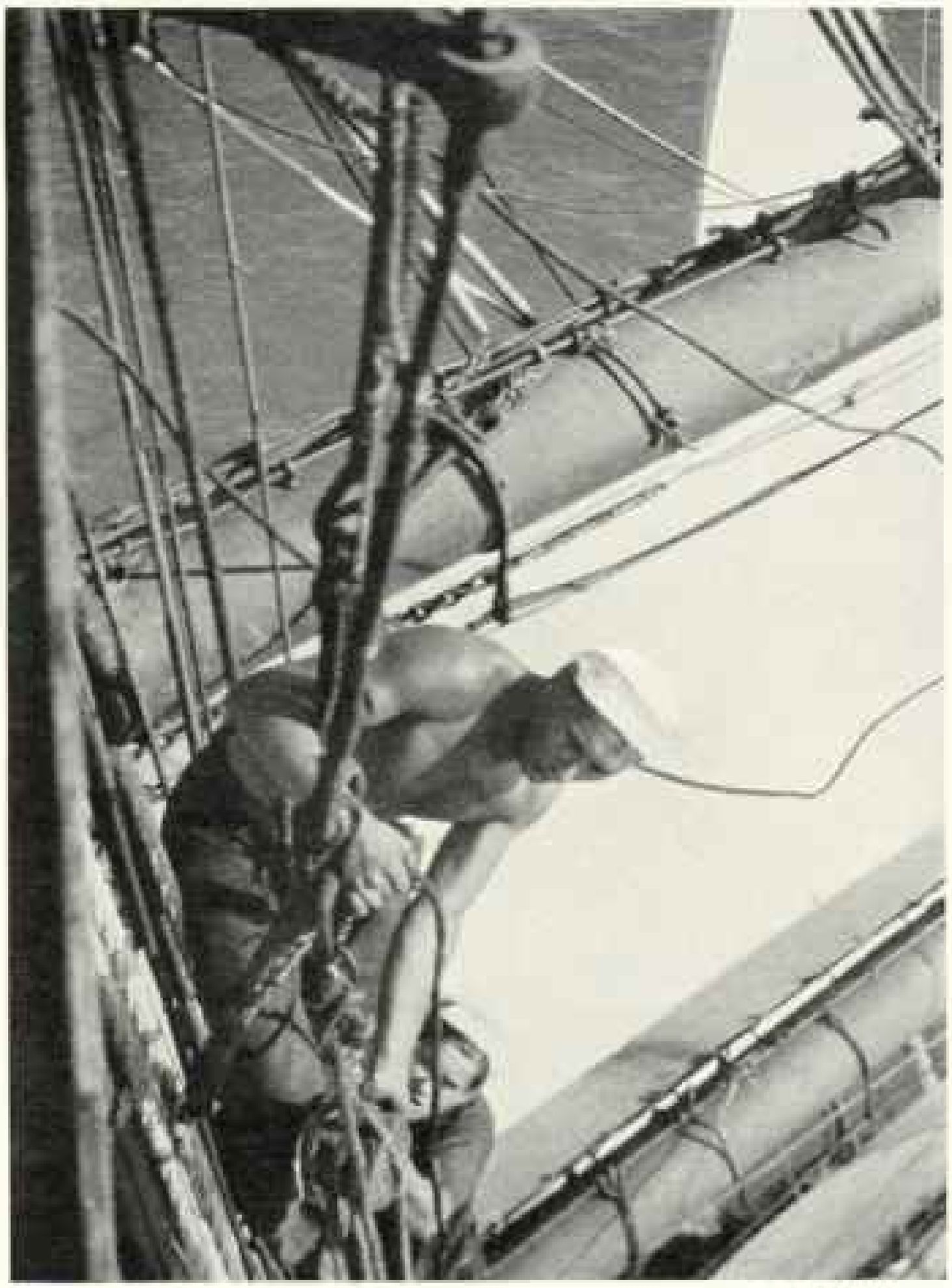
The whole ship was in the hands of God Almighty. What could we do? We waited for her to go.

She did not go. . . .

Captain de Cloux, who had been flung across the decks and badly injured, now fought his way aft to the wheel and took the weather helm himself, desperately determined to bring her out of the trough if he could and if she would come. If she lay there, rolling in the belly of the sea, with squared yards, she would *have* to go. He had to run her off before the wind again, to get her braced up and hove to, in order to weather the night.

How the wind screamed! Above all, above even its mighty roar, resounded the mighty thundering of the blown-out canvas, with the roaring of the seas sweeping aboard and the gigantic hissing of their boiling crests as they rolled by.

The captain, grim and determined, at the weather helm, bided his time. Out of the trough—if she would come—we could not run on without a compass.



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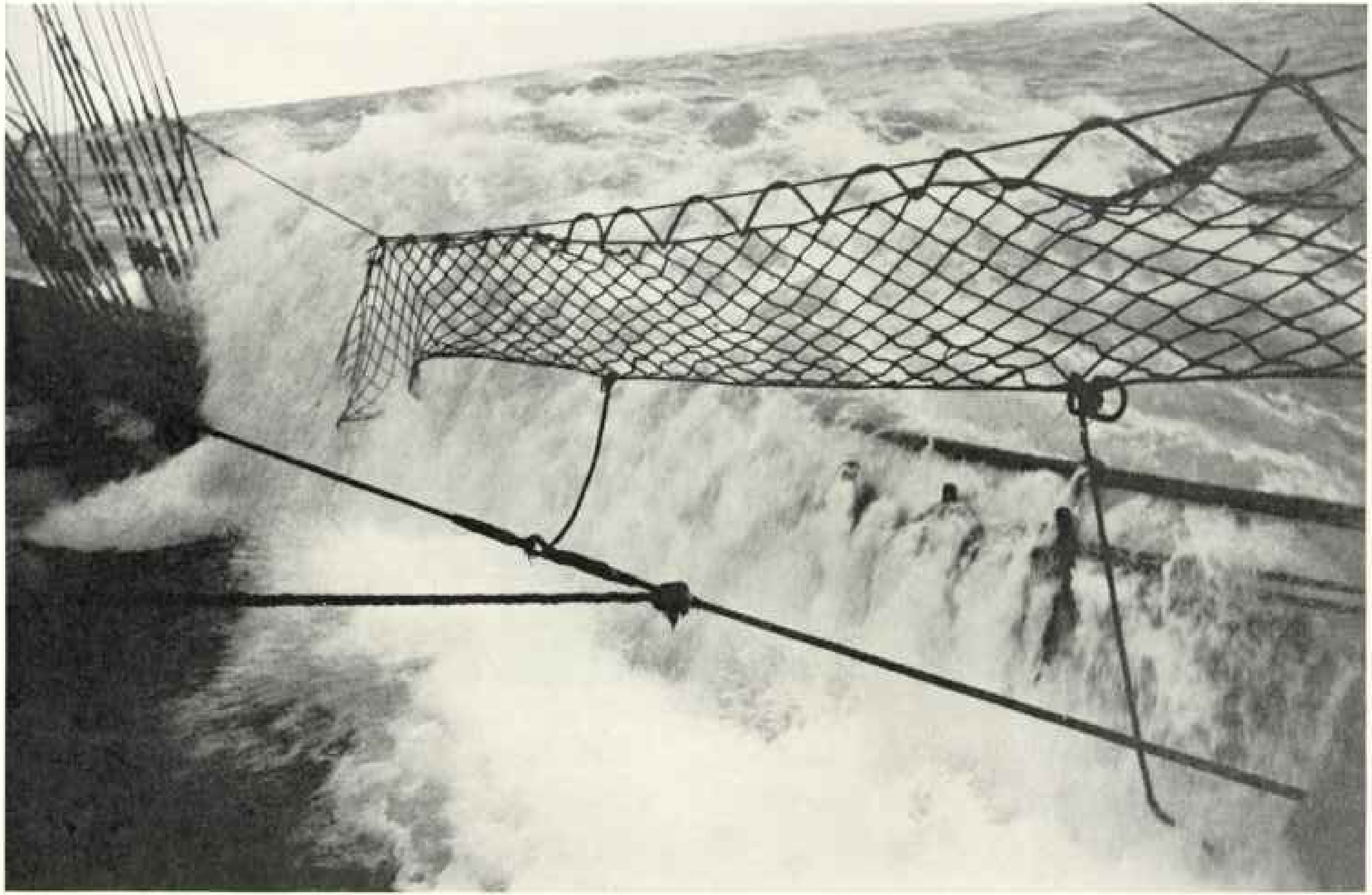
HOW MUSCLES ARE MADE

This German A. B. from the famous Laeisz Line works barebacked in the tropic sun, bending new ratlines (tarred ropes used as steps when going aloft; see illustration, page 9) in the topmast rigging. Eighteen years old, he had been five times around Cape Horn in nitrate ships and grain racers; the development of his body bears ample testimony to the healthfulness of sea life

We had no light. All the lights in the ship had been put out by sea and storm, and in that raving wind it was impossible to light anything. We had no electricity.

If we came out of the trough and ran on, we should broach to again. We had to get her out, take in the main upper topsail, and heave to. Captain de Cloux had never hove to in such a ship before.

Round the poop, the boys of the crew clung to what they could for their lives. At the wheel the captain, scarce able to stand, clung with bloody hands waiting for a chance to get her off.



SAFETY NETS FOR SAILING-SHIP ACROBATS

The nets were not of much practical use, though doubtless they were of some psychological aid. Several boys nearly went overboard and some were outboard at different times, but were saved by clinging to lines and not by being "strained" in the net. A steel life line is taut in the foreground.

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YOUTH AT THE HELM

This German apprentice said he was 15, but was suspected of being only 12. The wheel is more than one sailor can handle in bad weather; sometimes four, even six, helmsmen are required, and the second wheel, seen behind the boy, is indispensable (see illustration, page 7).

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THE SHIP'S CAT TAKES TO THE RIGGING

Kirri, as this little half-caste Persian was known to all hands, survived all the hardships of the voyage only to fall into the Cardiff docks when going ashore there one evening. Kirri became expert at climbing ropes, but more expert at dodging water (see text, page 32).

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THE MAJESTY OF TALL CANVAS AND BRIGHT SUN

Looking down from the jigger-top on a sailor at work on the lee crossjack yardarm, where he is tightening up the head gearing. In the foreground is the eye of the jigger stay; the jigger topmast staysail cuts across the picture from the right. The spray-covered sea shows that the old ship is slipping along at about nine or ten knots.

Now a chance! A momentary lull, scarcely perceptible. Up helm!

They dragged at the spokes of the wheel, tearing one of them out. The ship answered. Out of the trough she came again, decks still awash, fighting buoyancy gone, rails under, rolling fearfully.

With six at the wheel, now she ran on, Captain de Cloux still at the weather helm guiding her on her compassless way, while all hands fought their way forward along the main deck to get the canvas from her, if they could.

Nothing of the foresail could be saved: most of it was long since gone. In the morning we found pieces gnarled and twisted and writhed round many of the stays in the rigging. We tried to get the main upper topsail in, but this was impossible. All the wire gear carried away the instant we started anything, and this sail also was blown to pieces.

With these two sails so blown out, the ship was under easy canvas. She had now only the three small lower topsails on her and a wisp or two of heavy lower staysails. We canted the yards on the port tack to heave her to. It was a long job. Often all hands were under water.

Her yards canted while still she ran. All hands fought their way aft again, to be clear of the main deck before she came up to the wind again. At the wheel Captain de Cloux again bided his time, waiting a favorable moment to bring her shoulder to the sea again. It was a chance. Such a long steel ship takes unkindly to heaving to; she might damage herself irreparably when she came up. But it was our only chance.

THE "PARMA" SHAKES OFF THE CLUTCH OF DOOM

There came a chance about 10 o'clock, three hours after she had first broached to. Down helm! She was a long length to bring into the wind, a big ship to lie hove to in the belly of the sea. But she answered and she came. Into the murderous trough again—rolling, rolling, as if her previous endeavors in that direction had been only play—rolling she came and, her decks a small ocean, rolling stayed.

All hands stood by aft through the night. The captain, seeing that she would lie so, though still she took a furious battering, permitted himself to be carried below.

The midship house was gutted, the galley wrecked, the half deck destroyed. Everything movable had gone overboard. We did not know what damage the ship might have done herself; but the hatches stood and the rigging was still intact. She was afloat and ready to do battle again with the mighty ocean in the morning. For the time being she lay hove to in safety.

PLAYTHING OF GALES, THE CRIPPLED SHIP STAGGERS ON

April developed into a month of gales, and we drove onward in constant storm. The wind, working viciously from northwest through west to southwest, blew at gale strength from all these directions, but remained constant at none of them. The result was a nasty cross-sea which never ran true. The ship ran on always with the seas raging almost as much on her decks as outside them.

With our best foresail and best main topsail gone, we had to nurse the ship along and could no longer drive her as we wished. We had to shorten down continually; but whenever we had a chance, if only for an hour or two, we gave her the canvas back again and did our best for her. In return she always did her best for us. She roared on, averaging 1,200 and 1,300 miles a week. Yet we could never, in that nasty cross-sea, bring her up to anything like 300-mile days.

The youthful crew—the average age of our foremast hands was about 17—had more than its share of experience; and as week of gale succeeded stormy week, some of the younger boys began to be all but played out. Fortunately, we lost none of them (see pages 3 and 23).

On the night of April 5 the second mate was actually swept over the side and scooped up again by the mizzen brace bumpkins as he was being drowned. He just had strength enough left to climb aboard, where he staggered, white and shaken, into the wet saloon. If he had not come back, we should not have known until the morning that he had gone.

Such are chances of life and death in the wind ships racing for Cape Horn.

With the midship house destroyed, all hands had to live in the forecastle and the sail locker until we had come past Cape Horn. The cook, by heroic efforts, induced the galley stove to function again;

but the sea had got into the fresh water, and the ship's pig had been blown overboard in the storm. This was a succulent porker whose roasting we had long contemplated, and its loss was a serious blow.

We continually wondered about the other ships, nine of which we knew to be somewhere near us, and hoped fervently that they also had survived the storm. The fate of the *Melbourne* and the *Archibald Russell* concerned us particularly. We sailed on always with a sharp eye ahead on the horizon for sight of the other vessels, but never did we see anything or have any company save the wandering albatross and the blue whale.

So we came to the 31st day at sea and arrived at the longitude of the approach to Cape Horn. We had dipped to 56 south and 57, to weather that bitter headland. Having suffered gales over the whole 5,000-mile way from the south of New Zealand, we expected and hoped that the strong westerlies would send us scudding round. They did not. Instead, to our intense exasperation, it fell calm.

AFTER ROARING GALE, DEADLY CALM

Calm near Cape Horn! It was maddening. We hoped and hoped that the calm would be short; that it was only a breathing spell between two gales. It was nothing of the sort. We had an almost complete cessation of wind for three days, in the course of which we lay in stagnation, with the courses hauled up in their gear to prevent their banging themselves to pieces and the small cat playing by night in the moonlight on the poop.

We fretted and fumed and could do nothing, the while we kept pessimistic lookout on the horizon astern for pillars of canvas racing up with fair wind. Such sails would be the *Olivebank*, the *Grace Harwar*, the *Favell*, and the *Hougomont*, none of which had put to sea when we set out. (The *Hougomont* was never to sail, but we did not know that.)

Without wind, the best of sailing ships and the best of sailors may achieve nothing. A cargo steamer passed us, going round the Horn from New Zealand to the United Kingdom, belching her smoke and the brass-bound gang on her bridge looking at us through glasses. We asked to be reported and prayed for a westerly gale.

Early on the morning of the 37th day, Saturday, April 23, still going slowly before a light breeze, we picked up Diego Ramirez rocks ahead and passed between them and Tierra del Fuego. We sailed on quietly under all sail, with a dry main deck for the first time in a month and sunshine in the afternoon. Sunshine in Drake Passage! It was all wrong. We would have preferred a gale.

"The war has spoiled Cape Horn," said the mate, who had not sailed that way since he had been in the nitrate, the copper-ore, and the grain trades before 1918.

CAPE HORN BLOWS NO BLAST

We might have been sailing placidly down Chesapeake Bay. North of us rose the high, serrated, ice-laden peaks of Tierra del Fuego. The sea was blue, a heavy, severe kind of blue, and there were cumulus clouds, though in truth not very fleecy ones. Shags, Cape pigeons, albatross, and mollyhawks flew with us, and all day we had land in sight—Diego Ramirez in the morning, then the Hermite Islands, Wollaston Island, and the bleak Horn itself.

To the north the islands of the Land of Fire raised their sawlike hills from the sea, cold and grim, white and desolate in their snow-covered solitude. They suffered our passing in virginal disdain; yet there was an air of threat about the whole area. Under its heavy snow the Land of Fire looked more like South Victoria Land, at the Ross Sea. A high conical iceberg aground near the land added to the threat and the illusion.

And so we came around Cape Horn and were suffered to enter into the Atlantic without sacrifice. Our price had been paid on April 5. Our damaged ship still limped a little from that night of storm, while her master was not himself again when we came at last to our anchorage, two and a half months afterward.

Now we began the long, weary wandering through almost the entire length of both Atlantics. This grain race is a long course, and the ships engaged upon it wander over the face of the ocean strangely, each voyage encircling the globe, always eastbound—outward round Good Hope in ballast to pick up the golden cargoes that are ripening on Australian farms; homeward round the Horn, racing to the market.

Our *Parma*, with her big cargo, seemed inclined to take her ease upon an exasperating number of occasions, and after one

good run, which took us past the Falkland Islands, our progress in the main was painfully slow. The best day of the whole voyage was that on which we sailed from Cape Horn's Staten Island (to which there are no nickel ferries running) to the Falklands with one noon-to-noon run. In 23 hours and 20 minutes we ran 256 miles.

TALL TALES OF FAST VOYAGES

For a big ship carrying more than 5,000 tons of grain, blown entirely by God's wind, without aid of engine or of man, this was not bad. Stories of runs exceeding 300 miles by these deep-laden modern sailing ships are much more numerous than such actual performances. If the performance were not so rare, the stories would not be so common. In ballast, with a fair wind, it is different. Our *Parma*, unladen, had done 321 miles in 23 hours for us. But that was when she was high out of the water and ran light. Now she ran deep, and the bulk which her sails had to shift through the water was vastly different.

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FULL OF WIND AND GOING STRONG!

The sails of the mizzenmast, photographed from the poop, give a clear idea of the maze that is a sailing ship's rigging. The ship is braced sharp up, that is, sailing close to the wind on a tack, and the man at the wheel must watch the weather clew of the royal, full now, so that it may not shake the sailor (the antlike figure of a man on the royal, or highest, yardarm) from his place. Careless steering could easily catch the ship aback—that is, allow her to come into the wind with the wind blowing the sails against the masts and rigging instead of away from them (see illustration, page 29).

After that one good day, we had many delays. We had murky days of rain-filled calm, of head winds and little progress, of cold and fog and snow (for it was still winter in the South Atlantic), of heavy rolling and bad tempers, and no progress whatever. We had depressing, miserable days, which seemed nothing but a waste of 24 hours, with no indication of any other kind of day ever to follow—days of all kinds, indeed, except the longed-for days of ramping progress.

Our old foresail, which we had bent in place of the lost sail, blew out twice and had to be hastily made fast, dried, unbent, sewn, with all hands working with palm and needle day and night until the job was done, and then bent and set again. The foresail is one of the most important of the square-rigged ship's sails, and we did not want to waste even a head wind by showing it a bare foreyard.

Slowly we wandered on; wondering always where were the other ships, never

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COMING ABOARD IN "SHEETS"!

The camera, to its later detriment, caught a heavy sea in the very act of "dolloping" aboard over the rail. The photographer was well soaked and the camera never was the same again! At such a time life lines and nets are useful.

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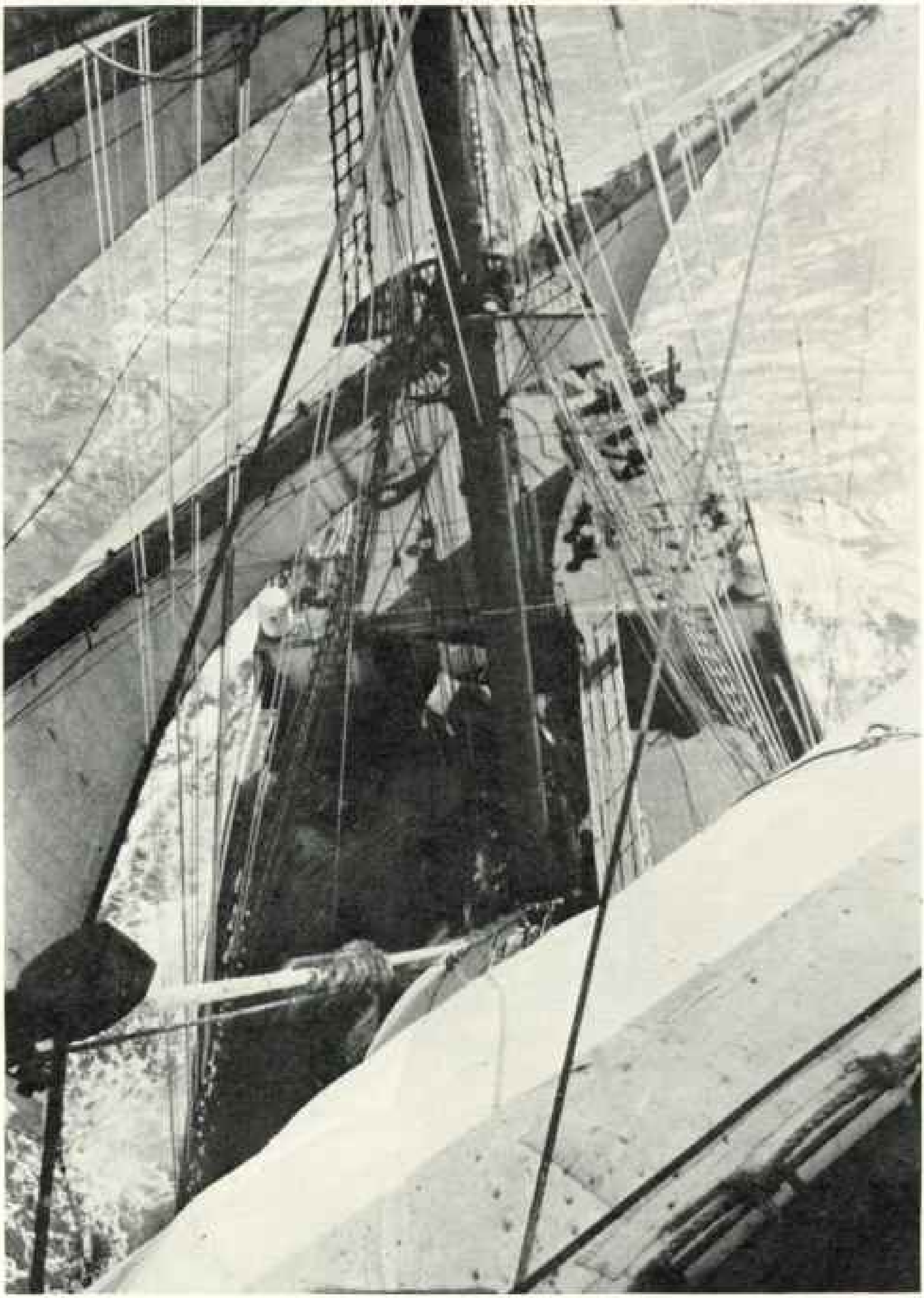
DECKS AWASH AND RUNNING HEAVILY

The main deck of the *Parma* is heavily awash in very bad weather between New Zealand and Cape Horn—the kind of weather in which the vessel was broached to and came perilously near to going down (see text, page 16). In the right foreground a sailor clings to the rail as he makes his way aft.



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WHAT AN ALBATROSS MIGHT SEE

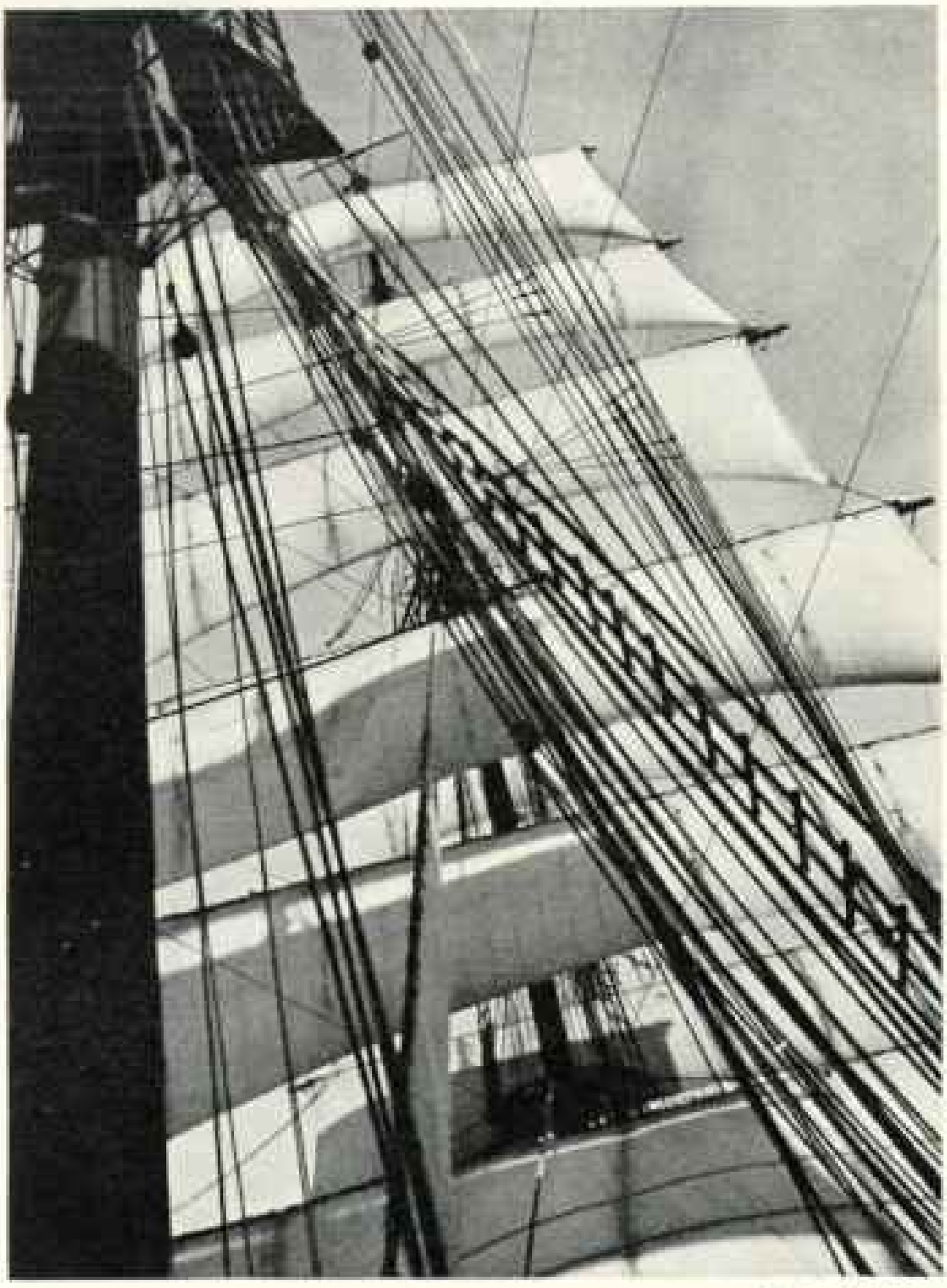
Looking down from the main crosstrees toward the *Parma's* bows on a day of perfect weather and leisured progress, the scientific plane of the sails is clearly seen. The yards are braced up and the wind is forward of the starboard beam—that is to say, the wind is ahead and the ship is accomplishing that feat always strange to the landsman, sailing against the direction of the wind. The birdlike curve of the big foresail illustrates how this is done: the ship sails on the wind as a bird might fly (see illustration, page 27).

UNDER ALL SAIL IN THE DOLDRUMS

The *Parma* did not carry a full spanker, but merely a trysail, because a larger stern sail on the jigger-mast would have been unwieldy. The vessel looks very deep in the water, which she was, with nearly 5,500 tons of wheat in her hold, but the deepness is accentuated here by the fact that she is shown in the trough of a long Atlantic swell. The swells in the Pacific are even longer.

THE PORT WATCH WRESTLING WITH A NEW SAIL

The boys are bending a new foresail to replace one which has been blown out. The sail is hauled aloft on its bantlines, leech lines, and clew lines, from the deck, and the head hauled out along the yard (see page 14). The figures on the end of the yard are just hauling the head home.



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THE GLORIOUS SYMMETRY OF THE SWELLING SAILS

With all sail set and drawing so, the ship drifted on placidly in the trades for weeks without need to touch tack or sheet or clew line, and the weary crew relaxed from the rigors of the Horn. However, many of them were taken from the watch-and-watch system and put to working 12 hours a day. No sail was furled from the latitude of Buenos Aires to the English Channel.

seeing anything of them or of any other vessels. The steamers we did not miss, having no interest in them; but we had nightmares in which the *Herzogin Cecilie* had anchored in Falmouth Bay in 72 days or the *Penang* in 85.

REST IS PLEASANT AFTER TOIL

As the days drifted by and we continued slowly in search of the southeast trade, we began to think less and less of our chances. It never occurred to anyone, after we had been 14 days between the 40th and 30th parallels in the South Atlantic, that we might in the end come into the Cornish port with the best passage ourselves.

As the days drifted by, such a possibility seemed to us more and more remote. Yet our days were not miserable or our lives filled with woe. We were come to the good weather now, with sunshine; the wreck of the midship house could be restored to something like order, and the havoc of the storm repaired. It was warm and the decks were dry, and the graceful sails billowed white in the sunshine under blue skies. The flying fish came and the bare-backed days (see illustrations, pages 20 and 34).

The hencoop, where lived our 14 fowls, was removed from its Cape Horn place by the standard compass to the jigger hatch, and the silly fowls could not find their home by night. They insisted upon going to the wrong place until the small cat took a hand in the proceedings and rounded them up like a dog (see illustrations, pages 3 and 23).

During week-ends, with the work of the ship done and the light breezes blowing in the rigging, the ship was given up to slumbering, sun-tanned youth stretched fore and aft in rope-yarn hammocks, with even the red-whiskered mate taking his ease in a deck chair on the poop, and the captain, able to walk now without difficulty, plying his sail needle with the sail-making gang that stitched all day on a new foresail (see page 12).

We had to sail to 20 south to find that southeast trade; and then it was much more

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MAKING THE MAINSAIL FAST IN HEAVY WIND AND RAIN

The canvas has been rolled up and the oilskinned boys are seen getting the gaskets round to make the sail fast. (Gaskets are pieces of rope which are wrapped tightly around the sail to keep it furled.) The boys are spread along the footrope, on which they always stand facing forward, balanced over the yard. They soon learn to maintain this balance, even in a howling gale in the middle of the night, with the footrope slippery with ice and the ship rolling heavily. One slip, of course, and they would never again learn anything. It is unusual for a boy to fall from jobs of this kind; accidents are almost invariably due to carelessness or to bad gear.

easterly than southeast, and we had to sail on by the wind, braced up on the starboard tack. From the latitude of Buenos Aires right to Falmouth Bay we did not make one sail fast, and for nearly the whole of that distance, except for working through the doldrums, we were on the starboard tack, which clearly indicates what kind of passage we had through the Atlantic.

We came across the Line at noon on May 23, which was 67 days from Port Broughton and 30 days from Cape Horn. To sail from Port Broughton to the Line in 67 days was not so bad. This was one day better than we had made in the *Herzogin Cecilie* in 1928, when we were racing the Swedish four-masted bark *Beatrice* and beat her by three weeks, with a passage of 96 days.* But on that occasion we had negotiated the North Atlantic in April and had anchored in Falmouth Bay 28 days from the Line; now we were to get through that ocean in June—a very different proposition.

From Port Broughton to the Line our log showed us that we had made 10,617 miles. These were miles *made*; miles sailed would be a much greater total. Our average for that stage of the voyage was 155 miles a day; from Port Broughton to the Horn our daily average was 170.

And then for the last stage, from the Line up, it was scarcely over the 100.

HOPE FOR VICTORY WANES

We began our passage of the North Atlantic well enough, with only three or four days in the doldrums and then a good northeast trade; but then the trade left us on 20 north, when we might reasonably have expected it to deliver us at least to 30. From 20 north to Falmouth we had to make what way we could, and it was on that stage of the voyage that our hopes of making good time were quite broken down.

*See, also, "Rounding the Horn in a Windjammer," by A. J. Villiers, in the NATIONAL GEOGRAPHIC MAGAZINE for February, 1931.

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A DECK VIEW IN THE TRADE WINDS

Looking aft from the forecastle head, a sailor is seen in tropic rig, pants rolled to the knees. He is about to walk on the flying bridge, or catwalk. Above his head is the foot of the foresail, with part of the wire buntlines showing.

But, fortunately, though we did not know it then, all the other ships were in the same case, except the *Magdalene Vinnen*, with her engine. She is not to be reckoned with the other vessels, all of which sail entirely without power.

When the trades left us, basely deserting us before their work was half done (our captain remarked that they had had so many ships to blow along they had got tired of it, and the mate blamed the war), we were left to wallow for days in stagnant calm. In that great windless area that lies to the south of the Azores and, in June, at least, stretches to Bermuda, we were caught for 11 days. In all that time we did not have a day's run over 100 miles; during four consecutive days we did not make a total of 60 miles (see illustration, page 6).

This was exasperating; but our delay would have been much more maddening if we had not chanced to meet our greatest rival, the Erikson four-masted bark *Pamir*, suffering similar misfortune. We had not seen her since we had left Spencer's Gulf together, 84 days earlier; and now the horizon ahead upon a windless morning brought her to us, lying there with her courses hauled up and no steerageway (see page 19).

She was far off and, picking up a little breeze while we had none, betook herself farther. We were by no means sure that she was the *Pamir*. We could see only that she was a four-masted bark, and that her general description fitted our rival; but she might have been any of the four-masted barks of the Laeisz Line—*Padua*, *Peking*, *Passat*, or *Priwall*—outward or homeward bound in the Chilean trade.

