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APRIL, 1910

CONTENTS

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NATIONAL GEOGRAPHIC SOCIETY

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VOL. XXI, NO. 4 WASHINGTON APRIL, 1910

THE NATIONAL GEOGRAPHIC MAGAZINE

LANDSLIDES AND ROCK AVALANCHES

BY GUY ELLIOTT MITCHELL

THE recent disastrous avalanches of snow and earth in the Northwest, while of a different character, recall to mind the tremendous mountain slide which destroyed a portion of the town of Frank, Alberta, a few years ago, and also lend interest to geological investigations covering an extensive area in our own San Juan Mountains of Colorado, which have been subject to monstrous rock and landslides, in some instances the entire faces of large mountains having been demolished.

It is the younger mountain systems, geologically speaking, which are most subject to these rock avalanches. Thus the Himalayas, which represent but infant industries, though lusty ones, in the mountain building line, have a way, like other youngsters of immature character, of tumbling about in a wholesale fashion which would result in great catastrophes were their slopes and valleys populated to any great extent.

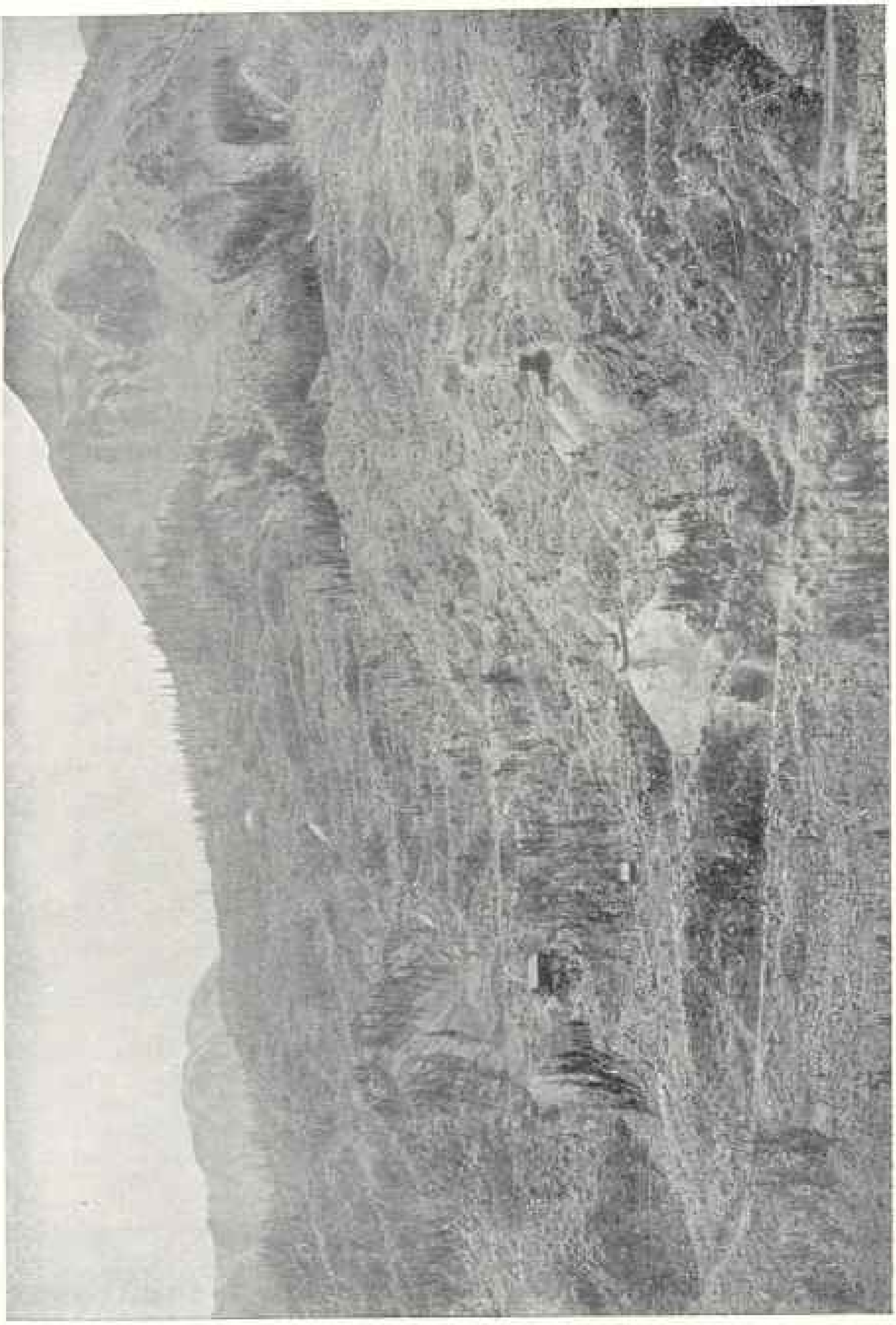
Sir William Conway describes the matter of a little shifting of rock which caused the formation of Gohna Lake, in the Central Himalayas, where the spur of a large mountain mass pitched bodily into the valley below. The front of the mountain had been undermined by springs until there was no longer sufficient support, and in the twinkling of an eye a large part of the mountain slid down and shot across the valley, damming its river with a lofty and impervious wall. *Masses of rock were hurled a mile away, blocks of limestone weighing 30 to 50 tons being sent through the air like huge cannon shots. It is estimated that this slide carried with it 800,000,000 tons of rock and debris.*

Plenty of Himalayan landslips quite as extensive as this have been recorded in the last half century, while among the remote and uninhabited regions of the great ranges numbers more are of constant occurrence.

The formations of the San Juan Mountain landslide area point to many such slides as these having occurred. Fortunately this catastrophe era has ended for the mountains of the United States, although it is true that some movement is still in progress, and as in the Alps and in Alberta, man's mining operations may precipitate disasters.

CAUSE OF LANDSLIDES

Aside from the study of landslides with reference to the safety of human life, there is economic value in their investigation as bearing upon man's search for the precious metals. The geologist



LANDSLIDE SURFACE OF ONE OF THE SUMMITS OF RED MOUNTAIN

The entire area is covered with the landslide debris (see page 279)

and the mining engineer look for gold or other metalliferous deposits in certain rock strata, and in ordinary mountain formations these strata are fairly regular; at least their positions can be determined. There may be rock faults, but these the keen geologist can trace. However, it is evident that even men who are supposed to see down a thousand feet into the earth's crust must be perplexed when the surface of a mountain slides off, and two or three strata come tumbling down to pile up on the slopes and the valleys to a depth of from ten to several hundred feet. This chaotic condition of the rocks in a landslide area is therefore the despair of the miner and most trying to even the experienced geologist.

The failure to recognize the true significance of the landslide phenomena and to perceive their extent, have led to very great loss of time, labor, and money in prospecting of the Rico Mountains—a portion of the San Juan—says Dr Whitman Cross, of the United States Geological Survey. The reason that much of the areas prospected have not been recognized as landslide in character is due to the fact that the great slides of the San Juan region, such as that described in the Himalayas, occurred long ago, perhaps about the time of the Glacial period, and many of the surface traces have been obliterated to the casual eye.

Landslides are believed to be due generally to moisture, which, under favorable conditions, undermines foundations and causes a breaking away of overlying rocks. In the San Juan area the surface rocks are volcanic and porous. These are underlain by a likewise porous conglomerate which rests upon a sandy shale. There is no drainage, and the rains and snows sinking through the two surface strata soften the shale and render it plastic.

The earlier physical forms of the San Juan Mountains were much bolder than at present. High, narrow ridges must have existed, but the slipping down of billions of tons of their materials has not only lowered the ridges, but filled the ravines, resulting in the present irregular topography of low relief.

Some of the landslide areas of Colorado show that in the earlier days, quite recent geologically, but probably scores of centuries before the coming of man, there must have been terrific times among her mountains. There have been thousands of slides, and some of them of great magnitude. Possibly the great saber-toothed tigers which ranged in the plains below, and the giant sloths upon which they preyed, along with other prehistoric animals, heard the roar of the descending rocks. But if so, man knows it not, for the age of the older disturbances can be but guessed.

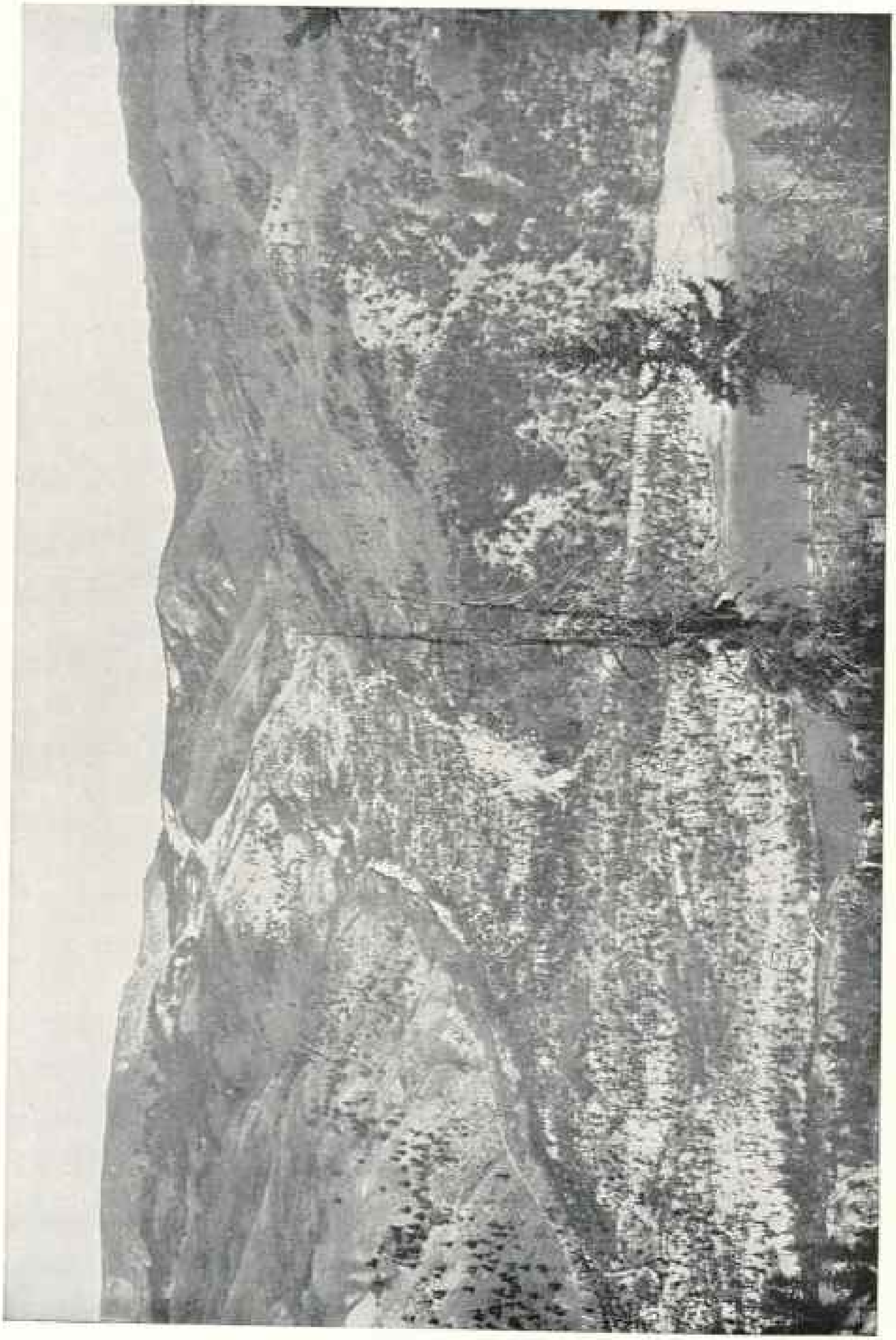
One of the greatest of the early convulsions is known as the Silver Mountain Slide. It covers ten square miles, and the amount of rock which crushed down the mountain sides is beyond conjecture. On the northwestern slopes of Red Mountain about six square miles are covered with landslide debris, while many other landslide areas cover from one to five square miles.

GLACIERS OF ROCK

A singular feature of the San Juan region is the presence of rock streams, veritable rivers of stone, which have flowed down the mountain sides. When seen from a distance they resemble glaciers covered with debris. Ernest Howe* describes these rock streams of which Pierson Basin, in the Silverton quadrangle, is typical.

"Nearly the whole floor of this large basin," he says, "is covered by angular rock debris to a depth of 50 to 100 feet. The length of this rock stream is more than three-fourths of a mile, while its average breadth is about one-third of a mile," with an estimated volume of material of 13,000,000 cubic yards. "In viewing this enormous mass of debris from a distance, one is at once impressed by its very peculiar form, which is like that of a great tongue of some viscous

* Professional Paper No. 67, U. S. Geological Survey.



A REMARKABLE ROCK STREAM: SAN CRISTOBAL QUADRANGLE, COLORADO

The flow with six miles long and dammed a fork of Gunnison River, creating a lake (see page 281)

substance that has slowly flowed down from the cliffs at the back of the cirque and gradually extended to the outer edge of the basin. The singular billowy surface and the curved, often concentric lines near the front or foot of the mass, and which closely resemble those caused by the cooling of lava streams, strongly add to the appearance of slow movement."

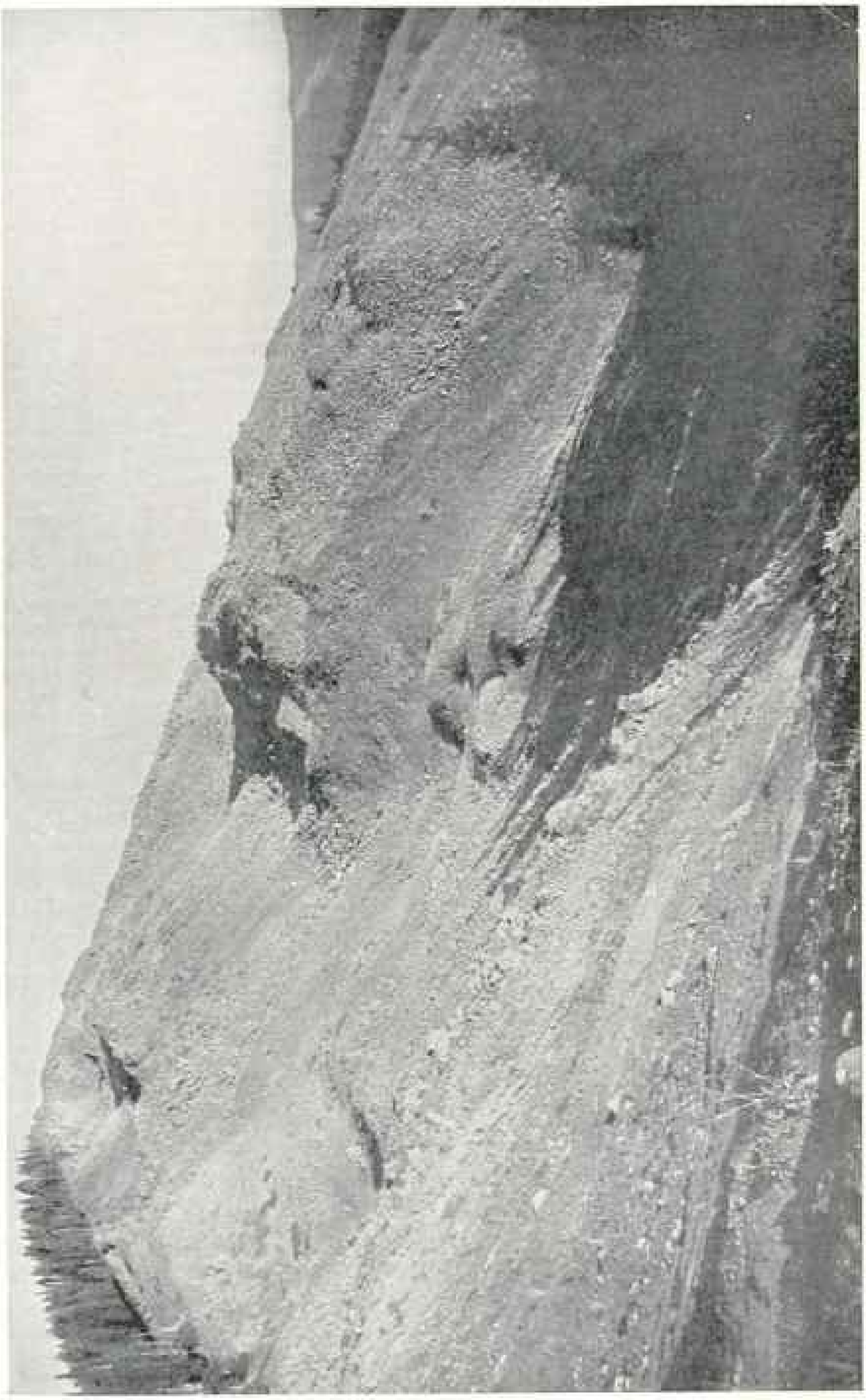
Scores of such rock streams can be seen in the San Juan Mountains. An interesting variation is what is termed by Doctor Cross "Slumgullion mud flow," which dammed a fork of the Gunnison River and formed Lake San Cristobal. At the head of a tributary of Slumgullion Gulch, 11,500 feet altitude, certain rocks had been decomposed into a soft, crumbling sand, underlying, however, other rock masses. In time, perhaps during some abnormally wet season, this incoherent decomposed material became so extensively softened as to be unable to bear the load of rock above, and gave way; the overlying rocks broke into fragments, and the whole mass of mud and rock fragments rushed as a flow down the lateral gulch to the main Slumgullion Gulch, and down that to the Lake Fork, six miles from the place of starting. On reaching the Lake Fork, whose course is here at right angles to Slumgullion, the flow turned north and ended about three-fourths of a mile below the mouth of the Slumgullion. The volume was sufficient to dam the main stream and to cause the formation of Lake San Cristobal, which now extends for nearly two miles up the Lake Fork Valley. The end of the flow is at about 8,900 feet altitude, 2,600 feet lower than its starting point. A sparse forest growth on the surface of the flow shows that the flow occurred many years ago. On the upper part of the flow the trees are in many places overturned or tilted at various angles, testifying to recent movement.

RECENT LANDSLIDES IN THE SAN JUAN

While the great landslides of the San Juan region are doubtless a thing of the past, the recent disaster at Frank shows that American mountains are not entirely trustworthy, and in the case of the San Juan there has been an actual though not very tremendous landslip within the present generation. However, had a city been located upon the three square miles of disturbed area, the movement was sufficient to have ruined it as effectually as did earthquake and fire the cities of San Francisco and Messina.

Late in July, 1886, there appeared in the Denver newspapers a report that an earthquake had occurred in the Cimarron Creek Valley. A few days later Dr Whitman Cross, of the U. S. Geological Survey, accompanied by a photographer, visited the area. The scene of the so-called earthquake was a well-timbered basin, and evidences of such disturbances as had been described were everywhere visible. In some parts nearly all the trees were overturned; in others they stood at various angles, presenting a weird picture. In places were bare slopes, presenting a fissured and step-like structure as if from the dropping down of successive sections of the earth. The movement as described by Cross was a downward sliding of the whole surface, unequal in different places. The impression produced was that a sliding or almost a flowing movement had taken place, involving the whole area of some three square miles. The mischievous agent which had produced the result was unquestionably water. Mud streams were here and there found in which tree trunks and rocks were embedded, while columns and mounds of moist earth were pressed up through cracks by movements of some part of the mass. This appears to have been more in the nature of a surface soilslip than a rock or landslide.

In another locality in the San Juan, namely, the C. H. C. Hill, near the town of Rico, progressive slipping is actually in effect at this time. At one point the stump of a tree has been split open since the tree was felled, and the two portions have separated about five feet in a period of four years. The crack was traced for some hundreds of feet. It is suggested



THE SLED-OFF FACE OF LANGELL MOUNTAIN, SHOWING THE SHARP LINE OF DEMARCATION WHERE THE

that similar cracking and subsequent saturation may have started the Cimarron slide.

Cross and Howe, in a reconnaissance of Ute Creek, a tributary of the Rio Grande, in 1903 found evidence of a landslide that had occurred in comparatively recent times, intermediate in character between that of the Cimarron slide and the incipient slide near Rico. The area covered by the Ute Creek slide is about one-fourth of a square mile, and while no trees appeared to have been actually thrown down as a result of the slip, most of them had been disturbed and stood at considerable angles from the vertical; the trunks of many were buried for several feet by fine sandy soil, which stood in steep slopes in an extremely unstable condition. Although this soil was dry, the horses sank into it so deeply that they were extricated with no little difficulty. The general condition of the locality suggested that a series of heavy rains might so saturate the soil as to cause a renewal of the movement with a violence comparable to that of the Cimarron landslide. So we may hear of more "earthquakes" in the San Juan region, with possible destruction of mining towns.