THE CREW GOES CALLING IN MID-OCEAN

The day was a Saturday, and after the midday meal our boys could restrain their curiosity no longer. Most of them were now working as "daymen," which meant that they worked 12 hours every day, from daylight until dark, and if there was no need to disturb them they slept all night. They were accustomed to finish work at 1 o'clock on Saturdays, and were then free until 6 a. m. on Monday. This meant that over the week-end there were 14 to 16

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IN A HEAVY SQUALL NEAR CAPE HORN

The main deck is under water and a black squall is coming up astern, with sleet and hail. The geared winch abaft the capstan is a patent German halyard winch, worked by hand. On the deckhouse is a brace winch, also worked by hand.

young men, including the carpenter, the bo's'n, and the sail-making gang, with nothing to do. As soon as they had their midday meal on this day, the entire gang came aft and asked to borrow a boat.

"Whatever for?" asked the captain.

"To pull over to the other ship," they said.

She was 15 miles away! Nothing could be seen of her from our decks save a haze of upper sails, cloudlike on the horizon.

"It is mad," said the captain.

Then he grinned. The adventure of the thing appealed to him. He alone—this venturesome and capable Ruben de Cloux—would permit such a thing. The boys could have the boat, he said, provided an officer went in charge and no apprentice went. He was responsible for the apprentices' lives. They could have the starboard lifeboat and must take food and extra water, and flares for coming back at night, and must not remain aboard the other vessel longer than two hours.

We set out a little after 2 o'clock in the lifeboat, manned by volunteers, strong young Germans and Swedish Finns and an American yachtsman from Vineyard Haven, who had signed on A. B. (able-bodied seaman) for the Cape Horn voyage. From the low elevation of the boat we could see nothing of the other vessel, but we took a compass and carefully steered for her by bearing taken from our *Parma* before we left.

After two hours our own ship was hull-down and the other showing upper topgallants and royals above the horizon. We were never out of sight of both vessels. When our own began to drop below the horizon, the other emerged; so that we had always either our departure or our landfall in sight. This was simple enough navigation.

A 30-MILE ROW FOR A VISIT

It was dead calm and stifling hot. We had a good crew, standing hour turns on the oars. The boys were very keen, and nobody thought of the danger of our expedition. Not that we admitted it to be dangerous, but a ship's boats do not often set out for a row of 30 miles for a yarn aboard another vessel.

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THE LIFEBOAT SERVES AS A TENDER

In Falmouth Bay, England, at the end of the voyage, the boat is going in with Captain de Cloux to ask orders about where to discharge the *Parma's* grain cargo. The ship carried two such lifeboats, always kept fully equipped and provisioned, but they would not have been of much use if she had been overwhelmed in a Cape Horn storm. The smaller boats would have little chance to survive in a storm that would defeat the sturdy ship. This is the lifeboat with which the *Parma's* crew went on a 15-mile visit in mid-ocean to the *Pamir* (see text, page 34).

We pulled through large, circular patches of sargasso weed, in which fat crabs and Portuguese men-o'-war drifted lazily. Frightened flying fish scurried wide-eyed before us and the astonished birds flew around.

In the twilight of the tropic evening we arrived aboard the other vessel. She was the *Pamir*, right enough, lying there with her mainyards backed to take from her whatever way she might have had—very little—while we pulled alongside and climbed aboard. Within a few seconds, although no one in either ship had ever met anyone in the other, the two crews were yarning excitedly together like the oldest of old friends at reunion. We had rowed so far that they were astonished to see us and at first thought there might be some special reason for our trip.

SAILING A SMALL BOAT BY THE STARS

We found that the *Pamir* had been in the same storms, and had suffered heavy deck damage and had badly injured one of her boys. She had gone south of Tasmania instead of through Bass Strait, and was four days ahead of us at Cape Horn. We had done very well, then, to sail up on her again in the Atlantic.

We had the evening meal aboard, gathered the *Pamir* men's news, gave them our news, and left again under the light of the moon, to pull back to our own ship, now quite lost to sight. The calm persisted. We had 15 miles and more to go and were not sure exactly where our ship was; but there was no danger. We were expected. It would be moonlight until 1 in the morning.

The 15-mile row back to our ship passed uneventfully, with the boys pulling steadily and all of us keeping good watch on the horizon ahead for sign of lights. We laid a course by the stars, knowing how our ship had been lying under them on so many, many nights. We laid our course and kept it, and after two hours and more burned a flare to see if we were right. We were! An answering flare came from ahead.

I was pleased, too, for we would have looked foolish pulling aimlessly round the middle of the North Atlantic in a small boat, merely from a desire to row over for a yarn aboard the *Pamir*.

By 2 o'clock in the morning we were back aboard the *Parma*, standing black and silent under the stars, with the luminous porpoises playing round her strong bows and her sails hanging lifelessly from the big yards. Though we were tired out then, we sat up until morning, discussing the news we had with those who had remained aboard. For days afterward no one spoke a sentence in the ship that did not have in it those two names — *Parma*, *Pamir*.

And so on again, eager that we might be up with the *Pamir* into port. Having shown up so well with her over 13,000 miles, we hoped to stay with her over the last stretch home. But she had a great advantage over us. She was bound to Cóbh (Queenstown) and we to Falmouth; and for the whole of the rest of the voyage what winds prevailed were much more favorable to the Irish port than they were to the Cornish. Cóbh, too, was some 70 miles nearer. We thought for a while of heading that way; but to Falmouth we were bound and for Falmouth we held our course, irrespective of the *Pamir*.

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THE MIGHTY BOWS OF THE RACER IN CARDIFF DOCKS

Two sailors on a stage are at the everlasting work of chipping rust; at the head of the graceful sweep of the sweet cutwater is the scrollwork figurehead. There once reposed the full-length figure of a lady, but the sea washed her away on a former voyage.

CHANCES GONE FOR 100-DAY RECORD

We did not see her again. We saw another four-masted bark off the Azores, far off alee, going for her life. We discovered later that this had been the ill-fated *Melbourne*, so soon afterward to be sent spinning to the bottom, with half her crew, after colliding with a steamer.

Between the Azores and England we had light winds, so light that over its entire length the North Atlantic was about as "rough" as Long Island Sound by the Connecticut shore on a summer's day. This kind of thing was all very well for steamers, but it held no pleasure for us. Our chances of being less than 100 days, the grain racer's great aim, were gone. In the *Herzogin Cecilie* we had sailed from the Azores to Falmouth Bay in six days, and

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MEETING A LINER NEAR THE ENGLISH CHANNEL

The Hamburg-American liner *Hamburg* is coming up astern, a welcome sight after a long voyage during which few other vessels were seen. Steamers report sailing ships met at sea, but in this case (with Falmouth only a few hours away) it was not necessary. Mrs. Villiers is examining the liner through the captain's glasses.

in the *Parma* we could have given an equal performance, given the chance. Instead we were 12, and pleased to be no longer.

And then, with our landfall made right in the very chops of the Channel, we had a strong head wind and had to beat doggedly over the last 100 miles!

At long last, after a passage of 103 days, we were come to our anchorage. The roar of the anchor cable as it disturbed the fish of the anchorage was sweet music in our tired ears. One hundred and three days! It was not fast. Yet the pilot astonished us with the news that no ship had made a better passage. So far as he knew, the *Pamir* was not yet in, and we had won!

VICTORS GREET THE OTHER SHIPS

We did not cheer too loudly. The pilot had been in his cutter for four hours, and we well knew that in that time the *Pamir* could have got her anchor down in the Cove of Cork (Cork Harbor). We discovered later that she had; nevertheless, we had the better passage. We had left the same day and arrived the same day, and we had sailed the longer voyage. Therefore we won; but the *Pamir* was a very close second (see text, page 39).

We had met the *Lawhill* beating out of Falmouth Bay as we came in. Since she had sailed almost a month before us, we knew that we had beaten her. The famous *Herzogin Cecilie* was 107 days. No ship was less than the 100.

As the other ships began to come in, we learned how they had fared in those Cape Horn storms. They had all had a very bad time. Before they arrived, the *Pommern* and the *Mozart* both figured in the reinsurance market as overdue, the *Pommern* only for a few days and the *Mozart* for a month. It was feared that she was lost, when at last, rusty and barnacled, she came into Falmouth Bay early in August, with a passage of 150 days, and reported that she had been almost overwhelmed in the Cape Horn gales.

The fleet four-master *Archibald Russell*, which we had often imagined to be lying at anchor while we were wandering fruitlessly in the Sargasso calms, did not come

in until nearly a month after we had anchored. She was 136 days and had been frightfully battered, her whole port watch being injured in one of the gales that beset her constantly for 15 days. She was 53 days to Cape Horn, compared with our 37. Her third mate had both legs broken and his hips dislocated, and at the same time her chief mate was also severely injured. Before she came in she was short of food; and, even if she had had a full larder, there was no fuel left to cook anything.

All of the ships had much the same tale to tell—of savage storms and long fights with the gales, of being very near the end on more than one occasion. The *Melbourne* had been nearly lost on April 5 and had suffered heavy deck damage.

THE "MELBOURNE" GOES DOWN

Then, six hours from her anchorage, with the Cape Horn storms thousands of miles behind her and the voyage all but done, she received her death blow from a steamer. Down she reeled, sinking so quickly that she literally did not lose way, but *sailed* under, her masts and yards falling on her as she went. Her master had both legs broken in the ghastly few moments that preceded her death plunge, and his bo's'n and his chief mate died trying to help him.

By some strange freak the *Penang* and the *Ponape* had found themselves in the center of the storm, and though the sea was the maddest they had ever seen, they had suffered no damage. The *Viking* and *Abraham Rydberg*, as well as the auxiliary *Magdalene Vinnen*, had gone westward round Good Hope instead of round the Horn, and so had escaped the storms; but they had had longish passages.

The *C. B. Pedersen*, after we left her in the Tasman Sea, had been caught by the same storms and very nearly overwhelmed. Some of her yards and rigging had come down, smashing in her main hatch, and she had been forced to get out of the bad weather area to lick her wounds. In the height of the storm her sailmaker had died, and the ship had been so damaged that her master had thought it prudent to give up all idea of rounding Cape Horn and had run for Panama Canal instead, passing that way into the Atlantic.

The *Hougomont* had been dismasted soon after we sailed for Port Broughton, and though she had managed to struggle into Port Adelaide under the shortest of jury rig, she could never go to sea again and had been condemned as a hulk (see Illustration, page 15).

The *Abraham Rydberg* had to put back to Fremantle and to Table Bay in distress, with sick boys (she was the only ship in the fleet to carry a doctor), and the *Winterhude* also had to put back because of illness. The *Olivebank*, one of the last to sail, made a very good passage of 108 days, the best she has done under the Finnish flag.

The *Grace Harwar*, lone full-rigger in the fleet (and my last ship before the *Parma*) was 131 days at sea. She spent 5 days beating around Cape Horn. There was rejoicing when she arrived, since she had not been heard from until she limped in. She is old and will probably not sail the seas much longer.

The records of the ships in the race are: *Parma*, 103 days; *Pamir*, 103; *Herzogin Cecilie*, 107; *Olivebank*, 108; *Penang*, 112; *Ponape*, 118; *Favell*, 120; *Lawhill*, 121; *Viking*, 122; *Abraham Rydberg*, 123; *C. B. Pedersen*, 129; *Pommern*, 129; *Killoran*, 131; *Archibald Russell*, 136; *Winterhude*, 146; *Mozart*, 150.

The *Magdalene Vinnen*, even with her engine, which she does not hesitate to use, was 96 days. The *Melbourne*, when she was lost, was only 105 days out and would have beaten the *Herzogin Cecilie*. Her loss threw a shadow over the entire fleet. The dismasting of the *Hougomont* removed another of the graceful vessels.

Most of them now are very old, and this annual grain race cannot go on much longer. We will sail the *Parma* while we can, but it is likeliest now that the number of entrants will steadily dwindle, until within a very few years there may be no commercial sailing ships left in the Australian grain trade.

WHEN CZECHOSLOVAKIA PUTS A FALCON FEATHER IN ITS CAP

By Maynard Owen Williams

Author of "Czechoslovakia, Key-Land to Central Europe," "Bulgaria, Farm Land Without a Farmhouse," etc., etc., in the National Geographic Magazine

EVERY six years Praha (Prague), the capital of the Czechoslovak Republic, moves to a heightened tempo. Hotel rooms are reserved weeks ahead; a chair in a restaurant puts one in a privileged class. Special trains, trailing one another into Wilson Station, disgorge colorful crowds from rural districts. Airplanes drop off visitors from the four winds of heaven.

The enormous stadium on Strahov Hill, bleakly barren between meetings, bustles with barelegged athletes of both sexes with the fire of enthusiasm in their eyes, and eager youngsters imitating their elders in athletic prowess.

Outside the distant gateways long lines of performers await the signal to invade the 567-acre field in which the largest "big top" would be but a side show.

Czechoslovakia's own Olympics return to the old stamping ground, and the greatest group drills on earth are fitted together out of hundreds of units, each a mosaic of all classes.

This national concourse of gymnasts is not a mere physical-culture exhibit. It is the mobilization of a nation's sinew, spirit, and dreams.

When the Czech Yankee Doodle sticks a feather in his cap, that feather marks the wearer as a falcon—a Sokol. In Slavic lands, from the Baltic to Turkey, the word evokes familiar heroes of age-old legends.

The Sokol movement affects all classes and all ages. Children of six move in uniformed companies. Mature citizens lift their centers of gravity to military contours. Countrywomen arrive wearing so many bright petticoats that they seem to be smuggling woolen goods into a besieged city.

Native arts, handicrafts, and songs take on new leases of life. The factory girl whose usual "best dress" is plain cotton brings forth old aprons strident with color and balloon sleeves bulging with embroidery. The society lady lays aside her clinging gown for such homespun finery as her mother habitually wore on festival occasions when costume was local rather than international in pattern.

Long before the main performance starts, the Charles Bridge resembles an endless belt of ethnographic exhibits issuing from the archway of a fine Gothic tower and losing themselves in the long arcades beyond the Vltava. Costumes from Čechy (Bohemia), Morava (Moravia), Slezsko (Silesia), Slovensko (Slovakia), and Podkarpatská Rus (Ruthenia) make the close-packed streets of the Malá Strana, or "Little Town," look like aisles in a dahlia show.

Czech theaters put on their best artists to supplement the mighty drama of the Pan-Sokol Festival. Art galleries vie with the living picture of a nation's strength. Concert halls furnish a musical relaxation after hours of suspense and emotional excitement. Never have I heard Dvořák's "New World Symphony" better played than in the Old Town at Praha.

EYE MUSIC WITHOUT STAR PERFORMERS

Czech genius is many-sided and there is a strong current of individualism, but there are no star performers in the mass drills, in which 60,000 arms and legs compose quick-flashing scales of eye music for 155,000 spectators (see Color Plates II and III). The home run, the last-minute touchdown, the final lunge to personal victory, are lacking in the group displays. Much of the drama is psychological, for the precision, the verve, and the magnitude of the spectacle are but visual evidences of a mighty spirit underlying all.

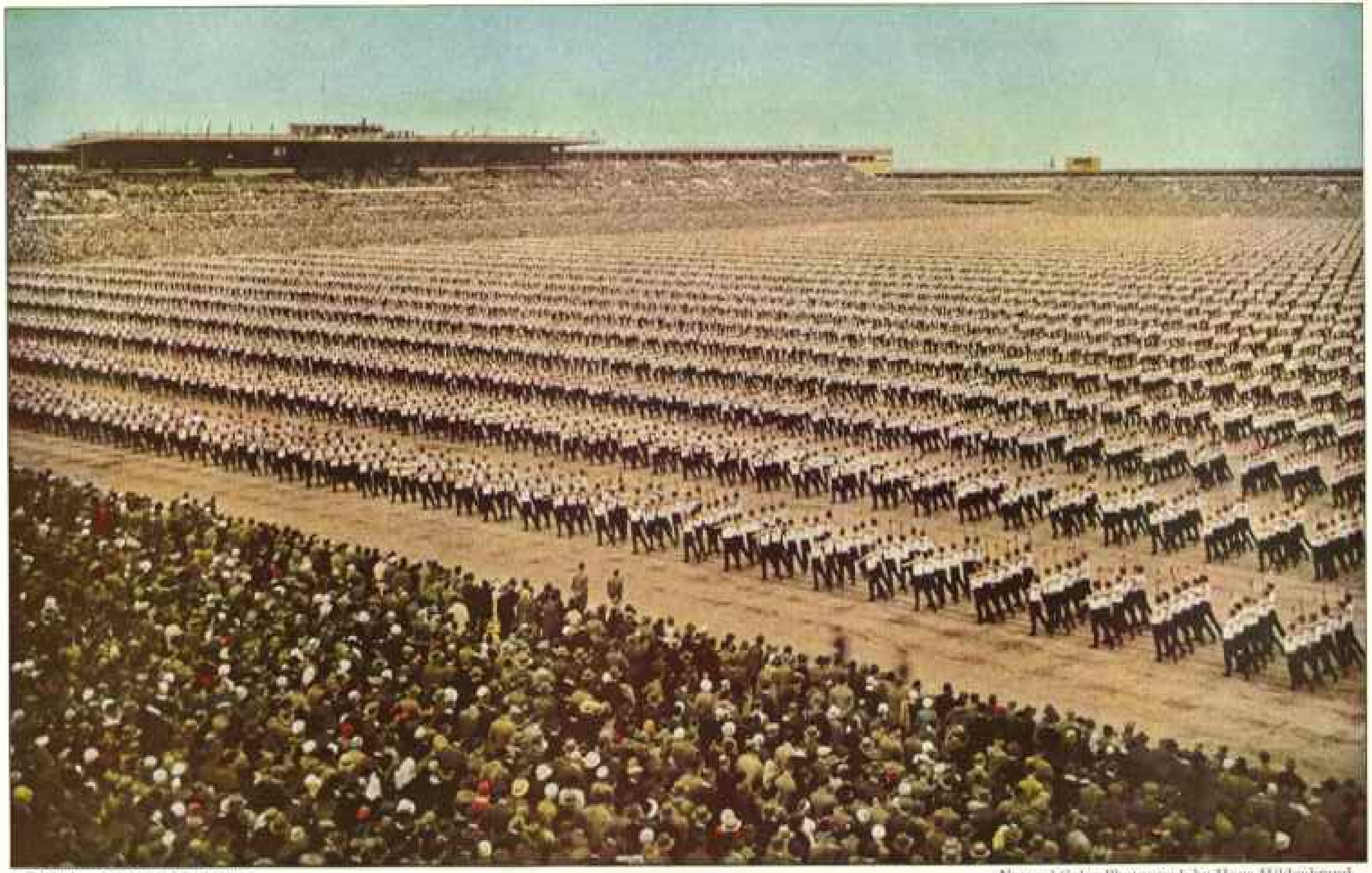
High on the roof of the tribune, hidden from the most-favored spectators, are the group leaders; but the invisible director is the man whose centenary was celebrated in 1932, at the Ninth Pan-Sokol Festival, Dr. Miroslav Tyrš (see, also, Color Plate I).

The Sokols united the Czechs when they were still men without a country. Thomas G. Masaryk, the distinguished and revered first and only President of the Czechoslovak Republic, added the pen stroke

 Natural Color Photograph by Hans Hildenbrand

A MEMORIAL TO THE FATHER OF THE SOKOLS

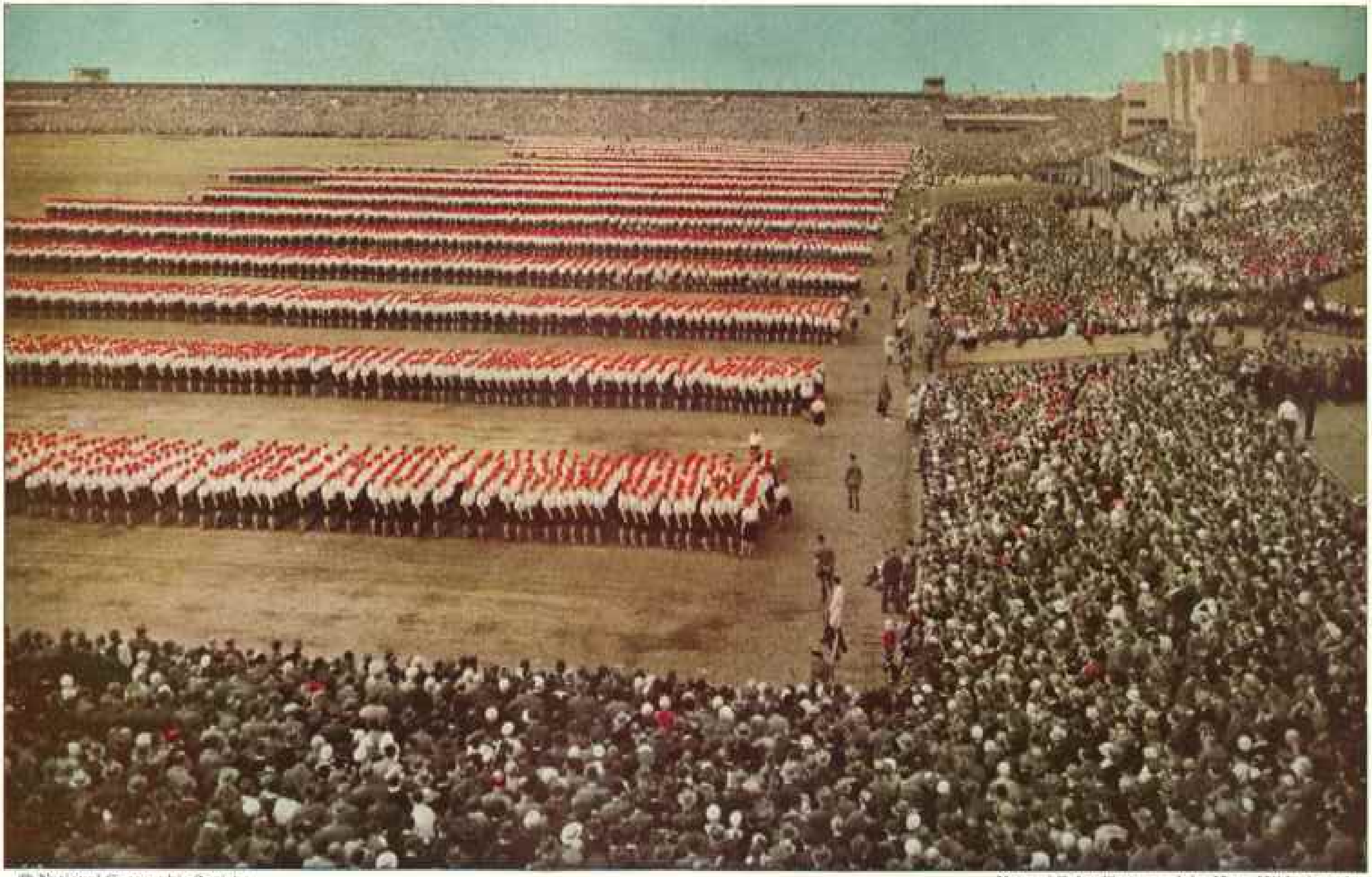
At the Ninth Pan-Sokol Festival at Praha (Prague) in the summer of 1932 was celebrated the centenary of the birth of Dr. Miroslav Tyrš, whose aim was the physical and moral betterment of his people. The great mass drills have played a major part in Czech unity and progress. A delegation from the 700,000 Sokol members stands before the monument to the founder.



Natural Color Photograph by Hans Hildenbrand

SEVENTEEN THOUSAND SOKOLS EXPRESSING THE "JOY OF MOVEMENT"

Although the Sokols date only from 1862, their underlying idea was announced by Comenius in the 17th century: "Since everything in the world is done and is maintained by movement, it is most natural that everything alive should experience the joy of movement." To all who take part, the mass drills are a spiritual adventure.



Natural Color Photograph by Hans Hildenbrand

A WOMEN'S ARMY IN THE FIGHT FOR HEALTH AND HAPPINESS

A quarter of a million women and girls learn grace, discipline, and democracy in the Sokol Unions, where equality and mutual respect are fostered. In solid ranks their picked representatives have entered the 567-acre stadium before spreading out over the entire field, around which 155,000 spectators can watch the marvelously precise evolutions of a mass drill.

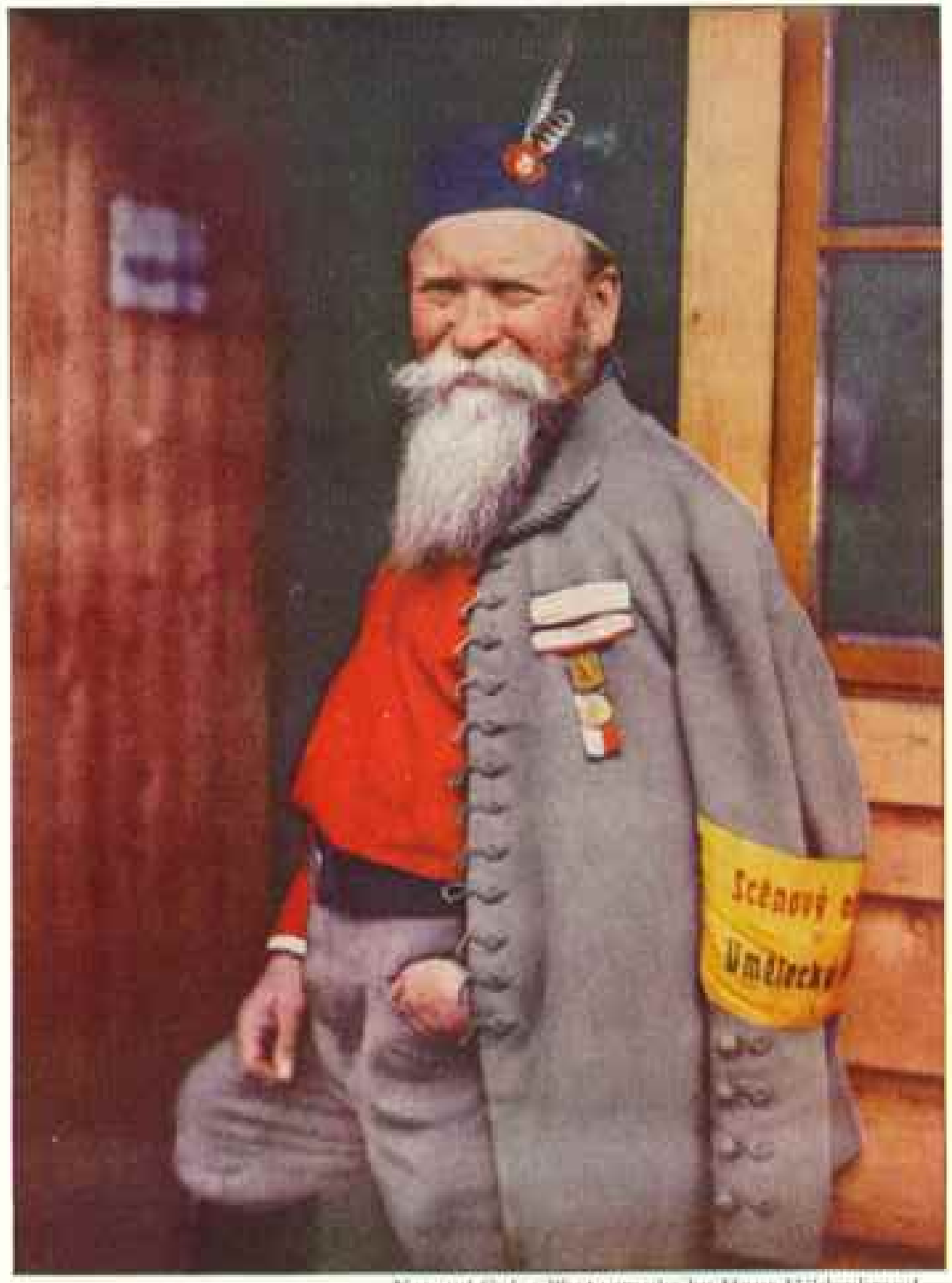
Natural Color Photographs by Hans Hildenbrand

FOREIGN VISITORS TO CZECHOSLOVAKIA'S FESTIVAL

Since 1905, Croats, Bulgars, Slovenes, and Serbs have been allied with the Czechs in the Sokol movement. In 1906, the Sokols visited Zagreb (Agram) and the word "Sokol," meaning falcon, comes from the name given to legendary heroes of Yugoslav epics. The gaily costumed girl at the left is from Bulgaria, the two others from Yugoslavia.

YUGOSLAV SOKOLS AT THE PRAHA FESTIVAL

These sturdy visitors to the celebration are from Bosna (Bosnia).



Natural Color Photographs by Hans Hildenbrand

SOKOL DIRECTORS ARE ARTISTS IN LIVING

A well-known Czech painter is an organizer of Sokol activities.

BULGARIAN GIRLS IN THE GOLDEN CAPITAL OF THE CZECHS

Nationalistic in spirit, the Sokol organization transcends national lines. It encourages distinctive arts and costumes and keeps alive local traditions.

 Natural Color Photographs by Hans Hildenbrand

LATVIA SENT GIRL DELEGATES TO THE GREAT STADIUM IN PRAHA

Like the Olympic Games, the Sokol Festival draws participants and spectators from afar. Posters announcing the meeting decorate railway stations and tourist agencies throughout Europe. A group of girls from Rīga.

WHEN GOLDEN PRAHA ENTERTAINS THE MAJESTIC SOKOL FESTIVAL

MACEDONIAN DRESS ENLIVENED THE PAN-SOKOL GATHERING

Sixty thousand people, some wearing the uniform, some dressed in diverse native costumes from Slavic lands, marched through the picturesque streets of "Zlata Praha"—Golden Prague.

© National Geographic Society Natural Color Photographs by Hans Hildenbrand

SOLID SUPPORTERS OF THE MOVEMENT

Dr. Tyrš conceived physical training as a factor in social unity and spiritual strength. The Sokol uniform is worn not only by athletes in the prime of youth but by mature leaders in wholesome living.

CZECHOSLOVAK YOUTH IN A PATRIOTIC PANTOMIME

A full-fledged Sokol member must be 18 years of age, but youngsters are trained in dramatic drills picturing the struggle of youth for liberty and strength.

© National Geographic Society Natural Color Photographs by Hans Hildenbrand

SCHOOL CHILDREN AWAIT THE SIGNAL FOR A MASS DRILL

A taste for this training is inculcated in the young and 25,000 students between the ages of 9 and 14 appeared in drills and contests based on Sokol principles.

which won the geographic setting for an accomplished fact.

Dr. Tyrš built his dream on a drill squad of 75 Sokol members, who initiated his system of gymnastics on March 5, 1862. The First Pan-Sokol Festival in 1881, including 696 Sokols gathered from 76 different units, was considered a great success.

The Seventh Sokol Festival in Praha in 1920, involving the mobilization of 70,000 trained athletes and countless spectators, was a major factor in the consolidation of a new nation in the heart of Europe. Czech consciousness and patriotism, fostered by the Sokol organization for nearly 60 years, had proved its worth.

Shortly before the 1932 festival I flew over the great stadium on Strahov Hill. It seemed more like a village than an arena.

There were 140,000 participants in this year's meeting. From June 5 to July 6 the athletic colony was busy. Preceding the main adult festival, from July 2 to July 6, first the children, then the adolescents, displayed their skill and training. From June 29 to July 6 the streets were a riot of color in informal or formal parades of marchers in local or national dress.

THE SOKOL ATTRACTS VISITORS FROM AFAR

Delegates from neighboring lands added even greater variety to the display, which took on characteristics of a fashion show of peasant handicrafts and needlework. Although membership is limited to Slavs and a few nationals from countries which fought on the side of the Entente during the World War, Serbs, Croats, Slovenes, and Bulgars have been allied with the Czechs in the Sokol movement and recent festivals have had an international aspect.

The Stars and Stripes wave over many a colorful procession and July 4 is celebrated as the "Fourth of July."

It is hard to understand how drill teams from 3,144 widely distributed units arrive at such perfection; but the Sokol organization has its own publishing plant and the music to which the movements are set is distributed long before the show.

Special gramophone records are made and sent to all parts of the country, and on Sunday mornings the Praha broadcasting station is used by Sokol instructors, who give directions and the words of command which are employed in the final exhibitions. Nothing is left to chance. That is contrary to the entire Sokol spirit.

The festivals are distinguished not only by mass drills and colorful parades, but also by an allegorical pageant.

In 1932 this allegory related this radio-directed spectacle with the original Olympic festivals which inspired Dr. Tyrš.

From the central stage a figure impersonating the Sokol founder expressed his aspirations for a healthy State composed of healthy beings. Time turned back to Olympia, where such ideals were so notably exemplified. Greek champions, warriors, priests, and poets engaged in spirited contests, and ancient Greece lived again.

THE SPIRIT OF OLYMPIA IN A MODERN STATE

These representatives of antique glories then turned into lifeless statues. There was a pause, during which one could sense the loss the world suffered when the glory that was Greece became a memory. Then the statues came to life, cast aside the drapings of an outworn past, and appeared in the Sokol uniforms which had won new glory during the mass drills of the earlier days of the festival. The Olympic ideal, resurrected, took a place in practical, modern living.

All classes unite in this great exhibition of individual health and group efficiency. Visitors here see a unified nation in concerted action.

Many a Czechoslovak is getting an even greater thrill. Splendid as is the spectacle from the side lines, a part in the big game is even more moving. Every six years a hundred thousand players, trained away from awkwardness and self-consciousness to grace and group-consciousness during months or years of practice, win a rich reward for their efforts. Small teams of athletes cannot attain this nation-wide spirit of coördination. The Sokol Festival is the flower of an entire nation's growth.

During these golden days in Praha a highly industrialized and modern nation lives in the fairyland of beauty and dreams. Where has a dream proved more practical than that of Tyrš, who, behind trained muscles, glimpsed clear, clean, thinking minds and the free State they were to build and serve?

Photograph courtesy U. S. Biological Survey

FREE LUNCH FOR A FEATHERED FRIEND

A Florida jay at Sebring, Florida, taking food from the hand of Dr. E. W. Nelson, until recently chief of the U. S. Biological Survey and a contributor of notable natural-history articles to the NATIONAL GEOGRAPHIC MAGAZINE (see page 71).

Photograph by George Shiras, 3d

EVEN A STUFFED OWL MAKES HIM SEE RED

One of the chief delights of a group of Florida blue jays is to locate some sleepy old owl and worry him. This one is attacking a stuffed owl and is a bit puzzled because the victim shows no interest in his onslaught (see text, page 61, and illustration, page 58).