TREE SPLIT BY LANDSLIDE MOVEMENT NEAR TOWN OF RICO

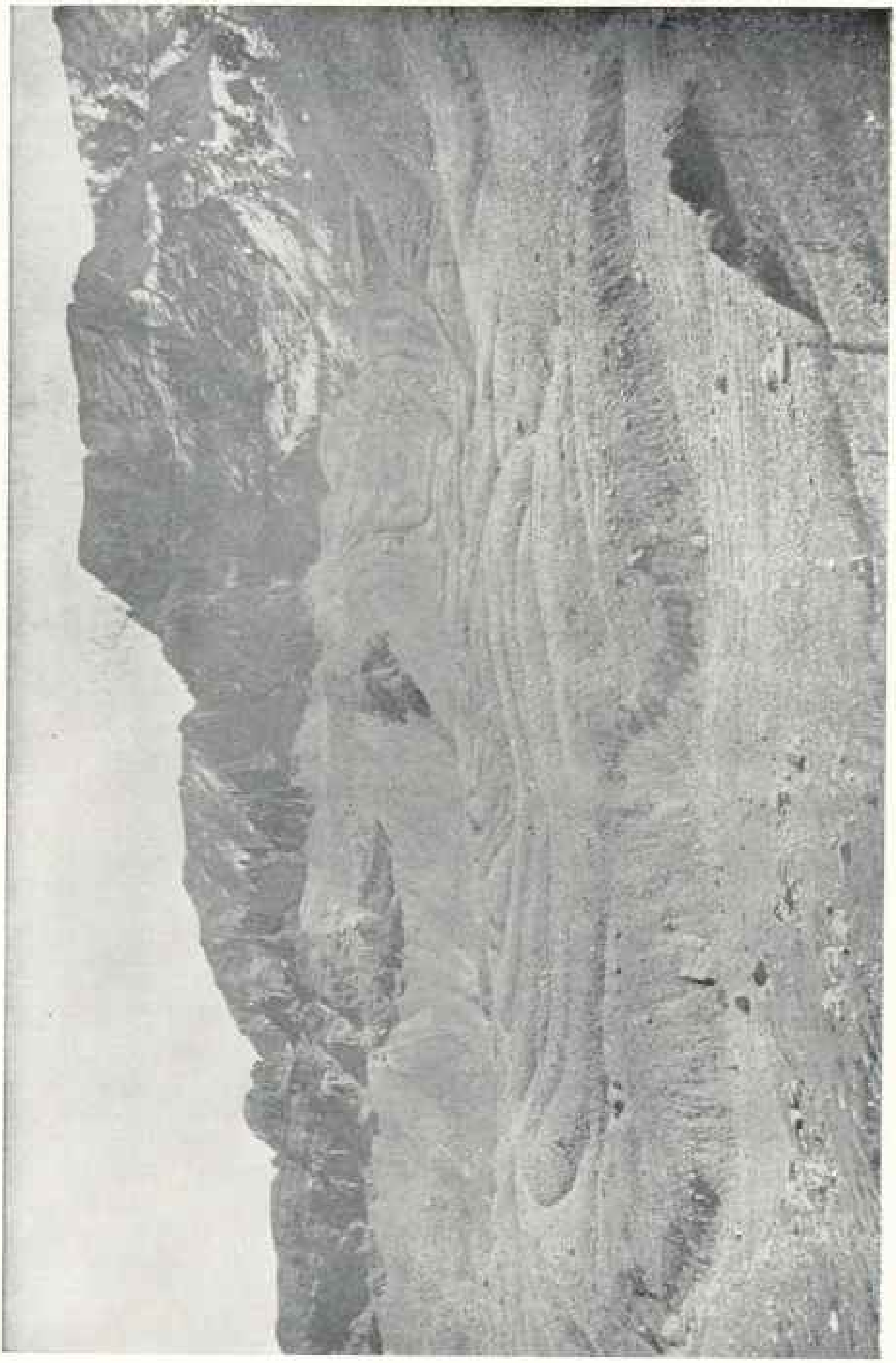
This area may be preparing for a general landslip

THE MOST TERRIBLE ROCK AVALANCHE IN HISTORIC TIMES

To realize the terrific effect of recent landslides, when associated with human activities, one must turn to the accounts of such catastrophes as the great Elm landslide in Switzerland in 1881, or the Frank slide in Alberta in 1903.

The town of Elm is the highest village in the Sernf Meadow. Overshadowing it rose the steep Plattenbergkopf, the outmost buttress of a greater mountain mass. About half way up this hill was a fine slate bed, which was mined in a careless manner for school slates. A crack began to form above the mine, steadily widening, and splitting the top of the hill. It grew to be over 12 feet wide, swallowing up all surface drainage. Every one seemed to have agreed that the mountain would ultimately fall, but no one thought the danger imminent. Rocks began to fall at intervals. September 11 was a rainy Sunday. Rock masses kept falling, and the mountain groaned and rumbled. People gathered at the foot of the laboring rocks to watch the falls. Many were interested, but none foresaw real danger. Yet the villagers then stood viewing an impending convulsion that not all the human engineering ability in the world could avert.

Suddenly a mass of the mountain broke away from the Plattenbergkopf, crashed down over the slate quarry and spread out upon the flat. No one was killed by this fall, though the rocks



ROCK STREAM AT HEAD OF SILVER BASIN, SILVERTON LANDSLIDE AREA

Showing concentric wave-like formation resembling lava flow, which is characteristic of many rock streams

reached within a stone's throw of where the sightseers were gathered. The people of the upper village now became mildly alarmed. This first fall came from the east side of the Plattenbergkopf; seventeen minutes later a second and larger rock mass crashed downward from the west side.

The gashes made by the two united below the peak and left its enormous mass isolated and unsupported. Then four minutes later, as if pausing only to catch its breath for the final plunge, those who were watching the mountain from a distance beheld the whole upper portion of the Plattenbergkopf—10,000,000 cubic meters of rock—suddenly shoot from the hillside. The great mass pitched downward with tremendous velocity until it reached the quarry. Then the upper part shot forward horizontally straight across the valley and up the opposite hill slope.

A cloud of dust accompanied it and a great wind was flung before it. Trees were blown about like matches and houses lifted through the air like feathers and broken up as though little toys by its force alone.

The avalanche, shooting with incredible swiftness across the valley, struck the opposite hill slope obliquely, and was immediately deflected, like water, down the level and fertile valley floor, which it covered in a few seconds to the distance of nearly a mile and over its whole width with a mass of rock debris 30 feet deep.

Most of the people who had run up onto the opposite hillside were killed instantly. Only when the avalanche had struck this slope and begun to turn aside from it did the people in the lower village, far down along the level plain, have any suspicion that they were in danger. Twenty seconds later all was over, and the rock torrent had swept away half that village. The sharp edge of the avalanche cut one house in two. All within the fatal edge were destroyed; all without were saved. One or two men had a race for life and won, but most who were in the path of the destroyer were doomed.

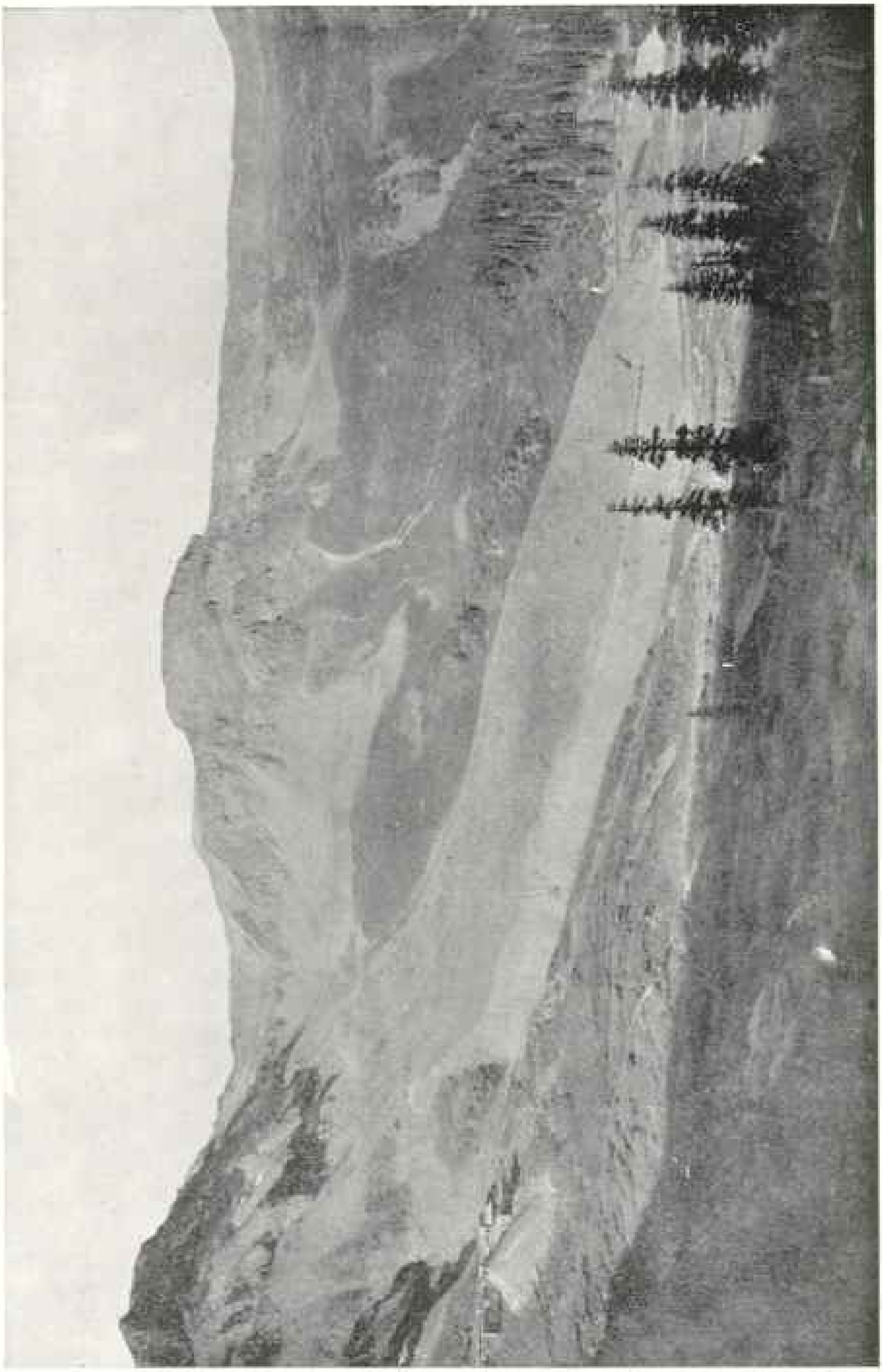
In brief, 12,000,000 cubic yards of rock fell about 1,500 feet, shot across the valley and up the opposite hillside to a height of over 300 feet, then deflected and poured like a torrent over a horizontal plane, covering it uniformly throughout a distance of 5,000 feet and over an area of 1,000,000 square yards, to a depth of from 6 to 65 feet. Before the avalanche there lay a peaceful village and fertile green fields; within one minute a solid gray rock carpet had been spread, beneath which rested the remains of 150 human beings, their houses and their fields, while the familiar Plattenbergkopf had vanished and a great hole was in its place. Few were the wounded requiring succor, and few the dead whose bodies could be recovered.

Those who witnessed the catastrophe from a distance hurried down to look for their friends. One such was Burkhard Rhymer, whose house was untouched at the edge of the debris. He ran to it and found the doors open, a fire burning in the kitchen, the table laid and coffee hot, but no living soul was left. All had run forth to help or see, and had been overwhelmed—wife, daughter, son, son's wife, and two grandchildren. Such was the rockslide of Elm.

THE GREAT FRANK LANDSLIDE

Only slightly less dramatic and quite similar in character to the Elm rockslide, was the one which partially swept the town of Frank, Alberta. By a hair's breadth only did the community escape complete annihilation. This slide was of much greater magnitude than the Elm disaster, although not so many people were killed.

Turtle Mountain, the scene of the avalanche, is a lofty, narrow ridge situated about 14 miles east of the Continental Divide, and is surmounted by a number of rocky peaks. The range is pierced, north of Turtle Mountain, by a narrow gap, through which flows Old Man River. Near the gap, and where the valley is broadened by the debouchment of Gold Creek, and close to the foot of the mountain, nestles the town of Frank, an



ROCK STREAM OF TROUT BASIN, SILVERTON AREA

Three-quarters of a mile long. Note pack-train ascending trail along its edge

important coal-mining center. The mountain itself is an exceedingly precipitate series of cliffs of limestone, sandstone, and shale rising over 3,000 feet above the river.

At dawn on April 29, 1903, a huge rock-mass nearly half a mile square, and from 400 to 500 feet thick in the center, suddenly broke loose from the mountain and crashed with terrific violence into the valley beneath, overwhelming everything in its course. The great mass, broken into innumerable fragments by the fall, plowed through the river bed, crossed the valley and hurled itself up the opposite slopes to a height of 400 feet. Within a minute or a minute and a half over a square mile of pleasant valley was covered with a rock-flow from 3 to 150 feet deep. Most providentially the greater portion of the town lay outside the course of the slide; nevertheless, 70 people were killed.

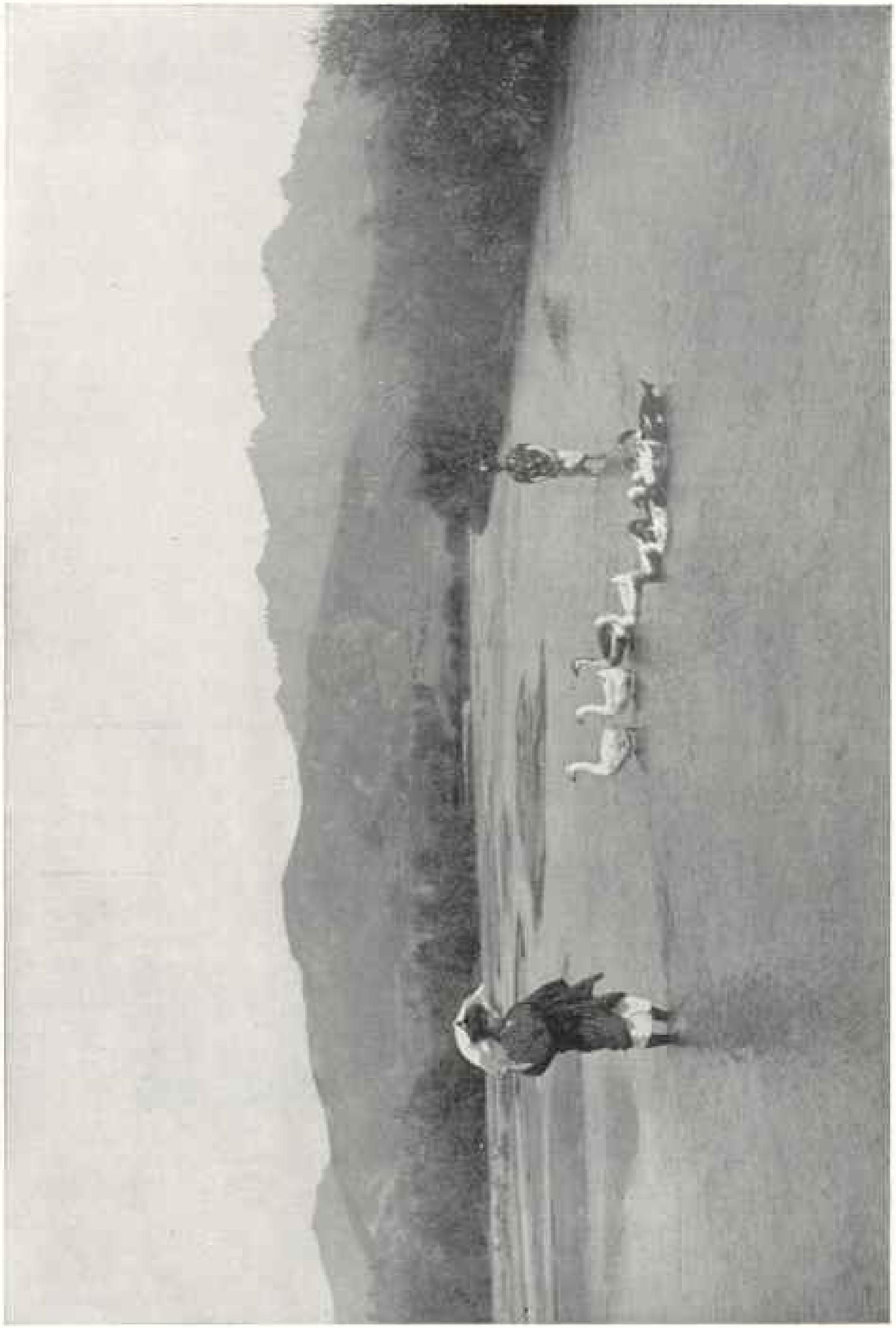
One man, hearing the noise of the rock-fall, rushed to the door of his house in time to see the slide flash by, only a few feet in front of him. Its passage seemed practically instantaneous. Another man, hearing a great noise, looked in time to see the fall of the mountain and almost instantly the spread of the material over the valley like a viscous fluid. Yet some of the rock pieces constituting the "flow" are 40 feet square. A gang of coal miners was entombed in the coal mine by the stoppage of the entrance by the debris, but they dug themselves out through the roof.

Two and a half miles were traversed by the slide, from the top of the creek on the mountain to the foot, while the material dislodged is estimated at 40,000,000 cubic yards. This is over three times the size of the Elm slide. While it is believed that the coal mining in the valley may have hastened the slide, the primary cause was undoubtedly the structure of Turtle Mountain. The huge mass was in a state of unstable equilibrium, and possessed a weak base.

Although this great slide was a sufficient catastrophe to make men gasp throughout the land, especially those living with overshadowing mountains as their daily companions, it might have been far worse. But one peak of Turtle Mountain slipped. The steep shoulder of the mountain which looks directly down upon the town of Frank stood firm. Had this, too, gone, the entire community would have been smashed to atoms in the twinkling of an eye, and none left to tell the tale.

Moreover, there is likelihood that such a catastrophe may happen at almost any time. The town of Frank, according to the Canadian Geological Survey,* might exist on its present site uninjured for ages, but there will always be a possibility of a second destructive slide. The fact that the north shoulder withstood the shock of the first slide is no proof that it is too solid to fall. Almost the same conditions exist on the north peak and shoulder today that obtained in the central peak before it broke away. Unusually heavy rains, rapid changes of temperature, a slight earthquake, or falls in the coal mine at the base of the mountain following the closing of the chambers, perhaps long after the people have lost all dread of the mountain, may snap the supports which retain this huge mass in place and precipitate it upon a career of destruction compared to which that of the recent slide would be child's play. The suggestion seems a wise one that the people of Frank move a short distance up the valley to a point of safety.

* Report great landslide at Frank, Alberta.



SCENE ON MANCHURIA, ON THE ANTUNG-MUKDEN RAILWAY

MUKDEN, THE MANCHU HOME, AND ITS GREAT ART MUSEUM

By Eliza R. Scidmore

Author of "China—The Long-Lived Empire," "Jinrikisha Days in Japan," "Winter India," "Java—the Garden of the East," etc.

MANCHURIA is a country as large as Texas or as large as France, but the Manchuria that the world knows—and it has only known it for these fifteen years—is a little stretch of seacoast, the Liaotang Peninsula, and the valley of the Liao River, the latter a fertile region some 30 miles wide and 900 miles long.

From the time when Shunche, the Manchu chief, was invited in through the "First In-Going-Gate in the World" to assist the rebels in their revolt against the Ming emperor—and the Manchus ousted him and sat down upon the Peking throne themselves for 250 years—nothing ever happened in Manchuria until the Japan-China war, the Boxer outbreak, and war again put it in the forefront of the world's interest. It promises to hold the stage for another decade or two, and is a storm center of world politics.

China has done next to nothing to develop or defend these three eastern provinces beyond the Great Wall, wholly outside of the eighteen provinces of China proper, although, as the early home of the Manchu rulers, Manchuria should have been the chief jewel in her cap. All has been impermanence and change in Manchuria during these fifteen years of stress and storm, and the rapid change of officials, from viceroy to lowest minion, has been the only policy of the distracted Manchus at Peking.

MANCHURIA AND KOREA ARE OVERRUN WITH TOURISTS

Since the war, travel has followed in the steps of the victorious army, and General Kuroki was unconscious advance agent of an army of tourists—a forerunner of scores of independent expeditions in search of excitement, the picturesque and the unexpected—something never seen before. The grand detour from the grand tour of the world now is—from Japan across the narrow straits to Fusan, in Korea; thence by train to Seoul; and from Seoul to the Yalu River, and on to Mukden, precisely following in Kuroki's footsteps. There is an American standard-gauge railway, with American cars, locomotives, and rails across all of Korea, and he travels in comfort to the Yalu's banks. Those historic banks are lined with the rafts of timber floated down from the headwaters of the Yalu, and are about to be linked with a great railway bridge.

From Antung, on the Manchurian bank, a toy railway, a Decauville tram line, of two-foot gauge only, traverses the 180 miles of rough, mountainous country to Mukden. This is the famous Antung-Mukden Railway, with which yellow journals filled their frenzied columns in 1909, between the adjournment of the tariff Congress and the discovery of the North Pole. After Doctor Cook came home, Antung-Mukden affairs were forgotten, and only by fits and starts did the yellow journals declare that the peace of the world and the rights of an army of American merchants and miners were imperiled by the Antung-Mukden convention concluded between China and Japan. That has since been shown to be a simple and innocuous arrangement between the two governments directly concerned, and officially declared so by our Department of State.

This comical little railway was laid by General Kuroki's troops to bring up their

supplies as they marched across from the Yalu to Liaoyang. After the war, it continued to run as it was, with terrific grades, switchbacks instead of tunnels, and rolling-stock of the simplest. It was intended to maintain communication only until such time as the improvements being concluded on the main line of the South Manchurian Railway, there should then be chance to reconstruct the line, make it a real railway, give it a few tunnels and some rolling-stock. The work is now in hand, and will be completed in 1911.

It traverses a most picturesque country, all hills and valleys and winding rivers—an old country with ruined fortresses and pagodas, valleys packed with waving crops, and terrace culture to the hilltops. The few adventurous tourists who have made the trip in the funny little springless cars, who have survived the hotel at Antung, and forgotten the half-way house in the hill country where one night was spent, are enthusiastic over the region.

THE JAPANESE HAVE RECHRISTENED DALNY

Dalny, "far away," has been rechristened Tairen, and is a wonderful place. De Witte's city has felt the touch of Japanese progress and sanitary science, while the Good Roads movement, the Village Beautification societies may find object lessons there. Tairen has changed its face as well as its name, and is a city redeemed, where the steam roller has rolled continuously for three years, and heard the rolling of other steam rollers as they progressed over the beds of broken stone that are fast transforming Kwangtung mud sinks and clay bogs into smooth park roadways. A film of green on the hillsides shows where afforestation's miracle has begun its work.

The Russians left their droschkies, the Japanese brought their jinrikishas, and have since provided electric cars, more luxurious and up-to-date than some of the green chariots that are propelled through the streets of Washington.

The Japanese are not pulling the jinrikishas, driving the vehicles, or doing any such manual labor in Manchuria. They are the employers of labor—and labor in unlimited supply comes over from Chefoo. Fifty thousand husky Shantung coolies cross over to this land of silver and opportunity as to a lesser America each year, and return after the harvest is gathered and outdoor work is suspended for the winter.

A CITY OF EXPERTS AND SPECIALISTS

Tairen is a city of experts—of high-priced experts and specialists in all technics' lines—and nearly all of them are grad[illegible] of American institutions. Brick works, cement works, mills, and factories fringe the town, and a palace of a bank, as splendid as anything in Washington, gives the humblest all the marble, and mosaic, black iron and plate glass a depositor is supposed to want. A wonderful Japanese laboratory at Tairen is always discovering something for the benefit of Manchuria, undertaking new and stimulating and increasing the older industries of the province.

The insatiable young scientists and technologists assure one that, after beans, wild silk or pongee is the future great crop of Manchuria. The silkworms, fed on the leaves of oak trees instead of mulberry, produce the thread for pongee or tussur silk. Besides the steadily increasing demand for pongee as clothing in China, Europe, and America, pongee is the best material for the wings of flying machines and the bodies of dirigibles, and the Chefoo market was stripped last year after the great flight of the aeroplane across the English Channel. As we will all be flying on wings of pongee in a few years, it becomes a matter of interest that the world's supply of pongee should be increased.

Beans are the great crop, however, and by beans alone Manchuria could live and supply the world. The bean plant should be the crest, the symbol, the coat-of-arms of Manchuria. It is a fortunate thing that there is one great food crop that never fails, and that can be depended upon to feed us when land gets too scarce

THE LATE EMPRESS DOWAGER AND SOME OF HER ATTENDANTS

to plant it in America, and wheat flour is the food of kings. Along with the banana, upon which we shall all be supporting life in a few generations, and, after the kaoliang or giant millet, beans are the most prolific crop. Thirty varieties of these soy beans grow in Manchuria, but the black and the yellow are the valuable oil-producing varieties. They have always been sent by tons by junks to south China for food, fertilizing, and illuminating, and a little to Japan. After the China-Japan war of 1895, when the Japanese commissariat learned their value for man and beast and crops, the exportation to Japan increased three times, replacing, fortunately, the failures in the herring fishery that year as a fertilizer. General export continued to increase until, in 1899, beans, bean-cake, and bean-oil were exported to the value of $12,000,000, and in 1909 the value was nearly $75,000,000.

THE GREAT BOOM IN BEANS

Tairen harbor was crowded all last winter with waiting ships. One hundred ships at a time lay at anchor waiting their turns, ten at a time, at the stone quays, and loading went on day and night.

The beans, when ground and pressed, yield 10 per cent of oil, and the refuse, compressed into great cartwheel cakes weighing 60 pounds and more, provides the best of all fertilizers for the rice-fields of Japan and the sugar-fields of Formosa, the Philippines, and even Java. The beans are converted into soy and bean curd in both Japan and China, and furnish those two popular articles of food—soy, the dark brown, pungent sauce resulting from a fermentation of bean dough. This bean soy is sent to England and America by the shipload, and, when treated to cayenne pepper, becomes our familiar red-labeled Worcester sauce. Bean curd, or bean cheese, is a

THE LATE EMPRESS DOWAGER IN HER IMPERIAL YELLOW DRESS

ANOTHER VIEW OF THE EMPRESS DOWAGER, TAKEN AT THE SAME TIME AS THE PRECEDING PICTURE

A CHARACTERISTIC EXPRESSION OF THE LATE EMPRESS DOWAGER

common and most nourishing article of food, popular with all the people, and is a clean and most attractive looking dish.

The Japanese, with their mania for investigation and analysis, have found that the liquid left from making the bean curd, and which used to be thrown away, has the same chemical value as milk, and is, of course, many times cheaper.

Europe at present uses the beans for making candles, soap, and dog biscuits, and as an adulterant for other flours. The oil is a substitute for olive oil that threatens to displace our cotton-seed imitation of olive oil.

Beside the great Japanese firm of the Mitsui, who started the boom in beans by their gigantic transactions, several English firms, including the representative of the Rothschilds and several German firms, have gone into this bean export business, and have established bean mills or oil mills and built godowns on a large scale—the open door quite satisfactorily open to them. Before the war, the beans were carted to the river bank in winter, when the ground was frozen as hard as a road, and sent down to Newchwang by junks. The trade by junks has not fallen off, and this enormous railroad freight

to Tairen, and to Vladivostock as well, and foreign shipment only represents the development of the province since the last war.

The new tenants, or rather the old tenants, on their return cleaned and tidied Port Arthur, paved the streets, and made the place a model of sanitation and order. Every wreck has been raised and sold, every bit of scrap iron dredged up from the harbor, every fragment of the dead interred with honor.

Port Arthur affords a day or two of the most tragic sight-seeing one can endure. A good carriage road connects all the dismantled forts and another leads to the Two Hundred and Three Meter Hill, the world's most awful slaughter-ground. A great mortuary temple has been built to the spirits of the dead on the high hill facing the harbor entrance, and also a great column to their memory, built with the granite blocks taken from the blockading ships which Hirose and his fellows sunk at the harbor entrance—that ballasting of their ships with their own tombstones the last word of the wonderful Japanese prearrangement.

At Tairen one meets the butterfly crest of the South Manchurian Railway, and thence northward "the company" is all in all. The letter M, whose loops are suggestive of a butterfly's wings (the butterfly being one of the Chinese symbols for good luck, long life, and immortality, and a favorite art motif), and the profile of a cross-section of a rail, greatly resembling the Chinese character for industry, compose a monogram that greatly delights the Chinese eye and mind. One soon gets bewitched with this butterfly crest of the South Manchurian Railway, as he sees it on every locomotive, car, and piece of railway property, on the uniforms of employees, even to the patterns of the kimonos and neck-folds of the little waitresses at the railway hotels.

BUILT OF AMERICAN STEEL RAILS AND EQUIPPED WITH AMERICAN CARS AND LOCOMOTIVES

The railway, 440 miles long, without a single tunnel, was a mere track, without bridges or rolling stock, when the Japanese acquired it as almost the only prize of the war. They floated a loan of $100,000,000 at 5 per cent and double-tracked the road with steel rails from Pittsburgh, equipped it with Baldwin locomotives from Philadelphia, Pullman cars from Chicago, and spent many more millions in the purchase of railway materials in America, as they are again about to do for the Antung-Mukden Railway. Beside paying 5 per cent interest on this loan and 6 per cent on the stock, the South Manchurian Railway reaps a surplus each year. Receipts are increasing by leaps and bounds, partly owing to the wonderful bean trade and to the opening and working of more and more coal mines—coal that is said to be second only to Cardiff in quality.

Because of its Pullman sleepers and dining-cars, and its long day coaches, American travelers have only words of praise for the railway, and European travelers sneers and open complaints. The Russians and Belgians loudly jeered at the Pullman cars, with their great expanse of glass windows, and said that they would never do in a Manchurian winter, being ignorant of just how many hundreds of such glass coaches daily traverse our most northern and western States and all parts of Canada through the blizzard season. The Japanese have also introduced the American baggage check into Manchuria; but, as the connecting railway across to Tientsin and Peking is of British ancestry, and the Trans-Siberian is a law to itself, the excellent example is not likely to spread.

When I checked my trunk from Tairen to Mukden, I held on to the check and the South Manchurian Railway held on to the trunk until I was ready to take train on to Peking. Then the trunk was tossed into an open truck, and third-class passengers roosted on it like so many chickens, any one of whom might have carried it off at any way station.

This British-built railway has dining-cars, a little less splendid than the Pullman-descended ones on the South Manchurian Railway, and the Chinese, with

THE GIANT MILLET FIELDS OF MANCHURIA LOOK LIKE OUR OWN PRAIRIE STATES

their childlike frankness and directness, call them "kitchen cars"—for one may dine, *i. e.*, eat, in any and every car, but you can only cook in a kitchen car.

LIKE OUR PRAIRIE COUNTRY

Nearly all of Manchuria that one sees from the railway is covered with crops of giant millet, and the short millet, which is the same as our sorghum. The giant millet, under the primitive culture employed, repeats itself 3,000 times and the short millet 800 times, so that even scientific agriculture can teach little to the Manchus. Giant millet grows 10 and 12 feet high, and can conceal a man and a man on horseback. This kaoliang furnishes food and fuel and distilled drink, mats for the floors and for a thousand economies of farm life, and the stalks, daubed over with clay, provide a good building material. When stacked in the autumn, kaoliang gives the landscape much the look of our prairie country. In fact, these vast flat fields of kaoliang stalks need only the pumpkins and James Whitcomb Riley to be exactly Indiana.

The poppy fields of Manchuria, covered for solid acres with billows of soft pink or white blossoms, are more beautiful than the tulip fields of Holland; but, with the growing moral sense and the rule of reform, the poppy must now disappear and the ground will be given up to the harmless and profitable soy bean.

As one journeys across the prairies of Manchuria, past Haicheng, Liaoyang, Shaho, and Hunho—names of burning interest five years ago, when the great armies were halted before Mukden—no sign of war or battle remains. As far as one sees are luxuriant fields of beans and sorghum and newly-built houses, the very newness of their mud walls significent of the utter waste and desolation left on that same plain when the two armies had gone by. In such vast levels one cannot understand how any one could know, not seeing, where the battle was going on or what the combatants were doing—a battle-field of all-out-doors, with no strategic point greater than a gully.

A CITY OF DIRT

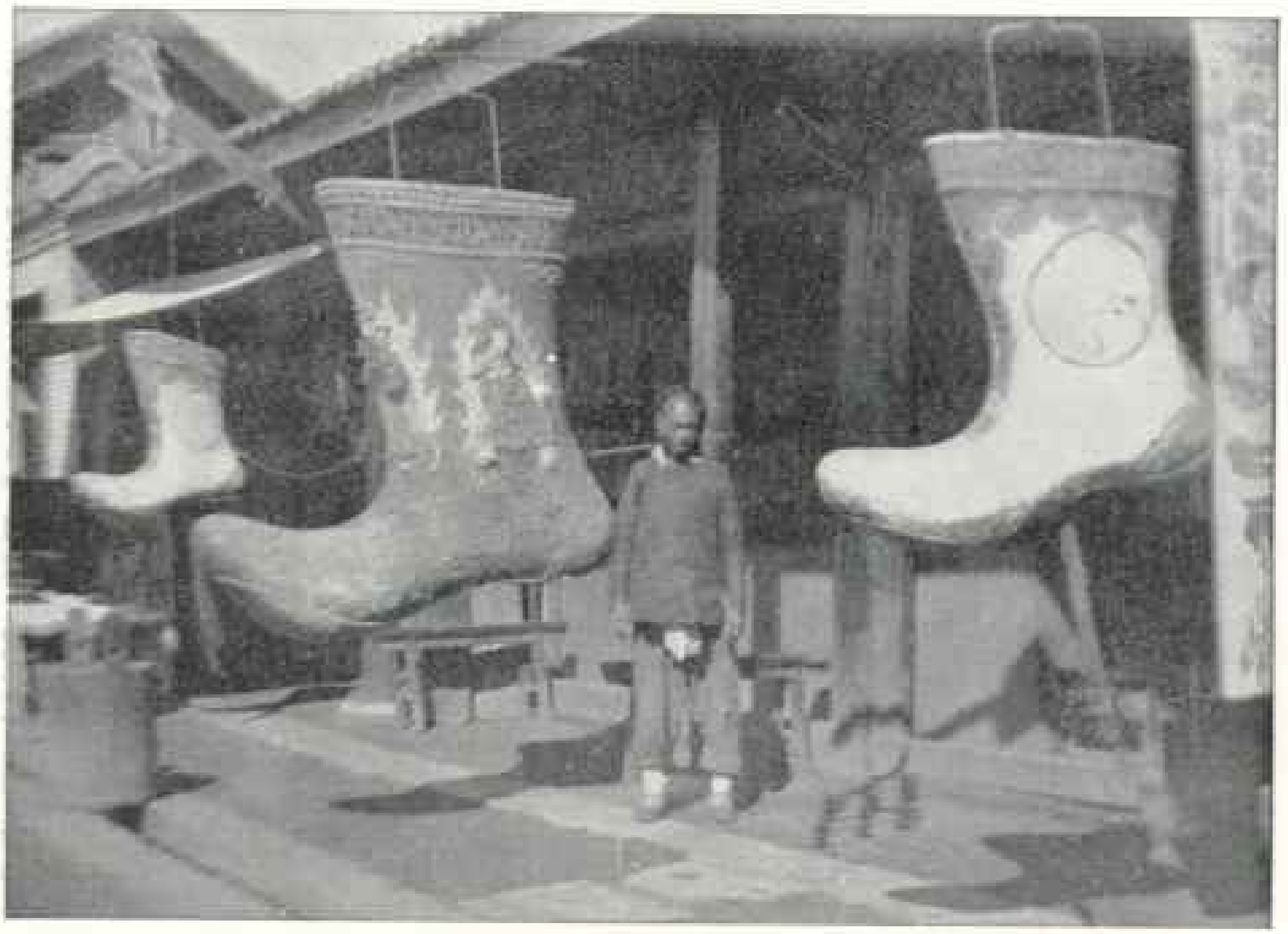
Liaoyang is the oldest capital of the Manchus, but the war has given Liaoyang its only interest for the tourist.

THE GORGEOUS STREET SIGNS OF MUKDEN: THE MAIN STREET AND BELL TOWER
(SEE PAGE 301)

One rides into the walled city and around its slummy streets on the most comical man-power tramway, two small benches on a tiny truck, some poles and cotton curtains constituting the standard rolling-stock. A husky Manchu in a loose dressing gown of wadded cotton, long, flopping trousers, and cotton shoes runs and pushes the clumsy toy for a while, and then jumps on and enjoys the ride until "the old cat dies," and he has to speed her up again. When one meets another special on the single track both cars stop, exchange their passengers and return on their same routes, the passenger paying another five cents at each transfer and at most switches.

One is jolted around the uninteresting, unpaved streets, with their blank walls and poor shops, avoiding innumerable head-on collisions, until he reaches a mountain of rubbish, a hillock of garbage, ashes, and brick-bats quite 30 feet high in the very heart of the city—a fitting altar to the deity of Dirt, which the Liaoyang people seem to worship with their whole hearts. From this lofty scrap-heap, as from the city walls, one sees the whole panorama of the battle plain, surrounded by low hills that were ideal for purposes of defense, "if the defenders could throw stones," one American officer said, after a tour of the battlefield. Yet the two armies shot away more ammunition in those three days than the combined French and German armies used during the whole war of 1870!

The Japanese children in the settlement can point to the strategic spots in the great plain—where Kuroki came out from the hills; where Kuroki cut through and was cut off for hours; where the Russian retreat began—and tell how the Russians fled, setting fire to the mountain of stores they had to leave behind, and burying cases of champagne, music boxes, and other delightful munitions of war for their pursuers to resurrect at their leisure one whole winter long.



A SHOE SHOP IN MUKDEN (SEE PAGE 302)

The Chinese show where the Russians deliberately breached and entrenched on the city walls, using the parapets for gun platforms and rifle trenches, inviting and drawing the enemy's fire into the peaceful city, packed with helpless non-combatant country folk, in addition to the terrified city folk—almost the most cruel, most wantonly cruel, act of the whole war.

DUST-STORMS WHICH HIDE THE SUN AND CHOKE MAN AND BEAST

The railway to Mukden does not get there—that is, to Mukden—not by three miles. In the original concession to the Russians it was not to come within 20 versts of the old home of the Manchu chiefs, but the exigencies of war brought the rails closer than that. It is a long, uninteresting three-mile ride through a one-story suburb from the gray brick station marked "Mukden" to the gates of the real Mukden, the permanent camp of the all-conquering Manchus.

Russian droschkies and Japanese jinrikisha and ancient horse cars from all parts of Japan, soon to be succeeded by the most modern of electric trams, carry one about Mukden, and the two-wheeled cart of the country is only for country folk and freight nowadays. The Japanese macadamized the roads up to the city gates and a shame-faced governor did the rest for the main streets of the inner city.

The long ride to and from the station is a penance, whether in the scorch of midsummer or the below-zero of winter, or in the dust-storms and rain-storms which rather evenly divide the days of the milder seasons. And it can rain at Mukden, especially in September. Torrents every day; deluges every night!

When it does not do that, the wind blows, rudely, fiercely, and, beginning far away in the desert of Gobi, sweeps up the solid earth and carries it along in clouds that fill the air, hide the sun,

choke man and beast, and penetrate every crevice and pinhole, until all the outer world and indoors is an inch deep with gritty brown dust. After the summer deluges and dust-storms there is a long and bitter winter.

A shabby dagoba, with crumbling images and peeling ornaments, a group of dilapidated temples up a mud bank, and some new temples, which have in turn served as Russian and Japanese military offices, and now shelter the American consulate, mark the way toward the iron grille, which replaces the tumbled-down gate tower in the outer city wall. Half way to the gate of the inner or Tartar city another temple, whose gateway and guardian lions are islanded in a reflecting lake after every rain, is falling to ruin on one side of the highway; and, on the other side, other tumbled-down temples show Buddhism in its last decaying stages.