CROWS, MAGPIES, AND JAYS

Unusual Intelligence Has Earned a Unique Position For These Birds

By T. Gilbert Pearson

President of the National Association of Audubon Societies

With Paintings from Life by Maj. Allan Brooks

The Geographic presents in this issue the third of a comprehensive series of paintings descriptive of all the important families of birds of North America. The first, "Seeking the Smallest Feathered Creatures (Humming Birds)," appeared in the issue for July, 1932, and the second, "The Large Wading Birds (Herons, Ibises, and Flamingos)," in the issue for October, 1932. The fourth of the series will be published in an early number of the National Geographic Magazine.—Editor.

WHILE driving along an unfrequented road in the semidesert country of southern Oregon, I noticed at a distance two large birds apparently engaged in some kind of game. They would fly almost together, then one would dive and quickly mount aloft. Twice he alighted on the ground, but only to rise at once. As we approached, they separated, one perching on the post of a barbed-wire fence. When we were within 80 yards, he flew to a distant post. For half a mile he thus preceded us with short flights.

This bird was carrying something in his beak. My companion fired his revolver, and the bird dropped an object which proved to be the dried leg bone of a jack rabbit. We had come upon a pair of ravens at a time when they were in one of their playful moods. Sometimes a dozen or more may be seen maneuvering about each other, nose-diving, volplaning, or tumbling about in mimic combats. For the time all dignity is forgotten and the solemn birds present a performance entirely out of keeping with what is generally regarded as their usual habits of life.

The Raven in Folklore

Tradition emphasizes the idea that the raven is a dour and somber bird. The shadow of his sable wings falling across the path of a bride foretells disaster. He is sinister and mysterious, and his coarse croakings through the centuries have been thought prophetic and portentous of evil.

His remarkable sagacity has caused many to believe that he possesses attributes of a divine nature, while others think that his uncanny shrewdness is derived directly from the Evil One. Odin, the chief god of the Norsemen, was attended by two ravens, who whispered advice in his ears. It was the raven that Noah first sent forth from the Ark. To Elijah, hiding by the brook Cherith, the ravens brought food. In Wales the legendary hero, Owein, was accompanied by an army of ravens that guarded him from harm. In Ireland, Cú Chulaim had the constant service of two magic ravens to warn him of the coming of his foes. The Greeks were not unmindful of the raven's power.

Tradition is back of the ravens kept in the Tower of London; there is meaning in the raven forms carved on the totem poles of Alaska.

The Pilgrims Warred on the Raven

In the world are many thousands of species of birds to which the people pay scant attention. But wherever the raven is found, the inhabitants are aware of his presence, and tell of his weird powers as they gather about the campfire or sit in council in the igloo, the hogan, or the mountain cabin.

Our raven is merely one of the geographical races of the ravens inhabiting many parts of the Northern Hemisphere.

The Pilgrim Fathers found him in Massachusetts, but he soon fell into evil repute, for it was discovered he would attack and

Photograph by Dr. A. A. Allen

YOUNG CROWS ARE MOSTLY APPETITE

This is the welcome home which awaits Jim Crow or his spouse when they return to the nest with dinner. They are faithful parents and work hard to keep their youngsters' voracious hunger appeased.

kill the newborn lambs and sickly sheep. So the people made war upon him, and to-day ravens do not build their nests within the boundaries of that State.

The bird is not uncommon in Maine, especially near the sea, where he is a scourge to some of the bird colonies of that rocky coast. On the island of No Mans Land, near the fishing village of Matinicus, Maine, a pair of ravens has lived for years in a nest in a sturdy evergreen tree. How long ago it was built I was not able to learn, but it is a very substantial structure. Year after year it has been repaired by the addition of a few new sticks, a little fresh wool, a few billfuls of seaweed, and small roots to help shape afresh the ample bowl for the eggs.

Defying the fierce gales which in winter sweep over these icy seas, the eerie stands secure, and every season has seen it occupied by young ravens, which, here at least, need not "lack and suffer hunger."

On this rocky island, safe from the ordinary enemies of birds which haunt the neighboring mainland, many thousands of herring gulls assemble in summer. Their eggs, as well as the young, are constantly eaten by the ravens, and a continuous warfare goes on between the two species.

On a sagebrush slope in northern Nevada I found a raven feeding upon a sage hen, and in a little opening in a Utah forest I came upon three ravens and a turkey vulture eating the body of a young mule deer. Probably in neither case were the ravens responsible for the death of the creatures upon which they were feasting.

It makes no difference to the raven how long an animal has been dead; he seems to relish carrion just as much as he enjoys the flesh of recently killed animals. Groups of ravens gather every day in summer about the refuse heaps back of the hotels in Yellowstone National Park and pick over the garbage in company with the bears. Often you may find one or more waiting expectantly on the posts of a certain corral in Glacier National Park.

Just north of the Grand Canyon, in northern Arizona, lies the Kaibab Plateau, with its famous deer herd attracting tourists from afar. Here, when the deer were accustomed to gather in the afternoon, I

From E. R. Kalmbach

WHAT IT TAKES TO RAISE A CROW

The nestling crow requires about 10 ounces of food per day, or about 13⅛ pounds for its nestling life of three weeks. At the end of that time it will weigh about a pound. During this period it will have eaten two and a quarter times its own weight of May beetles. The grasshoppers it has eaten would, if combined, form a mammoth insect about twice the size of the bird. Wild birds and poultry would each form a mass about a fifth of the crow's weight and corn about one and one-half times its mass. Here are pictured a fully fledged young crow and its principal food items. These include small mammals, spiders, caterpillars, May beetles, poultry, wild birds, miscellaneous beetles, carrion, corn, amphibians, crustaceans, and grasshoppers. These are all drawn to a scale that approximately represents the aggregate mass of the different items consumed during the nestling life, compared with the bird that ate them.

noticed that ravens were frequently present. In August, 1924, I counted more than 60 at one time. They would sail out from over the forest and gradually descend to the short grass, there to walk sedately about and feed upon the numerous grasshoppers of the valley.

Very rarely one sees so many ravens together. Usually they are found only in family groups, composed of the parents and their offspring. When the young have attained the necessary age and experience to shift for themselves, they wander off, but their elders remain together even until the snow begins to melt and the call comes to repair again the old nest.

RAVENS SEEK LOFTY NESTING SITES

Although sometimes ravens use trees as nesting sites, their usual selection is a high, beetling cliff. Here, often hundreds of feet above the sea, or above the floor of

Photograph by George Shiras, 3d

A CANADA JAY INVESTIGATING A HAUNCH OF VENISON

Meat is his favorite food and the sound of a hunter's gun seems to attract rather than to frighten him, for he has learned to associate that sound with meat (see text, page 76, and illustrations, pages 61, 63).

some inland valley, protected by projecting rock above, the nest is built in a niche of the wall. Such situations are exceedingly difficult to approach and the birds cannot readily be disturbed by any creature not possessing wings.

The cranny chosen for a nesting site may be of any shape, and often must be well filled in order to make a substantial structure of proper size and shape. The nests of many birds show little variety in their form or in the character of the materials used. This is not the case with the ravens, for their practical imagination permits them to adapt their nest to almost any kind of opening in the rock, and to use a wide variety of objects in its construction.

A few of the materials that have been noted as component parts of the nest are: sticks, twigs, cow-ribs, rope ends, ragged canvas, fragments of cloth of various kinds, moss, seaweed, roots of many sizes, hay, cow dung, clusters of hair from the carcasses of deer, horses, cows, and coyotes, and strips of hide and shredded bark.

That the raven's wit sometimes fails him is illustrated in an account by a California ornithologist, who for some time watched a pair carrying sticks to a certain point on a cliff. He says: "Investigation disclosed an astonishing condition of affairs. The daffy birds had been trying to lodge the foundations of a nest in a small sloping crevice where any sort of lodgment was practically impossible. As a result, every stick had fallen, in its turn, until a pile 6 feet in diameter and not less than 2 feet high lay at the bottom of the cliff—two hundred pounds' weight of wood and not a mud-sill to the good yet! And about 40 feet along, under the same cliff, was another stick pile, evidently the accumulation of the preceding season."

The raven mates for life and a pair uses the same nest season after season. These birds are extremely devoted to their young and to each other. Their domestic lives, therefore, are very regular, well ordered, and much more formal than those of the average bird.

The Family *Corvidae* in America includes two subfamilies. One is the jays and magpies; the other, ravens, crows,

piñon jays, and nutcrackers. It is represented in North America by 17 species and 22 subspecies, or varieties. If to these be added two European species, the rook (*Corvus frugilegus frugilegus*) and the hooded crow (*Corvus cornix cornix*), which have been recorded as accidental wanderers to Greenland or Iceland, we find a total of 41 kinds of the *Corvidae* which have been accredited to this continent north of Mexico.

Photograph by Dr. A. A. Allen

YOUNG CROWS TAME EASILY AND MAKE INTERESTING PETS

All three of these desperate-looking plotters are at work hatching some mischief and Jimmie Crow is probably in the thick of it (see text, page 58).

THE COMMON CROW

South America is the only continent where there are no native crows. Africa has a black-and-white species and Asia one whose black feathers are interspersed with markings of gray and brown. In Europe some of the family representatives are rooks, jackdaws, and carrion crows. The first named congregate in vast numbers to roost, and this practice has given us the name "rookery," which in the United States is applied to any numerous assemblage of birds in trees.

In the Piedmont country of North Carolina I came upon a little girl weeping beside the road. The mother, with red and toil-worn hands, was caressing her child and trying to comfort her. Dismounting, I led my horse nearer and learned that the outburst of grief was caused by a crow which had just killed and carried away the last of five newly hatched chickens, the pets of the distressed child.

It was no use telling these people that the crow is not really as black as he is painted, that he eats many grubs and beetles, and does much good about the farm. They lived with him throughout the year and found their contacts with him too intimate and disturbing. Crows had stolen their hens' eggs repeatedly and now had begun to acquire a taste for young chickens. Crows pecked holes in their melons; pulled up sprouting corn, and robbed the nests of birds which the family liked to have about the home. In fact, they were so destructive that the father had devised every means he could think of to rid the place of their presence.

The opinion which this family held about crows is entertained generally by farmers. In almost every community where the crow appears in numbers, the

Photograph from Dr. Spencer R. Atkinson

"FUCK-OF-THE-WOODS" HAS SOME FRIENDS AND MANY ENEMIES

The California jay is an impertinent creature, who seems to take conscious delight in mischief-making. Nothing could be saucier than this rascal, as, perched on a twig, he dips his head in a mocking bow, jerks his tail, and screams anathemas to the world at large. He destroys millions of other birds' eggs every year and takes keen delight in pecking cats' tails (see page 79).

Photograph by George Shiras, 3d

HE IS NOT AS NOISY AS HIS COUSIN, THE BLUE JAY

Florida jays are found only where there is a dense growth of oak and shrubby bushes or in adjacent sand-pine areas. They respond readily to human advances (see pages 50, 59).

Photograph by Dr. A. A. Allen

CROWS AT A WATER HOLE IN ITHACA, NEW YORK

The crow comes close to being the "great American bird," for it is likely that a thousand people know him personally for every one who ever saw a live eagle. He has waged a successful battle for existence, and there are probably more of his clan here now than there were when the Pilgrims came. Henry Ward Beecher once remarked that if men wore feathers and wings, very few of them would be clever enough to be crows.

inhabitants view his presence with apprehension and dislike. From the early settlement by Europeans, every man's hand has been against him. Scarecrows erected in ten thousand fields and poisoned grain scattered about have had little effect.

No town or city ordinance and no State or Federal law protects the crow. Bounties have been offered for his head. Neighborhood campaigns for destruction of crow nests and "shoots" at their roosting colonies have been organized and enthusiastically put into execution times without number.

Despite this widespread, continuous, and almost universal campaign for its destruction, the crow has steadily increased and yearly his numbers are becoming greater. In the bird world the crow is one great American success.

Personally I am very fond of the crow. He is such a shrewd fellow and so tremendously successful in the struggle of life that I cannot but admire him. His caw on a frosty morning reaches my ears from across the fields and I know there is life abroad in the land. He is the one bird I am pretty sure to see when the snow is deep and the sleet glistens on the trees. Sometimes I have seen him on an ice cake riding down the Hudson.

In summer I find him tearing rotten logs to pieces and turning over bark and sticks, and I see numbers of crows swarming in flocks over the newly plowed fields looking for grubs. I enjoy the sight of a

Photograph by Dr. A. A. Allen

A FLORIDA BLUE JAY AND PROOF OF HIS IDENTITY

This species is somewhat smaller and grayer and has narrower white tips to the feathers than the northern race. Although not a shy bird and quite at home in city streets, he does not tame as readily as his neighbor, the Florida jay (see pages 68-71).

crow, but I am a bird lover and therefore not an unbiased observer. Furthermore, I have no chickens, no melon patches, not even a cornfield, for him to raid.

YOUNG CROWS MAKE AMUSING PETS

Young crows make interesting pets. They are voracious eaters and require much food to keep them in a contented frame of mind, but they pay for their keep by performing many curious antics and by their amusing attempts to imitate the words and voices of the people about them.

They are fond of collecting and hiding bright trinkets of many kinds. A broken bit of china, a dry chicken bone, the cap from a ginger-ale bottle, a small block of painted wood, a glossy beetle, and pebbles of various hues are objects which may take their fancy. They have been known to carry away thimbles, small scissors, and pipes. Sometimes their treasures are hoarded in a hidden nook, or they may be buried here and there about the yard or in the garden. They are often forgotten, but sometimes are exhumed and transferred to some other favorite hiding place.

Crows often accumulate in large numbers. Hundreds of thousands have been known to assemble in some favorite roost. At times a flock will gather and engage in vociferous cawing. They make seemingly

Photograph by H. W. Brandt

LENDING A HAND TO A FLORIDA JAY AT SEBRING (SEE PAGE 71)

Photograph by Guy A. Bailey

MRS. BLUE JAY MAKES A DEVOTED MOTHER

Usually she and her mate build a new nest each year, using twigs and small branches broken from the trees. Although generally a noisy bird, the blue jay becomes a model of quiet and caution while the young are in the nest (see text, page 68).

Photograph by Dr. A. A. Allen.

ONE OF AMERICA'S BEST-KNOWN BIRDS TAKES THE STUMP

The handsome and active northern blue jay likes to hear his own voice, and is seldom so well pleased as when making a hair-raising din and a lot of fuss and excitement about nothing. From a safe thicket of vines, he makes so bold as to hurl nasty epithets at hawks, but in the open keeps discreetly out of their way (see page 68).

useless short flights, shift their positions on the limbs, or move from one perch or tree to another, all the time keeping up a most animated series of calls pitched in various keys.

Some observers claim that crows talk. It certainly is true that their various notes are understood by their fellows, who at once react as the emergency requires. These so-called "crow conventions" are most amusing and would probably be extremely interesting if we could know what they were all about. Some observers claim that they hold trials over the conduct of some of their members. There is little evidence, however, that anything of this kind takes place.

The nearest opportunity I ever had of being a witness to any of their activities suggesting condemnation proceedings against one of their kind occurred one winter evening while I was watching scattered flocks of hundreds of crows coming to their roost.

Suddenly I became conscious of an unusual commotion among a group of eight. One evidently was in great disfavor with the others, for with angry and excited cawings they were striking at him most vigorously. The strength of the persecuted bird was all but spent when I first sighted him, and when, a moment later, the fleeing one sustained a particularly vicious onslaught, he began to fall. He did not descend gradually, like a bird injured on the wing, but plunged downward like a falling rock for 100 feet or more, into the top of a large pine tree and, bounding from limb to limb, struck the ground only a few yards from me. Upon picking him up I found him to be dead.

THE AMERICAN MAGPIE

In the western part of our country is found the black-billed magpie, very closely related to the magpies of Europe and Asia. In some of the States it is a numerous species, and because of its large size, striking contrasts of plumage, and extremely vociferous habits, it is one of the outstanding birds which cannot readily be overlooked, even by the most casual observer.

Photograph by George Shiras, 3d

A DENIZEN OF THE NORTH WOODS SHOWS SCANT FEAR OF MAN

The Canada jay lives in the coniferous forests on the fringe or beyond the limits of civilization and is remarkably tame and bold. Despite an enormous capacity for food, he sometimes gets enough, and then stores his surplus in tree crevices. This reserve supply enables him to sustain his young in early spring, before good foraging is possible (see page 70).

This is another representative of the family *Corvidae* which is unpopular with various groups of people. Cattlemen tell you that he attacks weak or injured stock, and that by pecking the scars made by the branding irons on calves or colts he prevents the wounds from healing.

All observers agree that the magpies are a scourge to many birds, and that nests are constantly raided by them. Mourning doves, meadow larks, and other birds nesting on or near the ground are especially subject to raids. The eggs and young of swallows are dainties which parent magpies delight to gather for their young. Of course, they eat crickets and grasshoppers as well. A mouse is not safe if a magpie discovers it away from cover.

Ground squirrels are killed by them, and magpies have been known to wait long and patiently for one of these rodents to emerge from its hole, when it is pounced upon and dispatched with blows from the powerful bill.

I have seen flocks of magpies in Alaska, Colorado, and elsewhere engaged in hunting systematically every bush and tree as they progressed. From the way they peeped and peered and investigated, they were unquestionably searching for eggs and young birds. At a distance I could keep track of the onward movement of the marauding band by the cries of alarm and distress raised by the smaller feathered inhabitants of the underbrush.

THE BLUE JAY

It would be difficult to find a more noisy bird than our beautiful blue jay, and when a family group takes up its habitation in the trees about a dwelling, the occupants are kept fully aware of the fact that this bird is in the neighborhood. His note at dawn has been compared to a shout.

These jays have a great variety of calls and often imitate the notes and cries of other birds. Their imitation of the call of the red-shouldered hawk is so nearly perfect as often to deceive the bird student.

Their vocal performances are at their best when an owl is discovered. Shrill screams call together all the jays of the

Photograph by William L. and Irene Finley

CLARK'S NUTCRACKER INHABITS THE HIGH MOUNTAINS OF THE WEST

This avian mountaineer has a harsh, grating voice. One note, which he seems to use when at play, closely resembles the scream of a mountain lion. He is hardy and a good fighter; he has been known to tackle a golden eagle. His powerful claws and beak also serve him well for extracting seeds from pine and other cones (see page 75).

neighborhood. With flashings of blue and white feathers, they arrive and at once plunge into the fray. Abuse is poured out on the sleepy owl, who desires nothing so much as to be left alone. Growing bolder, the jays approach within a few feet of their traditional enemy and shriek anathemas at him in the most outrageous language known to the hardiest members of a blue-jay mob. This fuss and din may continue for half an hour before the owl is driven away (see page 50).

Jays are silent, however, when about their nest during the period of its construction; also while the eggs are being incubated and when the young are being fed. I have never seen a jay go directly to its nest. Once I watched a mother perch 21 times before she reached her eggs and settled upon them. Her approach and departure are accomplished with extreme stealth and caution.

The nest is usually placed in the crotch of a limb some 10 to 30 feet from the ground. I have found nests in old pear trees at an elevation of only six feet, and again in pine trees many times that distance from the earth. The nest is composed of dead twigs, usually broken from the trees for the purpose. Rootlets for a lining are much used. The eggs are drab-colored, with brownish spots, and number from four to six. Seventeen days are usually required for them to hatch.

Like most of the members of his tribe, this jay bears the reputation of being a plunderer of the nests of other birds. Evidences of this habit I have rarely seen, although for many years I have been on the watch for them. Once I saw a hungry jay try to strike down a junco feeding on the snow, and again I saw one seize and kill a young English sparrow just out of the nest. Twice I have seen them taking eggs from a robin's nest.

Blue jays eat insects of various kinds and acorns and beech mast are staple articles of diet. When such food is scarce jays will migrate considerable distances in search of it.

Fifty years ago little settlements began to spring up in the pine-woods country of

Photograph by George Shiras, 3d

"WHISKEY JACK" NEVER FAILS TO HEED THE MESS CALL

The Canada jay has an appetite so omnivorous that he has been known to consume large quantities of soap. His nickname may have come from the Indian word "wiskedjack," or from another Indian term, "wiss-ka-chon," corrupted by white men to "Whiskey John" and then to "Whiskey Jack" (see page 76).

central Florida. Jays were not very common there at that time. The settlers planted water oaks for shade, and as these and other deciduous trees developed, the character of the bird life began to change. Crested flycatchers, chuck-will's-widows, cardinals, and wrens, hitherto but little known in that immediate neighborhood, began to come about the houses. Inland towns to-day have bountiful acorn crops, and blue jays are abundant.

Blue jays are very engaging birds. You may suspect them of taking the eggs from the robin or yellow warbler's nest which you have been watching; you may object to their cries and shouts, but the blue jay is the dashing, handsome rake of the village.

In a vast evergreen forest in the mountains of Montana I was awakened one morning by a sound that was entirely new to me. A guttural, grating, rattling note, difficult to describe, yet easy to remember, was issuing from some point near by. Cautiously raising the flap of my sleeping bag, I discovered the author of the sounds. On a low limb of a tree sat a stocky, gray bird at least a foot in length. His wings were glossy black with a dash of white. He was peering at his companion standing on the ground by the log where we had eaten our supper the evening before. This was my first acquaintance with the "big camp robber," or Clark's crow, and the meeting was just as I would have had it—a perfectly natural environment and a visit staged in a manner wholly characteristic of this little-known bird.

High up on the slopes of Pikes Peak, a Clark's nutcracker dashed from a stunted conifer in pursuit of another. Straight out from the mountain they flew. Four hundred yards or more away, they turned to the misty valley far beneath and plunged downward, volplaning, banking, flying with flapping wings, but always descending until, perhaps 2,000 feet below, they were lost to my view. Diving flights from such dizzy heights meant nothing to them. In the wilderness the Clark's nutcracker is as adventurous as was the great explorer of the Northwest who first discovered it to science and whose name it bears.

NORTHERN RAVEN (Corvus corax principalis)

The raven looks like a large crow. Although it appears to be about twice the size of its smaller relative, as a matter of fact it is not. The common crow is from 17 to 21 inches long from bill tip to tail tip. Ravens vary from twenty-one and a half to twenty-six and a half inches. The raven is always heavier, the head and beak are stouter, the feathers on the throat are pointed and not rounded, and the cry is a deep-voiced croak that is unmistakably different from any note which a crow can produce. It is a bird of the mountains, of rocky cliffs by the sea, of barren mesas, of semiarid deserts, and of the great uncut forest lands.

It has retreated before the advance of man, being still an inhabitant of the wilderness. Its food is the offal or carcasses of animals, fish, and crabs gathered by the sea, insects, eggs, and helpless young birds of any species. As it comes very little in contact with man, its economic interest is not important.

Like many species of birds, the raven feeds its young for a time by regurgitation. Its devotion to its offspring is very great, and it is said to attack the eagle, if necessary, to protect them. The parents stay with the young, feeding them, guarding them, and teaching them the ways of the raven world throughout the summer, long after they have left the nest.

The northern raven is found from the Arctic Ocean southward to the northern tier of States and in the Alleghenies to Georgia.

AMERICAN RAVEN (C. c. sinuatus). This is a subspecies occurring from British Columbia, Montana, and North Dakota southward to Nicaragua.

WHITE-NECKED RAVEN (C. cryptoleucus). The white on the neck of this bird is seen only if the neck feathers are raised, since it is found only at the base of the feathers. The bird's habitat is the desert region of western United States and Mexico, from Arizona, New Mexico, and central Texas southward. Of a size midway between the common crow and the northern raven, it is often seen perched on telephone poles in towns.

EASTERN CROW (Corvus brachyrhynchos brachyrhynchos)

This is the common crow of much of eastern North America. The northern boundary of its breeding range is along a line extending from Newfoundland and through Quebec to Manitoba. From here it spreads in a southward and southeastward direction through the States to Maryland, the northern part of the Gulf States, and northern Texas. It winters generally in the United States.

The common crow is one of the best-known birds in this country and in many regions it is extremely abundant.

In the autumn, in some sections, crows congregate in large numbers to roost in a favorite grove, and here come together nightly for many weeks. In the morning they spread out over a great area of country in search of food. Long before sundown they begin to return from all directions, continuing to arrive singly or in small groups until dark. Many thousands thus assemble in a single roost.

They are very cunning and know to a nicety the range of a gun. In the woods and fields it is only by accident, or by the exercise of careful strategy, that a man may approach this bird close enough to kill it.

A story has long been current that a crow will talk only if its tongue is split. This cruel practice is neither necessary nor desirable.

Crows make their nests in trees, usually in March, April, or May. Four to six eggs are laid. They are greenish blue, thickly covered with markings of various shades of brown.

This is one of the species which has been divided by ornithologists into various geographical races. There is extremely little difference in their appearance, and their general feeding, nesting, and roosting habits show only such variations necessarily due to natural surroundings. In addition to the widely distributed eastern crow, this group includes four other forms, as follows:

SOUTHERN CROW (C. b. paulus). Its territory is from the lower Potomac and Ohio valleys south to southern Georgia and eastern Texas.

FLORIDA CROW (C. b. pascuus). This variety breeds throughout most of the peninsula of Florida.

WESTERN CROW (C. b. hesperis). This western subspecies occurs from British Columbia and Saskatchewan to New Mexico and northern Baja California.

NORTHWESTERN CROW (C. b. caurinus). The range of the northwestern crow is limited to a narrow strip of country from Kodiak Island and Kukak Bay, Alaska, to Puget Sound, Washington.

FISH CROW (Corvus ossifragus)

While skirting a salt marsh on the Virginia coast one June day, I sought the shade of one of the scattered pines dotting the landscape. When on the point of sitting down, I noticed an eggshell on the carpet of pine needles. Near by was another, and still another—in fact, I soon found the remains of at least two dozen eggs of the clapper rail, which inhabited the neighboring marsh in large numbers. The eggs must have been carried to a certain large limb, where they had been eaten and the shells dropped to the ground. While I rested, one of the marauders of the marsh appeared. He was a fish crow and he carried an egg in his beak.

Fish crows eat principally crabs, fish, and such other animal food as they can find along the coast and neighboring rivers and lakes. They range from Massachusetts southward to Florida, and thence along the Gulf coast to eastern Texas. One may find them inland, especially at various places in the Southern States. The bird is smaller than the common crow and measures about sixteen inches in length. Its usual cry is a nasal, reedy *caw*, which resembles the note of the young of the larger species. The best way for the student to distinguish this bird in the field is by its note.

© National Geographic Society The upper figure is approximately one-sixth natural size; the lower figures, one-fifth

NORTHERN RAVEN

Upper

EASTERN CROW FISH CROW

AMERICAN MAGPIE

Upper

Approximately one-fourth natural size

YELLOW-BILLED MAGPIE

Lower

AMERICAN MAGPIE (Pica pica hudsonia)

In 1927, under the direction of the State authorities of Montana, 25,269 magpies were killed and 18,071 of their eggs destroyed. Nothing, perhaps, can more forcefully illustrate the popular dislike for this bird throughout the cattle- and sheep-raising districts of the Far West than the fact that ranchmen are willing to pay for its destruction.

Despite the constant warfare made on the handsome black-billed magpie, its numbers seem not to decrease, except locally, and then only for a time. When its enemies become weary of the seemingly hopeless task of exterminating it and relinquish their efforts, the birds are soon about the country in their usual numbers.

The reason for the rural westerner's dislike is that the magpie persistently destroys the eggs and young of wild birds, and hunters deplore the destruction of game birds by any wild creature which they class as "vermin." Magpies kill young chickens and eat hen's eggs when they can find them. They will gather about a sickly sheep or a cow, or the newborn young of either, and kill it by their pecking. They attack newly branded stock and freshly sheared sheep.

At times, and in some localities, these propensities render them extremely annoying. However, Mr. Kalmbach well points out: "As in most, if not all, problems of bird control, the real need for drastic action against the magpie is confined to local areas where one or another of its faults has become unduly emphasized."

Over the greater part of the magpies' range they appear only in moderate numbers. They are great scavengers, and with the ravens, and in some regions with the vultures, they help to rid the countryside of offensive carcasses. They clean up scraps of meat and offal about places where stock is butchered. They flock about Indian villages or encampments where little effort is made by men to dispose of offensive refuse. Magpies eat grasshoppers that consume the grass, which is scanty enough in many regions. They destroy countless weevils, caterpillars, and grubs and kill a certain number of noxious rodents.

The magpie, therefore, is not wholly bad. It is a comfort to one interested in the conservation of all wild life to reflect that its range is so great over vast, thinly settled sections and its fecundity so pronounced, that we may expect this striking species to live and prosper for years to come.

The magpie is a very noisy bird and is continually chattering about something. Mr. Henshaw, speaking of the flexibility and the range of its voice, said that it runs "from a guttural chuckle to the softest whistle." The bird is imitative, and here and there magpie pets learn to imitate the human voice in a highly entertaining manner.

The nest is a bulky, domed affair of twigs, built in trees. It contains a mud cup lined with rootlets. Mrs. Bailey speaks of certain old nests which "were much in demand for roof-trees by English sparrows, and to a less degree by house finches."

This species ranges from Alaska and Manitoba to New Mexico.

YELLOW-BILLED MAGPIE (Pica nuttalli)

The yellow-billed magpie is a little smaller than the American, or black-billed magpie, but the difference in size is very slight. The birds are exactly alike in appearance, except that one has a black beak and the other has a yellow one and also a bit of yellow skin back of the eye.

The difference in the distribution of these two species constitutes one of the amazing and unexplained problems in the field of ornithology. Closely related subspecies of the black-billed form are found in northern Africa, Spain, northern Europe, northern Asia, China, and western North America. The race occurs over the greater part of the Northern Hemisphere. On the other hand, the yellow-billed magpie is confined to less than half of the area of California. Why is one restricted to such a limited region and the other so widely distributed? This is a problem for evolutionists and geologists.

The yellow-billed magpie may represent a very ancient race that is dying out. Since scientific interest has been directed toward the observation of its habits and distribution, it has been discovered that its range has become more restricted. There are reports that fifty or sixty years ago it was a common bird in many places in the immediate vicinity of the coast, where the observer would now look for it in vain. It inhabits only the interior of the State west of the Sierra Nevada, from Tehama County to Ventura and Kern counties, and chiefly in the Sacramento and San Joaquin valleys.

It haunts the neighborhood of stock ranches, because food to its liking is usually plentiful in such places. When cattle and sheep are butchered, the refuse attracts magpies. They gather about any animal which accident or disease has killed. They feed also on grasshoppers, worms, and grubs to be found in certain places, and, of course, always consider the possibilities of a reasonable supply of eggs of birds or of poultry.

The nest is a bulky, roughly rounded structure consisting of a great mass of twigs. In this is built a deep cup of mud or cow dung. The lining is of rootlets, pine needles, dry grass, shreds of cottonwood bark, and sometimes horsehair. Egress is through a passageway in the side. An opening in the opposite direction admits of swift exit if danger threatens at the front.

These rude cradles for the young are often placed in oak trees from 10 to 60 feet above the ground. Sycamores, willows, and cottonwoods are some of the other trees chosen for nesting purposes. Small colonies of these magpies are sometimes seen, but more often a single pair, with its nest, is found in some secluded gulch or out-of-the-way corner of the ranch. The nest may be cunningly hidden among clumps of mistletoe or it may be placed in such an open situation that it can be seen from a considerable distance.

These birds become much attached to a locality and will return year after year to build their nests in the immediate vicinity of the domicile used the previous spring. Often a pair will make use of the same tree and at times even build the new nest on top of an old one.

The five to seven yellowish or olive eggs are covered with spots of brown or grayish olive.

NORTHERN BLUE JAY (Cyanocitta cristata cristata)

The blue jay is one of the best-known birds in central and eastern North America. Recently I examined an index covering for fifteen years a publication devoted largely to notes and brief articles by contributors writing of birds which had interested them. Of all the 1,420 kinds of birds that are listed as occurring in North America, the blue jay stood fourth among those most frequently mentioned in this magazine.

One of the most outstanding characteristics of this dashing, handsome bird is its propensity to make a noise. He shrieks singly and in chorus. He shouts at hawks, owls, cats, and snakes, or screams only for the pleasure of hearing himself make a hair-raising din. His shoutings fill the woodlands of southern Canada and of the eastern United States. There is no escape from his cries for any great length of time. Only in the nesting season, when domestic duties and the safety of his eggs and young demand a certain amount of vocal restraint, can he be considered a quiet bird.

It is an abundant species, but has its natural enemies. Scattered clusters of blue feathers here and there in the woods testify to the success of some hawk or owl in the capture of one of his tormentors. Sometimes these feathers appear later among the nesting material used by birds whose eggs and young the blue jay has been known to eat.

Blue jays are devoted to their nests and young and show unusual boldness in defending them. Sometimes one will sit on the nest until actually touched by the hand of the intruder. With its mate it will make a great outcry and will often come within a few feet of the person who has violated the sanctity of its nesting place.

After the young have left the nest and acquired strength in flight, the family groups forage about the country with great excitement and vociferation. Two or three families will often unite and in scattering flocks go trooping along from one grove to another, crossing, a few at a time, the open, intervening areas. As autumn approaches, they may move for many miles in quest of more ample supplies of beechnuts or acorns. Some of them stay throughout the winter in the North, but many travel long distances and pass the colder months in the more southern States.

FLORIDA BLUE JAY (C. c. florincola). This jay is a little smaller, the white tips of the feathers are more narrow, and the back is slightly grayer than that of the northern blue jay. It is found in the South Atlantic and Gulf States from the coast of North Carolina to northern Florida and westward to Louisiana.

SEMPLE'S BLUE JAY (C. c. semplei). This bird was described to science in 1928 from specimens taken at Coconut Grove, Florida. Its range is central and southern Florida.

STELLER'S JAY (Cyanocitta stelleri)

Principally in the mountains, but also at times at lower elevations over the vast sweep of country from Alaska to Central America, the brilliant, long-crested, blue-bodied jay is found. Scientists know it in different places by separate names, but to the casual observer little, if any, difference in habits, form, or color can be detected wherever seen.

Maj. Allan Brooks here beautifully figures the Steller's jay, one of the six of this group to be mentioned. It inhabits the Pacific coast country, from the Alaska Peninsula southward to the State of Washington, including Vancouver and most of the other coastal islands. It is usually resident throughout the year, wherever it is found.