A MANCHU SAMOVAR (SEE PAGE 302)

PICTURESQUE MUKDEN

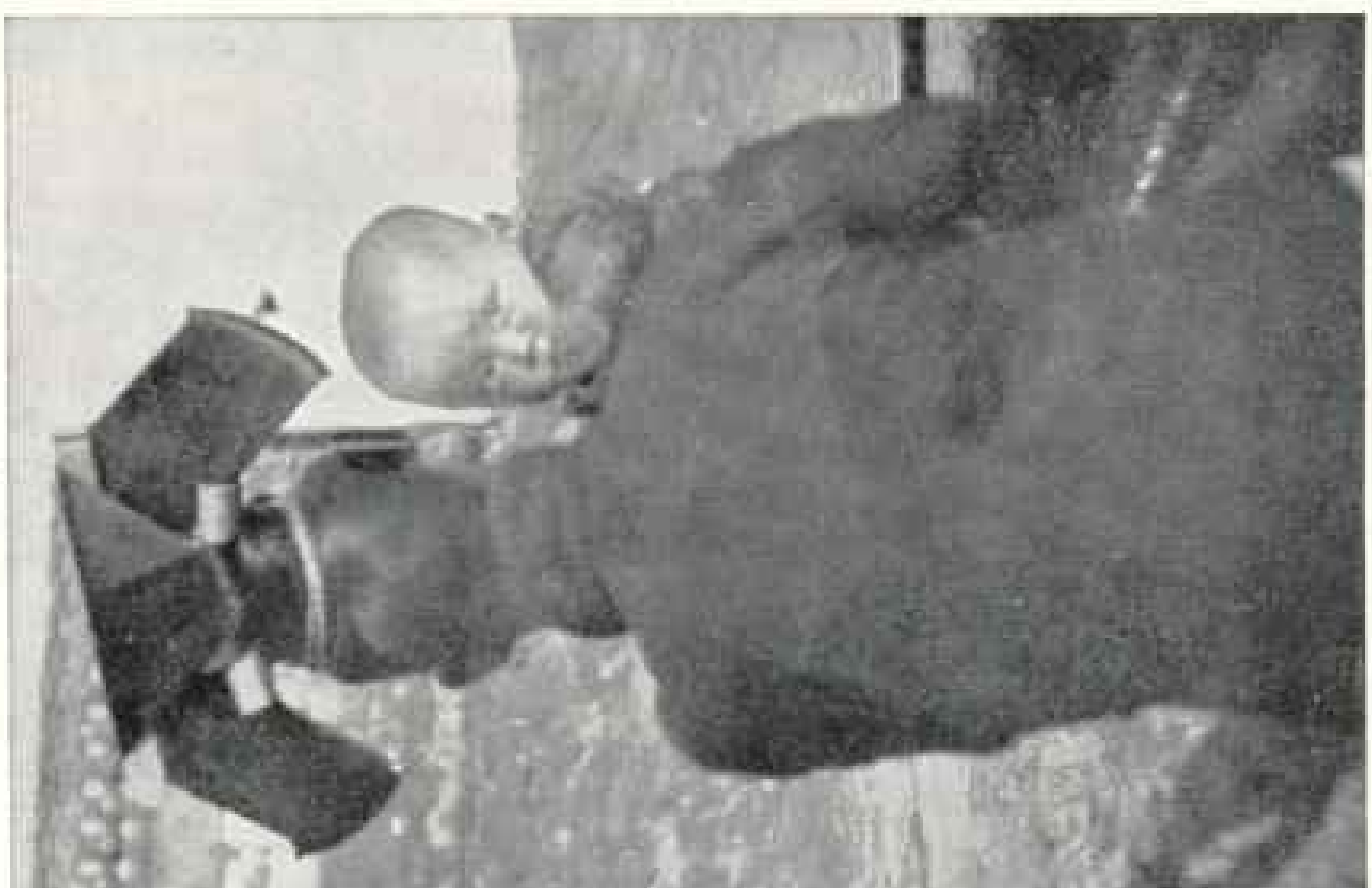
One-third of Mukden's people claim to be Mohammedans, forswear pork, take many baths, and prostrate themselves toward the west at every sunset; but the mass of the townsmen have no religion at all, modern, material progress and foreign example having shattered the old creeds and left neither hope nor fear in their place, giving them no new code or standards. "Better Buddhism than this," said one despairing evangelist.

Mukden, the permanent camp of the all-conquering Manchus, is an epitome of Peking—a smaller Tartar capital, with a lesser palace in an inner city, with ancestral tombs to north and east. It is a picturesque and fascinating place, its street crowds brilliant in color, and its street signs the most bewitching and fantastic decorations any Manchu can imagine.

There is local color to exaggeration—color on the carved and gilded shop fronts and street signs, color in the costumes of men, women, and children, and color of the most violent, vivid cerise on the women's cheeks, and on the peonies, chrysanthemums, and sunflowers set in bouquets at either end of their towering "double-loop" head-dresses. When the sun shines on an every-day Manchu street crowd it presents the gayest carnival scene. What it may be like in Mukden streets on high holidays and great festivals, I am ready to travel there again to see.

Mukden has its drum tower and its bell tower like Peking; each keep a

FRONT VIEW OF THE HEAD-DRESS OF MANCHU WOMEN
(SEE PAGE 305)



BACK VIEW OF THE HEAD-DRESS

grand cross-roads, where city life centers and gay street signs are thickest; each keep a solid old three-story tower with faded red columns and shabby old green-tiled roof.

Order of the most rigid kind is maintained in Mukden streets by flat-chested police and sentries, who wear top boots and semi-foreign uniforms, their queues coiled in psyche knots under the brims of their girlish sailor hats or upturned turbans. Rifle in hand, they have taught the public that street traffic is no longer a go-as-you-please affair, and the husky Manchurian cart driver follows the rules of the road as abjectly as the lately-tamed cab driver of New York. The local levies have learned military style and manners from two grand armies of occupation and re-occupation, and the people learned well their lesson that the man with the gun was not to be trifled with. When they severely nod the traffic to right and left, the carters no longer bellow and bluster, but obey.

WHITE FOX AND SABLE SKINS (SEE PAGE 302)

A SPLENDID RACE OF STALWART MEN AND HANDSOME WOMEN

Once through the deep-vaulted gateway of the Tartar city or citadel, color and picturesqueness surround one, and the streets are moving pictures of Manchu life—the life of brave horsemen and strong northmen, of bold hunters and fighting tribesmen, but lately come from nomad life on broad, dry plains to this permanent camp with its high brick walls. The Shantung people, in their dull clothing, are not numerous enough to spoil the picture.

These hearty Manchus, descended from northern Tungusic Tartar tribes, are a different people from the soft, sleek, languid, lemon-tinted yellow men of the steamy rice fields of the south—the common Chinese of commerce, the strictly-excluded, emigrating Cantonese who alone are known in the outer world. Their cold, dry northern winter has made men of these Manchus, given them backbone, brawn and "sand," sinews and muscles of iron.

Their women, when protected, are creamily instead of greenishly yellow. The Manchu women walk free and untrammelled on their natural feet, and their fine Manchu eyes are set straight in their heads, their eyelids not caught together at the corners. They, with their long robes of brilliant colors and their tremendous head-dresses, add the last, best touches to the brilliant pageant of street life—streets whose carved and gilded shop fronts, with gold and vermilion "beckoning boards," are as gay as any in south China.

THE GORGEOUS SHOP SIGNS

Mukden's streets have an additional glory in the shop signs, that make gorgeous cornices, shoot from the door-

posts, and stand on tall masts outlined against the sky. Golden scepters and dragons sprout from the eaves, horses, unicorns, and peacocks perch there, and gods and goddesses, fiends, and fairies jump from gigantic flower cups and ride on mythical monsters, along with every other fantastic and highly-colored thing Manchu fancy can invent. Besides these, there are the gigantic images of the articles sold within—hats, beads, pipes, and Brobdignagdian boots that dwarf the shopkeeper who stands beside them.

There were many more fantastic shop signs along the streets before the Boxers burned the rich shopping quarter in 1900, and after the rebuilding many of the new signs had to be moved to inner courts when the telegraph poles were erected, and many more put out of sight when the streets were paved.

One must lament any such sacrifice of picturesqueness to the demon Progress, and I begged the governor of Mukden to offer prizes for the most gorgeous shop signs of each year, to reward such public benefactors by an omission or reduction of taxes.

City life centers around the mediæval bell-tower and drum-tower that block the main street and make busy four corners of gossip and trade, and fend off the evils of the north from the palace. The rich silk shops and fur shops are near these old towers, and in the autumn every other shop is a fur shop. Fur coats, fur robes, and dressed skins are hung out and piled up on the counters of the open-fronted shops, along blank walls and on the ground.

Pursuing side streets and narrow alleys of bottomless mud, and crossing untidy courts, we found the storehouses of dealers in sable and ermine—second and third rate reddish-brown Manchurian sables and the superior dark, smoky-brown treasures from beyond the Amur—all put at the preposterous prices dealers dream of getting from strangers and greenhorns.

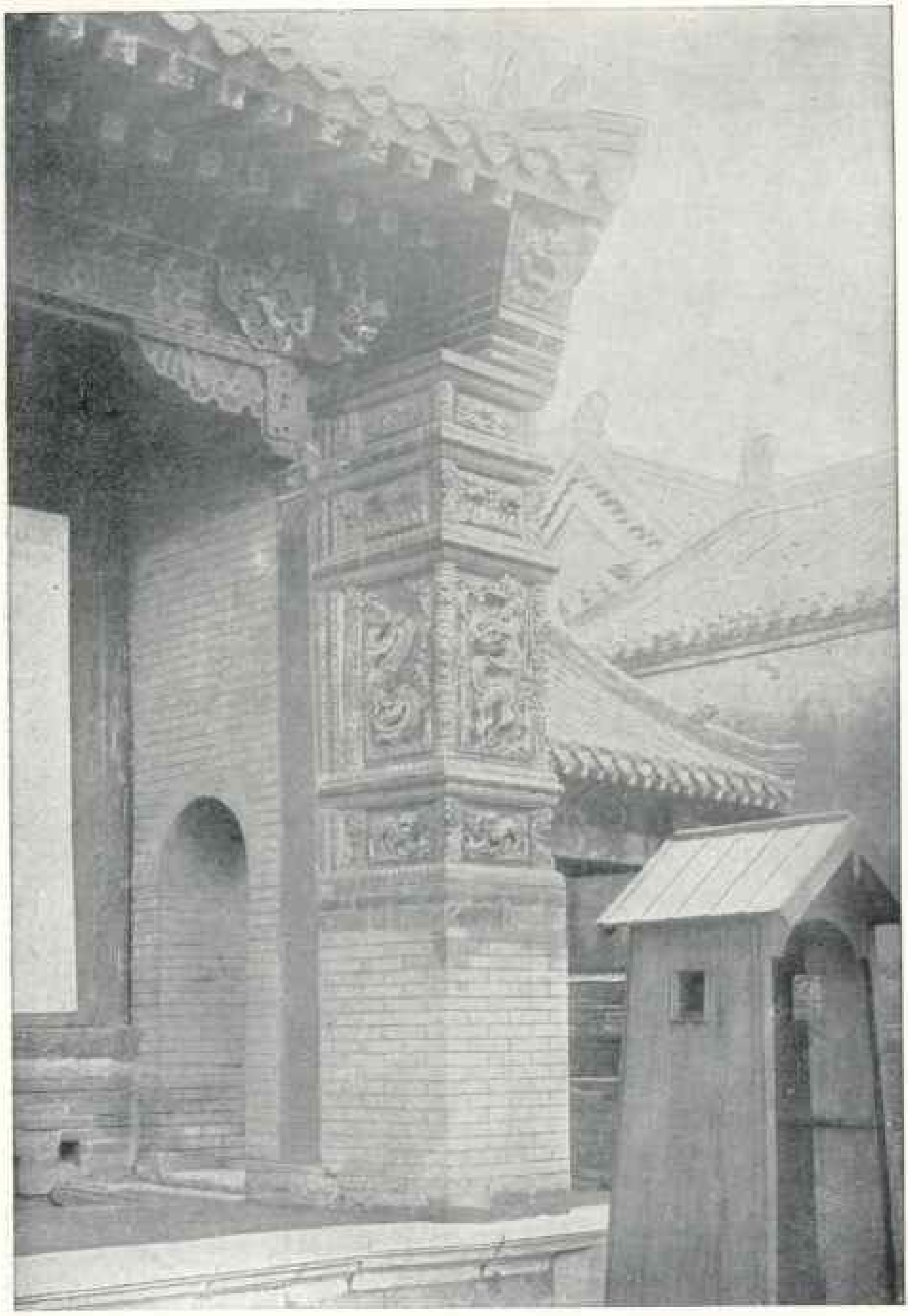
There are many shops for the sale of foreign goods, many more than drew the fury of the Boxers in 1900, and the popular fancy now seems to run to our enamelled tinware—pink and blue tea kettles, and, choicest of all, rose-du-Barry and turquoise wash basins that are always put last on the top of the big wicker market basket with netted cord cover, which is the most *chic* piece of luggage that a great personage carries on his railway travels.

THE MANCHU SAMOVAR

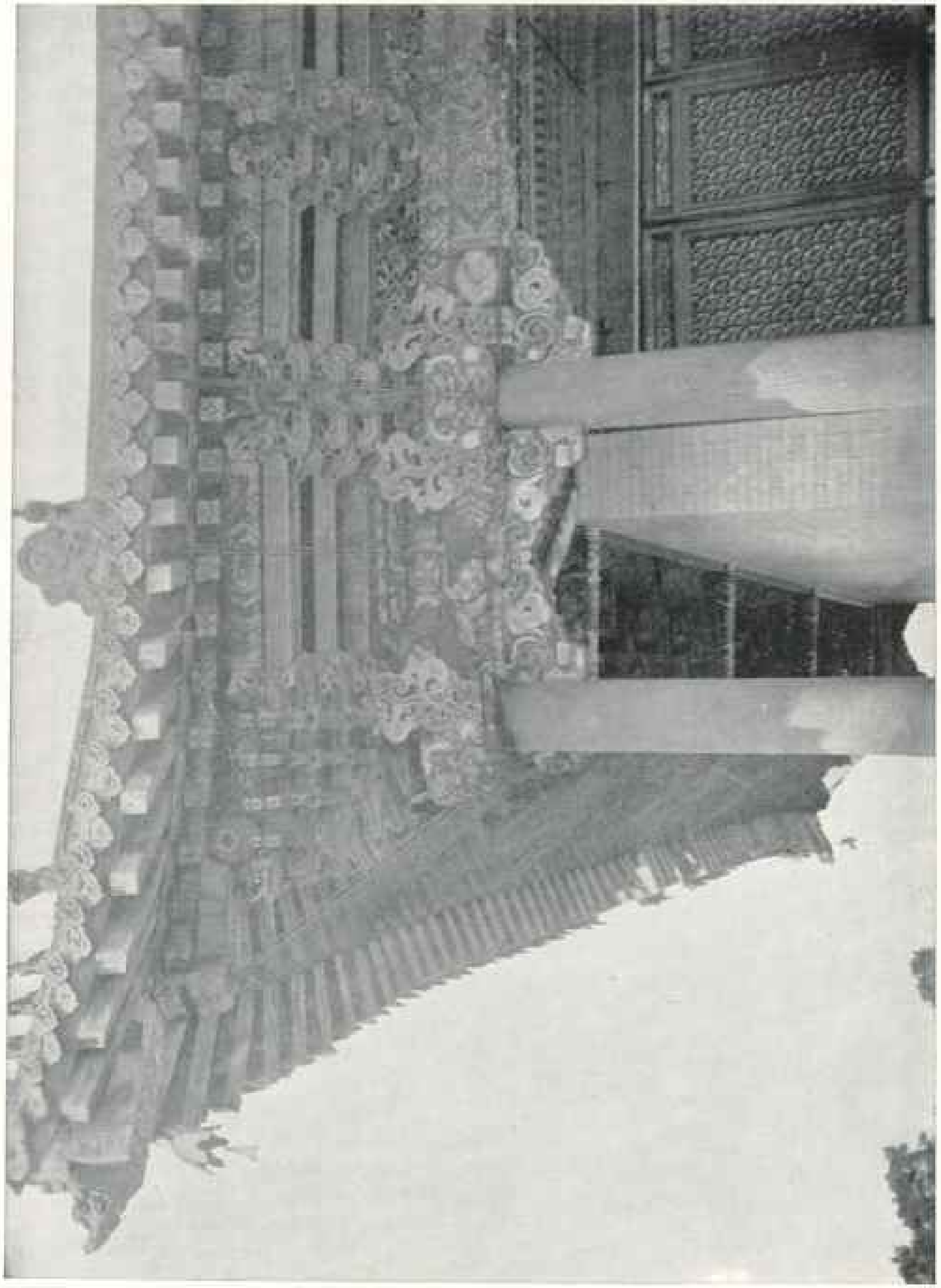
The viceroy and the governor ride in "glass carriages"—broughams with windows on all sides in Shanghai style—and the first automobile has come, in the shape of a steam roller that parades the streets and snorts in the lunettes of the old red gateways, whose tiled roofs wave with weeds and bushes, and have archaic cannon niched in quiet corners. Progress, with a very large "P," blares its presence when two young men in enormous spectacles drive up and down the main street in a real American buggy, clanging the gong of a police or hospital ambulance.

Far better to the eye is the two-wheeled Manchurian cart with three mules straining at the traces ahead of the shaft animal, and a soft, boomy bell sounding from under the body of the cart, instead of being hung on the animals' necks. When these carts are filled with country women rouged to the eyebrows, and their headdresses set with sunflowers, Mukden shows one street sights unequaled outside of the three provinces.

There is a purely Manchu samovar to be seen at every tea booth and street restaurant in Mukden and in Peking, which is plainly of the place and the race, and undoubtedly parent of the samovar, which the Russians did not have in Russia before the Tartar raids and conquests. The Manchu samovar burns wood, coal, charcoal, grass, and anything that comes along, and the shining, graceful, copper or brass body, with its beautiful and unmistakable Persian lines, has any sort of an iron or tin chimney thrust down its throat to draw the



DETAIL OF GATE-HOUSE OF IMPERIAL PALACE: GREEN FAIENCE DRAGON PANELS ON BRICK COLUMNS (SEE PAGE 305)



DETAIL OF WALLS AND BRACKETING SHELVES OF THE PALACE OF THE EMPEROR JAHANGIR

smoke and flame up through the hollow core. In the early morning and at the noon "rice-time" these great water boilers are fired up freshly, and send out clouds of cheering smoke and steam. For the rest of the day they simmer gently, always ready to pour a bubbling stream into the teapot. They are forged and hammered out in the brass bazar, a narrow street opening from the main street, and the ear is the only guide needed for one who would find the place.

THE MANCHU WOMEN ARE THE MOST STUNNING FIGURES IN ALL ASIA

The Manchu women are the most stunning figures in all Asia, and the tall *lian-bark-to* of Manchuria is the most magnificent head-dress I have ever seen. In the last decade the *lian-bark-to* has mounted and spread, until it is a towering, gabled affair that stands eight and ten inches above the smooth, blue-black head, the golden cross-bar wound with loops of black satin instead of hair. The simple guan-zan of the old Empress Dowager, balanced across the head and held there by loops of hair, has broadened as well as mounted, and its ends droop like railway signal arms. If they did not, it would be impossible for a Manchu lady to enter a house door or a cart without turning the structure sideways.

This exaggerated Merry Widow affair is so heavy that women must remove it indoors, and they cannot walk facing the wind nor turn on their course without certain scalping. On rainy and on dusty days this magnificent structure of satin and flowers, tinsel and jewels is shrouded in a cotton cloth, and their brilliant silk robes and gay little jackets are hidden in long sheath garments straight and tight as bolster cases or Parsee's coats.

To see the Manchu women in all their glory in the sunshine, I stayed on day after day in the Mukden hotel, sufficient test and proof of admiration and appreciation. That "Astor House!"—the Mukden-Astoria!—where all the rooms were back rooms, dark and damp, and the place cheerless enough in the rain to drive any one to suicide! Where the tourists came raging down from Harbin every midnight, to sleep on the floor as long as there was any floor space left—and where the tourists came raging up from Tairen at daylight, berating the universe and the fate that had landed them breakfastless in such a dilemma at the end of the long drive from the railway station—raged madly as only tourists will, until that genius of a French cook, lately turned hotel proprietor, always dressed in military khaki, gave them such a midnight supper or morning coffee that they thanked their ancestors that they—and he—lived.