Often the nests are built in firs, saplings being preferred to the larger, taller trees. Nests 60 feet from the ground have been found, but this is unusual. Often they are not more than 5 or 10 feet from the earth. In their construction, twigs are used for the foundation and the outer supports.

Into the basket thus constructed, 8 or 10 inches across, is sunk a deep cup, lined generally with grass or moss. Then the hollow is well plastered with mud, and this in turn is lined with rootlets or pine needles. Now and then the hair of deer or cattle is used to make a soft bed for the three to five spotted eggs which are to come. The eggs are about one and a quarter inches long and the greenish-blue ground pattern is sprinkled with dots and spots of brown and lavender. Incubation requires 16 days.

Steller's jay is common in many localities and is well known to the inhabitants of the country. Singly or in small groups, it comes to the back yard searching for something to eat. Such visits may be looked for especially in winter, when snow covers its food provided for by the forest. It eats insects, vegetables, nuts, eggs, and young birds. At times it robs the California woodpecker and its kin of their store of acorns.

In addition to Steller's jay, other varieties of this group of jays, very similar to it, but possessing sufficiently small differences to justify ornithologists in accrediting them with subspecific status, are the following, found in North America north of Mexico:

QUEEN CHARLOTTE JAY (C. s. carlottae). This bird inhabits the Queen Charlotte Islands, British Columbia.

COAST JAY (C. s. carbonacea). Its range is along the Pacific coast of Oregon to the Santa Lucia Mountains of California and certain small areas to the eastward.

BLUE-FRONTED JAY (C. s. frontalis). It inhabits the high and the medium elevations of the Sierra Nevada, from Mount Shasta southward to San Diego County, California; also, it is found on various inner coastal ranges of that State.

BLACK-HEADED JAY (C. s. annectens). Its home is in boreal and transition areas of the Rocky Mountains from British Columbia south to eastern Oregon, Idaho, and Wyoming. It has been known to wander to Utah and Nebraska.

LONG-CRESTED JAY (C. s. diademata). Here, also, is a jay of the moderate and of the high altitudes. It is found in the Rocky Mountains from Utah and Wyoming southward into the States of Sonora, Zacatecas, Jalisco, and Nayarit, Mexico.

Approximately one-third natural size

NORTHERN BLUE JAY
Upper

STELLER'S JAY
Lower

© National Geographic Society

Slightly more than one-third natural size

FLORIDA JAY
Upper

WOODHOUSE'S JAY
Lower

FLORIDA JAY (Aphelocoma coerulescens)

The ornithologist rarely forgets the time and circumstances when he first made the acquaintance of a bird which he had not previously seen. Forty-three years ago a water oak stood just back of the blacksmith shop, in the village of Archer, Alachua County, Florida. Here for several hours one day a strange bird sat on its topmost twig and called in a harsh, inquiring voice. I had never seen nor heard such a bird, so the impression it made was lasting. Later I learned that it was a Florida jay, and that it was at the extreme northern limit of its range. Not one of them has ever been noted in that neighborhood since that single wanderer made its brief visit.

This jay is very local in its occurrence. It is not found in the extensive pinelands, the heavy growths of hardwood about the lakes, or in the numerous swamps, prairies, and marshes that dot the State. It dwells only where there are dense growths of scrub oak, or of other shrubby bushes, or in the pine areas immediately adjoining these places. Such favored regions are scattered here and there over about half of the Florida Peninsula.

The bird is found in many places in the immediate vicinity of the Atlantic coast, from St. Augustine to Rockdale, south of Miami. Along the Gulf coast it occurs from about the mouth of the Suwannee River southward to Naples. Inland it occupies territory northward from Naples to Palatka and the Orange Lake country.

A short distance outside of Leesburg, in Lake County, Florida, I came upon a sandy area covered with bushes from four to six feet high. This looked like Florida jay country, and although I had seen no bird of this species in all that section, I began a search and within ten minutes found four of them. They were feeding on the ground by the side of one of the overgrown cement sidewalks laid down by an optimistic real-estate company. The birds seemed rather tame. They merely flew from bush to bush and watched quietly, as though waiting for me to leave.

Where one of these slender jays is found, there is almost sure to be others, for they live in small colony groups. Among the low dunes close to the ocean, not far from New Smyrna, I once counted fourteen in a few minutes.

They are not so noisy as the blue jays, nor have I ever heard them engage in any wide variety of "songs" and calls.

Mr. A. H. Howell, who has in many places gathered notes on the Florida jay, tells of visiting Miss Werner, who, at her home near Sebring, has won the confidence of her jay neighbors. "She whistles a bright little tune and in a few minutes the jays appear from all directions, and without hesitation alight on her arm or shoulder, to take the pieces of bread she offers them. She told us she had been a year or more taming the birds, and that it was a month or more before she could get them near her. At the time of our visit, however, they had become so used to strangers that they allowed us to feed them, and even alighted on our heads or shoulders."

In low oaks these jays nest, making of twigs and rootlets the cradle for their young, and they lay three or four olive-green, black-spotted eggs.

The length of this bird is ten and three-quarters inches, this being about one inch shorter than the common blue jay of the Eastern States.

WOODHOUSE'S JAY (Aphelocoma californica woodhousei)

Adjoining the eastern line of the territory occupied by the California jay, we enter the country of the magnificent Woodhouse's jay. It dwells in the foothills and on the mountains to elevations of 5,000 to 8,000 feet, although in winter it often descends to lower altitudes.

In scrub-oak trees, junipers, and nut-producing pines common throughout most of its range, it builds its nest of twigs, weed stalks, rootlets, and horsehair. For a tree-loving bird, the situations chosen are unusually low, the nests often being not more than two or three feet from the ground. They are clamorous birds and certainly make no effort to keep their presence a secret, except in the nesting season, when stealth and caution are their habits.

They live on a wide variety of food. Insects of different kinds are taken, fruits are eaten, and nuts and acorns form a staple article of diet. This jay is detested by all the small birds of the region, for well they know that in spring he is constantly hunting for their eggs and their nestlings. A collector of scientific specimens, who placed some phœbe eggs on the ground within a few feet of his camp, complained that one of these birds purloined them all while his back was turned for a few minutes.

The Woodhouse's jay is found in locations suitable to its habits of life, from southeastern Oregon and southern Wyoming southward to southwestern Texas and westward to southeastern California. It is one of the group of species *californica*, forms of which are distributed over much of western and southwestern United States. They are all so similar in appearance that few people can distinguish between them.

Two of these, the California and the Woodhouse's jays have been mentioned. The others, as recognized by ornithologists, are as follows:

LONG-TAILED JAY (A. c. immanis). It is found in the valleys and along the mountain slopes from the Washington border southward between the Cascades and Coast Ranges, and in the Sacramento and San Joaquin valleys of California.

NICASIO JAY (A. c. oocleptica). The homeland of this member of the Jay family is the coast region of California from San Francisco Bay northward to Humboldt Bay.

BELDING'S JAY (A. c. obscura). This is a Mexican bird found in the northwestern section of Baja California southward to latitude 30°. It occurs for the most part in the hills and mountains.

XANTUS'S JAY (A. c. hypoleuca). Here is another form inhabiting a region to the southward of our border, viz., the cape region of Baja California and from there on northward to latitude 29°.

TEXAS JAY (A. c. texana). Its range lies in the central and central-western regions of Texas, "from Kerr and Edwards counties to Davis Mountains."

GREEN JAY (Xanthoura luxuosa glaucescens)

In a region of bushy thickets in south Texas a bird suddenly appeared with a twig held in its beak and gazed intently at me. Its size, form and every movement revealed the characteristics of a jay and its colors showed that it was the little-known green jay of the lower Rio Grande Valley. When it flew, I followed, for not many bird students had seen the nest of this species and I was interested in learning what disposition the bird would make of that twig.

It led me for more than half a mile, alighting frequently and appearing to make no special effort to keep out of sight, although I am sure it was aware of my movements. At length it flew into a bushy tree, still carrying the twig. When I came close it departed, but without the twig. In the tree I discovered a nest. Cutting thorns and limbs, and pushing upward among innumerable small branches, I reached it and found it to be an old one with no signs of any repairs being in progress. I have often wondered if that jay did not deliberately deceive and outwit me.

Very little has been written about its food or general habits, but it is known to occur within the limits of the United States only in the valley of the Rio Grande below Laredo, Texas.

In Mexico it is a common bird in the States of Tamaulipas and Nuevo León. Closely allied forms are found farther south, two of these within the limits of Mexico. The natives call it *pájaro verde*—green bird.

Mr. Ludlow Griscom, who has had personal experiences with green jays, has written me as follows:

"The green jay prefers a relatively dry climate and is most abundant in thick patches of scrub or in dry open gallery forest where there is considerable bushy undergrowth. It is rare or absent in Mexico in the humid rain forests near the coast. In southern Texas it is particularly fond of the dense patches of evergreen scrub which line the *resacas*, depressions filled with standing water in the prairie which formerly served as one of the mouths of the Rio Grande.

"In spite of living in such dense and impenetrable tangles, the green jay is not a difficult bird to observe, because its habits are characteristic of practically all jays throughout the world. It is bold, impertinent, and full of curiosity, and is highly social or gregarious, except for the breeding season. The bird goes about, consequently, in small flocks of eight to fifteen individuals, and the approach of their haunts by man is almost certain to bring them out in the open to look at him.

"They have a great variety of harsh screaming notes, varied with a medley of caws, toots, and whistles, and for a few minutes noisily hover about the intruder from a discreet distance and then melt silently away into the bush and are seldom seen again unless deliberately followed up. Farther south they wander through the more open forests, and in Yucatán I would suddenly find myself surrounded by a screaming flock where a moment before the forest had seemed quite silent and empty, and after satisfying their curiosity they would disappear as mysteriously as they had arrived.

"In spite of its gorgeous coloring, the green jay is surprisingly inconspicuous in its haunts. The green upper parts are not easily seen against the background of the forest, and the golden yellow merges surprisingly well with the dapple-yellow light of the more open glades."

ARIZONA JAY (Aphelocoma sieberi arizonae)

Early in November, 1913, ascending the Santa Catalina Mountains north of Tucson, Arizona, my guide kept me in the saddle all day long except for a brief rest at noon. We had crossed many miles of arid plains with cacti on every hand. Then we had climbed upward until late in the afternoon, when by a little rill we prepared to spend the night.

A headache, induced by the long ride in a beating, bright sunlight, caused me to spread my sleeping bag in the shade of one of the scrub oaks which dotted the ridges. The guide unsaddled the horses and took them to a distant grazing ground, while I lay with eyes closed, hoping for the pain to pass. I had not been resting long when a jarring, querulous note sounded from the limbs above, and there, only a few yards distant, was a pair of Arizona jays. Three others quickly appeared, and for some time they engaged in a critical examination of our duffel and of the recumbent form under the scrub-oak tree.

The next day I saw others; so, evidently, they were common in the oak belt. After entering the pine woods covering the upper regions of the mountains, no more of them were seen.

It was in December, 1873, that Robert Ridgway, writing in the Bulletin of the Essex Institute, described this bird from specimens taken in Pima County, Arizona. Its eggs were not discovered by a naturalist until 1870. It is one of the various western jays having a clearly marked and extensive range. Since Ridgway's publication concerning it the bird has been found by students in various regions. Its breeding range is believed now to cover the upper Austral Zone of southern Arizona, southern New Mexico, and parts of the neighboring Mexican States of Chihuahua and Sonora.

The nest of this jay is made usually in scrub oaks, at a height of from 10 to 15 feet from the ground. It is a rather untidy, loosely constructed affair of twigs and rootlets. When horsehair can be found, this also is employed. As a rule, the eggs are four or five in number, although six, or even seven, have been found in some nests. They are light greenish blue and are the only jay eggs in America which are not decorated with dots or spots.

Major Charles Bendire, writing of these jays in Arizona sixty years ago, said that he often saw them in spring along a near-by creek, "evidently on a raid, after eggs and the young of smaller birds, which breed in abundance here."

The food of the Arizona jay consists of insects of various kinds as well as of acorns, wild fruit, and a wide variety of seeds and nuts. They bury many acorns which later grow into trees.

COUCH'S JAY (A. s. couchi). This form of the Arizona jay occurs in the "Chisos Mountains, central-western Texas, to southern Nuevo León and northern Coahuila."

Approximately one-third natural size

GREEN JAY
Upper

ARIZONA JAY
Lower

© National Geographic Society

Approximately one-third natural size

PIÑON JAY
Upper

CLARK'S NUTCRACKER
Lower

PIÑON JAY (Cyanocephalus cyanocephalus)

When traveling in the far Western States at an altitude of from 5,000 to 8,000 feet, where the sagebrush ridges and valleys are decorated with scattering juniper and piñon, if you should chance to see a compact flock of birds wheeling about the landscape it might be interesting to stop and examine them with your binoculars. It may well be that you have come upon a foraging party of "blue crows," which the books refer to as piñon jays. They are rather short, stumpy birds, thus being somewhat different in form from the typical jay. Unquestionably they are the most noisy denizens of the regions they inhabit.

Piñon jays are sociable at all times of the year. To feed, they often gather in flocks of hundreds. When thus assembled, feeding on the ground, those in the rear continually rise and fly over their companions in front. In a kind of flattened, hooplike formation the flock goes rolling across the country. Loud chattering notes are continuous, and an advancing company may be heard long before the birds come into view. Their notes are of many kinds. About the nest they are low and soft, soothing and reassuring. There is a single harsh, guttural, rasping call frequently uttered as the birds fly about the trees. Also there are many squeaks and clucks and chatters which strongly suggest the sounds produced by the eastern blue jay.

Because of the wild, unsettled country usually inhabited by piñon jays, and of the fact that they are erratic in their movements, and more or less local in their distribution, comparatively few bird students have been privileged to witness their nesting habits. Mrs. Florence Merriam Bailey, who has had long experience with birds in the western wilderness, has given us a picture of the season, location and conditions of their nesting, as seen by others. In part she has written:

"In 1013, west of the Rio Grande, on the San Mateo and Gila River Forest Reserves, Mr. Ligon found them constant residents, wintering in flocks, nesting in colonies, roosting in thick tall pines, generally on canyons, and meriting the name of 'the most noisy bird in the southwest.' He says they nest generally from March 1 to 31, in gray live oaks among the piñons, though occasionally in piñons, even where the oaks can be had. On February 10, 1013, he noted that the birds showed 'nesting inclinations, flying two and three together.' On February 17, while the ground was still half covered with snow, on the southwest side of Black Mountain in the Datil Forest, at about 7,500 feet, he found one nest about complete and others under construction, in scattered scrub oaks on a steep grassy canyon side. There were more than 50 birds in pairs and flocks mingling and scattering and flying about noisily. On March 3, he returned to the colony and found nests in almost all the scrub oaks of sufficient size, but never more than one in a tree. One, half completed, was in a juniper. The birds, slow to leave their nests, finally did so noisily. As it had snowed many times since his first visit, the nests were damp from melted snow. Nearly all contained four eggs, but one had five. The birds were continually going and coming to their feeding grounds, where the main body stayed bunched."

Piñon jays breed chiefly in piñon and juniper belts in the mountains, from central Washington, Idaho, and central Montana south to northern Baja California, Arizona, southern New Mexico and western Texas, and from the Sierra-Cascade ranges east to the eastern base of the Rocky Mountains and northwestern Nebraska.

CLARK'S NUTCRACKER (Nucifraga columbiana)

Herders who drive their sheep to the higher grazing grounds in the Western States, guides who conduct hunting or fishing parties up to the great plateaus and about the shoulders of the towering mountains, and wandering miners, all will give you bits of conflicting information concerning the habits of the Clark's nutcracker.

From such men of the open one will hear much that, with patience, he can readily observe for himself, for these large gray and black-winged inhabitants of the wilderness will come to one's very tent door. Rarely they become so bold as the jays of the neighborhood, and they will not take as many liberties with your belongings, especially if you are at hand. However, they will come to the camp for food, and, with a little discretion, can be studied quite at leisure.

The nutcrackers make a very pretty picture, walking sedately about, much after the manner of crows. Now and then they may be seen chasing insects like a domestic hen, for they are almost as much at home on the ground as in the trees. They consume great numbers of grasshoppers and the large, wingless crickets of the mountains. At times they chase butterflies, catching them on the wing. They also cling to the sides of tree trunks and peck in the bark for grubs, as do the woodpeckers. They raid the cones of the pine trees for their seeds and feed on piñon nuts, which constitute a staple and very important article of their diet.

The nutcrackers are birds of the mountain heights and in summer delight to play along the tree line. In many places they gather in the fir belt for purposes of nesting. Wheelock says of them: "Their nests were all rather bulky, composed first of a platform of twigs, each one nearly a foot in length, so interlaced that to pull one was to disarrange the mass. Upon this, and held in place by the twigs at the sides, was the nest—a soft warm hemisphere of fine strips of bark, matted with grasses and pine needles until it was almost like felt. This is stiffened, bound, and made firmer by coarse strips of bark around the outside, these also binding it to the twigs and helping hold it to the limb. So firmly is the whole put together and fastened to the branch, that no storm can move it from its foundations."

The birds breed early in the year, when there is little travel in the heavy snows of the upper ranges, so their nests are rarely seen. Egg-laying begins in February or March. Incubation requires eighteen days. Their breeding range extends from southern Alaska, southwestern Alberta, and western South Dakota south to the high mountains of Baja California, Arizona, and New Mexico.

CANADA JAY (Perisoreus canadensis)

One winter day I followed for a time a bear trail which wandered here and there through the snow among the ridges flanking a forested mountain. This was in the Adirondacks of northern New York State. Wearied at length, I brushed the snow from a log and sat down to enjoy the sandwich I had brought from camp. The forest was very still. There was no wind, and not one living creature had I seen or heard since leaving camp that morning. My only evidence that animal life existed in the country was that bear spoor and some deer tracks I had crossed.

Then suddenly two birds appeared. Neither one was sixty feet away. They were a little less than a foot in length, were gray in color, with some white and a little black in the plumage. Quietly they looked down from the limbs upon me—or perhaps upon my fast-disappearing sandwich, which might have been of more interest to them. Now and then one changed his position to come a little nearer. They exhibited no alarm, but rather a mild curiosity, mingled with restrained eagerness. Not a sound did they utter. It was almost eerie to watch these birds in pantomime, here in the white silence of the great forest. They remained until I departed, leaving on the log some of the bread and a little meat as a token of my appreciation of their visit. I had seen at close range my first Canada jays.

In later years I was to see them in their more northern summer home. About logging camps, or wherever man tarries for a time in the wilderness, they make their appearance. I know of no bird that is so bold. He will light on a low limb and watch the kettle boil or the meat frying in the pan. He will drop down and seize a piece of bacon, raw or cooked. He will snatch a cracker from the box inside the tent. He will peck at the fresh meat hung up to cool.

It is well to be careful of the articles one leaves lying about, for "Whiskey Jack" is the famous "camp robber" of the North. He will carry off your matches, your pencil, your cigarette, or your piece of chewing tobacco, although what he wants with such things I cannot guess. He will peck to pieces your candles or soap and carry away in chunks the fish you catch. He visits the trap line and takes the bait. He is aware of the presence of hunters and comes at the sound of the gun, knowing that when a moose or a deer is killed great feasting is in store for himself and his friends. There seems to be no end to the mischief that "Jack" can make about a camp in the wilderness. However, let us remember that he does eat insects and, now and then, a mouse.

The Canada jay breeds from the limit of conifers, from Labrador to British Columbia, and southward to northern Minnesota, and to Maine. Its nests are placed in trees and are composed of twigs, plant fibers, bark, moss and other soft materials. The bird lays from three to five brownish spotted eggs.

ROCKY MOUNTAIN JAY (P. c. capitalis). This bird is very similar to *P. c. canadensis*. It breeds in the mountains from British Columbia to South Dakota and New Mexico.

ALASKA JAY (P. c. fumifrons). Inhabits the wooded parts of Alaska except the southeastern coastal district.

OREGON JAY (Perisoreus obscurus)

As will readily be seen from the accompanying drawings by Allan Brooks, the Oregon jay and the Canada jay have certain marked resemblances in figure and color. Like all the forms of the genus *Perisoreus*, their bills are short, and they remind one more of overgrown chickadees than of the jays with which most people are familiar. Also, they lack some of the sleek, smart appearance characteristic of the typical jays.

The species is an inhabitant of the coastal area from southwestern British Columbia and western Washington southward to Mendocino County, California. The species *obscurus* is now recognized as being composed of two subspecies, the Oregon jay and the gray jay (*P. o. griseus*). Since their ranges join and the two species look so much alike, the student may have difficulty in determining which bird he is observing, unless he informs himself carefully as to the exact range of each. The gray jay is found in southwestern British Columbia, south-central Washington, and Oregon through the Cascade Mountains to California. The jays of this species seen in the fir regions of the Warner Mountains and on Mt. Shasta, for example, are gray jays. Those inhabiting many of the heavy redwood forests are Oregon jays. So far as general habits and activities are concerned, they may be considered as one bird. Early ornithologists regarded them all as the Oregon jay.

Major Bendire wrote that on the summit of the Blue Mountains in Oregon he saw these birds at an altitude of 6,500 feet. He and his companion had stopped for lunch and, "While so engaged," he said, "I heard several whistles in a large pine close by, and these were answered from other directions. Shortly after I saw one of these birds in a little fir a few feet from where I was eating my lunch. I threw him some scraps of bread and meat, and he was by no means slow in accepting the invitation to help himself. A few minutes later three others made their appearance and fed among our party with the utmost unconcern and almost allowed themselves to be touched."

Many observers testify to the unusual tameness of these jays. Mr. A. W. Anthony has recorded that they are "utterly devoid of fear." As an example of this pleasing characteristic, he said: "While dressing deer in the thick timber I have been almost covered with jays flying down from the neighborhood trees. They would settle on my back, head, or shoulders, tugging and pulling at each loose sleeve of my coat, until one would think that their sole object was to help me in all ways possible. At such times their only note is a low, plaintive cry."

All campers in this country know these jays, for they constantly come about the camps looking for food. "Camp robber" and "venison bird" are names often applied to them. Although only about the size of the robin, they are also called "meat hawk" by some people.

The nests are built in evergreens. They are sufficiently substantial to stand the wear and tear of domestic occupancy, and so serve well the purpose for which they are made. The eggs are a little more than an inch in length and are spotted.

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CANADA JAY
Upper

Slightly more than one-third natural size

OREGON JAY
Lower

Approximately one-third natural size

CALIFORNIA JAY
Upper

SANTA CRUZ JAY
Lower

CALIFORNIA JAY (Aphelocoma californica californica)

The "blue jay" of California is quite different in appearance from the bird of the Central and Eastern States that bears that name. The blue is a different shade, there are no conspicuous white patches on the wings, and the bird has no crest on its head. He is one of the noisiest birds in California and is thoroughly disliked by a considerable portion of the people. But he is a very vigorous character, alert, bold, prying, and at times startling in his lusty shouts. These qualities arrest the attention and many admire him. Like all characters possessing strong personalities, he is both loved and hated.

Some of his food habits have brought him into disrepute, for undoubtedly he is an agency of considerable destruction to the small birds of the country. However, this loss seems to have been balanced by a wise Providence, for when a bird's eggs or its young are taken it will invariably lay again; so California is very rich in bird life, despite the fact that by eggs and by nestlings it must help to feed the jay population.

Mr. Mailliard, California ornithologist, relates instances of this bird's destructiveness to garden products. Of one case he wrote: "I remember one spring when a patch of about an acre and a half was sown with a mixture of peas and oats, and the peas were pulled up as fast as sprouted, by the jays, so that the crop consisted of oats alone . . . I shot over forty, one afternoon on this occasion, and a good many more on succeeding days, but they soon became so wary, that it was impossible to get another shot after one was killed—and still the crop was destroyed."

It has remained for a woman, Irene Grosvenor Wheelock, to present one of the most scathing denunciations recorded of this jay. In part she says: "He is one of the greatest trials a bird-lover must encounter, and I know no reason why the law should protect him to the destruction of our beloved birds of song and beauty. Were he of benefit to the farmer or to the fruit grower, no word of dispraise would I offer; but he not only robs them, but also destroys annually hundreds of feathered creatures which, living upon harmful insects, would be of great assistance in preserving the crops. No hawk is more destructive to small birds than he is. Ruthlessly he robs every nest in his vicinity that is left unguarded long enough for him to carry off the eggs or young. Not content with this he pulls down and breaks up the nest itself. Usually he prefers the newly hatched babies to the raw albumen, and waits for the incubation to be finished. I have seen him sneaking around the nest of a pewee day after day until the eggs hatched, when he at once made a breakfast on the nestlings—in this case, calmly disregarding the cries of the poor little mother. . . . About the farms he is even a greater pest, eating the eggs and occasionally killing the newly hatched chicks."

The California jay ranges the coast region of California from San Francisco Bay to Mexico and to the eastern base of the Coast Ranges. There are other races of this species which are discussed under "Woodhouse's jay."

SANTA CRUZ JAY (Aphelocoma insularis)

There is only one of the Santa Barbara Island group on which any jay is found. This is the island of Santa Cruz, and since the jay which lives here is found nowhere else in the world, it has been very appropriately named the Santa Cruz jay.

The island home of this species lies in the Pacific Ocean 20 miles or a little more from the coast of Ventura County, California. Santa Cruz is about 22 miles in length. Although it is a rocky region, abundant soil is available, so trees, shrubs, and gardens thrive without difficulty. The jay is unquestionably its most common bird.

Few species have such a restricted range within which every individual of its tribe is confined. They have done well in their island home, and are larger than their relatives in Ventura and Santa Barbara counties, visible over the sea to the eastward. The length of the Santa Cruz jay is more than 13 inches, thus exceeding by an inch or two the measurement of its mainland cousin, the noisy and none too popular *A. californica*.

Bulky nests are built among the limbs of trees or bushes only a few yards from the ground, and the three to five lightly spotted eggs are deposited usually in March or in April.

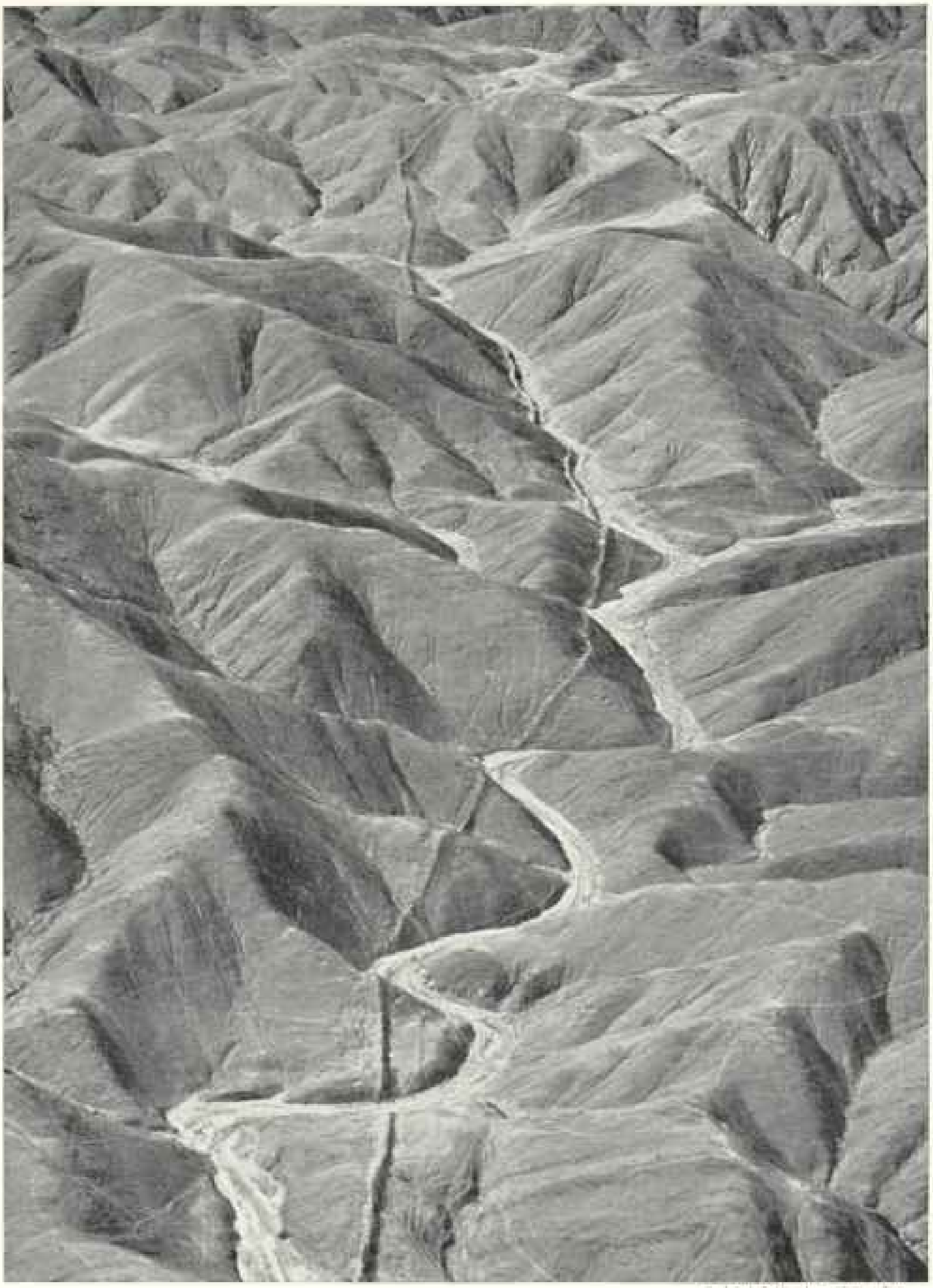
This bird was first discovered to science in June, 1875, by the naturalist H. W. Henshaw. Since then other scientific men have visited Santa Cruz for the specific purpose of making its acquaintance. One such student was W. L. Dawson and regarding the bird and its environment, he wrote:

"This gem of the islands belongs to him by unquestioned title, and he has no need to defend his claim by frantic protest or scurrilous abuse.

"This demure quality shows itself to best advantage when his nest is threatened, for it is then, if ever, that a bird's soul is tried. Yet I have spent an hour beside a nest of jay babies with never a word of protest from the closely attendant parents, beyond a mellow and almost inaudible *choop choop*—this and the sound of pecking on tree limbs, for even this gentle bird employs the familiar corvine device for relieving surcharged feelings. But this jay is capable of vigorous expression, and the variety and suggestive affinity of its note are worth considering.

"There is first, the Aphelocomine scolding cry of common use, but this is fuller, rounder, and much less than harsh. Then there is a *djay, djay* note which distinctly recalls that of *Cyanocitta stelleri*. Lastly this note is so modified and accelerated as to strikingly simulate the *rickety rack rack* or *shuck, shuck, shuck, shock* of the magpies. I know the magpie's voice better than the baying of a hound, but I have leaped to my feet and reached for the glasses at this *jack, jack* call before realizing that there are no magpies on Santa Cruz Island."

Little has been recorded of the feeding habits of this bird, but, in common with other jays, it is known to eat nuts, insects, and eggs.



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THE GREAT WALL OF PERU, LIKE THAT OF CHINA, MAY HAVE REPELLED INVASION

Across the Santa River delta and up into the hills it twists, crossing dry river beds, climbing sharp ridges, and swooping into valleys. The author and his companions followed it for 40 miles by airplane, yet, they believe, explored only a small portion of its length. Almost certainly it was erected to stem the tide of Inca warriors who once harried the country. At intervals along its sides are sturdy forts.

AIR ADVENTURES IN PERU

Cruising Among Andean Peaks, Pilots and Cameramen Discover Wondrous Works of an Ancient People

By Robert Shippee

With Illustrations from Photographs by Lieut. George R. Johnson

FOR three years Lieut. George R. Johnson had served as chief photographer of the Peruvian Naval Air Service.

Prowling the sky paths over that ancient land, cruising among its peaks and high valleys, time and again Johnson had looked down on hidden nooks and crannies whose ruins hinted at forgotten people—a challenge to exploration.

There were weird craters waiting to be filmed for the first time, old churches tucked away in odd little towns beside the mountain trails, and tiny, isolated colonies where Inca descendants are yet born to live and die of old age, never venturing beyond these narrow valleys.

Of these things, and more, Johnson told us upon his return, until we marveled at such wonders. Gladly we joined him when his chance came to return to Peru. We took with us two specially built airplanes and full equipment for high flying, for exploring and making pictures along the byways of the old Inca land conquered by Pizarro.

Sailing from Brooklyn one December morning, we were a party of five, all under 30 years of age. There was, of course, Johnson himself, as chief photographer and field leader; Valentine Van Keuren, topographer; Max Distel, mechanic; Irving G. Hay, pilot and mechanic; and I, Robert Shippee, pilot and historian.

Landing at Callao, the gate to near-by Lima, we based our planes at Faucett's Field, Lima's airport.* In the "City of the Kings" we set up our laboratory, later in charge of Harry Watkins and W. O. Runcie, both experienced in South American photographic work. Later, when making air pictures, we flew back to Lima to have our films developed (see pages 84, 117).

In eight months of fascinating, adventurous work, afoot and in the air, we discovered and traced the "Great Wall of Peru," mapped the prehistoric city of Chan-Chan, with its 11 square miles of ruins, mapped the Talara oil fields, and explored the Colca Valley and that of the Andagua, the Valley of Volcanoes (see map, page 83).

We made an aërial survey of Andagua Valley at an altitude of 21,000 feet, taking thousands of air and ground pictures and 30,200 feet of motion-picture film. Our total flying time was 454 hours and the highest altitude attained east of Lima, in about 12° south latitude, was 24,700 feet. The temperature at this height was 4° F.

EXTENT OF CHAN-CHAN REVEALED FROM THE AIR

Long ago the Chimús, a people antedating the Incas, built their great capital of Chan-Chan near the site of the present-day Peruvian city of Trujillo. Van Keuren and I lived in Trujillo, with its oleanders, olive trees, morning-glories, and tiled patios, while making our ground survey of this ancient metropolis (see page 88).

Although Chan-Chan's walls have endured time's assaults for countless centuries, they are fast crumbling now, especially from the action of repeated floods on their adobe structure. We were eager, therefore, to preserve the present-day appearance of the ruins in pictures, and also to map them from the air. It is only from the air that one can now obtain an idea of the once vast extent of the city and trace, even indistinctly, the remains of what once were its temples, palaces, plazas, gardens, and reservoirs (see page 91).