A SILVER CHEESE

The palace of the Manchus, as built in 1656, was doubtless a very simple affair. It was rebuilt in 1750 by Kienlung the Magnificent, a very Louis XIV for splendor, a Cosmo de Medici for learning and love of the arts. Kanghsi and Kienlung and the early great ones of the Manchu line revisited the ancestral home often in those days, when traveling meant something. They came to Mukden once in every ten years, at least, to thank their ancestors, to worship the tablets, to make offerings and to deposit the dynastic records, bringing with them gifts and treasures of every kind to the rarely occupied palace, until it became and remains a great storehouse of eighteenth century art—an Art Museum bursting with incredible treasures.

There was the theory that the Manchu rulers were preparing against a rainy day—preparing against any chance of fortune sending them for refuge to the old home—and there was a fable that they stored solid treasure there against the time when the next conqueror should push them from the dragon throne at Peking. They did not send bags of loose coin to be sifted along the highway. Even the bars and shoes of silver bullion were not put in final storage in any such convenient shape.

The Manchus knew themselves—that is, their own people; and, as the fable goes, they took an old dry well in the

THE DRAGON THRONE, MUKDEN PALACE: THE DAIS COMPLETELY COVERED WITH PILES OF IMPERIAL YELLOW PORCELAIN BOWLS AND PLATE (SEE PAGE 309)

palace compound and set up a mud furnace at its edge. Then, melting the ingots, they poured the treasure down the well until it was full to the curb with a solid cylinder of pure metal. They cemented that well over and filled another and others with more bullion in safe cold storage.

When the rainy day should arrive, the Manchus were to retreat to Mukden, and, chipping away at the silver treasure, nibbling at their precious silver cheese, live on in happy idleness forever after. In Mukden they scoff at this story of buried treasure, but one does not like to give it up. It is so plausible, so characteristic, so Manchu, that even Prince Ching might have devised it last week.

NEGLECTED FOR 100 YEARS

Tao-kwang was the last emperor to visit the ancestral home. After his stay in 1805 the caretakers assiduously neglected the palace, dusting out a corner or two every ten years, when the imperial prince, who could not escape the honor-

THE GREAT PAVILION OF THE IMPERIAL PALACE AT MUKDEN BEFORE THE REPAIRS

able penance of imperial proxy, came to bring the records of the preceding ten years to add to the ancestral chronicle, and to bring more precious things to the palace storehouses. Prince Ching was starting on that errand—but comfortably, in a through railway train, in October, 1908—to deposit the records of Manchu rule from 1898 to 1908! From the coup d'etat to the promise of a constitution! And a fine series of fairy stories the imperial historians must have concocted, too, to save face before the ancestors! For the bald, disgraceful truth about these last ten years would make the Manchu forbears rise from their grave mounds.

The red entrance gate and the pailows of honor admitting to the Chin Lan palace face the south gate of the Tartar city, and five courts on rising terraces lead back to the garden at the far north end of the compound. All the pavilions, save the first audience hall, and the Hall of Worship, where the Emperor Taitsung died, have been nearly rebuilt in the

BLUE-AND-WHITE VASES, IMPERIAL YELLOW BOWLS AND PLATES OF THE PERIOD OF KIENLUNG

course of the very thorough restorations undertaken since the Japan-Russia war. Both armies respected the sacred precincts during the war. When the Japanese General Kodama came to visit the grateful viceroy after the peace, the latter asked his advice as to what he should do to improve his provinces and help his people, so long the sport of contending armies. "Pave your Mukden streets and make roads, so that your country people can bring their crops to market first," said the great military genius.

"What next?" asked the contrite viceroy.

"Well," said the candid friend, looking around at the sagging and weed-grown roofs, the broken windows, torn mattings and blinds — everything in the last stages of dilapidation and deeply dirt-encrusted—"if you Chinese had half the respect for your ancestors that you talk about you would never let this old palace remain in this condition. Clean it up. Repair it, or it will fall down on your heads in another year."

It was the year for plain talking and the visitor improved his opportunity, saying, incidentally, that he would repair the palace at the expense of the Japanese government, if the local officials would not do it, and charge it against the revenues of the province.

The viceroy commanded and the minions fell to with such zeal that when General Kodama came back six months later the place was hardly recognizable. To save face before the Japanese general they did what reverence for the imperial ancestors had not moved them to do for nearly a century, and, after a frenzied house cleaning, they painted, papered, mended, plastered, and slicked things over to a miracle. Chinese pride was roused to prodigies of activity, and, as pride grew and money was granted for the "sacred places," the later repairs have been entire reconstructions. "Clean and

LARGE BLUE-AND-WHITE KANGHSI VASES TEMPORARILY STORED IN TUBS AND COVERED WITH DUST: MUKDEN PALACE (SEE PAGE 310)

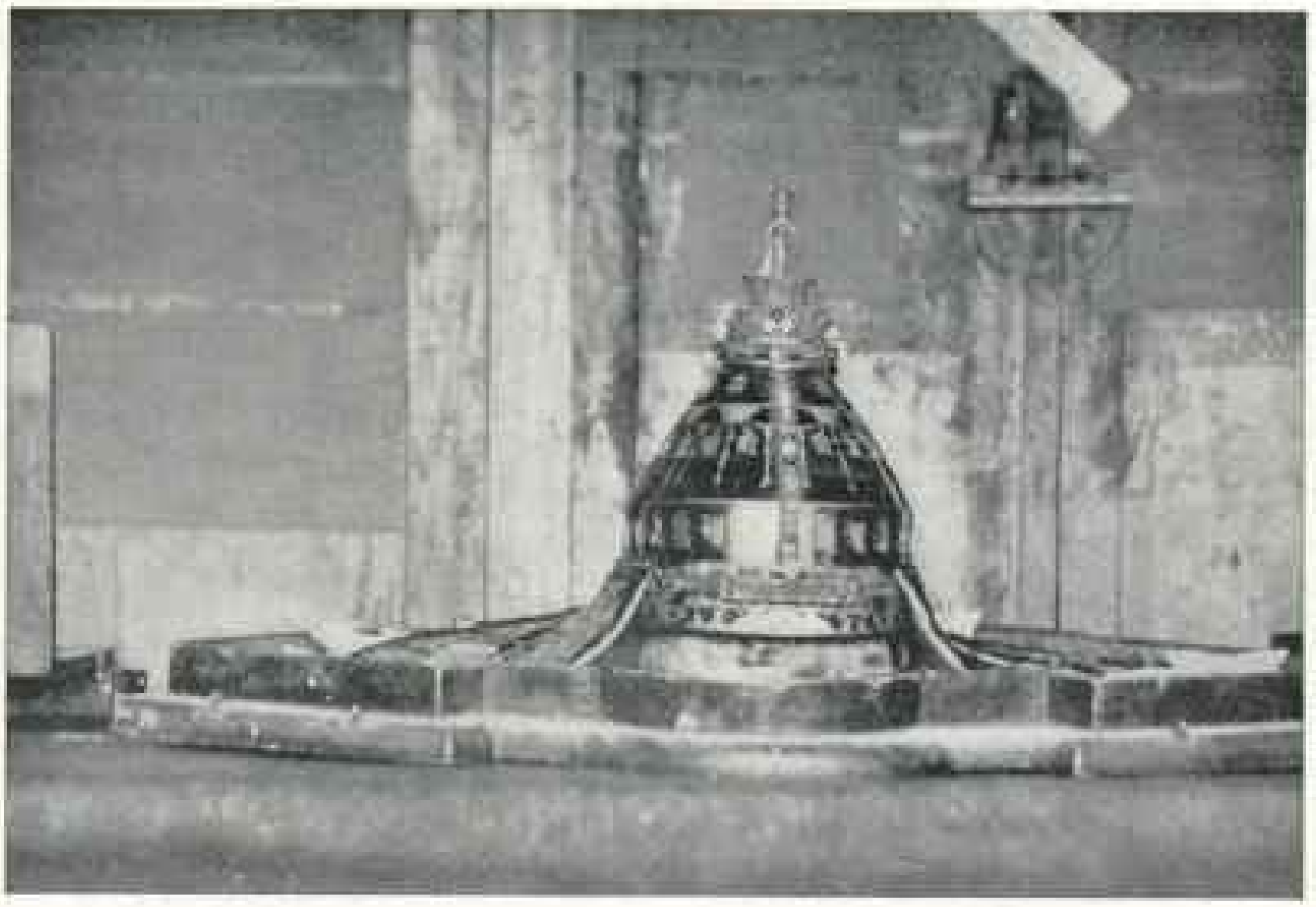
Peaceful," the inscription over the door of the pavilion which was the study of the Emperor Taitsung, is no longer a mirth-provoking legend to western visitors.

THE DRAGON THRONE

The audience hall is not as vast as the great temples of throne-rooms at Peking, but it is sufficiently impressive, and the red-raftered ceiling, with its fine ribbing and its great beams covered with rainbow decoration, gives excellent setting for the ornate ark sheltering the chair of state. The attendants tell one that it is the chair of Shunche, Kanghsi's father; and then they tell one that Kanghsi's successor, Kienlung, sent the chair from Peking—a much more likely tale, since it is plainly a replica of the "imperial seat" in the Pao Ho Tien, the great audience hall in the old palace in the Forbidden City at Peking.

The state chair is a mass of interlaced dragons carved to a miracle, covered with vermilion and gold lacquer, and stands on a dais approached by three stairways under a canopy supported by splendid dragon-wreathed columns. When the jeweled person of the great Kienlung sat upon that golden throne it must have been a sight to dazzle the eyes of the simple tribesmen who garrisoned the old citadel.

On either side of the audience hall are the great storehouses and the famous imperial library, and behind it is a terrace twenty feet higher on which stand the great palace pavilions, where the sovereigns lived and passed their hours of ease and occupation. Chief of these is the great three-story tower where the Emperor Kienlung spent all his time during his Mukden visits—in the Manchu "old home weeks." It was in the most fearful state of dilapidation in



BLACK LACQUER JEWELED HELMET OF THE EMPEROR KIENLUNG

1905, but now, having been completely rebuilt, is practically the same thing of joy to the eye as when Kienlung first surveyed the completed palace.

All now is new, clean, and perfect, from the first red-latticed doors and rainbow beams under bracketed eaves to the last roof of shimmering yellow tiles, with scaly dragons coiled like rampant shrimps on the ridge pole, and dogs and lions parading down every angle to keep away evil spirits.

Wind bells of gilded copper swing from every angle of the tip-tilted roofs, and the restoration has been faithful and exact. In the side court, the two-story pavilion of the empress, the eunuchs' quarters, and a little study or library with quaintly gabled end walls, all glow with new tiles, latticings, fresh gilding, vermilion, and polychrome decorations on the broad beams and rafter tips. There are a few ceilings with square sunken panels, where golden dragons grin in coils, but others, like the audience hall, have timbered roofs, the rows of slender red ribs of rafters defined against a flat gold ceiling—a direct suggestion of the primitive lodge poles of their tented ancestors. Some wonderful old panels of glazed pottery with dragons and devices in high relief have been reset in walls and screens, and used in ornamental constructions in these courts.

The great imperial library of more than 6,000 cases of volumes, deposited by the Emperor Kienlung, is a duplicate of those also deposited at Peking and at Golden Island monastery, on the Yangtse.

THE MOST MARVELOUS COLLECTION OF PORCELAIN IN THE WORLD

The palace storehouses contain more than one hundred thousand pieces of porcelain of the best period of the imperial potteries at King-te-Ching. Tens of thousands of pieces of porcelain were sent up to the Peking palace every year, and the supply for Mukden was in proportion. The eastern storehouse, the Fei Lung Ko, where the thousands of vases, plates, bowls, and cups were kept, had so very nearly sagged to the ground by 1905 that it had to be completely rebuilt.

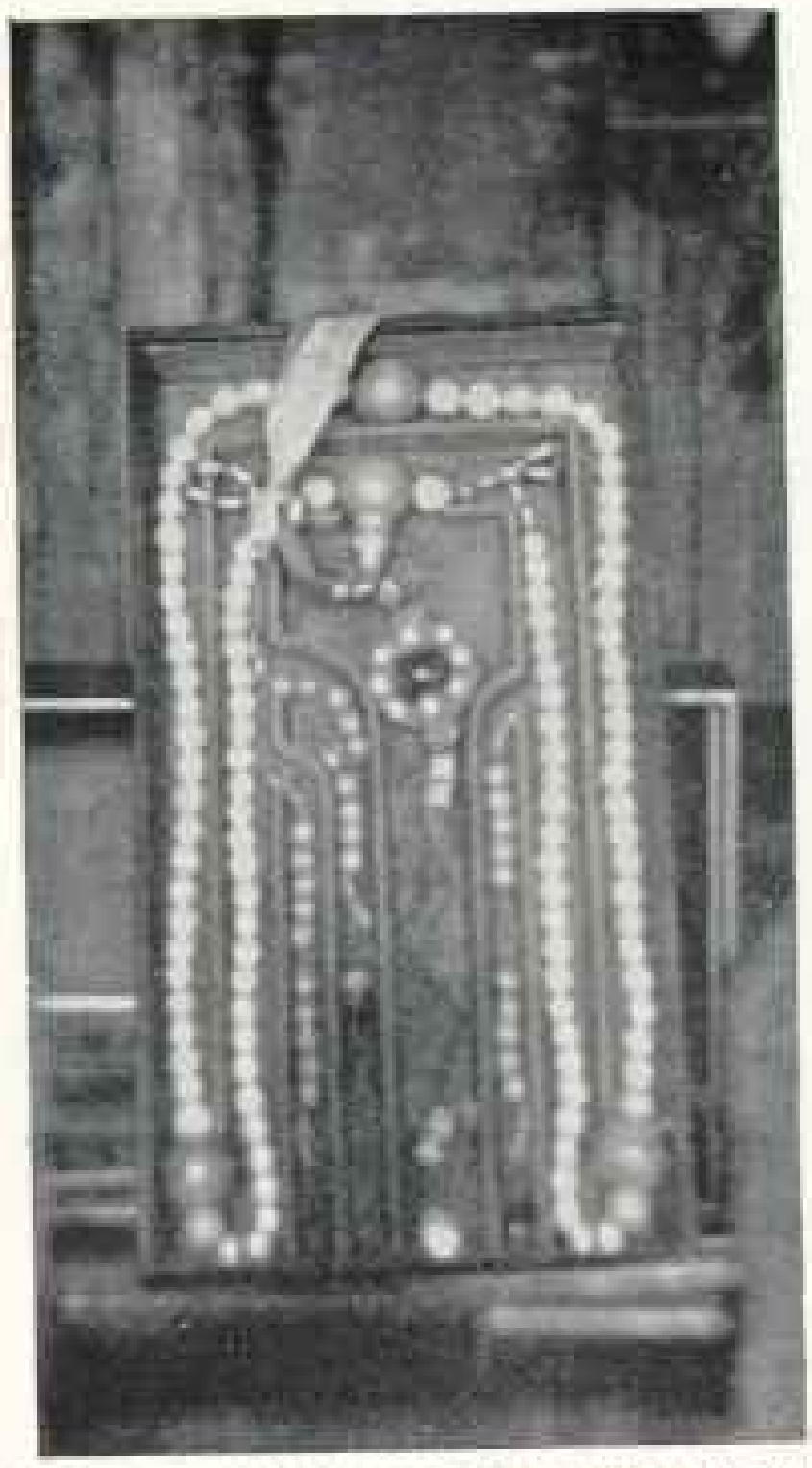
All this ceramic treasure was taken to the audience hall, where it covered the floor, the dais, and even the imperial

chair itself. In the side rooms large blue and white vases of the Kanghsi period were tumbled recklessly together in huge casks, without as much as a rag or a wisp of straw to protect them. Smaller vases were ranged on shelves in duplicates and duplicates of rare blue and white beauty past counting.

The throne room was only a grand palace pantry when I saw it, imperial yellow, powder-blue, and chicken-liver-red plates and rice bowls stacked all over the floor to the area of nearly an acre. All were dirt-encrusted and spider-webbed together in a way to make one gasp, and the attendants pottered around over and among this fragile treasure, sorting it and carrying out by the basketful to the court, where leisurely ones scraped off the first dirt crusts with twigs, and then washed the pieces to near-clean stages.

Things that are treasured in glass cases and satin-lined boxes in western museums were strewn all over the flagged court. When Tang Shao Ii was starting off on his spectacular tour of all great nations, he had permission to choose from this storehouse gifts for all the potentates and benefactors he was likely to meet. He chose for American gifts eight pairs of great ribbed celadon vases, some famille vert jardinieres, and some smaller celadon and sang de boeuf pieces, and a single peach-blow vase as the particular gift to President Roosevelt, who promptly sent it to the National Museum, where it is now on exhibition with other such official gifts from foreign rulers.

The Yale-graduate governor of Mukden listened to me with doubt when it was suggested that he offer this palace porcelain collection as security or collateral for any loan he might wish to raise for the colonization and development of Manchuria. He looked with more incredulity when it was suggested that a certain American banker might jump at it at two per cent. with such a collateral, and then pray and pray for a chance to foreclose.



ROSARY OR OFFICIAL NECKLACE OF LARGE PEARLS WHICH BELONGED TO THE EMPEROR KIENLUNG; MUKDEN PALACE (SEE PAGE 312)

TREASURES NOT TREASURED

The western storehouse, the Hsiang Feng Ko, is a still richer treasury. It contains personal relics of the Manchu emperors, a great accumulation of jeweled arms, ancient bronze mirrors, jewels, and precious stones, crystal, enamel, bronzes, and more than ten thousand paintings of the Ming and early Ching dynasty. All is kept without much order or care in big red cupboards, closed by padlocks as large as a hand, and sealed with strips of paper that the keepers paste on and lift off with their long talons of finger nails with a simple ingenuousness that is startling, considering the tales of craft and graft and villainy that run up and down the empire and the incredible value of the contents of those cupboards.

NORTHERN TOMBS: MUKDEN

They seem to have the strongest feeling for the money value of these treasures and relics, and give one plain figures when they produce the great seals of Kienlung—a pair of solid gold cubes four inches square, with crouching, dragon-like tortoises run through with imperial yellow cords, the characters of the imperial cypher cut sharp and clear.

They show one the imperial yellow satin robes of Kienlung, embroidered with the finest gold thread, the dragons worked in seed pearls; his overcoat of plum-colored satin, with more gold thread and seed-pearl dragons; his Mogul helmet of black lacquer encrusted with gold, set with pearls and rubies; his diamond-hilted Indian daggers and his jade-handled swords

Best of all is his rosary, or official necklace, of one hundred and eight half-inch pearls. The four "regent beads" of this rosary are *lapis lazuli*, the pendent "disciple strings" are coral, with large sapphire "dewdrops" at their ends. The reliquary, or central medalion, has one huge, burning ruby in a circle of creamy button pearls, and a fast and largest pear-shaped pearl hangs from that cord.

Fully one-third of these large pearls are dead—dull and lustreless. They have been lying there untouched, unworn, shut away from light and air in the satin-lined box for more than a century.

Everything is Kienlung's in Mukden and in its palace. Kienlung did this and that, built the city walls and towers, the palace and the mortuary temples without the walls. Kienlung deposited the great treasures there, the collection of paintings that is alone of its kind as an imperial possession, and the library that the Chinese were always fearing the Russians might seize and carry off to St. Petersburg. One almost grows weary of Kienlung with the incessant repetition of his magic name, but no other emperor ever impressed himself upon Peking as did this great one—shadows only, names merely, those others.

The Russians built a very splendid administration building that would be a fine prefecture in any European city, and Tang Shao Ti, while governor of Muk-

THE EMPEROR OF CHINA, HSZAN TUNG, AND HIS BABY BROTHER

den, built himself a greater brick palace in foreign style in an incredibly short space of time. The viceroy of Manchuria has been much in the lime-light since 1900, and remains a conspicuous satrap of the empire.

When I saw the viceroy and his suite at a Japanese fête at Tairen, whither he had gone to pay a state visit, I was convinced as never before of the common origin of the North American Indian and the Chinese or Manchu-Tartars. There might as well have been Red Cloud, Sitting Bull, and Rain-in-the-Face, dressed in blue satin blankets, thick-soled moccasins, and squat war bonnets with single bunches of feathers shooting back from the crown. Manchu eyes, Tartar cheek bones, and Mongol jaws were combined in countenances that any Sioux chief would recognize as a brother's.

THE TOMBS OF THE MANCHU ANCESTORS

The tombs of the Manchu ancestors are in two great parks, the one to the north and the other to the east of the city. Tung-Ling, the eastern tombs, are the most extensive, the grove of gnarled cedars surrounding them the oldest and most impressive. In the face of all the talk of ancestor worship, the sacred burial place is sadly neglected, and the enclosures unapproachable after any heavy rain and often cut off from the world for weeks at a time by deep mud sloughs and gullied water courses untended for a century. Any pretense at a road, any vestige of the imperial highway that once existed, has long ago been swept away and forgotten by Kienlung's degenerate descendants, who have so misruled and so nearly wrecked his empire, bringing it again to the stage of decadence it had reached when Confucius strove to awaken the rulers of his day.

The Peiling, the northern mausoleum, where Taitsung is buried, is less than five miles from the city wall, its groves of cedars and yellow-tiled roofs visible

THE EMPEROR OF CHINA, HSZAN TUNG

PRINCE CHUN, THE REGENT OF CHINA, WITH HIS TWO SONS: THE EMPEROR HSZAN TUNG STANDS BESIDE THE CHAIR

Photo and Copyright by Underwood & Underwood

GRINDING THE GRAIN, MANCHURIA

The illustrations accompanying this article, unless otherwise indicated, are from the author, Eliza R. Scidmore

across the level plain. They are the Ming tombs in miniature, noble pieces of eighteenth century architecture and decoration, a long series of gate towers, courts, and pavilions leading to the tower of the imperial tablet, immediately before the simple earthen mound. The brilliant colors, the red walls, green and yellow tiled roofs, rainbow bracketings, and vermilion eaves are all softened by time to the mellowest bloom and tones.

There is an avenue of stone animals and guardian figures, as at the Ming tombs, and at the top of the steps of the last of the marble terraces a broad doorstep, a solid slab of jade (green-veined jadeite), leads to the hall of worship.

Both armies respected these tombs during the war, and their venerable cedars were the only trees spared on the whole plain. The Russians did maintain an outpost at the gates and stabled horses in some of the outer green-tiled buildings, but that was taking a great risk with really fine horses, as the roofs were then leaking and leaning almost to the point of collapse.

THE MANCHURIANS DID NOT SUFFER MATERIALLY BY THE WAR

There are no signs of war or battle on any of this great Mukden plain, this vast Manchurian outdoors, covered with rich crops of kaoliang, beans, and corn. Only the bayonet spire on Putiloff Hill, far to southward, a Japanese memorial column,

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PAGODA GATE AND TOWNSPEOPLE OF MUKDEN

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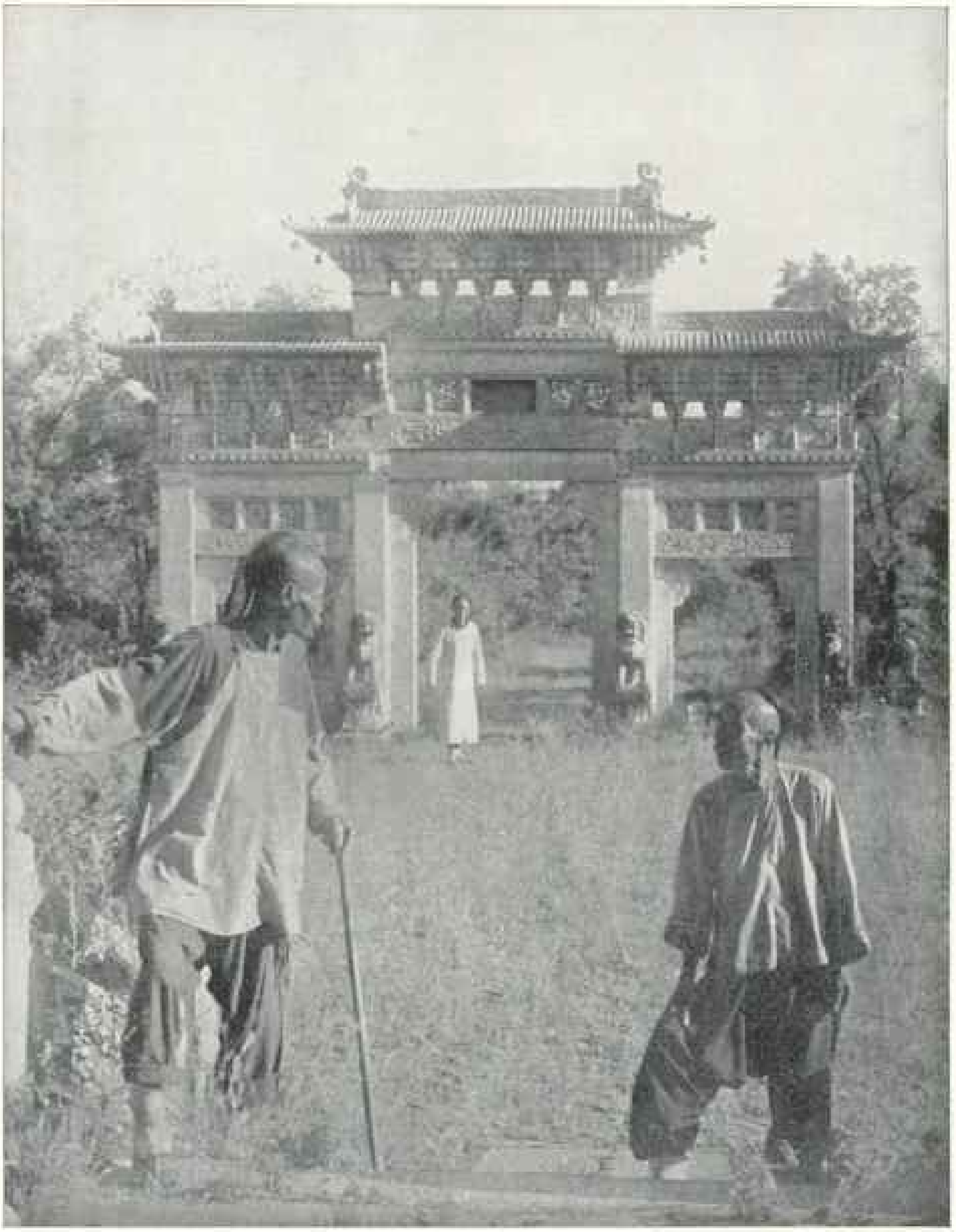
THE DRUM-TOWER AND THE EXTRAORDINARY SIGN-POSTS IN THE PRINCIPAL STREET: MUKDEN (SEE PAGE 301)



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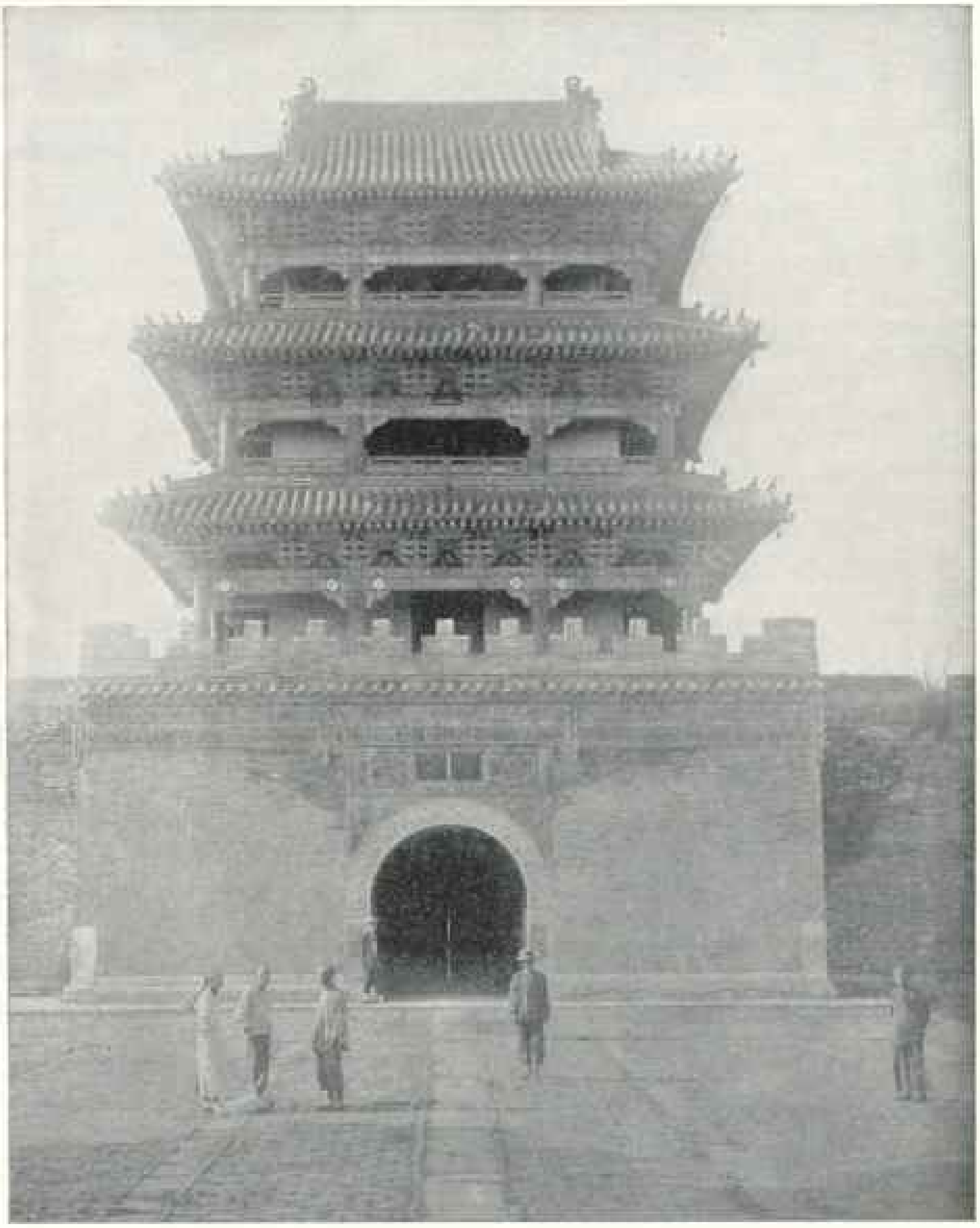
BEAUTIFULLY SCULPTURED STONE ARCH BY THE TOMB OF AN ANCIENT MANCHU EMPEROR: MUKDEN, MANCHURIA



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FINE PAGODA GATEWAY ENTRANCE TO THE MANCHU EMPEROR BAYLING'S TOMB

speaks for the million men who lay at arms all of that one winter, and for the silent thousands who remained.

When fugitives and pursuers disappeared to northward, and the incessant din of cannonading ceased for the first time in six months, the country people crept back to the places where their homes had been. Nothing of their houses remained, and their fields were filled with pits and trenches and dugouts where the troops had hibernated.

Marshal Oyama gave all the quarters, the dugouts, and their contents to the peasant owners of the soil, and, by the end of March, the little communities had reassembled and were busy with spring plowing. They soon rebuilt their wattle and dab houses, their mazes of mud walls that mean safety, propriety, and orderly life to them, and to this day the man with the hoe and the man behind the plow are turning up unexploded shells in their fields. As they always open any such strange finds with a stone or a hammer, the mission hospital is never without some such gunshot case in its wards.

In the large sense, the province did not suffer materially by the war, for, while the people were driven from their homes, their property seized or destroyed, and payment rarely made to them for such losses, the presence of those two great bodies of troops stimulated all industries, and gave employment at high wages to thousands who would otherwise have been idle through the winter months.

Altogether, the two armies spent more than four hundred million roubles for provisions, clothing, labor, and transport in the province, although sums equivalent to their individual losses did not always come to the same sufferers. The townswomen made money beyond all their dreams by sewing on the fur and wadded garments required for the Russians.

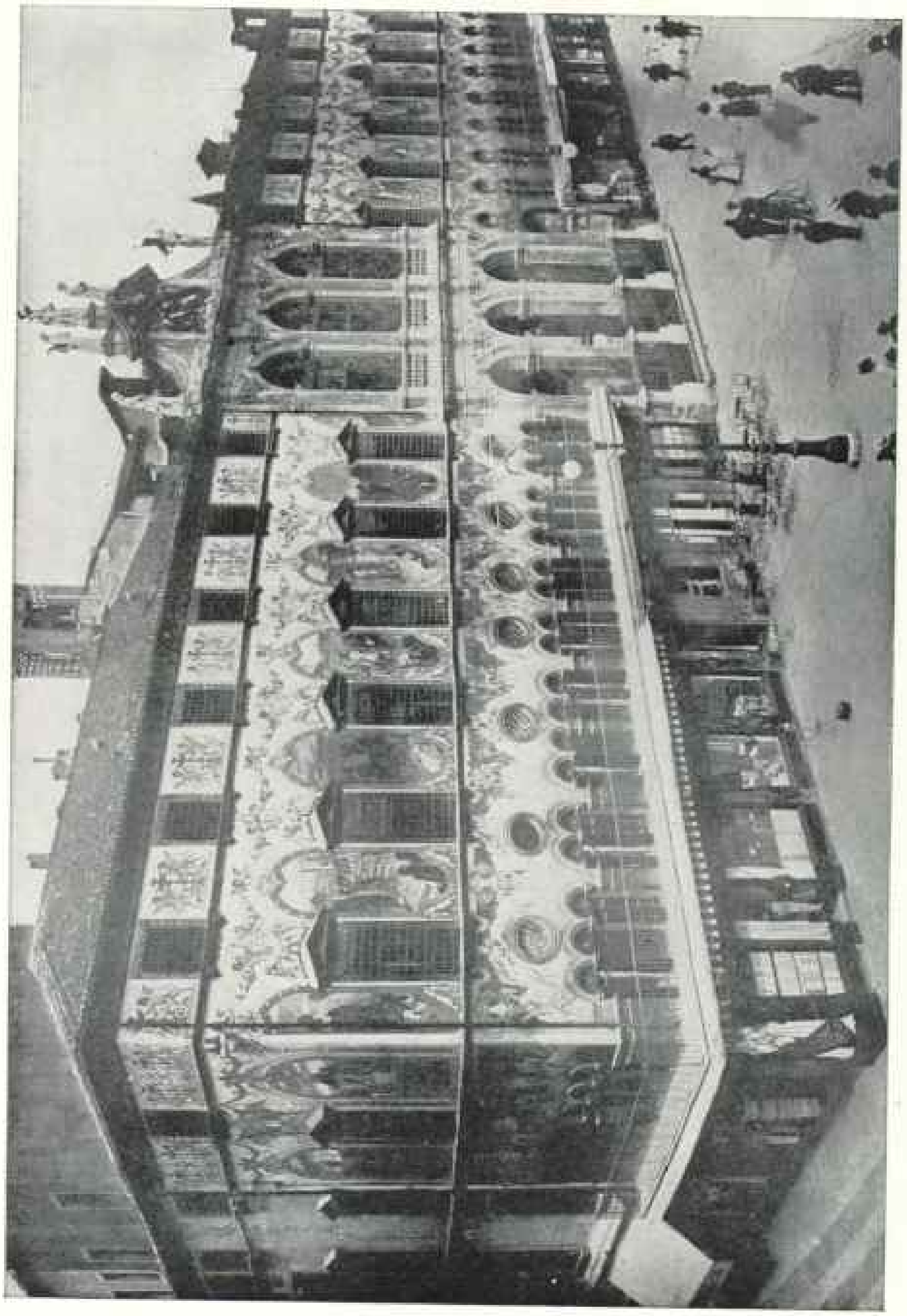
Country women and children shared in this silver shower, and the keen Manchu middleman reversed the old advice, "*eplucher le mandarin*," and plucked the Russian, cruelly, to the last.