WE FIND THE GREAT WALL

After mapping the ruins of Chan-Chan we made a flight inland as far as the Marañón River and returned around Mount Huascarán, down the valley of the Santa River, to the coast. Our course was over the edge of the foothills that border the narrow upper valley of the river on the

* See "The Lure of Lima, City of the Kings," by William Joseph Showalter, in the National Geographic Magazine for June, 1930.

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CONSTANT BREEZES AID IN ANDEAN THRESHING

After the grain has been trampled by oxen, the native farmer, by means of a crude wooden shovel, tosses it into the wind which blows the chaff away.

north. It was there that Johnson, watching for photographic subjects, noticed what appeared to be a wall flowing up and down over the ridges below us. Immediately he made several photographs of it. After these had been printed, they aroused so much discussion that we flew back for further study of this singular and mysterious structure.

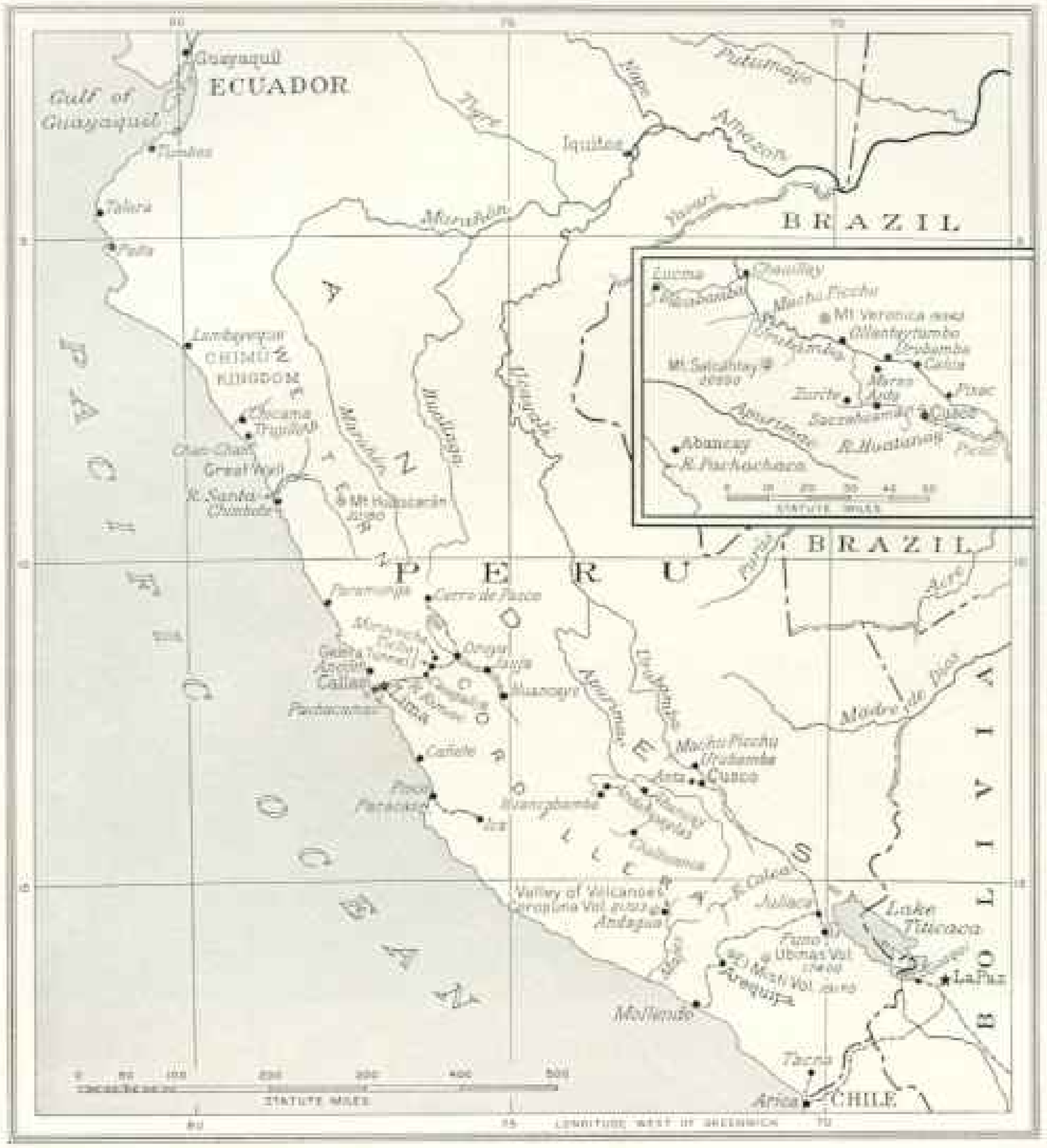
We found then that from a ruined village, five or six miles from the coast, the wall leads inland on the north side of the Santa River. Like some huge prehistoric snake, it writhes first across the level, sandy plain of the river delta, and then, as the valley narrows, over the edge of the bordering foothills. As the ridges become sharper and steeper, the wall rises and dips and in places turns slightly from its generally straight course. In places it blends so well with the background that it is almost indistinguishable.

At the time of this second flight over the wall the light was extremely poor for photographic work and the valley itself was filled with layers of fog. It was August then, a winter month on the Peruvian coast, when fogs are bad for aviation. It was impossible under these conditions to follow the wall along its entire length. We passed over several short breaks, but finally failed to pick it up again, after we had traced the wall for at least 40 miles.

It was on this flight that we first noticed the forts that are lined at irregular intervals on both sides of the wall. These forts, of which we saw fourteen, some circular and some rectangular, are more or less set in the tops of small hills, so that they are invisible from the valley floor. The largest one, rectangular in shape, seems to be about 200 by 300 feet, with walls 15 feet high and perhaps five feet thick. This particular fort was of piled-stone construction, though some appeared to be adobe.

Our ground exploration of the wall began at Chimbote, one loop of the coastline south of the Santa Valley.

Chimbote, in the lee of three tall, barren sand hills, has a natural harbor that would make an ideal naval or submarine base, and a level landing field used now by commercial air lines. Its natives did



Drawn by A. H. Bumstead

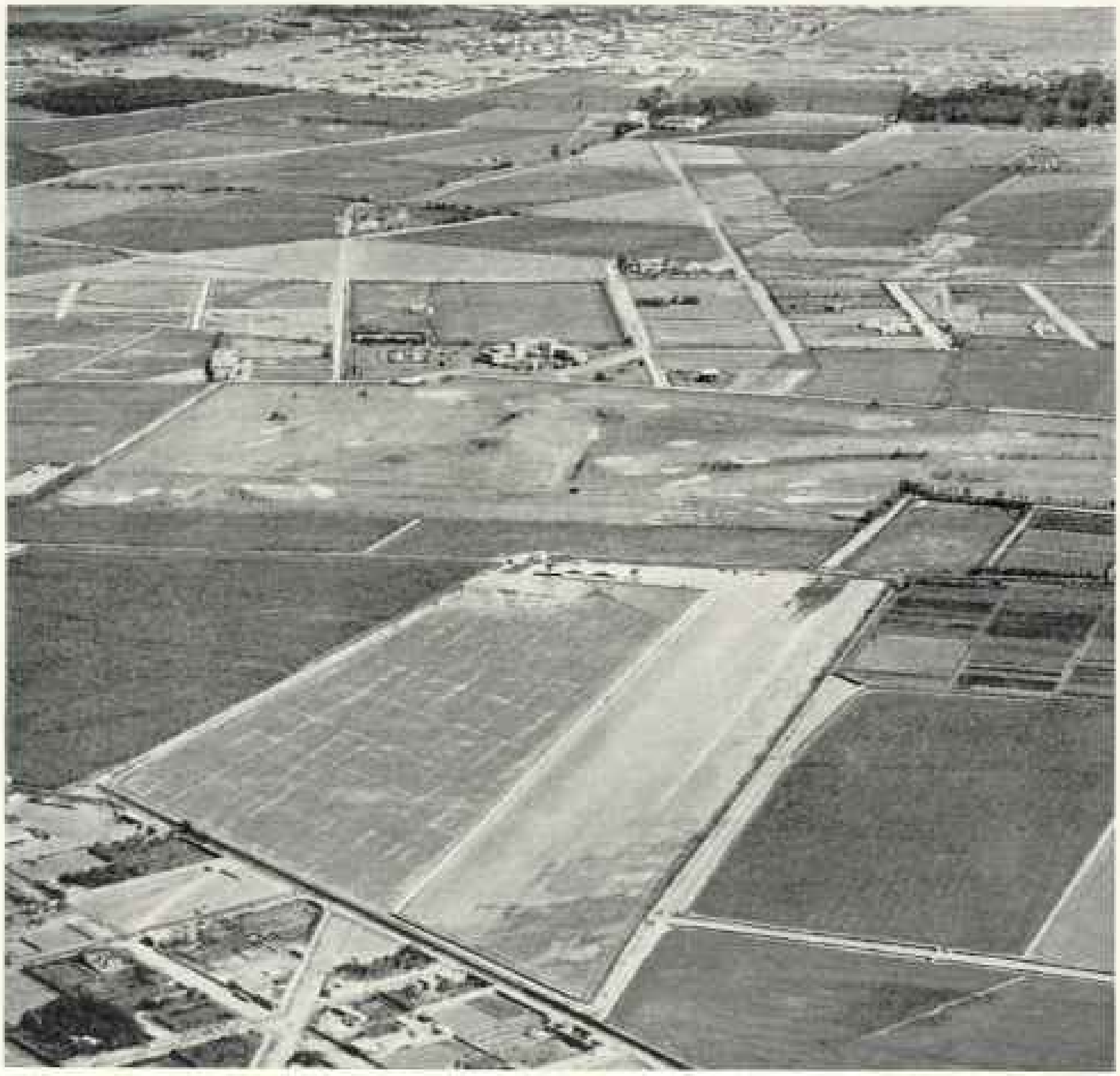
MAP OF PERU REVEALS STRONGHOLDS OF ANCIENT INCAS, SCENES OF PIZARRO'S CONQUEST, AND OF MODERN AERIAL EXPLORATION

From the area of the Chimú Kingdom to lofty Lake Titicaca, the "Roof of the Andes" has yielded treasure to Conquistadores, to history hunters, and now is penetrated by railways and industrial development and its most hidden nooks inspected from the air.

not seem to know much about the wall, though they assured us they had heard of it from their fathers, and that it was of pre-Inca construction.

At Chimbote we loaded our equipment into an old Ford and started off. We thought we could direct our course by a rough sketch made while in the air, but we began to lose hope after five hours of bumping over trails, slithering down muddy cow paths, and plowing through deep sand. By chance we recognized two curiously formed ridges of the foothills, near which we found the sand-covered ruins of the village at the beginning of the wall.

From the air this village had been clearly defined. We had been able to make out the plan of the streets, even the walls of the separate houses; but from the ground



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FAUCETT'S FIELD AT LIMA SERVED THE AUTHOR WELL AS AN AIR BASE

Though narrow, it is placed admirably to take advantage of the prevailing winds, which seldom change direction. The Country Club is at the center of the picture, and at the extreme upper right the Race Course.

we saw nothing but a few ridges, made where crumbled adobe walls were covered by centuries of drifted sand.

For several miles we followed along the wall until, as the valley narrowed and the cross-ridges dipped more sharply, the car could go no farther. We lugged the cameras afoot for another mile, at intervals taking photographs showing construction details and the character of the terrain.

WHY THE WALL WAS BUILT

It was exasperating not to be able to explore the upper reaches of the valley, particularly the various forts. However, such exploration would have required a mule train and more time than we could spare. As it is, our photographs tell much of the story (see pages 80, 86, and 87).

Without doubt this wall, with its double line of forts, was erected as a defense barrier. If it be true that the forts at Paramonga, south of the Santa Valley, marked the southern limit of the Chimú Kingdom, then the wall may have been raised against the Inca invaders. That theory would explain the tradition that the Inca abandoned his coastal invasions of the Chimú Kingdom from the south and finally conquered by marching through the Andes and laying direct siege to Chan-Chan, the Chimú capital (pp. 90 and 91).

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THE GREAT WALL AS IT CLIMBS SPURS OF THE ANDES

Ruins of 14 flanking strongholds similar to the one shown in the right foreground were counted by the explorers in their 40-mile flight along the barrier which the Chimús erected (see pages 80, 86, and 87).

Possibly the wall represents a temporary boundary defense, erected before the final consolidation of the kingdom. Many similar walls have been discovered in this region, although others are fragmentary and extend for short distances only.

Again, it may have been an intertribal affair, dividing water and pasturage rights.

Or there may have existed, beyond the wall but north of Paramonga, what we know as a "buffer State." Certainly some such condition existed in north Peru. There the warlike people of Tumbes practiced human sacrifice, worshiped wild animals, were dissolute, and in no way assimilated the Chimú culture; but they were nominally vassals of the Great Chimú, and he let them go their own way because they fought off in bitter efficiency the warlike and savage tribes of what is now the Ecuadorian coast district.

It is still hard for us to believe that we have actually made a new discovery of such evident importance in a region that has been carefully studied by many noted archeologists. It is less astonishing, however, when one considers that, even though the wall has been noted from the ground near its western end, it is only from the air that one would recognize the significance and realize that it is something more than just another wall in a region

UNCUT STONES CEMENTED WITH ADOBE FORM THE FORTS ALONG THE GREAT WALL

This stronghold, the largest discovered, is about 200 by 300 feet in extent, with rock breastworks 15 feet high (see text, page 82). Its location at the top of a ridge permitted use of rolling bowlders against advancing foes. These military posts are invisible from the valley.

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SOME OF THE SUPPORTING FORTRESSES NEAR THE GREAT WALL WERE CIRCULAR, OTHERS RECTANGULAR

The people who laboriously constructed these elaborate fortifications had been completely exterminated by the Incas long before the Spaniards came to Peru.

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TRUJILLO STANDS WHERE THE CHIMÚ CAPITAL, CHAN-CHAN, FLOURISHED

Francisco Pizarro named this city for his birthplace. History reports something of the splendor that the conqueror found here—majestic palaces, homes of haughty chiefs to whom gold, great roomfuls of it, was nothing.

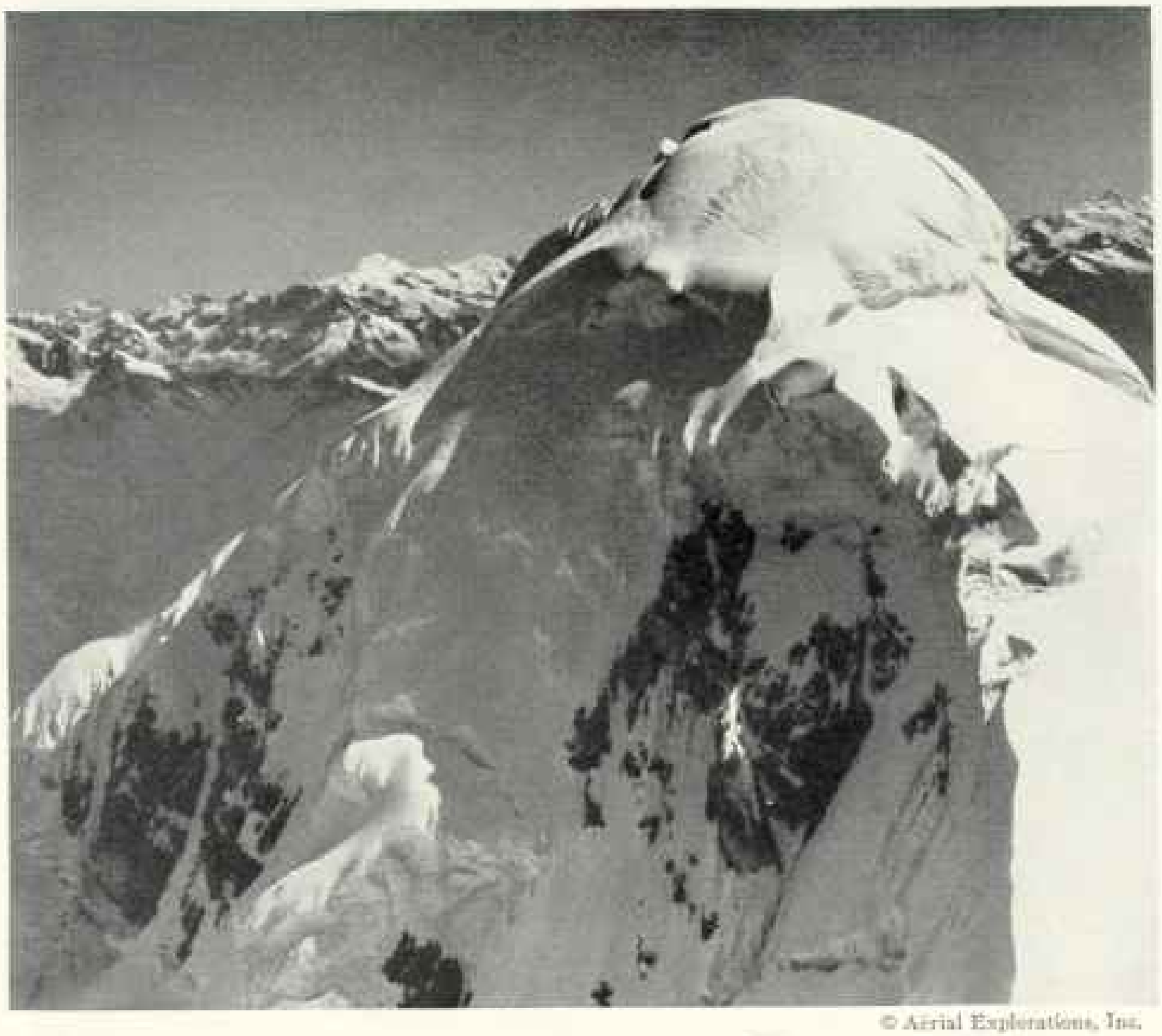
filled with the ruins of a forgotten civilization.

Of the coastal ruins, next in importance to Chan-Chan are those of Pachacamac. Because they are only a few minutes' automobile ride from Lima, these ruins are perhaps better known than any others in Peru. They are the remains of the pre-Inca temple of the Creator-God Pachacamac and the Inca Temple of the Sun. Here, also, were two villages where hundreds of pilgrims from all over the Inca empire lived while visiting the shrines.

PACHACAMAC AND TALES OF BURIED TREASURE

Going in by automobile, we surveyed and measured the ruins, which we later mapped from an altitude of 10,000 feet. Pachacamac is strangely impressive in its battered disdain of the centuries. Like Chan-Chan, it suffered heavily in flood years. Walls have crumbled and their colorful designs have been washed away. Generations of treasure-seekers have despoiled the myriad graves; the ground is pockmarked with excavations; and skulls and skeletons lie bleaching in the sun.

This ravaging of ancient ruins in quest of treasure is the curse of many lands. In Peru the Government has tried various means of prevention, with the unhappy effect that earnest archeologists may be hampered in their research, while unscrupulous treasure-hunters still work in secret. Yet some of the "finds" have been enough to turn any man's head. From Chan-Chan alone more than four millions of dollars' worth of silver and gold ornaments were removed by the Spaniards.



MOUNT VERONICA, 19,342 FEET, GUARDS THE URUBAMBA GORGE

This precipitous peak, 35 miles northwest of Cusco, did not frighten the Incas, however, for one of their old routes to the lower valley of the river was by way of a high pass that skirts its north side.

Legends tell of great treasure caches in the sierra. Any "West Coaster" can tell tall tales of lost cities in the interior. Beach combers have sold maps to the unwary, showing the "exact location" of fabulous treasures. We were approached time after time with advice on how to locate various treasures. Once we figured up the total. We had passed up wealth worth $46,000,000!

INTO THE THIN AIR OF HIGH ALTITUDES

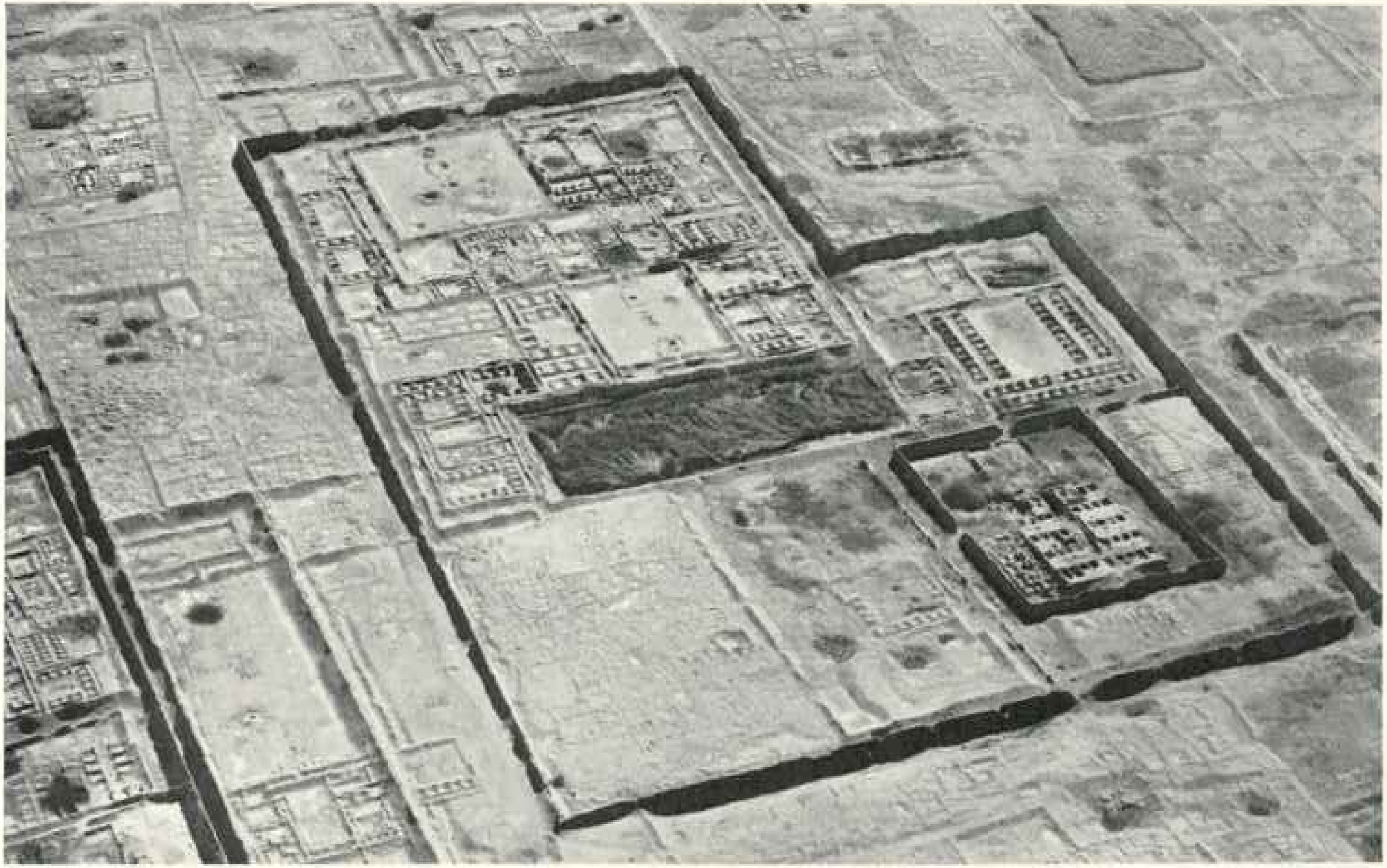
Now we were ready to photograph the glaciers and snow peaks of central Peru. We planned to land in the upper Jauja Valley, near the town of Huancayo, and operate from a temporary base there (see map, page 83). As this program entailed landing at the dangerously high altitude of 11,000 feet, we decided it would be wise first to make a trip by rail "up the hill" to look over the ground.

So we rode up, over the highest standard-gauge railroad in the world. From Lima the rails rise higher and higher. At the pass of Galera the road touches the very fringe of the snow peaks. Mountain streams rush by under the car windows, as the route winds crazily along switchbacks and through tunnels. The train seems fairly suspended in the thin air, as it glides across a spidery suspension bridge. And the air *is* thin, too. Many a passenger has felt the splitting headache and overpowering nausea of mountain sickness.

Monotony is broken by more than a score of stops. Each successive town, clustered about the railway station, seems just like the one before. Each has its

THIS REMARKABLE FORTRESS (LA FORTALEZA) AT PARAMONGA SUPPOSEDLY GUARDED THE CHIMÚS' SOUTHERN BOUNDARY

The fact that the Great Wall lies between this place and Chan-Chan strengthens the theory that that barrier was a secondary defense against the Incas (see text, page 84). This stronghold is, perhaps, the best preserved of all the structures of the ancient empire, which was overwhelmed by the Incas.



CHAN-CHAN, ANCIENT CAPITAL OF THE CHIMÚS, HAS FALLEN INTO DUST

These are the remains of one of the central palaces, and the sunken gardens, homes, and temple pyramids that surrounded it. At the height of its glory 250,000 people lived in Chan-Chan. They were a powerful race and of a relatively advanced civilization, but had completely disappeared before the Spanish Conquest of Peru. The dark oblong at the center of the picture was probably a reservoir (see text, pages 81 and 84).

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OLD PACHACAMAC CEMETERIES HAVE YIELDED MUCH TREASURE

The small depressions around the ruin in the foreground are opened graves, disinterred skeletons from which lie scattered everywhere on the plain. In the upper background is the tree-bordered river that waters the valley. The remains of the ancient town, with its temples and walls, stand on low hills close to the sea (see text, page 88).

little plaza, its "Gran Hotel," and its motley crowd of station idlers.

At one halt the natives swarm over the narrow platform with baskets of fruit for sale; at the next flowers are waved in at one's window. At first the venders all look alike: one cannot understand how they recognize each other.

Then, after a time, they seem to appear more as human beings. At the third stop I could readily identify the man who short-changed me in a fruit transaction, although, as the train stopped so briefly, I did not have the time to persuade him of his error.

That night we stayed at Oroya, and next day continued on to Huancayo, where we found a good landing place. Near by was the Huancayo Magnetic Observatory of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, where Mr. Paul Ledig, chief of the observatory, gave us comfortable quarters and the use of a darkroom.

"Stay over Sunday and see the market in Huancayo," advised Mr. Ledig. It was well worth the extra day. Main Street for a half mile was crowded with natives of every age. Women lined the curbs with their woven stuffs, silver ornaments,

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CURIOUS "POCKMARKS" NEAR THE PISCO VALLEY MAY BE EXCAVATED GRAVES

From the air it is impossible to determine the nature of this strip of bowllike depressions along the backbone of a rocky ridge. The explorers did not land to investigate the hollows, which are a mystery to archeologists and not mentioned in the literature of the region (see illustration, page 97).

leather goods, fruit, dried potatoes, and even bottles of ginger ale, brought up from the coast. Burros wandered through the crowd; here one was loaded with jugs of *chicha*, the native beer, and over there one might be carrying a pack of blankets woven in the hills. The scene revealed a complete cross-section of life in the sierra (see illustration, page 114).

OUR FLIGHT TO HUANCAYO

We had planned to return by air to Huancayo immediately after our trip there by rail; but Peru was in revolution and we were grounded for several weeks.

Finally, early one April morning, both ships left Faucett's Field and headed inland, climbing with full throttle toward snow peaks beyond which lay Huancayo. The *Washington*, the plane generally used for photography, flew ahead of us. As my altimeter registered 17,000 feet, the *Lima*, heavily loaded with extra cans of gasoline, was gradually left behind.

Clouds were swirling around the peaks, just a few feet below our wheels, and at times the *Washington* was lost from our view, as it slowly drew ahead. The railroad, which we were to follow to Oroya, was just a tiny ribbon thousands of feet

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AREQUIPA LIES IN THE SHADOW OF EL MISTI, LIKE POMPEII ON THE SLOPES OF VESUVIUS

However, Vulcan keeps his fires so well banked here that no danger is feared. The *Lima*, in the foreground, is circling over the outskirts of the city in a flight preparatory to the exploration of the volcano's crater (see text, page 99).

below the peaks that rim the valley (see map, page 83, and illustration, page 111). At times the mists closed in and that guiding strip of steel was blotted out.

As we were approaching the highest part of the range, the clouds were thickening. With the heavy load, the *Lima* had reached her "ceiling" and could go no higher; the *Washington*, still climbing, was just a speck in the distance. The railroad now was lost to view. We were over a sea of white through which jutted islands of snow peaks. A cracking and snapping warned us that the gas cans were near the bursting point. In the rarefied air, the pressure of the air sealed in the tins had distorted them; no longer rectangular, they had become almost cylindrical.

With 18,000 feet of altitude, by winding around the peaks, we might have got-

ten through but for the clouds. A wall of clammy whiteness closed in before us. There was danger of running into the *Washington*, should that plane be forced to turn back. I cut the gun and, praying that we had not strayed from our course, dived through the clouds.

It was an uncomfortable sensation, plunging at 150 miles an hour through the eerie half light of that layer of cumulus, expecting any moment to see the scarred hulk of a mountain peak flash before the dripping windshield. Then the tension was broken. The light gained brilliance, as we shot into the clear. Below was the railroad and farther down the valley there were patches of sunlight where the clouds had not yet closed in. Turning inland again, we kept under the clouds, hoping that this time we could sneak over the pass; but as the rails climbed to meet us the clouds settled, and again we had to turn back.

Gliding in for a landing at Faucett's Field, we were surprised to see the *Washington* already on the ground. We had thought it must have flown safely through the pass. But no; their account was even more thrilling than ours. Ice had formed on the wings at 19,500 feet. The ship had dropped without warning for 1,200 feet, snow peaks on either hand. They, too, had expected a mountain side to end the flight. Once safely out of the clouds, the *Washington* had headed for the coast. We called it a day.

THE FOURTH ATTEMPT IS SUCCESSFUL

Two more attempts were made to reach Huancayo. They were much the same as the first. Then, on the fourth try, we were successful. This time we adopted different tactics. Climbing to 23,000 feet in the clear skies over the coast, the *Washington* cut directly across the Western Cordillera to the Jauja Valley and Huancayo. In the *Lima* we flew south down the coast. At the Cañete Valley, an hour from Lima, we turned inland. Sneaking along under the clouds, we crossed a pass there, the lowest in the range, and at last reached Huancayo (see pages 102 and 109).

Already the *Washington* had landed on the roadway we had selected from the ground. The plane was drawn up at one side, but its crew waved to us to stay in the air. Puzzled, we circled and circled. Natives were running in from every direction and Johnson seemed to be distributing them along the runway. Finally we realized that the runway was being cleared of rocks. In a half hour we were waved down and soon heard the whole story of the *Washington's* adventures.

When previously inspected, the road had been free of rocks. Now, owing to farmwork by the natives, many stones upturned by plows had been tossed on the roadway. When the *Washington* came in for a landing, there nearly was a catastrophe. The wheels, set down at that altitude at nearly twice the normal speed, struck the rocks; the plane was tossed into the air, and then, as it settled again, one of the wheels was bent so that the plane ground-looped sharply. Fortunately, there was no serious damage.

HIGH ALTITUDE LANDING DIFFICULT

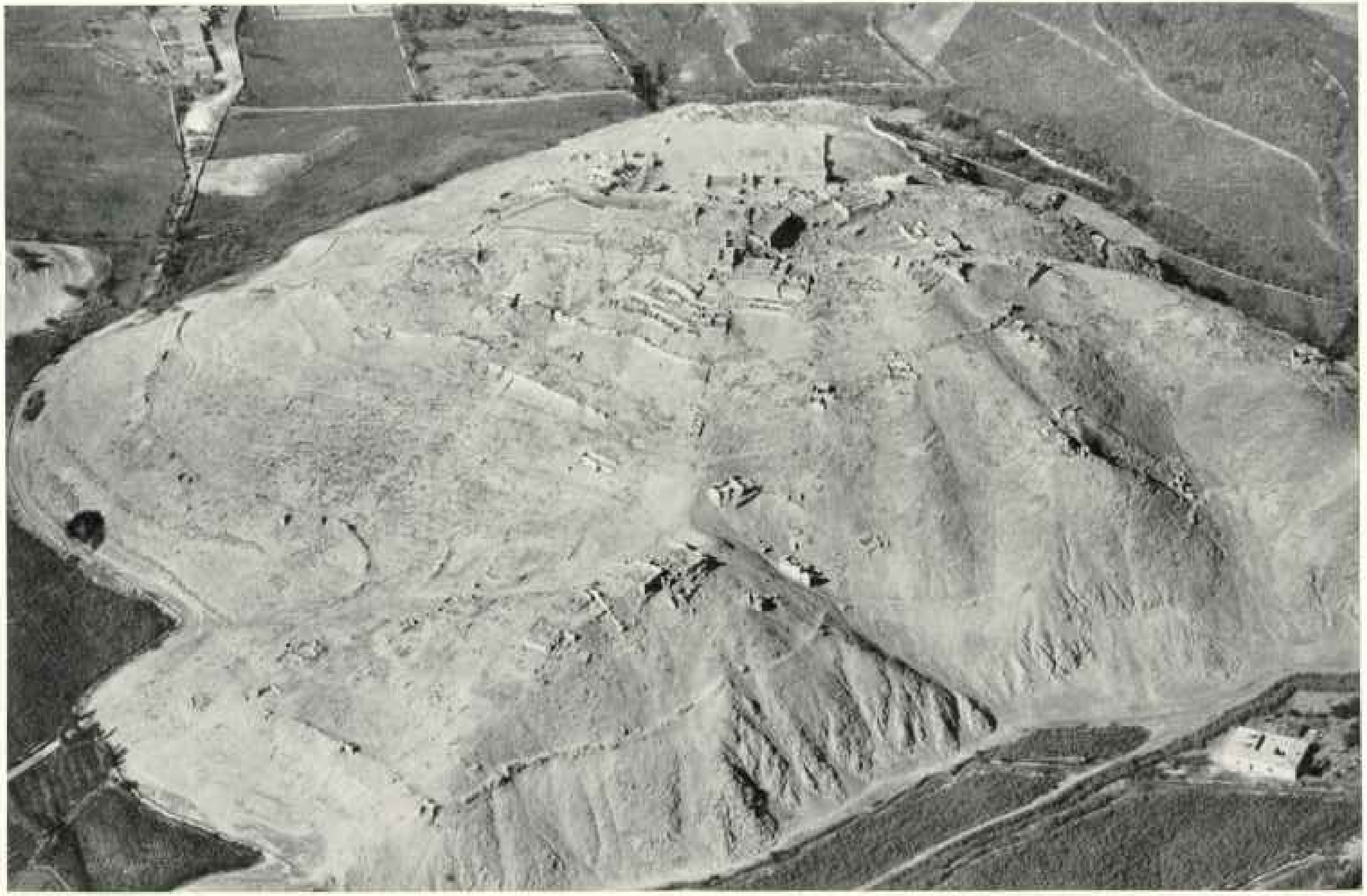
That was our first attempt at high-altitude landings. Since later we were to land at altitudes up to 12,500 feet, this early experience was invaluable. We found that the chief danger came not from the actual landing, but from the sloppiness of the controls, which made it almost impossible to "feel" when the plane was about to stall. Turns had to be banked perfectly, and always it was advisable to keep speed well above the minimum.

From the Carnegie Observatory, less than a quarter of a mile from where the planes were staked down, we could look across the valley to the glaciers we planned to photograph. But that work was delayed by weather conditions—clouds and rain. For eight days we were grounded. Finally, the weather cleared. The *Washington* made several long photographic flights; then both ships headed for Lima, making the three hours' flight safely and uneventfully.

UNNAMED GLACIERS PHOTOGRAPHED

When the Huancayo negatives were developed we felt more than repaid for the delay. Although the snow fields and glaciers of that section are among the largest in the Andes, they are rarely mentioned; many are still unnamed.

On May 4 both ships lifted heavy loads from Faucett's Field and headed south, bound for Arequipa. With us now came



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BETWEEN LIMA AND AREQUIPA FERTILE FIELDS SURROUND THE REMAINS OF A FORGOTTEN CIVILIZATION

The crumbling walls of this ancient town in the Cañete Valley stand on barren hills that once were clothed with verdure, watered by elaborate irrigation systems. From the air the characteristic ground plans, arrangement of buildings, streets, and defenses are clearly seen.

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RUINS OF A GIGANTIC IRRIGATION SYSTEM MARK THE PISCO VALLEY AS AN ANCIENT CENTER OF AGRICULTURE

Such patterned areas of canals, dams, and fields abound throughout the region, proving the existence of a remarkable culture before the coming of the Incas. From the air the explorers were able to distinguish details that were not discoverable by investigation on the ground (see illustration, page 93).

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CASAPALCA MINERS WORK AT 13,600 FEET ALTITUDE IN THE UPPER RIMAC VALLEY

In the background is the snow-capped range through which the world's highest standard-gauge railway emerges from the Galera tunnel, 15,665 feet above sea level (see text, page 89).

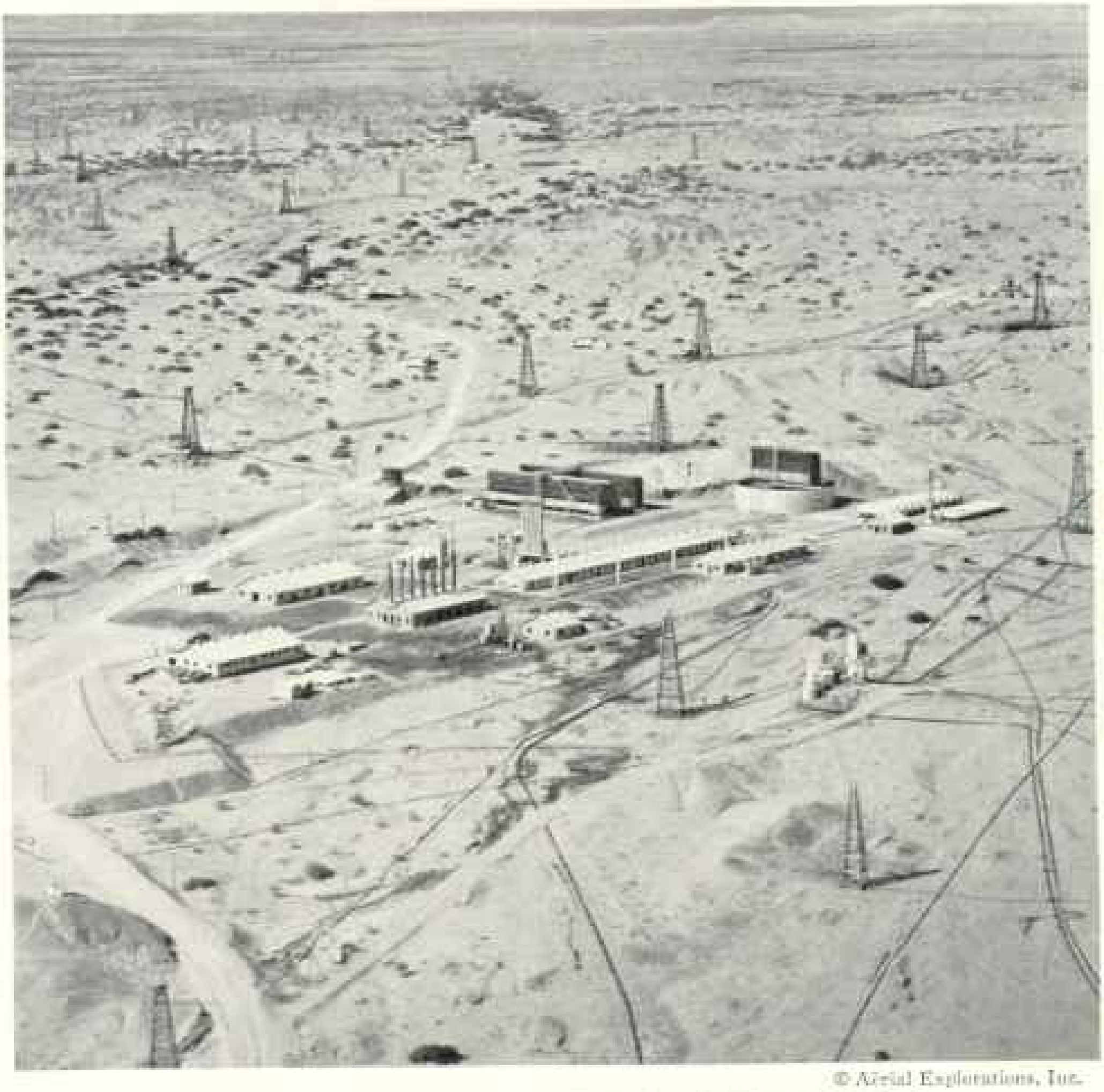
W. O.Runcie, an accomplished motion-picture cameraman. His aid would leave Johnson free to work on still pictures.

Whether north or south of Lima, the coast is much the same. A narrow strip of barren sand, broken at intervals by fertile valleys, runs between the blue Pacific and the brown foothills of the Andes. Inland a few snow peaks rise above the clouds. Occasional groups of ruins catch the eye. The planes roar over the pitted ground of Paracas, from which hundreds of mummies have been removed.

At last we swing eastward, away from the ocean. Climbing to 12,000 feet, we slip over the edge of a table-land and are rewarded with a glimpse of El Misti, the famous volcano that towers over the city of Arequipa. In the thin air it seems as if we shall reach our destination in a few minutes, but a long hour passes before we circle above its main plaza.

Arequipa is 7,500 feet above sea level. Its sharply sloping aviation field, at the very base of Misti, is the one drawback, to aviators at least, of an otherwise delightful city (see map, page 83, and illustration, page 94). Because of the approach, it is necessary to land downhill. Sometimes the sandy surface is hard; sometimes tires will sink up to the rims.

From the field it is a few minutes' automobile ride into the city. And, with the roar of airplane motors still throbbing in



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OIL DERRICKS AND STATIONS DOT THE DESERT NEAR TALARA

Where only a few years ago was wind-blown waste, an extensive petroleum district now is being developed. Trucking trails lead from the outlying field units to the town, six hours by air north of Lima. Here Americans and Canadians have established a club with a swimming pool and have planted palm trees in defiance of the barren sands that stretch away to the horizon.

one's ears, it is not strange that the ride seems to lead into an entirely different world—a world of burros and llamas, the trucks of Peru.

Barefooted natives pad silently along street-car tracks. In the central plaza a cathedral is framed by luxuriant palm trees. Through graceful colonnades one glimpses modern shops; from one comes a phonograph's voice.

Arequipa, which was to be our headquarters for nearly three months, is a mingling of past and present. On the outskirts, isolated by high walls, the Quinta Bates (estate) is an oasis to travelers.

During our first week in Arequipa the two planes put in a total of 48 hours in the air, three-quarters of that time being flown above 17,000 feet and with the use of oxygen.

OVER THE CRATER OF EL MISTI

We shall never forget the flight which carried us over the crater of El Misti, which towers 19,170 feet above sea level, 11,670 feet above the city of Arequipa. In the clear air the huge cone seems to be right in Arequipa's back yard; yet in the *Lima* it took a full hour to climb from the airport to the level of Misti's serrated rim.

THRESHING IN URUBAMBA VALLEY REMAINS PRIMITIVE

Oxen tread the grain, and men and women with wooden shovels winnow it.

We set our motion-picture camera in the cabin and removed a door to give wider range of vision. Fresh oxygen flasks were installed. Half the gasoline was drained from the tanks to lighten weight and thereby increase the plane's "ceiling."

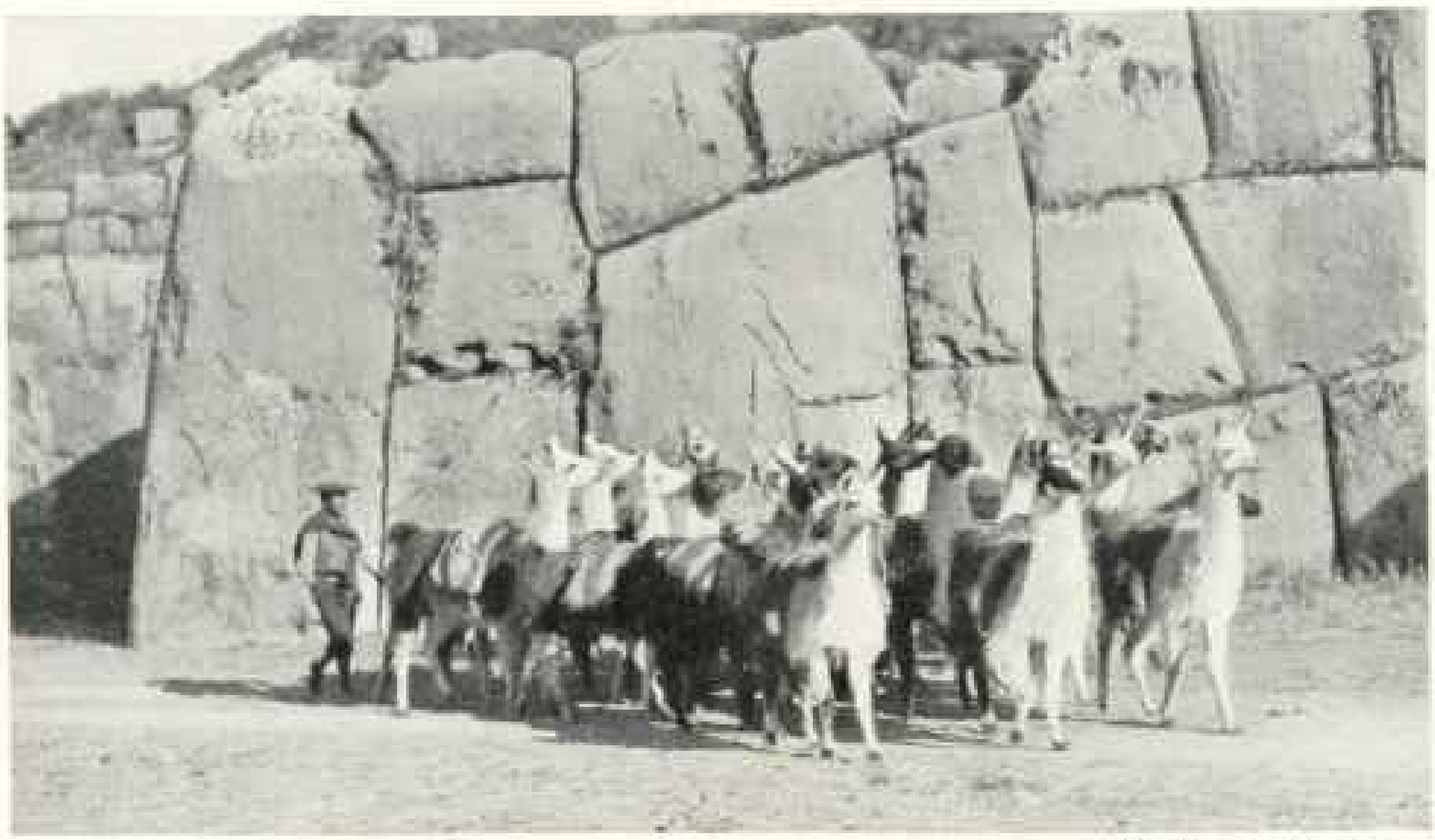
In the soft sand it was necessary to taxi with full motor; but at the end of the runway we had to stop and dig out the wheels, where they had buried themselves a foot deep as the plane was blasted around. Finally, we were ready. Runcie nodded his "O. K." and I opened the throttle. The *Lima* wallowed clumsily through the sand; the undercarriage shivered and creaked as the wheels met the deep ruts. Then, after what seemed an eternity, there was sufficient speed to lift the tail, and the wings took up their load. At midfield the wheels were barely skimming the sand. Held down till the last second, the ship cleared the trees in a climbing turn. Runcie waved farewell to our friends on the ground.

At 18,000 feet we turned on the oxygen. Runcie was shivering, as the cold air from the open doorway bit through his thick flying suit. Forward in the cabin, I had the better of the temperature situation. I was wearing a native poncho, which reached completely to the floor and covered even my feet and hands at the controls. It formed a perfect tent, and since one of the cabin heaters was directly under the pilot's seat, the tent was comfortably warm.

I glanced back at Runcie. He was seated on the floor, directly over the second heater, but the rush of air from the doorway was blowing directly down his neck. As I smiled at him, in sympathy, he glared enviously through his goggles and drew so furiously on his oxygen hose that my supply was entirely cut off. Gasping for breath, I gestured eternal peace and good will. It was Runcie's turn to smile.

Nearing 19,000 feet we were almost upon Misti, and its rim was still above us. Making a wide circle, climbing slowly, we finally crossed directly over the crater at 20,000 feet. But Runcie signaled for more altitude. He was not satisfied until we had risen to 22,000 feet. Then, with the plane squashing along through the thin air, he began to crank his camera. At that altitude the crater appeared as a huge porridge bowl. In its center still smoked a small mound of the porridge, of a sickly, greenish-yellow hue and a sulphurous odor.

With the camera clicking rhythmically, we spiraled lower and lower. There is a false crater protruding beyond the true bowl. Around that we circled at 100 miles an hour. Then, as Runcie called time out to change his films, I gratefully swung away from Misti, so that if the motor



LLAMAS ARE TO THE ANDES WHAT YAKS ARE TO THE HIMALAYAS

Laden with packs, this herd is being driven past the massive rocks of Fort Sacsahuamán, on the heights above Cusco (see illustration, page 113).

should cut out we would be in the clear. Runcie had five extra magazines; he tried them all, only to find that as soon as the crank turned the film broke. In the cold, dry air (8 degrees above zero) the film had become so brittle that it snapped almost as soon as it was looped through the threading gates of the camera. Fortunately, we had cans of extra film.

Runcie sat down on the floor, put his arms in the sleeves of a light-proof changing bag, and proceeded to reload the five magazines. The air was getting rougher now, and he was tossed from side to side, once very nearly going out of the open doorway. At last the job was done.

Shaking from the cold, his fingers bleeding where the skin had stuck to frosted metal, Runcie waved me back to Misti. We made another circle of the false crater, so low that the sulphur fumes were pungent even in the forward part of the cabin. Then, staking everything on the motor, we cut down below the rim of the crater itself.

With plane cocked over almost to the vertical, we roared around the edge of the huge bowl. The fumes made our eyes water, but Runcie kept on cranking. The turbulent air currents made it impossible to hold the ship steady. I was glad to feel the safety belt tight around my waist, and Runcie, I noticed, had a scissors grip on the camera tripod. When his roll of film was exhausted, we wasted no time in climbing up over that crater rim.

Ubinas Volcano, 17,400 feet, is about 35 miles east of El Misti, and the diameter of its crater is nearly three times that of Misti. Flying above it, we experienced a strange adventure (see pages 116 and 119).

PLANES TO MEET OVER VOLCANO

Our two ships, we had planned, should meet over the volcano, the *Washington* on the way back from a flight farther inland and the *Lima* flying directly there from Arequipa. We wanted an airplane in the background of the photographs, to show the tremendous size of the crater, some three miles around the rim.

At the hour agreed, Runcie and I, in the *Lima*, were circling Ubinas at 19,000 feet. We expected to see the *Washington* draw alongside at any moment. Twenty minutes went by and we still circled aimlessly. Then Runcie yelled, above the roar of the motor. I glanced back. He was pointing straight down below us.

As I hurriedly opened the little sliding window by my side and craned out, I caught a flash of crimson far below us. It was the *Washington*. In a diving turn we

THE ROCKY BARRENS AT ANDAHUAYLAS PROVED AN AWKWARD PLACE FOR A CRACK-UP

Forced down, the *Washington* damaged a wing tip and propeller. Repairs were made under difficulties (see text, page 110)

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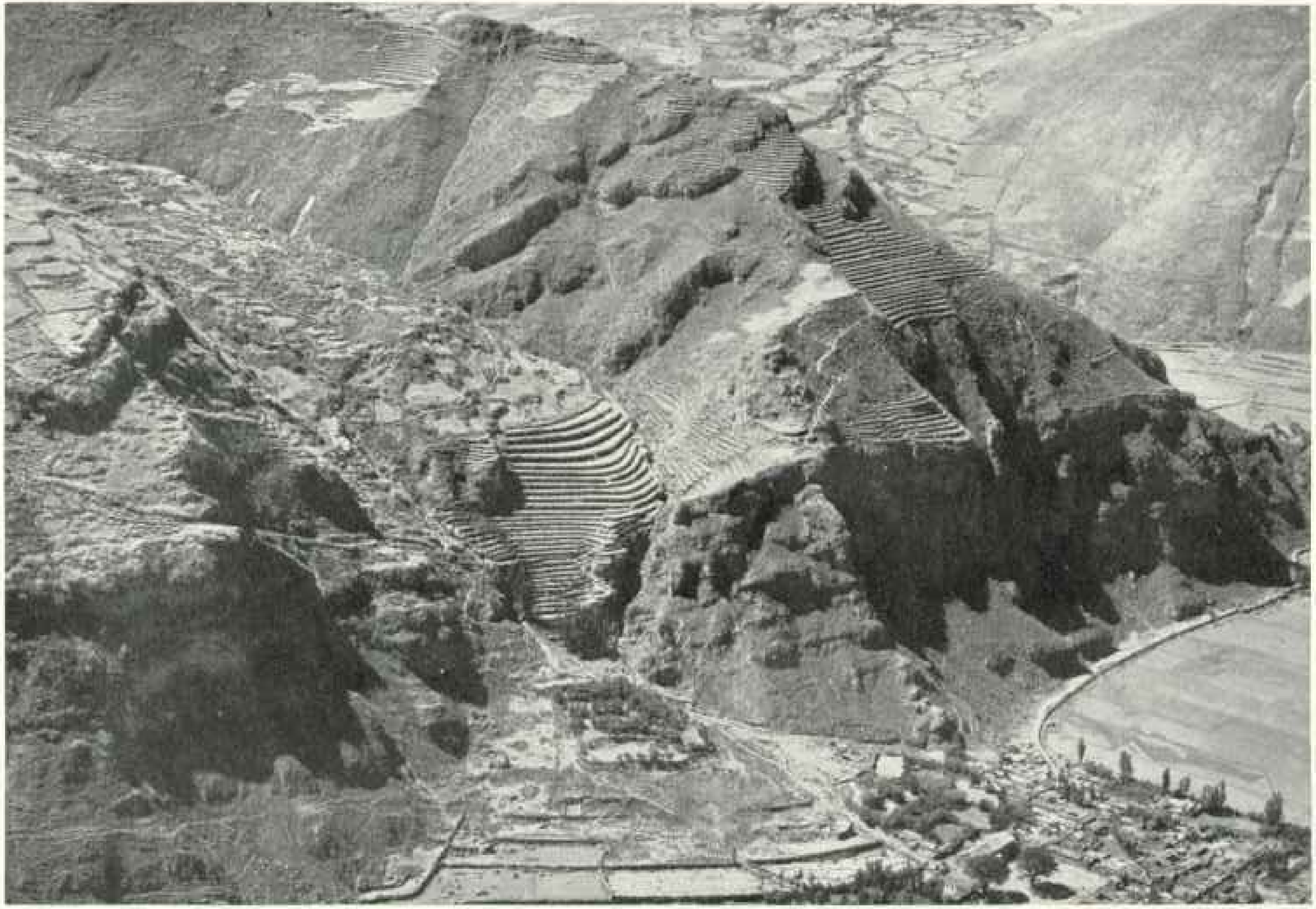
EVEN A LEVEL FIELD MAKES A PRECARIOUS LANDING PLACE AT 11,000 FEET

After three attempts, the two planes finally came down without mishap on sheep-grazing ground at Huancayo (see illustration, page 109)

THE CRUMBLING WALLS OF PICON, IN THE URUBAMBA VALLEY NEAR CUSCO, HOLD TREASURE-TROVE

A wealth of Inca relics, many of them silver and gold ornaments, has been unearthed among the fallen walls of such cities, and pillaging still goes on, although the Peruvian Government has laid rigid restrictions upon excavators (see text, page 88).



TERRACES AND FORMAL GARDENS BEFORE A RUINED PALACE AT PISAC SPEAK OF BYGONE GRANDEUR

Here, archeologists believe, was once the seat of a proud noble of the Inca race. Modern civilization utilizes the valley lands, but the forgotten people crowned the hills with their temples, homes, and verdant fields.

PEOPLE OF ANCIENT CUSCO THRONGED THE PLAZAS TO WATCH THE "MECHANICAL BIRD" FLY OVER

The aviation field is at Anta, connected with the city by a narrow-gauge railway, and special trains brought 5,000 spectators to see the landing (see text, page 110). The journey from here to Arequipa requires two days by rail, two and a half hours by airplane.

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SERIOUSNESS COMES EARLY TO URUBAMBA CHILDREN

Dressed like their elders, these little folk seem strangely grown up. However, they scrambled eagerly for the black paper tabs thrown away by the photographers.

went to meet it. Then I rubbed my eyes in amazement. The plane seemed to be flying far below the rim of Ubinas, but as it neared the huge cone it apparently shot upward, as if drawn by an invisible string.

In less time than it has taken one to read that last sentence, the other ship had neatly hurdled the volcano and again seemed to be flying far below the rim. I looked back at Runcie. I knew he had seen the same thing, for he was open-mouthed in utter bewilderment.

It was a long minute before we could understand the phenomenon. At that altitude we had lost perspective. Against the dark, unrelieved background, the *Washington* had seemed thousands of feet lower than it had actually been. Then, when it had passed over the volcano, the sudden rise of ground had brought it into perspective, giving it the hurdling effect.

In this brief interval we had lost altitude rapidly and were now only a few hundred feet above the volcano. The *Washington* had disappeared, but I expected to see it come circling back to meet us. In the meantime Runcie began to crank the motion-picture camera.

Our next quarter of an hour was a repetition of our flight over Misti, except that the circling below the rim was less nerve-racking, since the larger circumference of the crater gave more room for maneuvering. Finally, Runcie drummed his heels on the cabin floor, a signal that the rest of his film would be exposed when the *Washington* was alongside.

But as we climbed for altitude, we saw no sign of the missing ship. I feared it might have made a forced landing, and so made a wider circle around the base of Ubinas to look for it. But there was no splash of crimson to mark the other plane. We continued to circle. Once Runcie stepped forward and yelled that he had caught a glimpse of the *Washington* flashing across the crater. We banked sharply; there was nothing in sight.

At 1 o'clock the oxygen supply was failing. We decided it was useless to wait any longer. Something had gone wrong with our plans.

We spiraled down over the Arequipa field and landed as quickly as possible.

PEOPLE OF ANCIENT CUSCO THRONGED THE PLAZAS TO WATCH THE "MECHANICAL BIRD" FLY OVER

The aviation field is at Anta, connected with the city by a narrow-gauge railway, and special trains brought 5,000 spectators to see the landing (see text, page 110). The journey from here to Arequipa requires two days by rail, two and a half hours by airplane.

Johnson and Hay were sitting in front of the hangar and in it stood the *Washington!* For 25 minutes the four of us argued determinedly. Runcie and I were immediately accused of having failed to appear over Ubinas. And if we had been there, we must have been up 30,000 feet, since they had not once caught sight of us. The *Washington* had been over Ubinas at 11:40 and circled around, taking pictures for 50 minutes. It had landed only a quarter of an hour before we came in. At last it was decided to suspend judgment until the films had been developed; the pictures would tell the story.

Yet, when those photographs were printed, we found it hard to believe the story they told. The still pictures, made from the *Washington*, proved that that plane had been right over Ubinas, and at times even lower in the crater than we had flown. A careful check of the time showed that the two planes must have passed again and again, at least if we in the *Lima* had been in position. Later, when the motion pictures were developed and printed, we had conclusive proof that the *Lima was* in position. After close inspection, we found one place where an airplane came into view just for a second, on the very edge of the strip. An enlargement of that section clearly showed the *Washington* just over the crater's rim.

Apparently the rarefied air had played tricks on our eyes. On later flights we noticed that it was extremely easy to lose sight of the other plane, even when it had been flying a parallel course, unless the two ships remained in the same plane of vision. No more accurate explanation of this phenomenon has yet been offered us.

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IT IS EASY TO OBTAIN FRESH POULTRY IN AREQUIPA

Not to be outdone by the milkman, who drives his goats from door to door, the chicken vender delivers fowls alive.

FLYING THE HEIGHTS TO ANCIENT CUSCO

One May day we flew from Arequipa for Cusco, distant two days by train or two and a half hours by air. Van Keuren, Runcie, and I were in the *Lima*. In the *Washington* were Johnson, Distel, Hay, and Captain Ceballos, a Peruvian. The air route was over rough country and the two ships were to keep close together, so that should one be forced down the other could bring relief.

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LANDING AT HIGH ALTITUDES PRESENTS DIFFICULT PROBLEMS

The *Lima* came down on a narrow roadway near the Huancayo Magnetic Observatory and taxied into a field. So thin is the atmosphere at such heights that the pilot is forced to bring his plane to earth at high speed. (see text, page 95).

After an hour in the air I noticed the *Washington* swinging from its course. Thinking it was only after photographs, I kept on my course. But the other plane swung farther north and then out of sight behind a high ridge. With motor full out we turned after it. When we rounded the ridge, the *Washington* was not in sight. There was nothing for us to do but continue on to Cusco.

As we flew low over that city, people swarmed into the plazas. They were so excited that it seemed logical the *Washington* had not yet appeared. We wasted no time over the "City of the Sun" but continued to Anta, where the Government had prepared a field.

A narrow-gauge railroad runs by that field. Special trains had brought five thousand people from Cusco to see our planes. Bands were parading as we zoomed again and again, to warn the crowd to keep back from the runway. At last the way was clear, until the *Lima* was rolling to a stop. Then the crowd broke and raced toward us.

NO SIGN OF MISSING AIRPLANE

Luckily, Van Keuren had cut the switch even as I let the wheels touch. So our propeller was no longer a whirling death. As we stepped from the cabin we were shoved in the milling throng. It was several minutes before we could get any coherent answers to our questions. No one had seen the *Washington;* all they knew was that a telegram had come from Arequipa saying that we were *en route* to Cusco, but not mentioning that we had *two* airplanes.

After an hour of waiting, the skies were still empty. At last we could stand it no longer. Taking off again, we retraced our course to where we had last seen the *Washington*. We stayed in the air for three hours, returning at dusk to Anta. No sign of the missing ship. Somewhere she must have been forced down.

In Cusco the telegraph men had been doing their utmost. They had traced the plane for what must have been the first four hours of its flight. As we checked telegrams from various hamlets, we saw they covered a wide arc that swept just to the north of Cusco and back toward the coast. Either something had gone wrong with the *Washington's* compass or else she had become confused among the mountains about Cusco.

At 11 p. m. word came over the wires from Andahuaylas, an hour's flight to the westward. The missing plane and its crew were safe. After flying for five hours and ten minutes, they had first landed on a pampa near the hamlet of Chalhuanca, at an elevation of 12,500 feet, to ask their way. Directions given them at this point had proved erroneous. After flying another hour and twenty minutes, they were forced to come down, just before nightfall, on a small plateau near the village of Huancabamba.

In landing, the plane had ground-looped and damaged the left wing tip. Men of the village had disappeared at once, apparently fearing that the plane was a military ship, possibly bent on army recruiting. The women had offered no help, and our men finally had decided to go to the larger town of Andahuaylas, which lay in a valley some ten miles distant. After stumbling and sliding for hours down a dark mountain trail and wading an icy river, they had reached the latter town (p. 102).

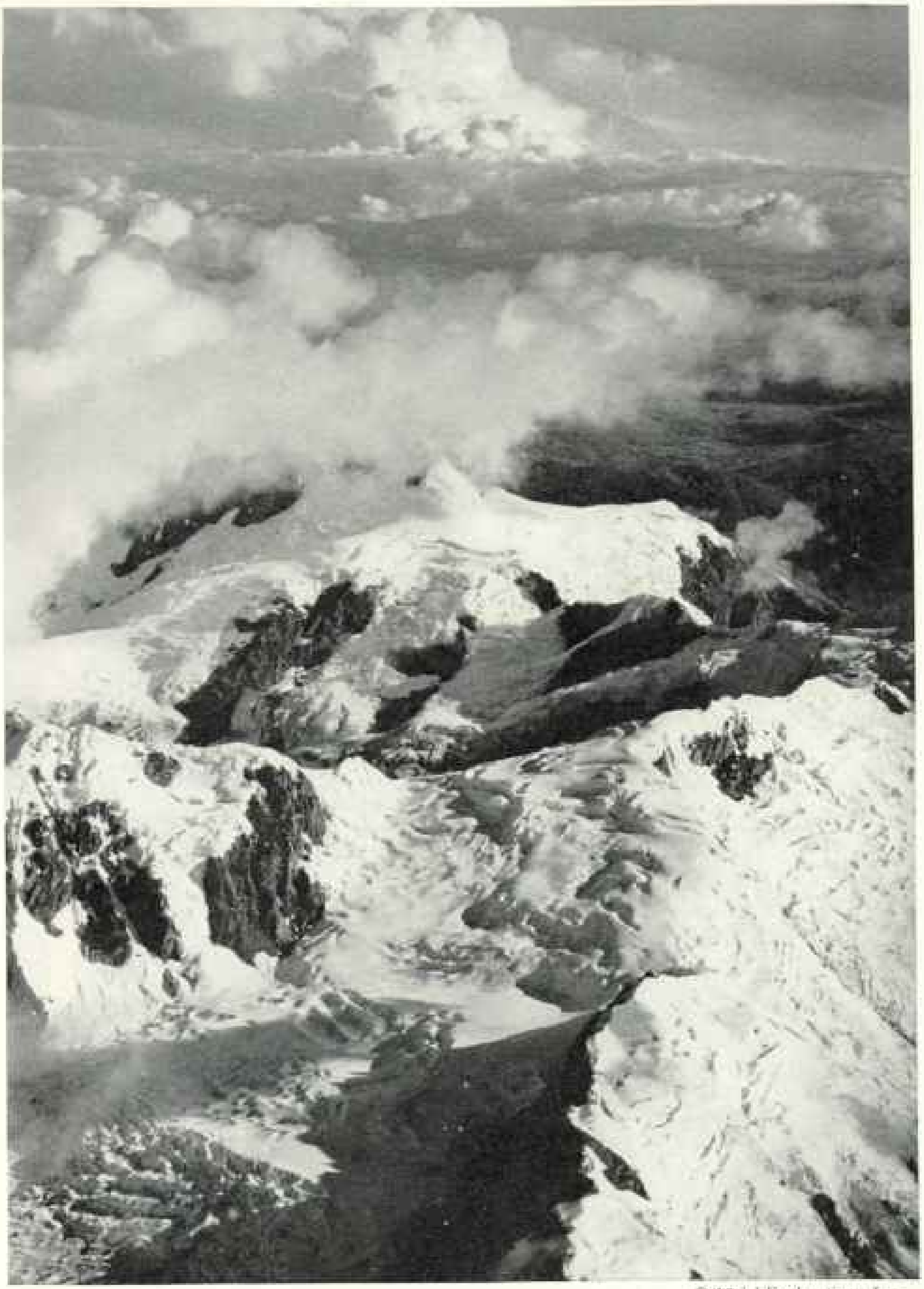
The following morning we flew the *Lima* from Cusco to Andahuaylas, taking repair materials and extra gas. So many natives had gathered on the pampa there that they hindered our work; it was dark before we had finished.

With nightfall the temperature dropped to a few degrees above zero. The planes were parked as close together as possible. Cameras and gas cans were piled into a barricade against the swirling wind. We had ponchos and light flying suits, yet we were cold almost beyond endurance.

Next morning the sun had scarcely struck the surrounding snow peaks when the temperature began to rise. By 8 o'clock the wings were free of the thin coat of ice that had formed during the night.

By noon we had finished the repairs. We amputated three feet of the left wing of the *Washington*. No Department of Commerce inspector would have passed those repairs, perhaps, but it was the best we could do there.