Photo by A. C. Barlor, Chicago

ON THE ISLAND OF CAPRI

Photo from Paul Thompson

A RELIGIOUS FESTIVAL PARADE AT PALERMO: THE CAR OF THE BLESSED VIRGIN

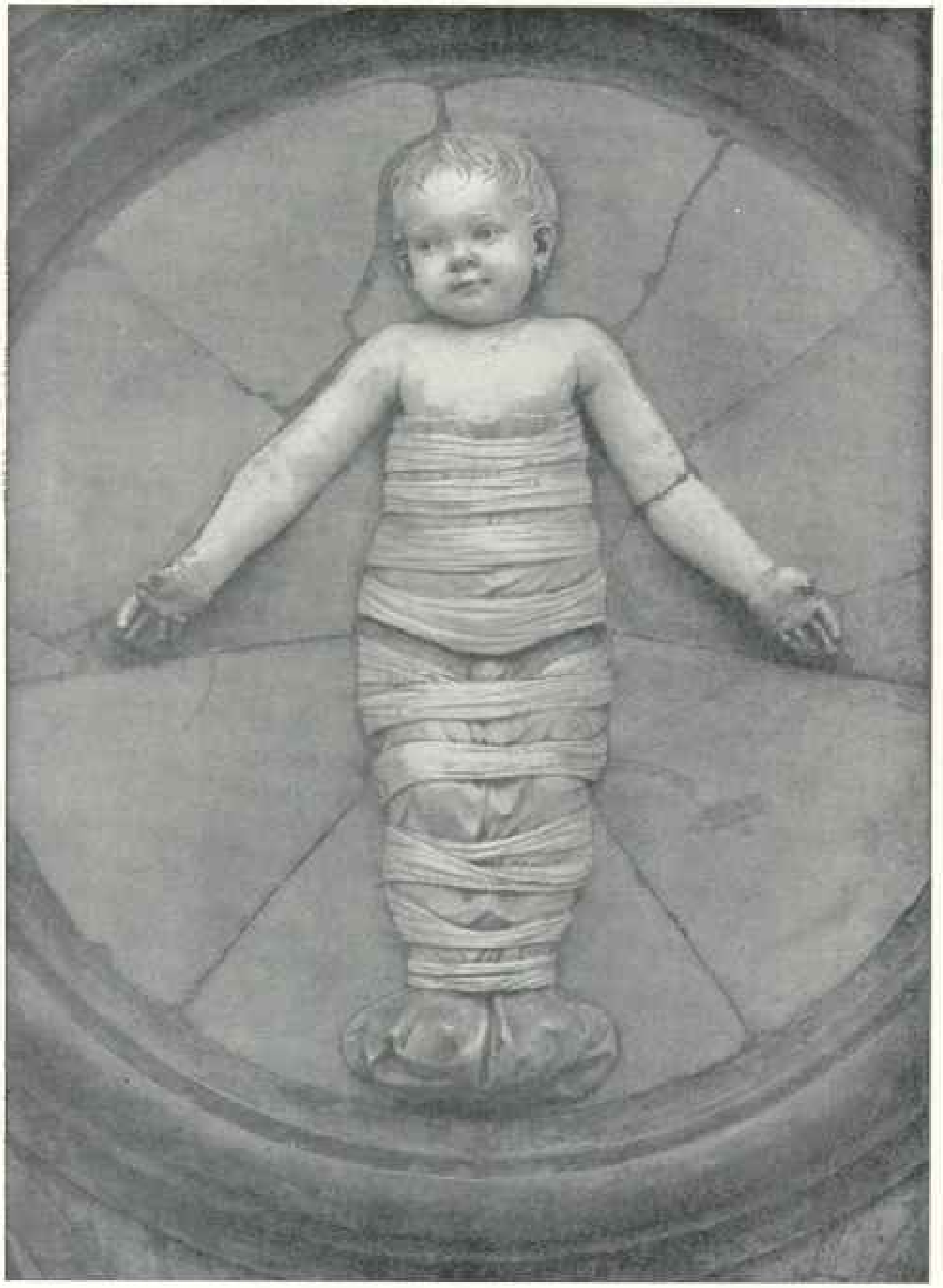


ONE OF THE GRANDEST FRESCOES IN ITALY, ON THE PALACE OF THE MONT DE PIETÀ, IN FLORENCE
THE FLORENTINE ARTIST, BRUSCHI

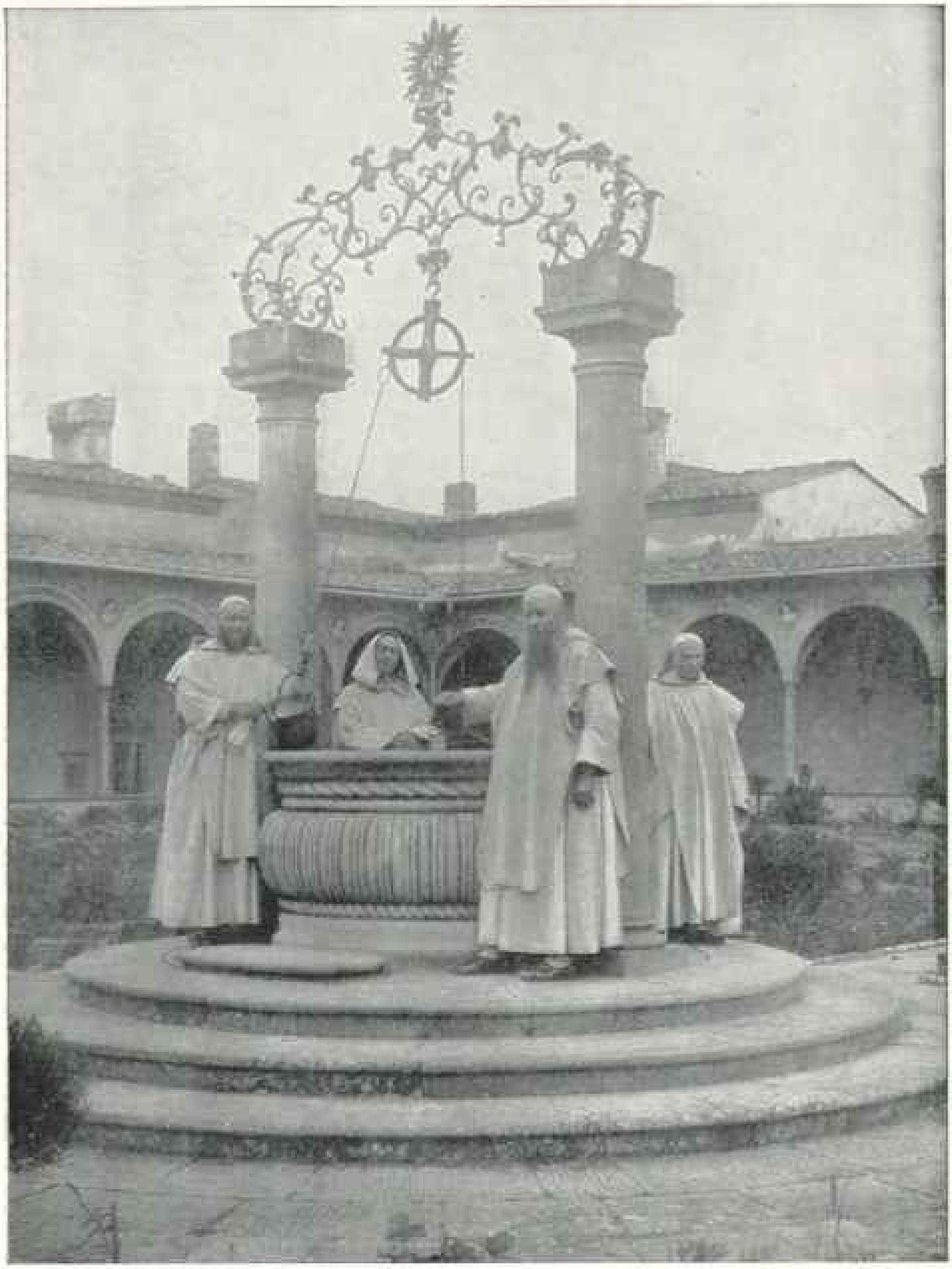
Photo from Paul Thompson

IN VENICE: PAINTED BY

These very alarming persons are not, as might be supposed, night riders or vigilantes surreptitiously disposing of a victim, but men from all stations in life who have come at the call of a bell to help convey some unfortunate to the hospital. These Italian "Brethren of the Misericordia" are laymen who do penance or fulfill some vow by serving as stretcher-bearers in carrying the sick, burying the dead, or collecting alms for charitable purposes. The society has been in existence some hundred years, and this peculiar garb was adopted as disguise, for the cardinal principle is to conceal their identity from each other and the public.



This is one of several very beautiful China medallions of babies by Andrea della Robbia, which adorn the outside walls of the old Foundling Hospital built by the silk-workers of Florence, Italy.



THE CERTOSA OF THE VAL D'EMA IS BELOVED OF ALL TOURISTS IN FLORENCE, ITALY

It stands like a fortress on a hill, an afternoon's drive from the city. Within its garden is this beautiful old well. Around lie the graves of monks. In the gardens were cultivated flowers and herbs, from which the brethren distilled their Chartreuse and sweet perfumes. The monastery is now closed and the monks all gone but one or two who linger on suffrance and sell the perfumes to Americans.

Photo from Paul Thompson

A MARBLE QUARRY, CARRARA: PREPARATION OF A CHARGE OF DYNAMITE TO DETACH A BLOCK OF MARBLE FROM THE MOUNTAIN SIDE

Photo from Paul Thompson

CUTTING A BLOCK OF MARBLE TO ORDER: CARRARA

THE PICTURESQUE SETTING OF THE CARRARA MARBLE-WORKERS' LABORS Photo from Paul Thompson

Photo from Paul Thompson

OXEN DRAWING A BLOCK OF MARBLE THROUGH THE STREETS OF CARRARA

Carrara owes its fame and prosperity to the marble hills which surround the town; 5,000 men are employed in the neighboring quarries to cut and ship the beautiful white Carrara marble, which is sent to all parts of the world to be carved into exquisite statuary.

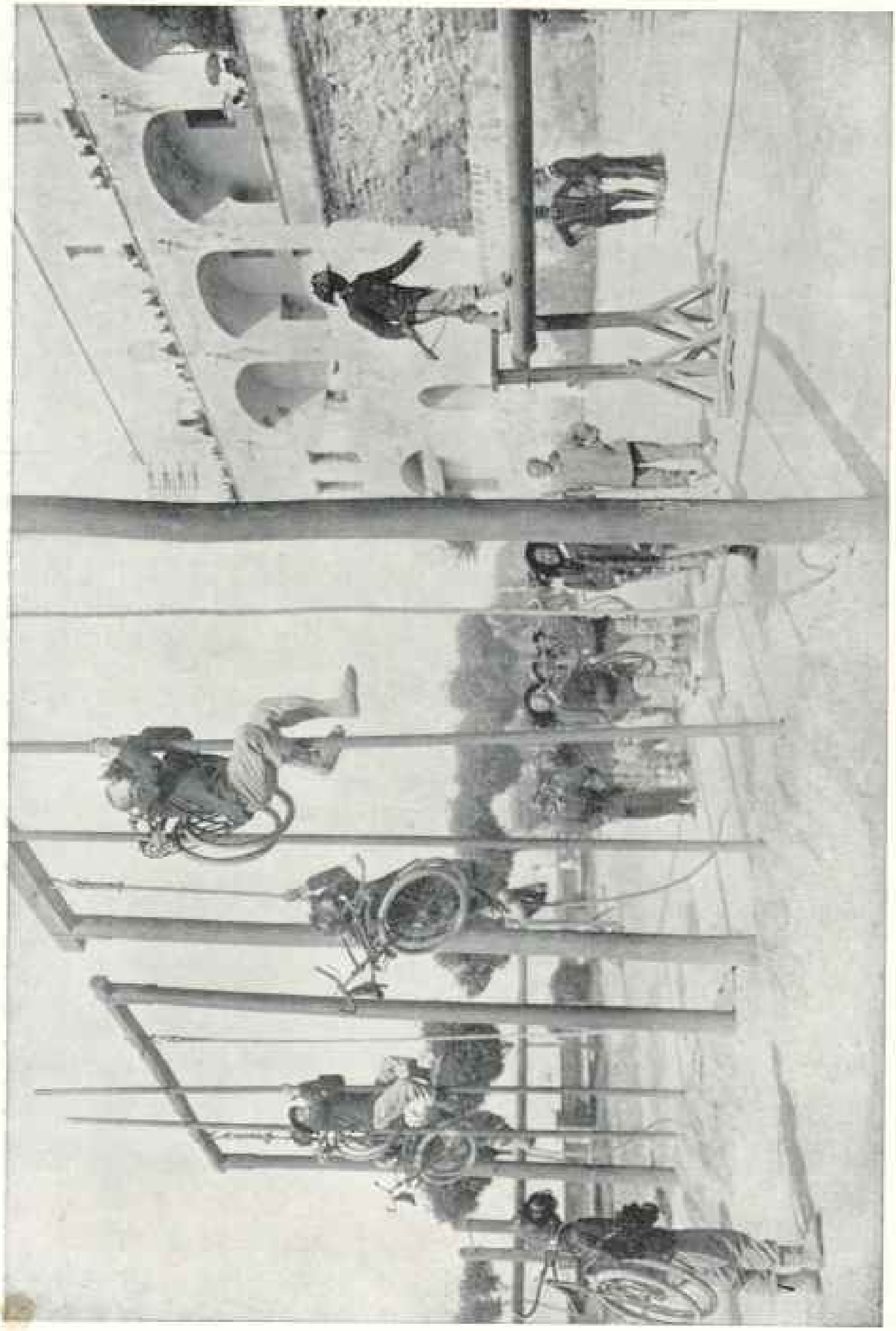
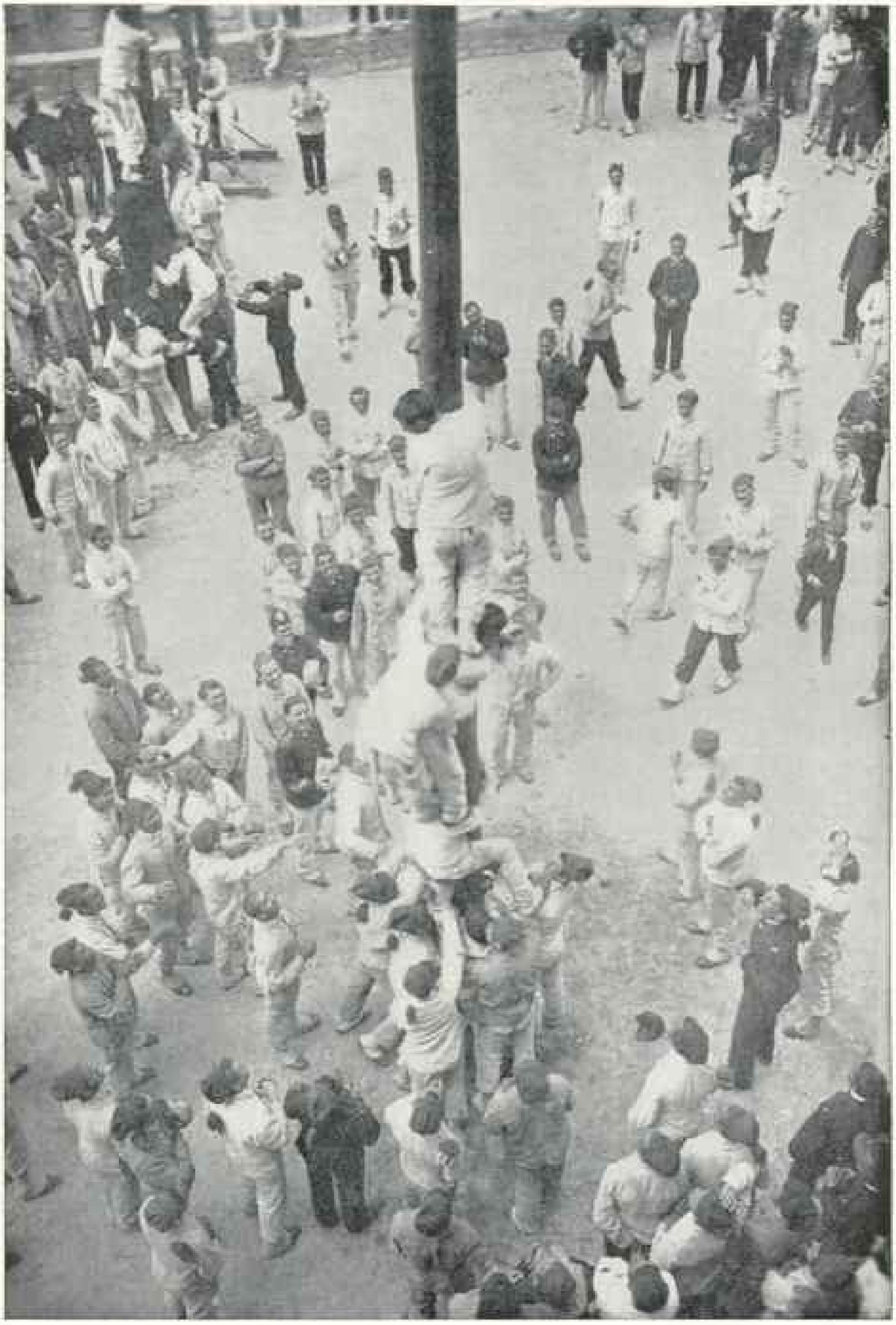


Photo from Paul Thompson

THE CYCLE CORPS OF THE CRACK ITALIAN CAVALRY REGIMENT



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ITALIAN SOLDIERS CLIMBING A GREASED POLE

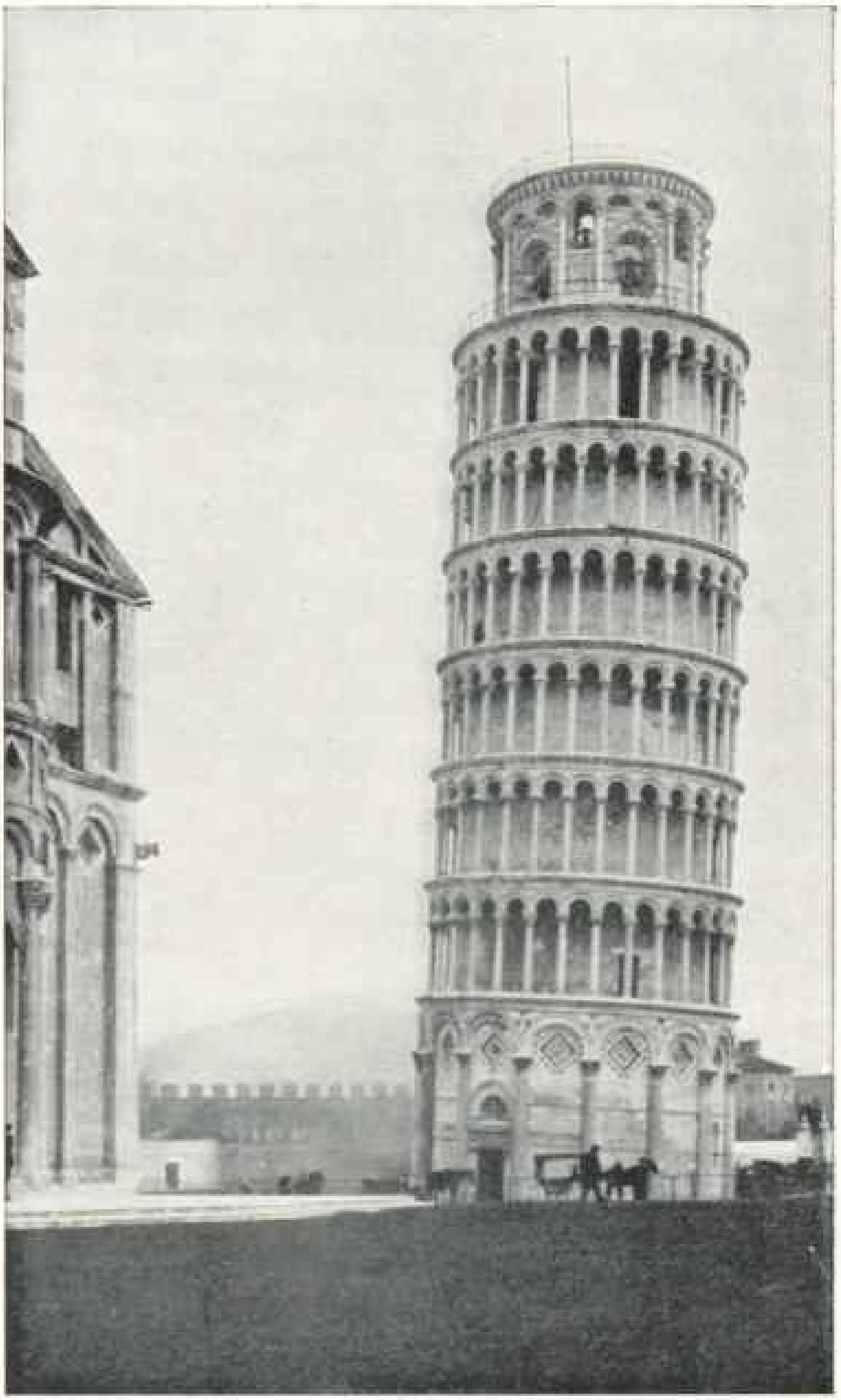


Photo by A. C. Barlor, Chicago

THE LEANING TOWER OF PISA, BUILT OF WHITE MARBLE

The view from the top, reached by 300 steps, is wonderfully beautiful, embracing the Carrara and Apuan mountains, the city and the blue sea

THE SPIRIT OF THE WEST *

The Wonderful Agricultural Development Since the Dawn of Irrigation

By C. J. Blanchard, U. S. Reclamation Service

THE spirit of the West is optimism and progress. It is the spirit that fired the hearts of our forefathers who erected in the primeval forests of New England the superstructure of the greatest nation on earth. It is the optimism and faith which imbued their descendants who carved an agricultural empire of unparalleled richness from the Mississippi Valley.

Once a wilderness so unpromising that it evoked derision in the halls of Congress, the West has become today the land of fortune and opportunity. In this land of boundless distances the altitude is stimulating, the air is a tonic, giving health to the infirm and courage to those who have failed elsewhere. Its constant sunshine encourages optimism and cheerfulness. The glories of its opal-tinted dawns, the indescribable beauty of its sunsets, and the nameless witchery of its twilight softly melting into night are the work of a divine painter.

There is mental and spiritual uplift in its mountains, whose summits are in regions of perpetual snow. Its sapphire lakes, excelling in beauty those of Switzerland, open up a wondrous field of interest and pleasure to the sight-seer and those in search of rest and recreation. The monarchs of its forests cast their shadows on the earth before the coming of the gentle Nazarene.

Its canyons, sculptured during uncounted centuries by wind and wave, are unrivaled in their wonderful and varied coloring and in their awe-inspiring depths.

Its deserts, in vastness of area, in potential wealth of soil and climate, and in rivers of constant supply, are sleeping empires awaiting exploitation and development. Here nature offers to every man his birthright—a wide sky, the sunshine, the wind, and a sure reward for intelligent effort. Here things are writ in characters too vast for human pen.

It is our own land of mystery and enchantment, of crumbling ruins, and of lost races which have vanished utterly.

On the lofty mesas of the painted desert are "tribes whose ceremonies bridge the years between ages of stone and steam," living antique lives in a modern day. Their houses are fortresses erected a hundred years before Columbus sailed the unknown western seas. On their walls the watchman still holds vigil, and in their kivas strangely clad priests recite their prayers, which may antedate those of our own religion.

The late Governor John A. Johnson well said the West symbolizes "homes for the homeless; food for the hungry; work for the unemployed; land for the landless; gold for the penniless; freedom for the enslaved; adventure for the restless; dangers for the brave; an unknown world to conquer, and room for all."

Irrigation has wrought its miracle, and 13,000,000 acres reclaimed are annually producing harvests valued at more than $250,000,000, and supporting in homes of their own more than 300,000 families. The wealth of that portion of the country which great statesmen in Webster's day were wont to declare worthless is greater now than that of the entire nation in 1860.

In the swift march of national events during the past decade, the development of the West has focussed the attention of the world. It furnishes one of the

* For previous articles on this subject by the same author see "Winning the West," February, 1906; "Millions for Moisture," April, 1907; "Home-making by the Government," April, 1908; "The Call of the West," May, 1909. Nat. Geog. Mag.

THE WAY THEY ADVERTISE THEIR MARVELOUS CLIMATE AT YUMA, ARIZONA

A climate where crops ripen every month in the year, and a region remarkably like that of the Valley of the Nile

most inspiring pages in the annals of our commonwealth. It is a story of progress and human achievement—a battle with nature in her sternest and most forbidding aspect.

Future writers will record the irrigation movement as an epoch in our history the far-reaching influence of which overshadowed in importance any other progressive movement since the opening to settlement of the Mississippi Valley. The reclamation of vast areas of our arid and semi-arid regions, which is being promoted by the Federal Government and by large corporations working in conjunction with several States, is of profound economic importance to the nation.

The additional opportunities thus created for homemakers are already serving to check the undesirable efflux of the country people to the city. Millions of acres of desert, unleached by rain and storing in its bosom the fertility gathered there by centuries of washings from hills and mountains, are being quickened by life-giving waters.

Cities, populous and great, have sprung up; rural communities, attractive and prosperous, broad vistas of fertile fields, and blossoming orchards whose yields are prolific beyond comparison, replace the wastes of sand and sage-brush.