With the *Washington* repaired and refueled, we got the *Lima* ready for the return flight to Cusco; but apparently our streak of bad luck was unbroken. In running over the rough pampa, the *Lima's* tail wheel tire collapsed. Then we found that the inner tubes we had been so confidently carrying as spares were oversized and



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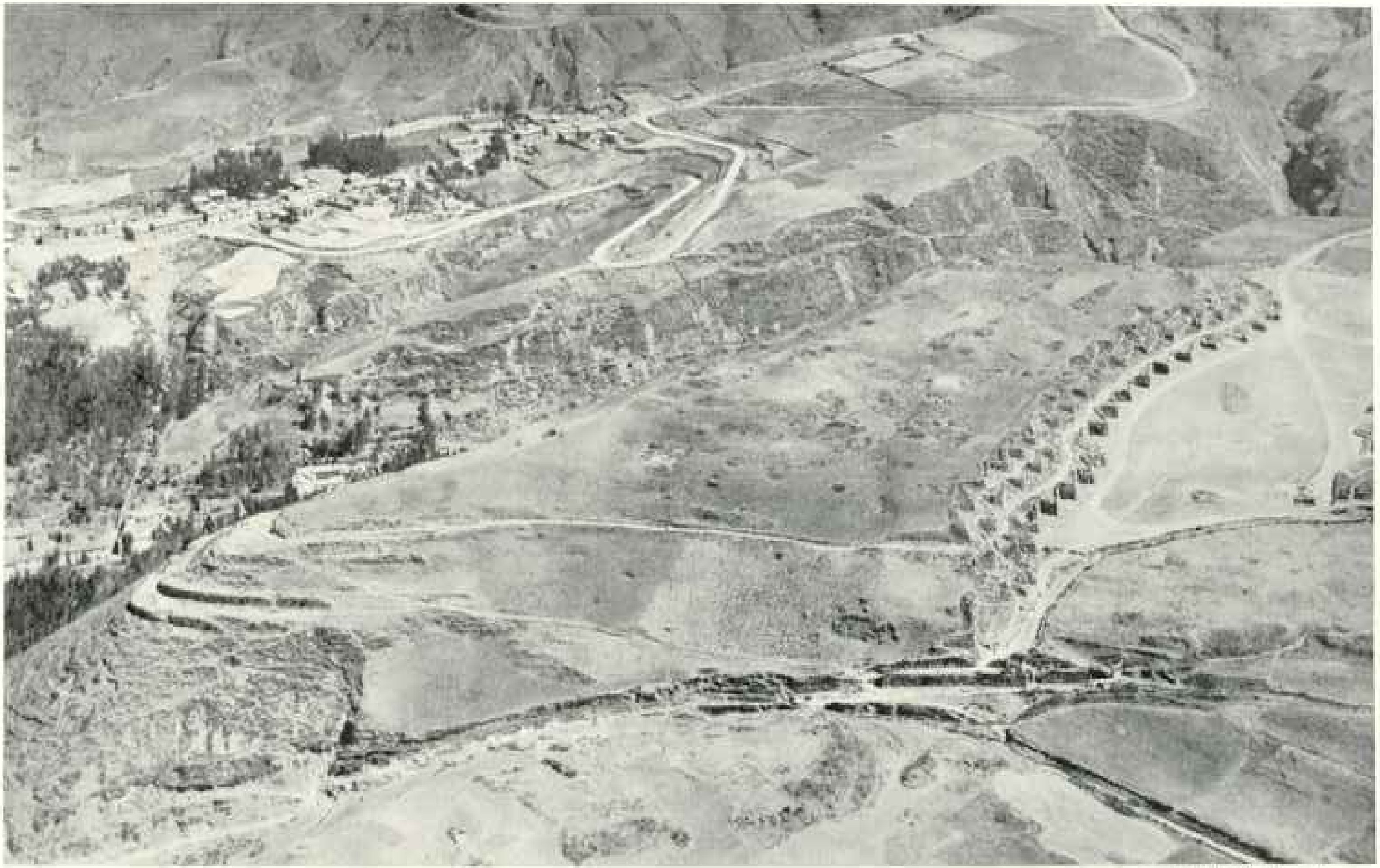
ETERNAL SNOWS BLANKET THE RUGGED ANDES ABOUT HUANCAYO

Flying at an altitude of 23,000 feet, the awesome grandeur of the peaks becomes a storm-tossed ocean of clouds, ever menacing to the plane which may be forced down by adverse air conditions. The author and his companions made many flights in this region, but they were careful to ascertain possible landing places before venturing far from base (see text, page 89).

MAGNIFICENT MACHU PICCHU, IN ITS STUPENDOUS CANYON, DREAMS OF THE DAY WHEN IT WAS AT THE PEAK OF ITS POWER AS THE CITADEL OF THE INCAS

On sheer precipices a thousand feet in height, in a cleft whose rim is more than a mile above the river, are ruins once peopled by a race of proud warriors (see map, page 83, and text, page 115).



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ON THE HEIGHTS ABOVE CUSCO STAND THE RUINS OF FORT SACSAHUAMÁN

This region is rich in relics of both the Incas and their predecessors, the Chimûs. Walls built by these ancient peoples were of adobe, and floods have dissolved many of them. Only the structures in arid regions remain fairly intact.

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CAMERA-SHY NATIVES SELL FOOD ON HUANCAYO STREETS

The flat loaves of bread offered by this woman vender are freshly baked and palatable.

would not fit the casing. By stuffing the casing with layer after layer of rope, we completed a makeshift. It held for the take-off. After a half mile run the ship lifted from that 12,000-foot plateau.

We had agreed that the *Washington*, with the crippled wing, should wait till later in the day for more wind for a take-off.

The *Lima's* flight back to Cusco was uneventful until the plane was set down. Then, rolling at more than 50 miles an hour, there came a sudden jar from the rear of the fuselage. The rope-filled tire had given way, and the tail wheel assembly broke under the unusual strain. As the rudder was dropped to the ground, it crumpled, breaking several wooden ribs in its framework.

Late that afternoon the *Washington* appeared. Her crew, Johnson and Hay, had experienced a nerve-racking flight, with the crippled wing threatening to dip out of control. Only by holding the stick over against the right side of the cabin had they kept that left wing level.

Early next day the *Lima* was ready. Hay flew a return trip to Andahuaylas, and that afternoon the expedition was at last united in Cusco, though somewhat the worse in flying equipment. The *Lima's* rudder had been patched with sheet tin; a crude tail wheel had been cut from a block of hardwood.

The *Washington* was lopsided, with one wing three feet shorter than the other. We decided to replace the damaged member with a good one from the *Lima;* for the former, being better equipped for photography, could carry on in the Cusco region, while the *Lima*, borrowing her sister's crippled wing, could fly to Faucett's Field for overhaul. This change we made successfully and Hay and I warmed up the *Lima* for a test hop.

But we never learned how the *Lima* would have flown with that one short wing. She seemed sluggish in getting under way. We had passed midfield before she lifted her tail. Fifty yards from the end of the field her wheels were still on the ground.

CUSCO NATIVES TAKE PART IN THE CORPUS CHRISTI PARADE

In this procession, as in numerous others celebrating church holidays, floats of religious significance are borne on the shoulders of native worshipers.

At the controls, Hay pulled back on the stick. The ship lifted for a few feet, then squashed sickeningly.

Trying to hurdle a ditch, the wheels struck its banks. There was a terrific, smashing jar. The plane bounded 20 or 30 feet in the thin air. I caught a hasty glimpse of our undercarriage shooting off to one side; then the *Lima* slipped sideways and the short wing dropped.

We braced ourselves for the expected crash.

Struts splintered and bolts snapped, as the now wheelless ship plowed and bucked over 50 yards of corn stubble.

Choking in the dust that filled the cabin, Hay and I felt for injuries. My right elbow was bruised; Hay had a bump on his forehead where it had struck the windshield. Otherwise we were unhurt. It was a miracle!

Before night we had completely dismantled the *Lima* and loaded the "remains" on a flat car.

Next day Distel and I left Cusco on the freight train which was to carry the wreck to Mollendo, whence it would be shipped to the United States. The *Lima* would not fly again in Peru.

While Max and I rode the slow freight for five days down to Mollendo, then back up the line to Arequipa, the others were hard at work. From the *Washington* both still and motion pictures were made of snow peaks and various ruins in the Cusco region; among the latter, Machu Picchu (see map, page 83).

These ruins in the Urubamba Valley, "two days' hard journey" on the ground or 55 minutes by air from Cusco, are known to the world by the labors of Dr. Hiram Bingham for the National Geographic Society and Yale University.*

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Explorations in Peru," April, 1912; "In the Wonderland of Peru," April, 1913; "The Story of Machu Picchu," February, 1915; and "Further Explorations in the Land of the Incas," May, 1916.

MOUNT UBINAS THRUSTS ITS GIANT MAW TO AN ALTITUDE OF 17,400 FEET

Though it is only 35 miles from El Misti, which rises in the "back yard" of Arequipa, this volcano is little known. The diameter of its crater is nearly three times as great as that of the higher and more famous cone. At the height from which this picture was taken, the rugged contour of the roof of the Andes is revealed in all its magnificence (see text, page 101, and illustration, page 119).

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DESERT OIL HAS MADE CALLAO A GREAT PORT

Here, as elsewhere along the Pacific side of South America, harbor facilities have been provided at heavy cost. The dock project, the best equipment of its kind on the coast, represents an outlay of more than $8,000,000. Until these artificial breakwaters were built with capital obtained in the United States, ships had to stand some distance offshore and take on cargo from lighters.

THE AVIATOR MUST REACH A BREATHLESS HEIGHT TO LOOK DOWN ON EL MISTI

Looming far above the lofty city of Arequipa, the great volcano lifts its crater to an altitude of 19,000 feet. The airplane from which this photograph was taken was nearly four miles above sea level (see pages 94 and 99). To sustain life in the high altitudes the flyers were obliged to attain in order to secure these pictures, flasks of oxygen were used.

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NEAR CUSCO LIES A GROUP OF CURIOUS "BOWLS" RESEMBLING MODERN STADIA

Whether these strange structures were Inca amphitheaters or sunken gardens embodying the characteristic terraces is unknown. Thus far they seem to have escaped the study of archeologists.

THE CRATER OF UBINAS (SEE PAGE 116) PLAYED TRICKS WITH THE VISION

Though the snow-choked cup is almost 2,000 feet lower than that of El Misti, it is so large that it presents peculiar problems. In flying over it and dipping down between its walls, the pilots of the two planes became confused (see text, page 101) and, though they were flying not far apart, completely lost each other.

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AN ARTERIAL HIGHWAY OF OLD LEADS PAST RUINS IN THE CHICAMA VALLEY

What pack trains laden with the spoils that tempted Pizarro may have worn this ancient road, traces of which are still visible on the desert between Talara and Trujillo!

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NEAR HUANCAYO AN ICE-RIMMED ROCK CUP HOLDS A GLACIAL LAKE

What subterranean fire prevents the water from freezing is unknown, for the region has not been penetrated by travelers on the ground.

The site of Machu Picchu is magnificent, above "a stupendous canyon whose rim is more than a mile above the river, whose precipices are frequently a thousand feet sheer." It is disappointing to the aërial observer that the forest growth has so covered the ruins since they were cleared away in 1912. However, an incomparable view of the Inca citadel is afforded from the air (see illustration, page 112).

An odd group of amphitheaters in the Maras Pampa, 15 miles northwest of Cusco, was also photographed. The structures resemble the amphitheaters of ancient Greece, even though they may be nothing more than agricultural terraces. Cusco priests said they had been used by the Incas for religious presentations during their fiestas (see illustration, page 118).

In Cusco we photographed the Corpus Christi religious festival. Many more pictures might have been taken, if the natives had not been so interested in the "gringos." People had come for miles to attend this fiesta, and it seemed as if nine out of ten were determined to be photographed. Children fought bitterly even for the paper tabs from the film packs. Some actually tried to tear them from the pack itself before the film had been exposed.

To get elbow room to make motion pictures, one of us had to play decoy—running madly down the street. The crowd would instinctively pursue, leaving Rumeie free to crank his camera.

Adios, now, to Cusco. We had yet one more adventure ahead of us—exploring the Colca Valley.*

* His explorations of Colca Valley and the Valley of Volcanoes (the Andagua) will be described by Mr. Shippee in an early number of the NATIONAL GEOGRAPHIC MAGAZINE.

MONTSERRAT, SPAIN'S MOUNTAIN SHRINE

By E. John Long

Author of "Oxford, Mother of Anglo-Saxon Learning," in the National Geographic Magazine

HARDLY out of sight of the smoking factory chimneys and scarcely out of hearing of the noise and bustle of Barcelona, busiest and most restless city of Spain, a medieval Benedictine monastery clings to the face of a fantastic stone peak that rises boldly from the brown foothills of Cataluña (Catalonia). It is Montserrat, the Nation's holiest shrine, to which thousands of the Spanish faithful make pilgrimage each year to pay homage to what is called the Black Virgin.

The prosperity, modernity, and political activity of Barcelona trampled my illusions of a Spain of castles, balconies, castanets, and guitars. The city had, to be sure, a bull ring and toreadors; but these, I was informed with much shrugging of the shoulders, are for the crowds.* Consequently, after I had admired the fine view from Mount Tibidabo, Barcelona's Hollywood Hills, I was ready to go on to other parts of Spain.

ONE MUST SEE THE BLACK VIRGIN

"Ah, but, *señor*," remonstrated the hotel manager, "have you seen Montserrat? It is Spain's most sacred shrine. It is very quaint and old, and the Benedictine monks will let you live with them in the Monastery for three days! It is not far from Barcelona. You should see the Black Virgin, and the view from the Monastery is magnificent! You will change your opinion of Cataluña," he added with characteristic Catalan pride.

Spain's most sacred shrine! I tried to recall others. There was the Escorial, near Madrid, where royalty was buried.† But no, the common people, the peasants, seldom went there. And the birthplace of El Cid, Spain's national hero, in Burgos. El Cid, however, was a popular figure, like Robin Hood or a motion-picture star. People talked about him, but they did not worship him.

Live in a monastery with the monks! Why hadn't some one mentioned this before? I had included Barcelona in my itinerary because it lay conveniently on the route from southern France to the beauty spots of Spain—the Alhambra at Granada, La Mezquita of Córdoba, and the Alcázar and the Giralda of Sevilla.‡

Montserrat, I learned, is the name of a strange mountain, and also of the Monastery, which clings like a swallow's nest halfway up its precipitous cliffs. The Black Virgin, a wooden image darkened by age, is not the only reason why it is a place of pilgrimage. Montserrat, in Catalan tradition, is the Monsalvatsh or Monsalvat of the Middle Ages, site of the castle of the Holy Grail. The Arabs called it Gistaus, or the stone watchman. Here Ignatius of Loyola, a wounded soldier, knelt in prayer, and went away to found the Society of Jesus. In more recent years the Montserrat choir school has become celebrated.

HOSPITALITY EXTENDED TO ALL

I inquired of the hotel manager if one must be a Catholic to stay in the Monastery.

"Oh, no, señor," he replied. "The Benedictine fathers are most hospitable to all, whether one comes to pray, or atone, or meditate, or just to see. And there is no charge for lodging, although one is expected to leave a small contribution for holy work."

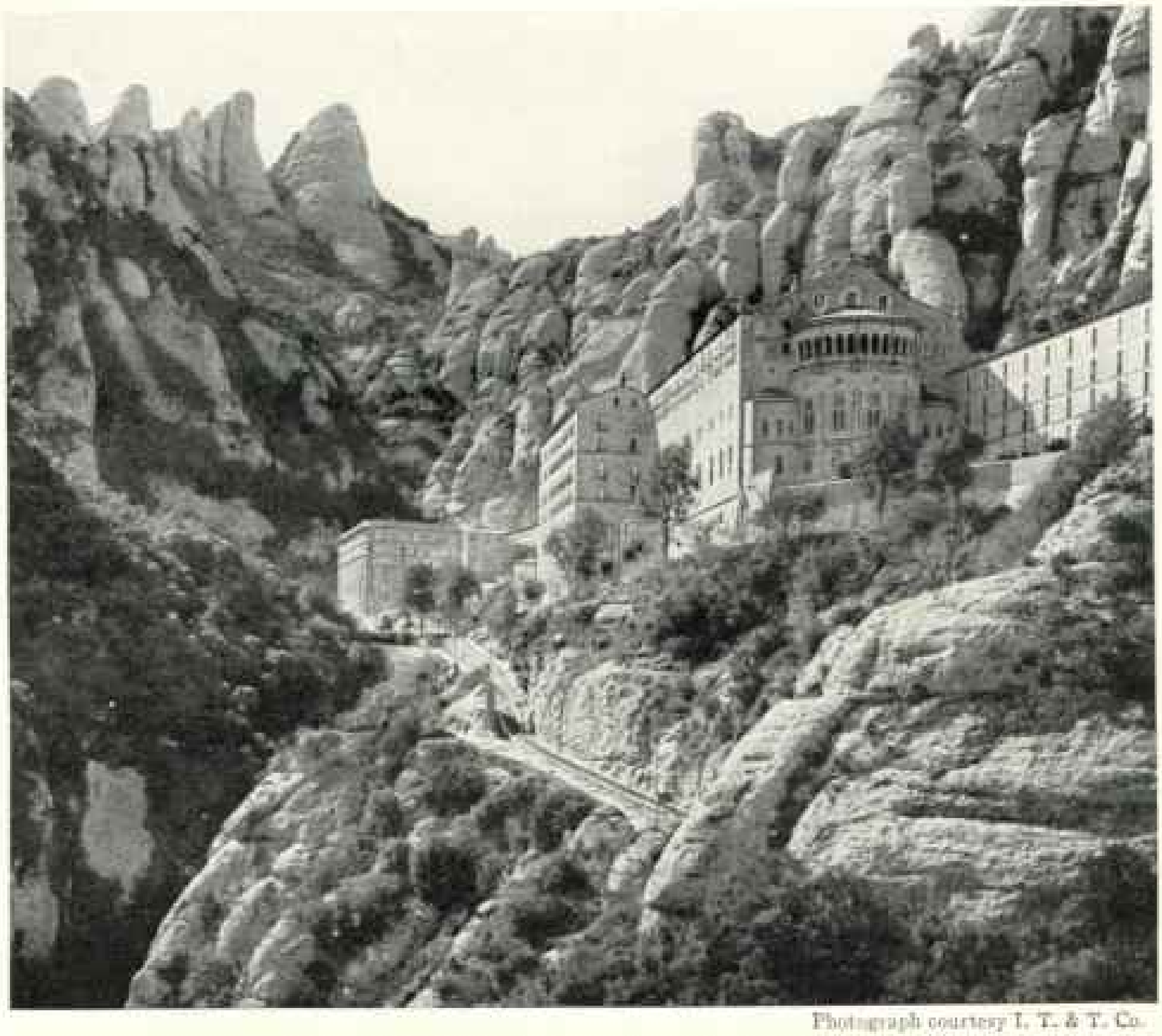
Montserrat is accessible to Barcelona by both railway and road. One way is as picturesque and as spectacular as the other; for, while the highway climbs to the Monastery in a series of hairpin turns and horseshoe curves, the last few miles of the 35-mile railway journey may be made on a narrow-gauge rack-and-pinion line or in the bobbing cage of a new aërial cableway.

Being in no hurry, I chose, at the recommendation of my host in Barcelona, the railway and the rack-and-pinion route. Once clear of the spreading suburbs of Barcelona, the main-line railroad strikes boldly out into the beautiful plain of Sardañola. How much the countryside here resembles southern California! There are green fields with angular irrigation

* See, also, "Barcelona, Pride of the Catalans," by Harriet Chalmers Adams, in the National Geographic Magazine for March, 1929.

† See "Madrid Out-of-Doors," by Harriet Chalmers Adams, in the National Geographic Magazine for August, 1931.

‡ See "Seville, More Spanish Than Spain," by Richard Ford, in the National Geographic Magazine for March, 1929.



Photograph courtesy I. T. & T. Co.

STARK GRANDEUR ENFOLDS THE MONASTERY

One must walk to the edge of cliffs, which drop almost sheer to the Llobregat Valley, to obtain this view of the abbey, with its rounded apse, and of the rack-and-pinion railway terminal. The smoothly weathered pinnacle of rock directly above the new dormitory (left center) is known as "The Liberty Cap."

ditches; rocky river bottoms, rising at first gently and then abruptly, into brush-covered foothills; and scraggly and unkempt clumps of eucalyptus and pepper trees around the water holes.

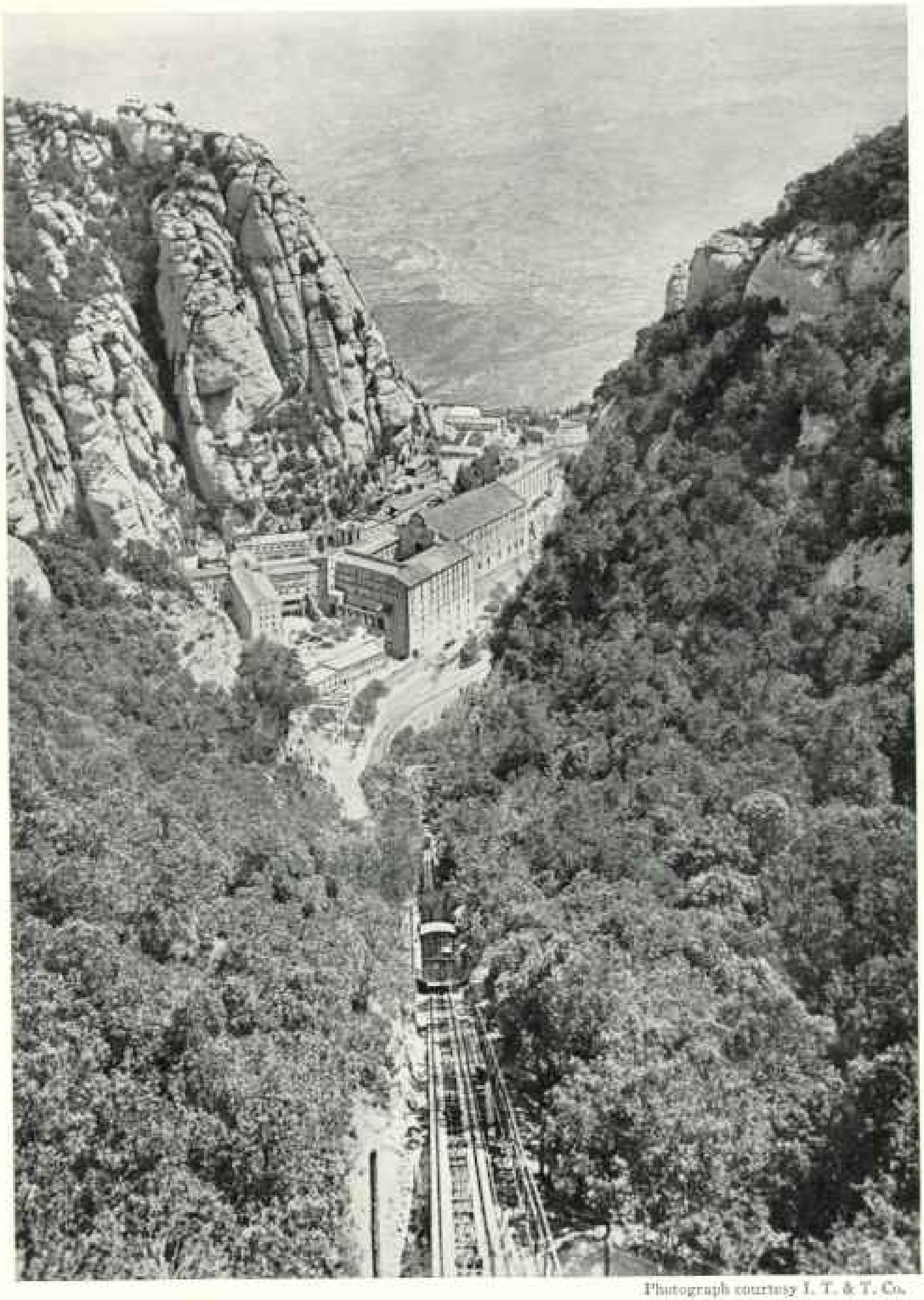
Now and then a dusty cactus and a cluster of feathery date palms give evidence of the true nature of the country beyond the silvery irrigation sluices. One sees the high water wheels and the hedges of agave, relative of the century plant, that distinguish the Catalan landscape.

THE MOUNTAIN BURSTS INTO VIEW

Gradually the scenery changed. We entered a region of irregular hills and rocky valleys, sparsely covered with vegetation. The line twisted and turned, now hurdling a deep ravine on a stone viaduct, now plunging into a short tunnel. The cars swayed drunkenly from side to side as we climbed to the plateau.

Not until one is very close to Montserrat does the mountain come into view. The train emerges from a tunnel and suddenly a giant mass of rock seems to spring from the foothills, flinging a thousand cathedral pinnacles skyward! As the train swings closer, so that only a deep river valley separates it from the Brobdingnagian mass, a fantastic stone forest of smoothly weathered domes, sugar loaves, minarets, and organ pipes is silhouetted against the sky.

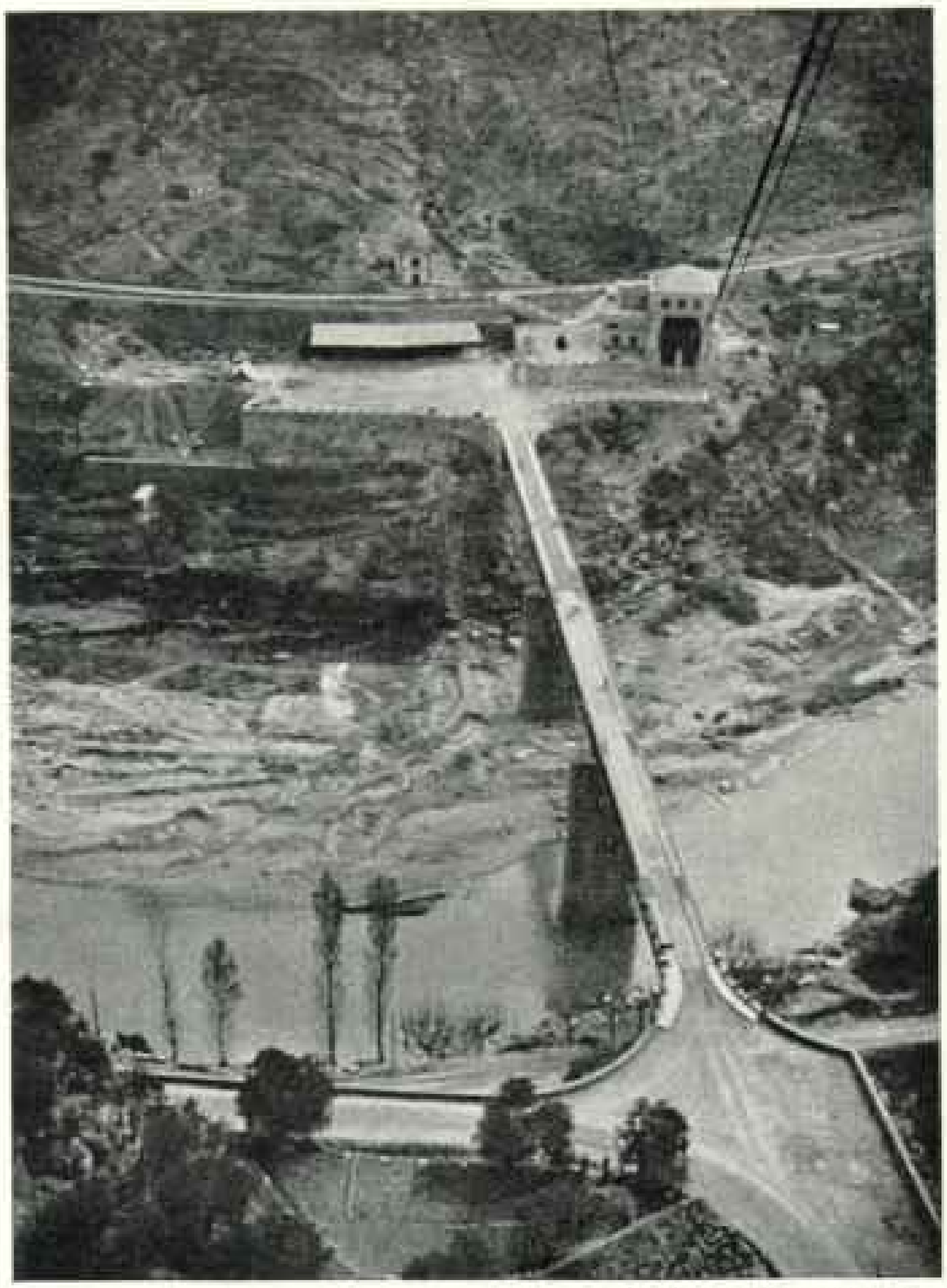
I gazed, fascinated, and began to understand why this sublime mountain should be associated with the supernatural, the mystical. Its stark grandeur has set it apart for the ages.



Photograph courtesy I. T. & T. Co.

LOOKING DOWN ON THE MONASTERY OF MONTSERRAT

Snugly the buildings of this holiest of Spanish shrines fill a ravine in the steep sides of the serrated mountain mass. In the distance, more than 3,000 feet below, spread the rugged foothills of Cataluña (Catalonia), from which Montserrat rises in almost complete isolation. While most of the larger buildings are new, the Monastery itself dates from 976. Tradition says the Holy Grail was once hidden in the recesses of one of Montserrat's rocky caves.



Photograph by Juan Terrasa

A NEW AND EXCITING APPROACH

Engineers recently have built an aërial cableway from the banks of the Llobregat to the gate of the Monastery. This view, taken from the bobbing cage *en route*, shows the new bridge and cableway station (see text, page 121).

Of the Monastery nothing was visible at first. Then, just as the brakes began to grind for the station, I caught a glimpse of tiny buildings which seemed to be carved from the rocky cliffs themselves. The little buildings, it was to be revealed later, are rather extensive; but against the vast bulk of the mountain they seemed no larger than wren houses.

At Monistrol Station one changes from the main line to the rack-and-pinion railway for the last five miles of the journey. Five miles! It is incredible that so great a distance remains! The clear air of Cataluña lends an illusion of nearness.

When the baggage and the passengers had been loaded aboard the two little cars, and the furor of slamming doors, blowing whistles, and tooting horns had ended, the fussy little shunting engine started with a jerk, its driving gear biting into the teeth of the rail between the tracks. Downhill we rolled at first and crossed a rushing mountain stream on a high iron bridge. On the opposite side the ascent began.

Puff-puff-puff-puff! The tiny engine, tilted so that its boiler remains level on the steep grades, labored and panted. Orange and lemon trees, olive groves, and long vineyards slipped by.

Presently the train came to a sudden stop at a steep platform. We were at Monistrol Villa, the station for the picturesque village of Monistrol, in a declivity a little to the south of the narrow-gauge road. A few passengers alighted and turned down a rose-bowered path leading to the town, whose church spire and red-tile roofs could be seen through the trees.

GOATLIKE, THE ENGINE SCALES THE HEIGHTS

Then the real climb started. Dead ahead now were cliffs and terraces of the mountain itself, rearing like the ramparts of a hostile fortress. It seemed impossible that a goat could scale those steep, unbroken walls. Yet always there was a bend or twist in the line which made the ascent level out a bit, and always the panting little engine forged ahead to a new ledge. The

rocky pinnacles towering overhead seemed to pierce the blue sky.

Below, a vast sweep of tumbling, open country evoked from the passengers, most of whom were Spaniards, exclamations of ecstasy. Monistrol now was only a toy village, and the rushing river a silver ribbon which writhed and twisted through the lumpy, brown-green hills. Far off along the horizon the Pyrenees lifted their white-locked heads.

The last of the tilted vineyards gave way to stubby pines, boxwood, and felt-leaf oaks, which seemed to spring from the rocks themselves. Finally we threaded a tunnel and emerged into the dazzling sunlight at the very gate of the Monastery, 3,000 feet above the sea.

Photograph from Arthur Stanley Riggs

THE BLACK VIRGIN OF MONTSERRAT

The most picturesque Mass at this shrine is held on New Year's Eve. Then the road from Barcelona to Montserrat is one long procession of lighted motors and carts, and the highway up the mountain glistens like a necklace of diamonds.

No sooner had I stepped to the escalatorlike platform than I was assailed by porters from the little inns a short distance down the highway from the Monastery. Each man deprecated the Monastery fare and extolled the comforts of his own caravansary. But I had come to sample monasticism. Elbowing my way, I followed a short pathway that leads under a handsome stone arch into the Monastery grounds.

The group of buildings snugly fills a notch or narrow ravine cut deep into the mountain side. A thousand feet above it, the topmost pinnacles of the mountain rise menacingly, but the notch is safe enough, a perfect place for a hermitage. On the side toward the station the buildings are tall, one dormitory being eight stories high. The group resembles nothing so much as a large stone resort hotel, except that the roofs are surmounted by stone crosses.

ABOUT IT ALL THE AIR OF ANTIQUITY

While most of the present buildings are comparatively new, the Monastery itself dates from A. D. 976; and legend reports that a nunnery that preceded it was founded in 880. So faithfully have the monks followed the lines of the older parts of the Monastery in making additions that even the new garage, for modern pilgrims who come by motor, has an age-old air of permanence. There is no embellishment

Photograph by Gervais Courtellemont

A FANTASTIC FOREST OF STONE DOMES AND MINARETS

From a distance the smoothly weathered sugar loaves and turrets of Montserrat resemble the strange pinnacles of our Colorado National Monument. It is said that Wagner drew inspiration from the mountain terraces of Montserrat for portions of his opera "Parsifal."

Photograph by Kester Lichtbild-Archiv

IN THE FOOTSTEPS OF THE FIRST PILGRIMS

Although narrow pathways have been widened and safeguarded with low walls, climbing is no less arduous than when the first devoted worshipers scaled Montserrat's rugged flanks. Here the pathway swings under the *Roca Foradada*, or perforated rock.

Photograph by Kester Lichtfild-Archive

LIKE A MOUNTAIN GOAT CLIMBS THE COG RAILWAY

The self-important little engine of this rack-and-pinion line, like that on Mount Washington, in New Hampshire, pushes its "train" uphill. Constructed more than forty years ago, the cog line is still a popular means of pilgrimage, but many visitors use the highway or the aerial cableway.

Photograph by Juan Terrasa

"HOW MUCH FOR THIS SCRAWNY CHICKEN?"

A pilgrim is bargaining for food at the peasant market in the Monastery grounds. Recently a building of small housekeeping apartments was erected for those who wish to stay longer than the prescribed three days in the dormitories.

Photograph by Juan Terrasa

CATALAN GENDARMES AID THE VISITOR

State police are to be seen everywhere in Cataluña (Catalonia), and they vie in efficiency with the celebrated *Guardia Civil* of Spain. Under the Republic, Spain also has a body of official interpreters, dressed in khaki uniforms, who meet boats and trains from foreign countries and are not permitted to accept pay or tips.

anywhere except on the chapel, with its rounded apse.

The archway emerged into a sun-lit plaza or market place, filled with lowland peasants hawking their wares, and groups of pilgrims of all classes actively and noisily bargaining for food. Among city Spaniards dressed in modern garb walked farmers in red caps, or *gorros*, and sandals; workingmen in velvet knee breeches and faded scarlet sashes; wives with mantillas and shawls drawn closely over their heads; pairs of *somatenes*, the typical Catalan State police; monks in sable cloaks; and children of all ages. A few pannier-laden donkeys nibbled at the grass under the stunted trees. Except that the setting was undoubtedly Spain, it was all very much like a page out of "Canterbury Tales."

THE MONKS ENJOY MODERN CONVENIENCES

I was directed to a terraced arcade at the far side of the court, within which is the office. Here I was given somewhat of a surprise. Over the desk of the father in charge of pilgrim registration was a shining electric light, and at his right hand was a telephone! I had not expected such innovations in a Benedictine monastery.

The fault was my own. Had I been better acquainted with the rule of St. Benedict I would have known that it has always been, in a phrase, "conspicuous for its discretion." The manner of life among Benedictine monks has never been austere.

The father took my name and place of abode and informed me that I might remain for three days. He then assigned me to a room, gave me an armful of linen, and turned me over to a lay brother. Solemnly the latter led the way through the sepulchral corridors of one of the large dormitories, fitfully lighted here and there by a dim electric-light bulb, to a small, plainly furnished room overlooking one of the courts. It was clean and neat, with two iron beds, a table, a chair, a basin, an empty waterpot, and a candlestick without a candle. The lay brother handed me a key,

informed me that meals could be taken in the restaurant of the Monastery, accepted a small tip under protest, and withdrew.

As his echoing footsteps receded down the corridor, something of the blissful peace and quiet of the place stole over me. The clear sun poured through the window, dazzling bright against the whitewashed walls. The keen mountain air was invigorating, conducive to meditation. The workaday world seemed far away.

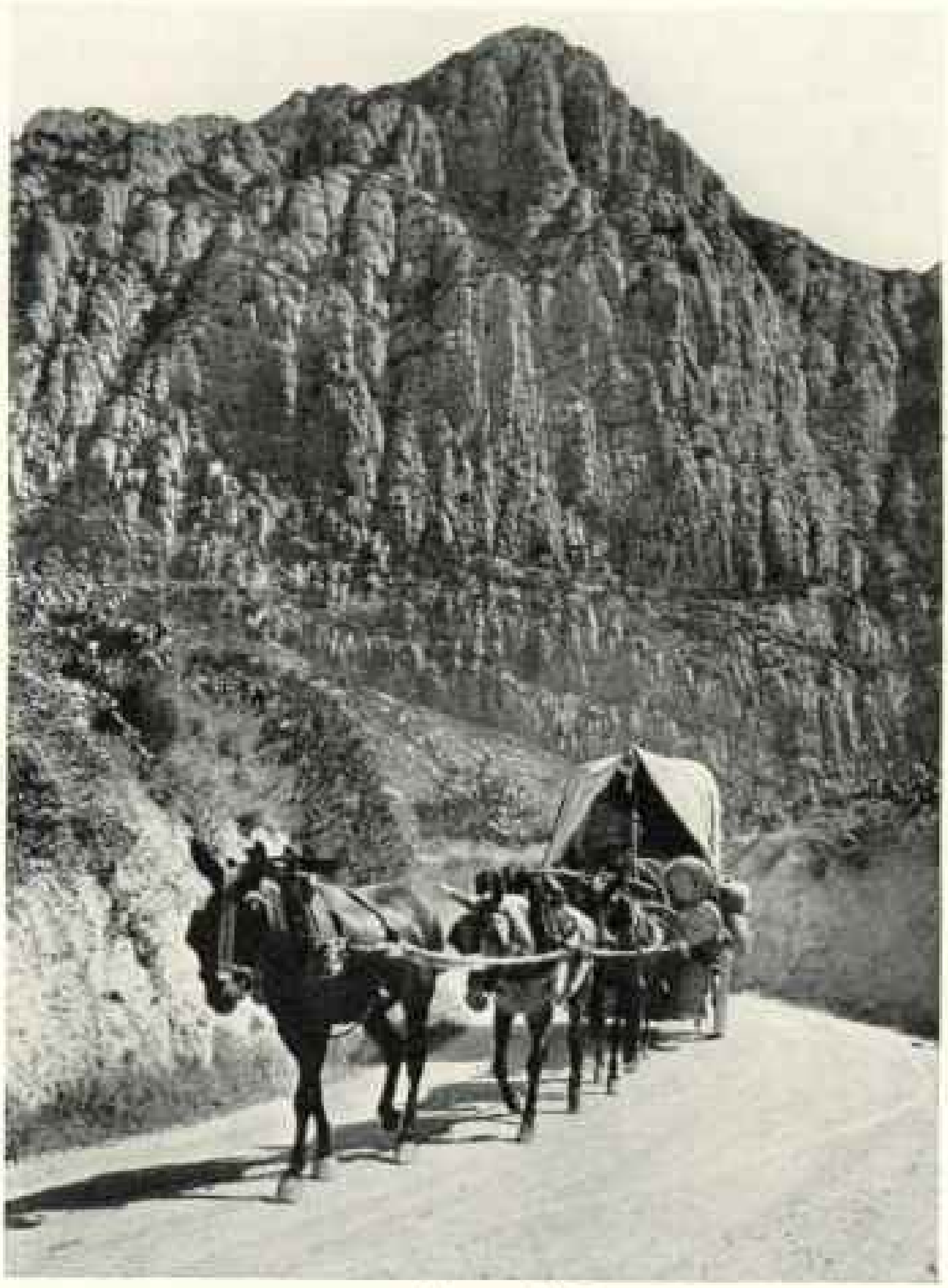
THE STORY OF THE SACRED IMAGE

But I had not yet seen the sacred image, which, the lay brother had said, was shown at the 10 o'clock Mass. I hurried down to the courtyard. There was no need to ask questions. A steady stream of worshipers was filing through the carved doorway of the Basilica. I followed and took a seat near the back of the dimly lit nave.

On the train I had read a Spanish booklet which told the story of *La Moreneta*, as the Black Virgin is called. According to legend, it was carved by St. Luke himself and brought to Barcelona A. D. 50 by St. Peter. During the Moorish invasion and occupation it was hidden by Christian monks in one of the caves of Montserrat near the site of the present Monastery. Years later shepherds discovered it and told stories of strange music heard in the vicinity.

An effort was made to bring it down from the mountain, but, although the statue is not quite life-size, it could not be moved beyond the ledge where the Monastery now stands. The Basilica, accordingly, was erected to protect it, and the Monastery built to care for the throngs of pilgrims who climbed the mountain to worship at the Virgin's shrine. Especially do young couples come to Montserrat, for the blessing of La Moreneta is said to insure a happy union.

The dinginess of the interior of the Basilica serves only to accentuate the brilliance of the altar, with its jewels, silver



Photograph by Burton Holmes from Galloway

MULES FULL SINGLE FILE ON SPANISH ROADS

These high-wheeled carts, shortened versions of the American "covered wagon," are giving way to modern motor trucks in northeastern Spain. Flawless highways, with banked and protected curves, lead from Barcelona to Montserrat. Many pilgrims now drive to the shrine in their own motorcars, or in buses that run regularly from the Catalan capital.

plate, and bright vestments. It was on this altar in the 16th century that Loyola laid his sword when he abandoned his military life to devote himself to the service of Christ. Above the high altar, surrounded by lighted candles, is a small stage, concealed by two velvet curtains. I kept my eye on those curtains, for I knew the image must be back of them. Presently the chanting of the priests increased in volume, and the curtains were drawn slowly aside (see page 125).

I gasped! Even though I had been told that the image was blackened from age, I had not expected anything like this. White vestments and a light background made the face and the hands gleam like jet! For a silent moment everyone gazed, and then the curtains dropped together. Only so long is the sacred image exposed to view.

Quietly I made my way to a door leading upon a paved terrace. "El Camí dels Degotalls" (The Road of the Drops), a sign read. The "drops" do not refer, as they well might, to the breath-taking abysses along the side of the path, but to a kind of grotto, moistened by trickling water, which is reached after a few minutes' walk.

BEAUTY UNFOLDS BELOW THE ROAD

Here is one of the finest panoramas in Montserrat. Almost half of Cataluña is spread below. Surprisingly near is the sparkling blue water of the Mediterranean, while the white peaks of the Pyrenees seem but a good stone's throw away. The river, which was a silver ribbon from the cog railway, is only a thread from this dizzy height. It is a view to stir the imagination and to make the head swim. Here might well be the long-sought Mohammed's tomb, too, for the place seems truly to be "suspended midway between heaven and earth."

The clanging of vesper bells finally drew me back to the Monastery. The peasant venders and their donkeys were gone, and the summits of Montserrat above the Monastery, wreathed with delicate mist, were pink-tinged where the uppermost crags caught the last rays of the setting sun.

Visitors to the Monastery must procure their own food. I had hoped that I might find a general hall where the monks would dine with the pilgrims and visitors. But the monks, apparently, dine apart. For visitors two floors of one of the buildings are set aside as a café. Downstairs the food is very plain, and costs about 35 cents; upstairs meals are very bountiful and cost about 60 cents. Neither place was overcrowded, for many of the pilgrims buy their food in the peasant market or from the shops.

QUIET FALLS LIKE A BENEDICTION

After nightfall the old Monastery is very quiet. The mysterious depths below are dark and only the outlines of the peaks show against the stars. The night wind sighs through cloisters that were old when Columbus set sail to discover America. I slipped up to my room, trying to be very silent, but every light footstep seemed to echo in the corridors like an army on the march, and the hinge of my door set up a protesting shriek as of a guardian spirit aroused. I did not trouble to light my candle, but quickly undressed and jumped into bed.

With an effort I opened heavy-lidded eyes the next morning to see overhead the rosy-tinted pinnacles of the mountain, kissed by the first soft rays of the rising sun. Gradually I became conscious of merry laughter, snatches of song, and chattering voices, as the pilgrims made ready for early Mass.

Soon measured cadences rose above the chatter; and, looking down from my courtyard window, I saw a procession of the pupils of the choir school, moving two by two, like the choristers of the Holy Grail of old, slowly across the flagstones of the court and entering the carved portal of the church. Their greeting to the newborn day, the Salut, faded like a dying echo as the procession disappeared within.

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ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

TO carry out the purposes for which it was founded forty-four years ago the National Geographic Society publishes this Magazine monthly. All receipts are invested in the Magazine itself or expended directly to promote geographic knowledge.

ARTICLES and photographs are desired. For material which the Magazine can use, generous remuneration is made. Contributions should be accompanied by addressed return envelope and postage.

IMMEDIATELY after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resulting given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. As a result of The Society's discoveries this area has been created a National Monument by proclamation of the President of the United States.

AT an expense of over $50,000 The Society sent a notable series of expeditions into Peru to investigate the traces of the Inca race. Their discoveries form a large share of our knowledge of a civilization waning when Pizarro first set foot in Peru.

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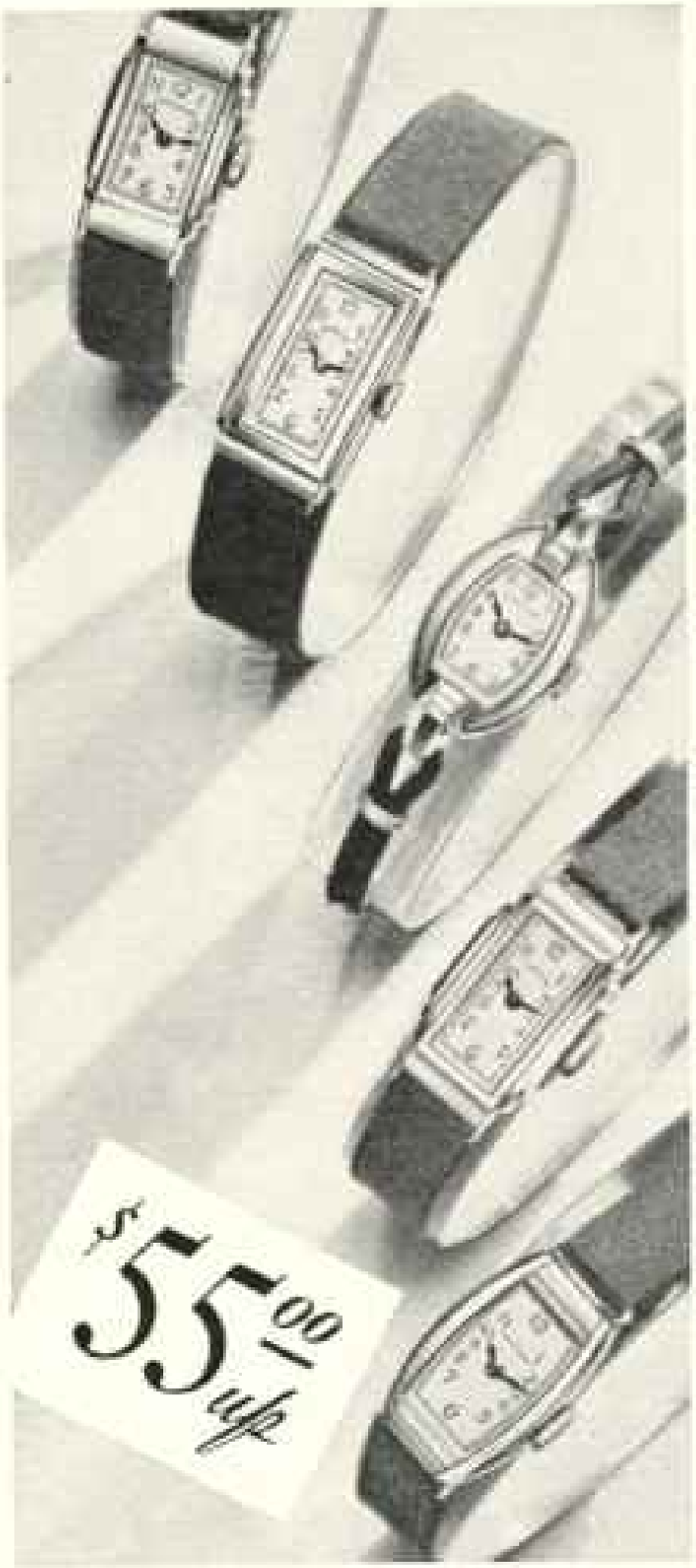
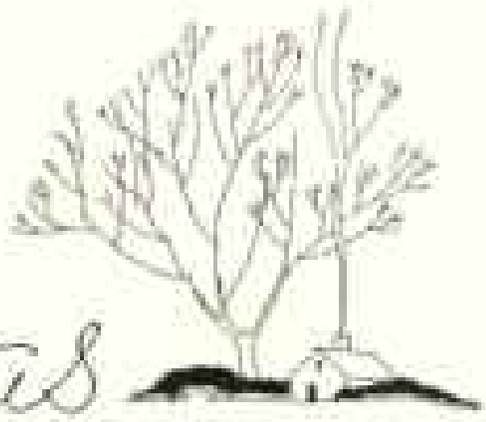


■ *(In panel at top, reading down)* GLENWOOD, filled gold, $55; MARSHALL, filled gold, $55; VIRGINIA, novel model, solid gold, $70; RUSSELL, solid gold, $65; QUANTRILL, solid gold, $65.

■ *(Right)* FARRAGUT, 17 jewels, 14k filled gold, natural yellow or white, with seconds dial, $55. PUTNAM, 17 jewels, 14k filled gold, natural yellow or white; raised gold figure dial, $55. Other Hamiltons, in many attractive models for both men and women, from $45 to $500.

A Green Christmas  *means a White Easter?*

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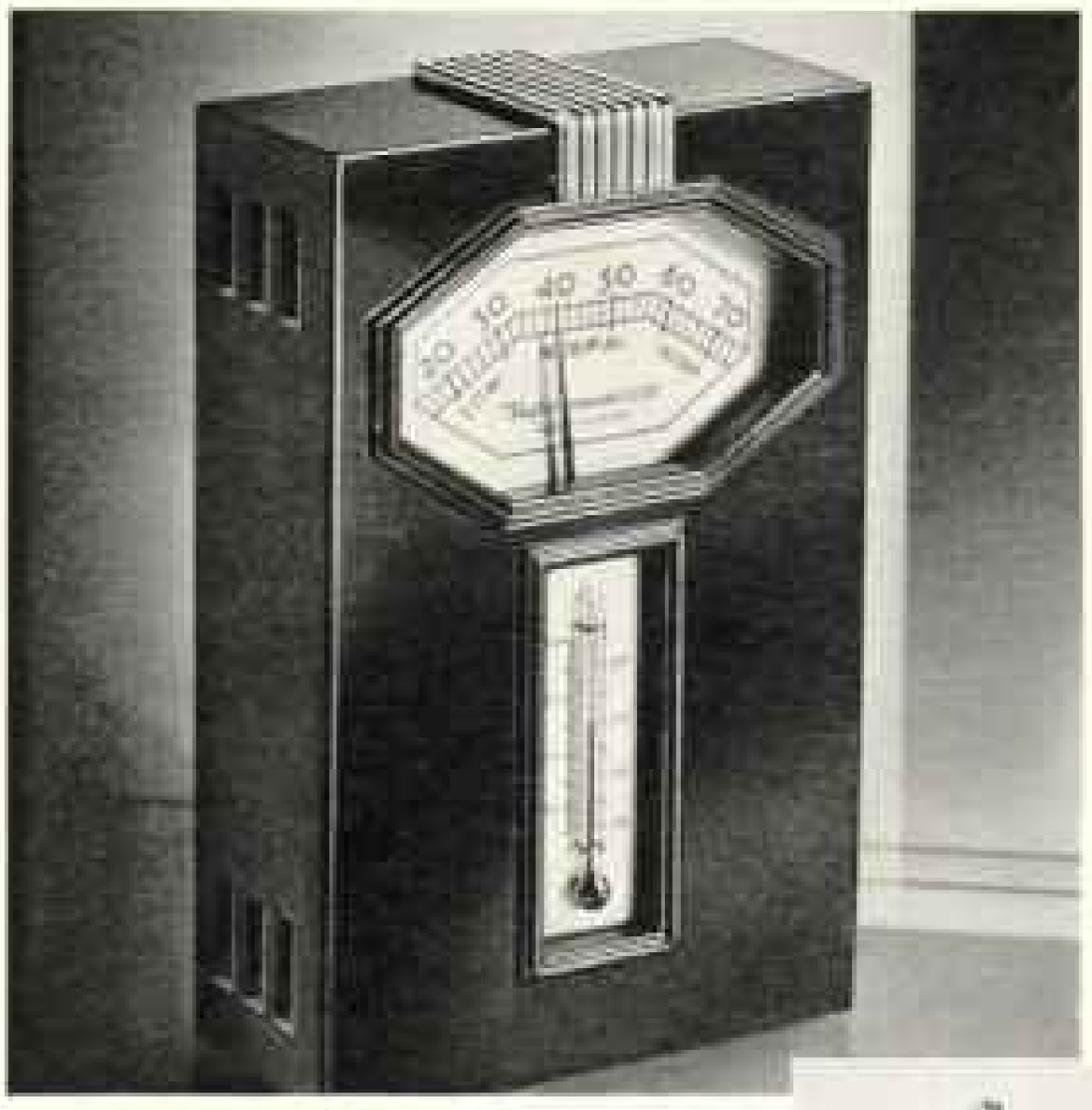

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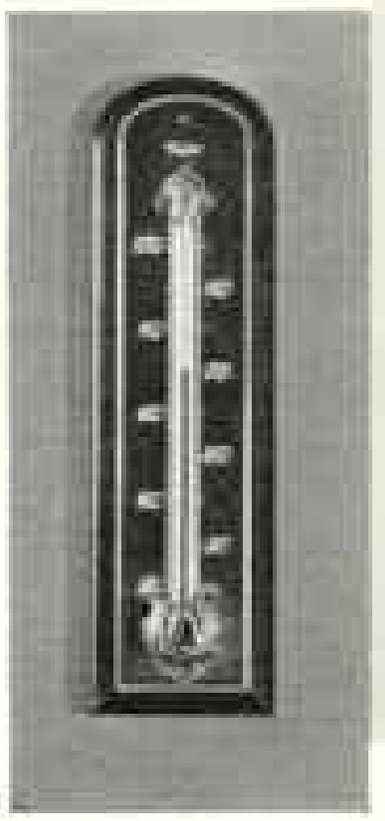

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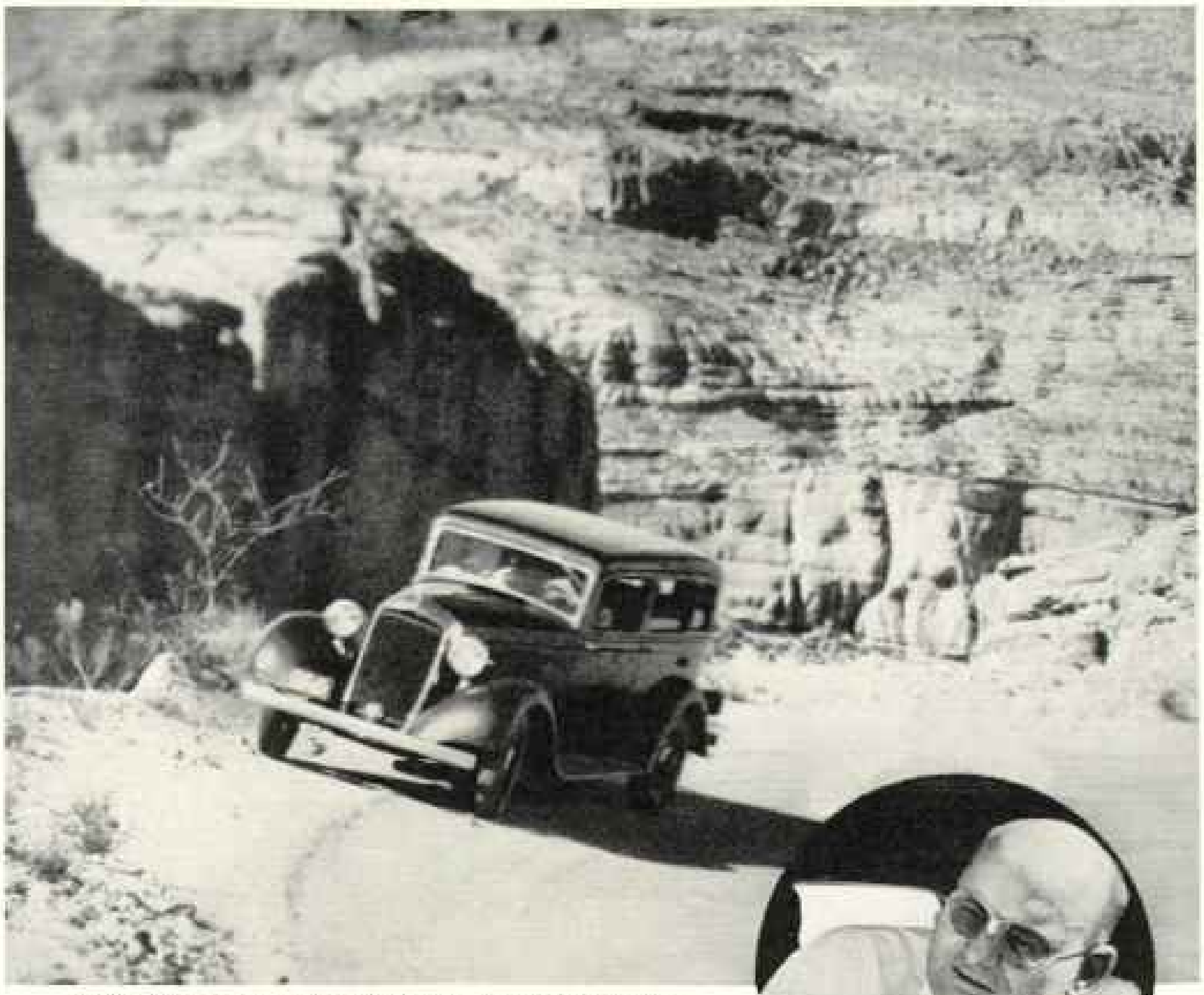

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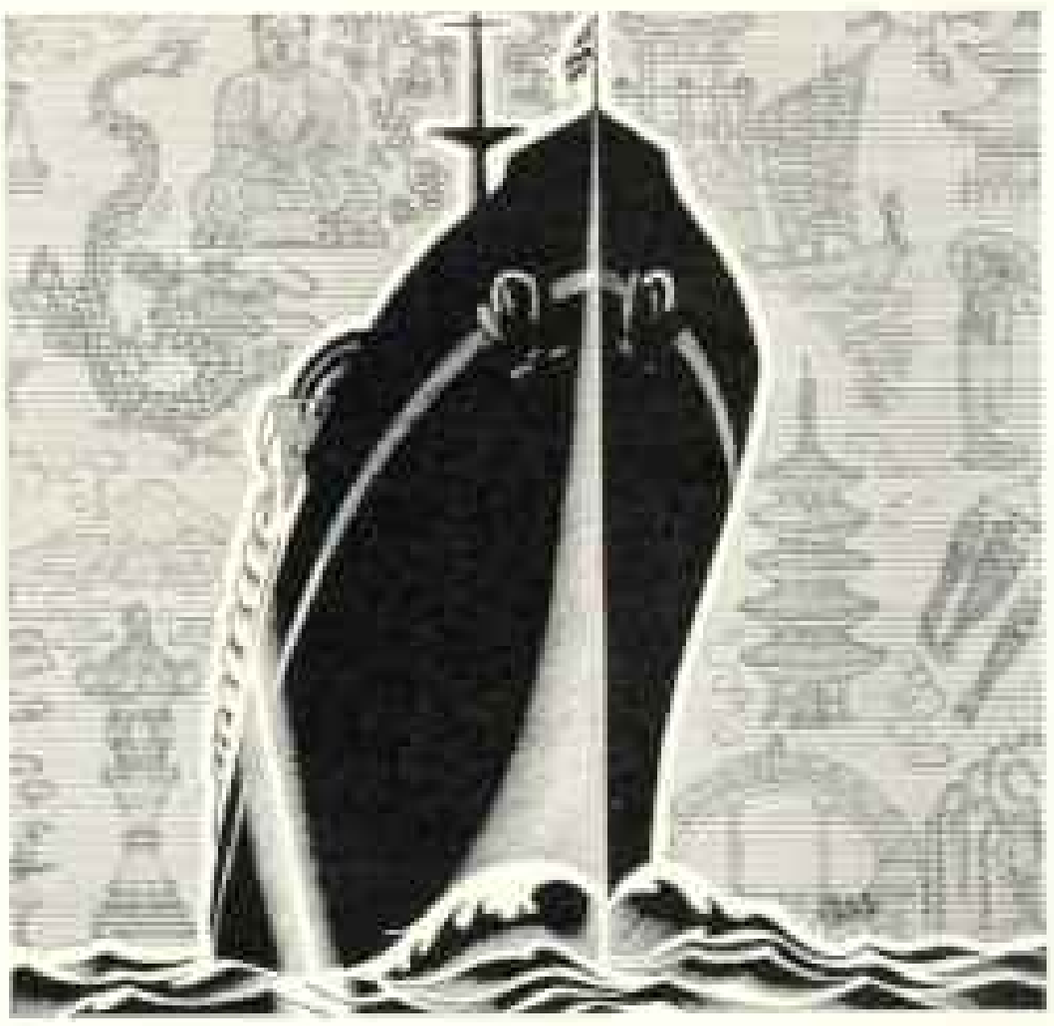

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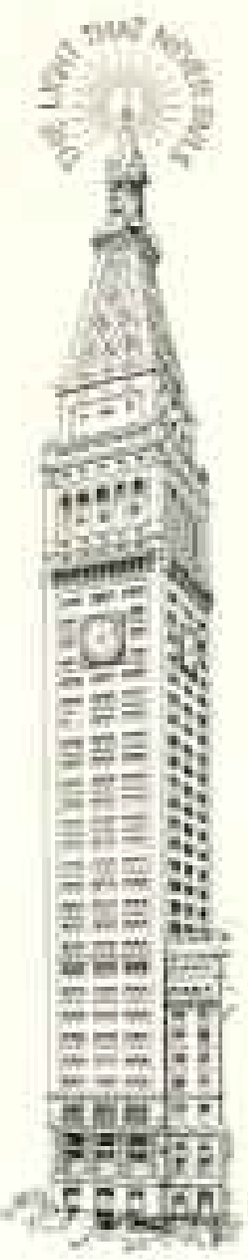

If, however, he reports you to be in good physical condition, you will be glad to know it. It will be a tonic to your spirits and give you added confidence in yourself. You will tackle your problems with keener interest and greater capacity.

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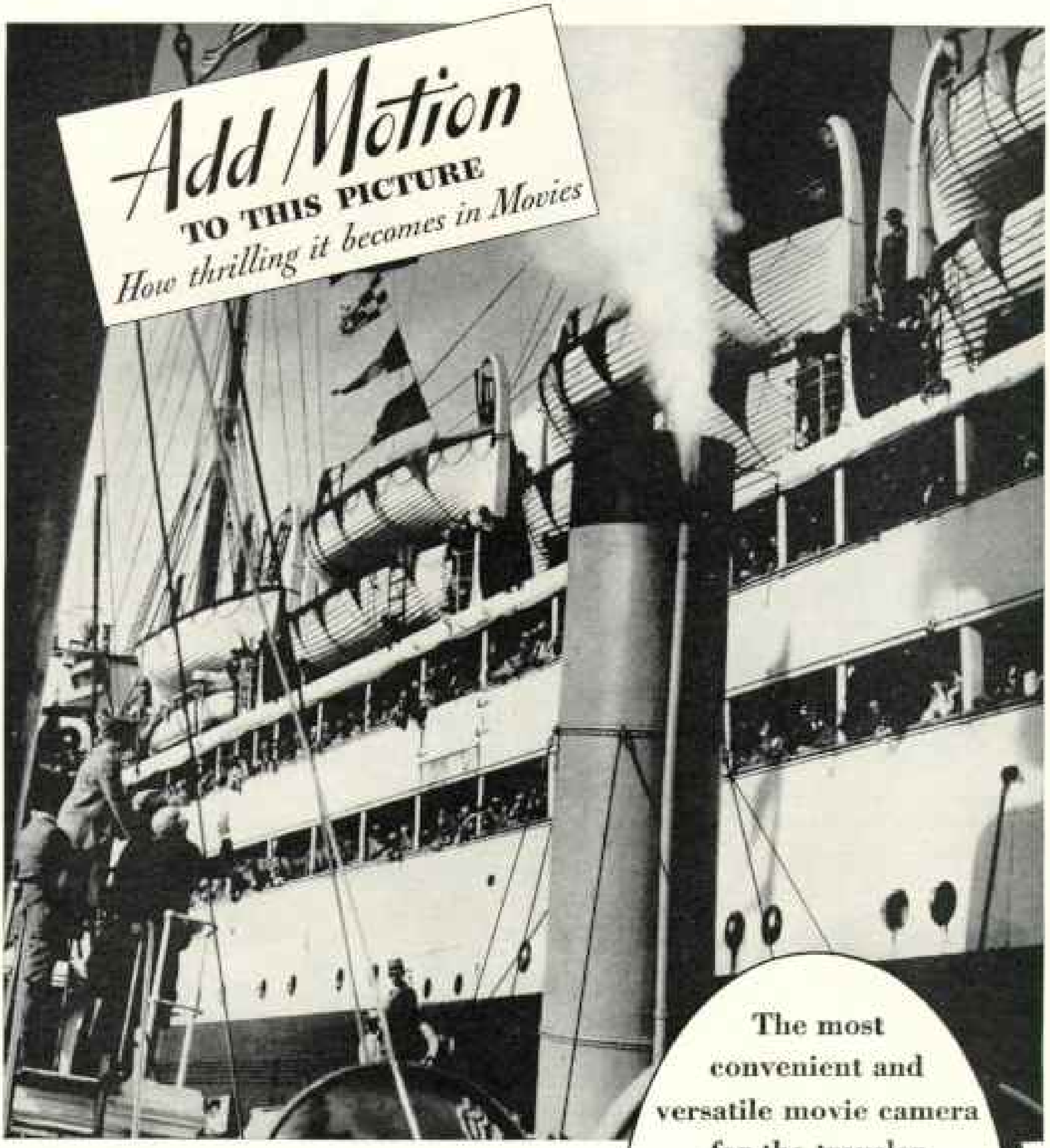

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1-33

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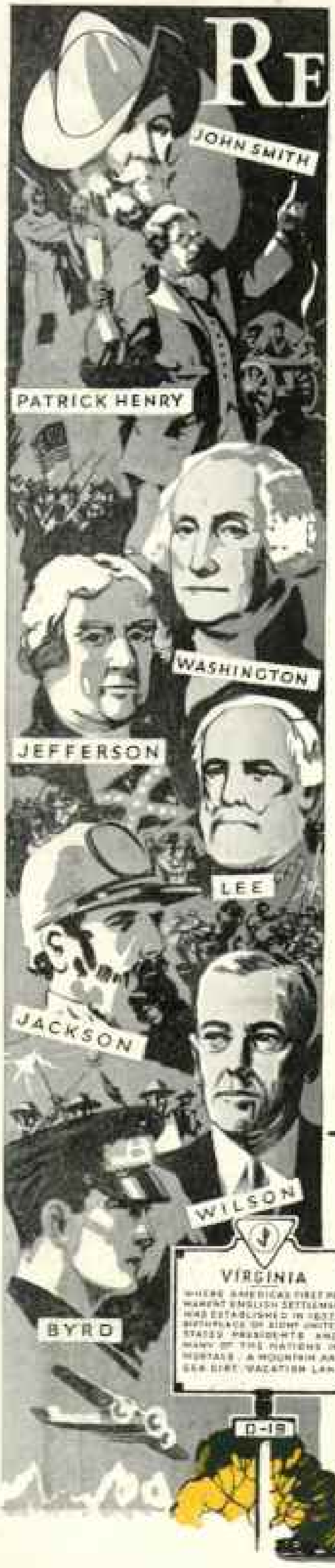

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