Economic forces are at work today in the country, and particularly in the arid West, which are gradually but surely shaping our agricultural development along new lines. In many parts of the irrigated country agriculture now occupies a position of greater dignity among the vocations than ever before. Its place among the scientific professions is now recognized and it is calling more strongly every day for the best talent and brains the nation affords.

Agriculture in the desert is intensive and calls for and encourages a higher degree of intelligence than is found in humid regions. Farms are small and settlements are compact. There is constant interchange of ideas among the farmers, whose relations become intimate in the transaction of daily business.

Individualism, which is a characteristic of the farming regions of the East, as well as provincialism, are less known in the irrigated sections. The irrigation canal is the connecting link which binds the community together.

This great public utility is controlled and operated for the common benefit. Cooperative management of the irrigation system is a fundamental principle on each of the Government projects. The inevitable tendency of such management has been cooperative organization, which today is extended to all the farmers' activities—individual, educational, and social.

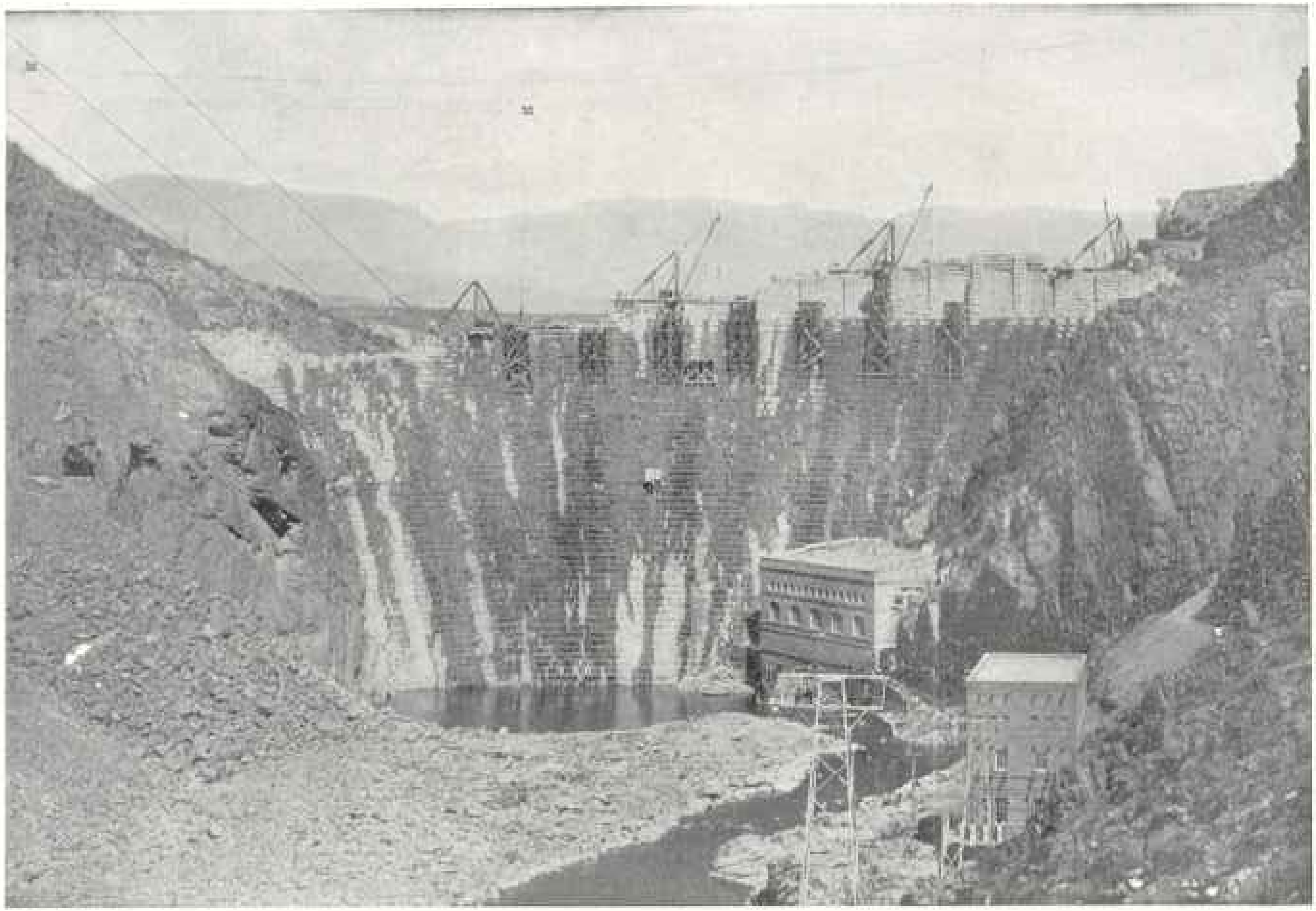
Gradually there has grown up a desire for betterment of conditions, and with the coming of ample financial returns there is evidence of a desire to improve the character of home life. The country is becoming citified, and life on the irrigated farm is growing attractive. The isolation and loneliness of farm life where farm homes are far apart are eliminated.

Farm life and its duties under these conditions are regulated today very much the same as the man of business orders his affairs. The old haphazard methods of agriculture have no place here, where every acre must be made to give its maximum yield, and where the crop itself is carefully considered with regard to markets and cost of production.

There are today in the irrigated West a dozen or more rural communities which in artistic and beautiful homes, or in the nearly ideal conditions of home life enjoyed by the people, have no rivals in the East.

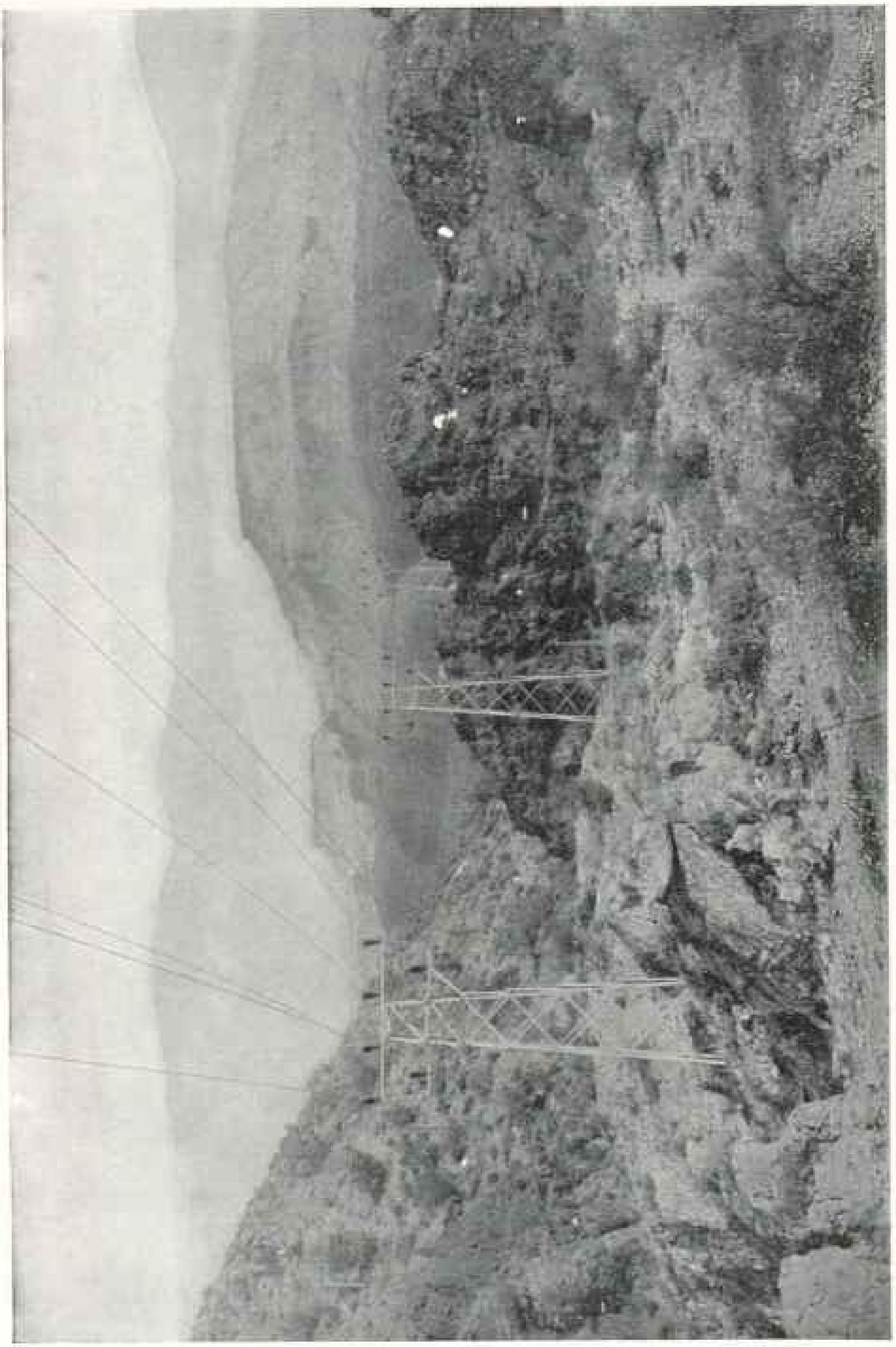
As new communities rise, provision is made at once for the educational and religious needs of the people. The centralized graded school is growing in popularity, and is being established in many sections. The children are carried to and from the school in carriages. Elementary agriculture is being taught, and an effort is being made to inculcate in the child a love of nature and a respect for life in the country.

The daily newspaper keeps the farmer in touch with the outside world and its



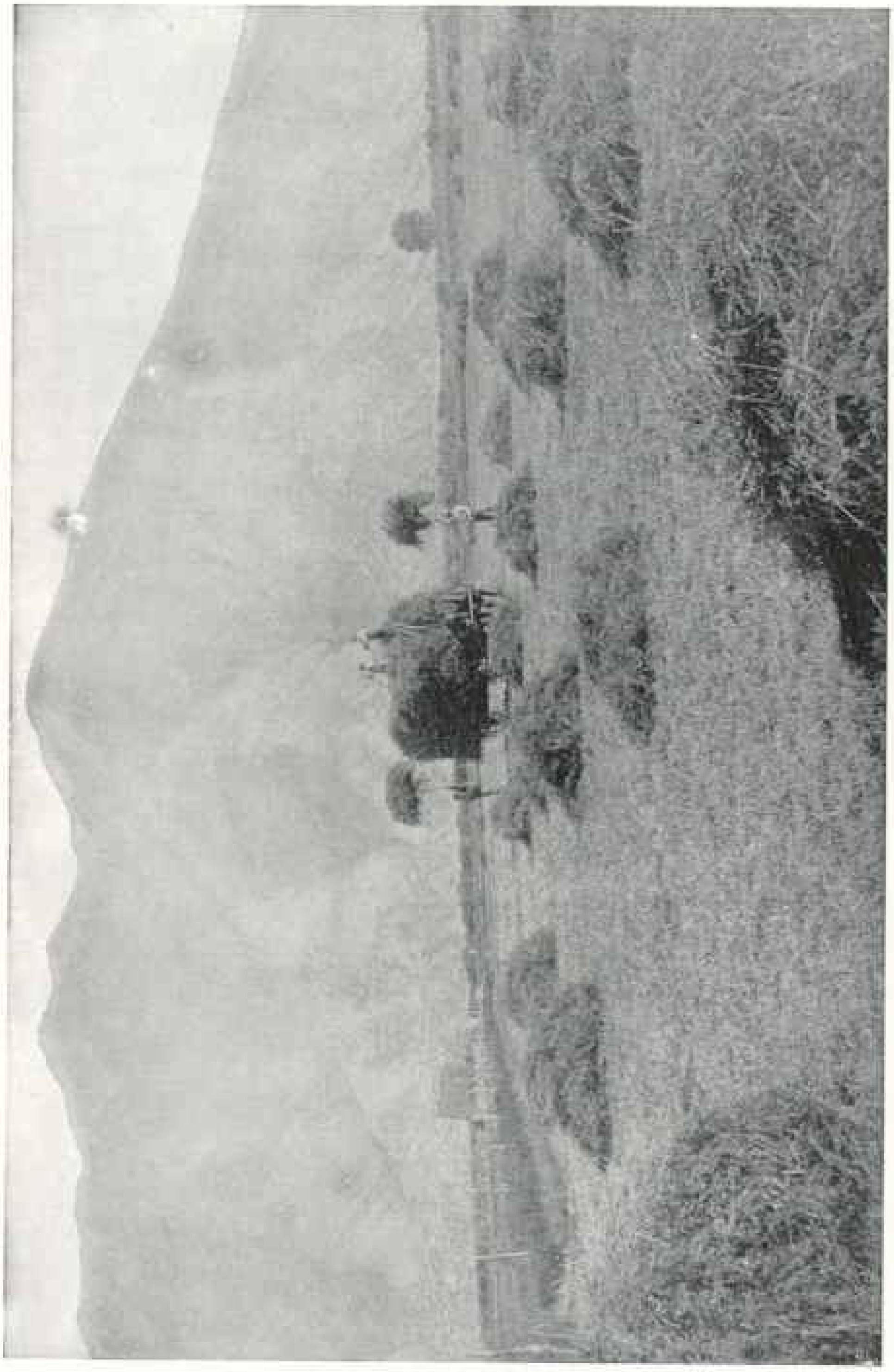
THE ROOSEVELT DAM: TYPE RUBBLE MASONRY ARCH GRAVITY (SEE PAGE 360)

Maximum height, 280 feet; length of crest, 1,080 feet; contents, 326,000 cubic yards. Below the dam is the power house where 7,500 horse-power is developed. In the nearer foreground is the transformer house and transmission towers



TRANSMISSION LINE OF THE GREAT ROOSEVELT DAM
THROUGH THE ROUGHEST PART OF ARIZONA TO CONVEY POWER FROM THE GREAT ROOSEVELT DAM
TO THE SALT RIVER VALLEY

The character of the country traversed by the transmission line of the government is clearly shown



HAYING SCENE IN THE STRAWBERRY VALLEY, UTAH, ONE OF THE MOST BEAUTIFUL VALLEYS IN THE WEST (SEE PAGE 357)

Alfalfa is the farmer's bank account in the arid country

markets; the circulating library introduces the best literature into his home; the trolley lines now being extended through many irrigated valleys bring the city to his very door.

Throughout the arid West there is evidence of an orderly arrangement of detail and a planning of duties which in time will give us office hours on the farm. When crops are intelligently diversified there is little of the back-breaking, heart-discouraging work of the old time one-crop farm. Crops ripen and are harvested at different intervals, giving the farmer and his family ample time without crowding. Where harvests are sure and there is no interference by reason of rain, the farmer can apportion his time and his work with some degree of accuracy.

It is remarked everywhere in the West that the mental attitude of the farmer has undergone a pronounced change. The factors of better roads, rural delivery, telephones, trolley lines, coöperation, and frequent association with neighbors are primarily responsible.

For several years nearly all professions, from bootblacks in Butte to steeple-climbers in New York, have been organizing, except farming. Acting alone, the farmer has been for years at the mercy of the commission man or the elevator company.

In the irrigated valleys of the West today there have been perfected a number of strong and successful business organizations for handling special crops. Fruit-growers' associations in several districts are marketing crops each year valued at millions of dollars, and, largely as a result of up-to-date methods, have secured control of the best markets of the world for their products.

The success of these organizations, the opportunities they offer for first-class business ability, as well as the assurance of profits in agriculture, have excited widespread interest among many city-bred people, and have drawn thousands back to the country who could never have been induced to leave the city to take up the old system of farming.

The agricultural colleges report among their students an increasing number of city-bred youths who are perfecting themselves in the advanced lines of agriculture and horticulture preparatory to taking up the profession of farming.

The Reclamation Service began its work in 1902 on the passage of the Reclamation Act. The first contract was let in September of the next year, and, on June 17, 1905, an important project in Nevada was formally opened.

GIGANTIC TASKS ACCOMPLISHED IN FIVE YEARS

Progress has been rapid and the activities of the bureau have been extended to 26 or more projects, which to date have involved the expenditure of $60,000,000. In the seven and one-half years of its work the Service has built 4,215 miles of canal. Placed end to end, these canals would reach from Washington to San Francisco and back to New Orleans. Several of these canals carry whole rivers.

It has excavated 17 miles of tunnels.

Before the end of the year it will have completed four of the highest dams in the world. Its excavations of rock and earth amount to the enormous total of 60,000,000 cubic yards.

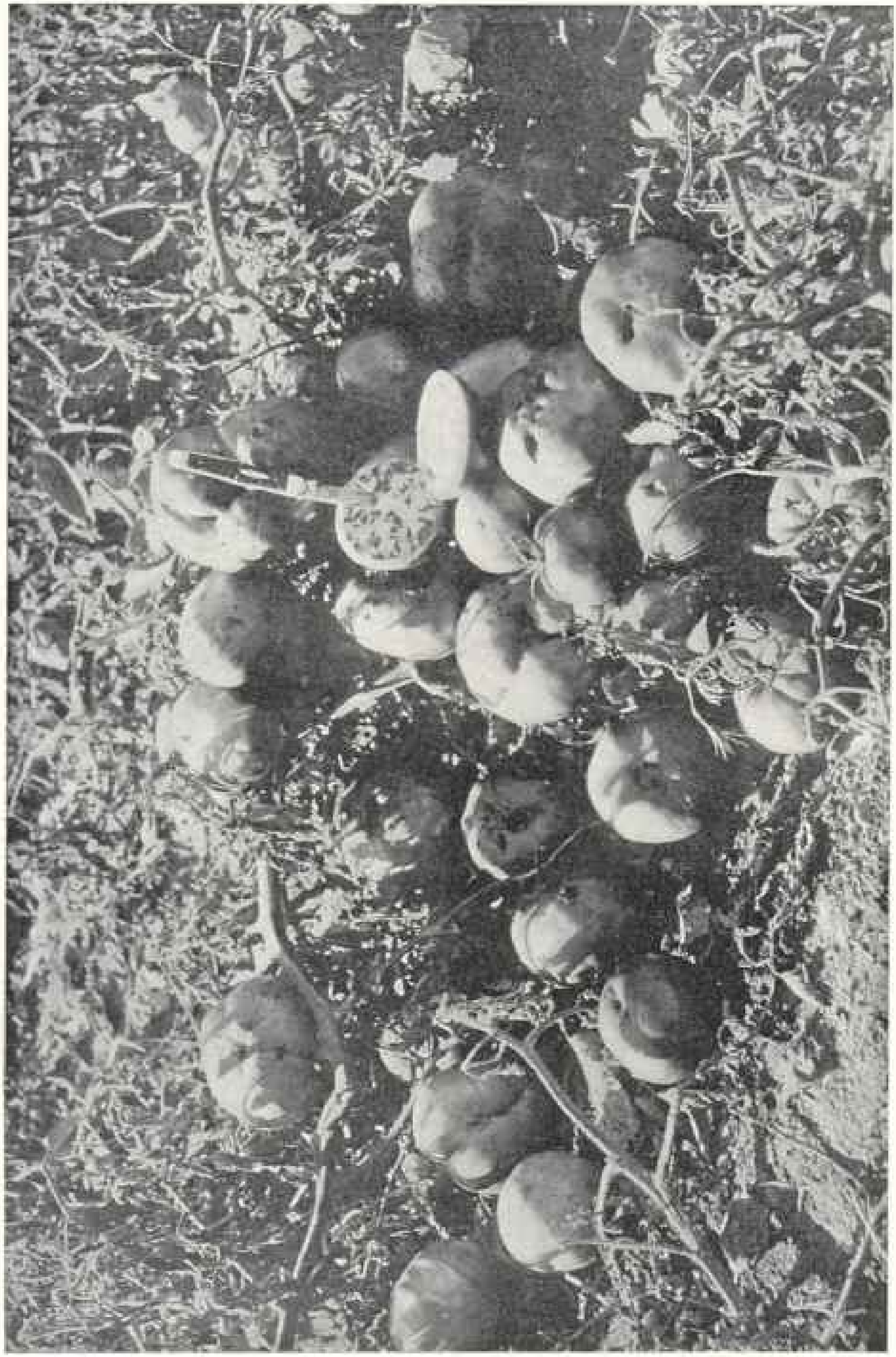
Its roads have a total length of 417 miles; telephones, 1,127 miles; levees, 70 miles.

It has purchased 915,751 barrels of cement and has manufactured in its own mill 340,000 barrels. As a result of its work, water is available for 750,000 acres on 13,000 farms.

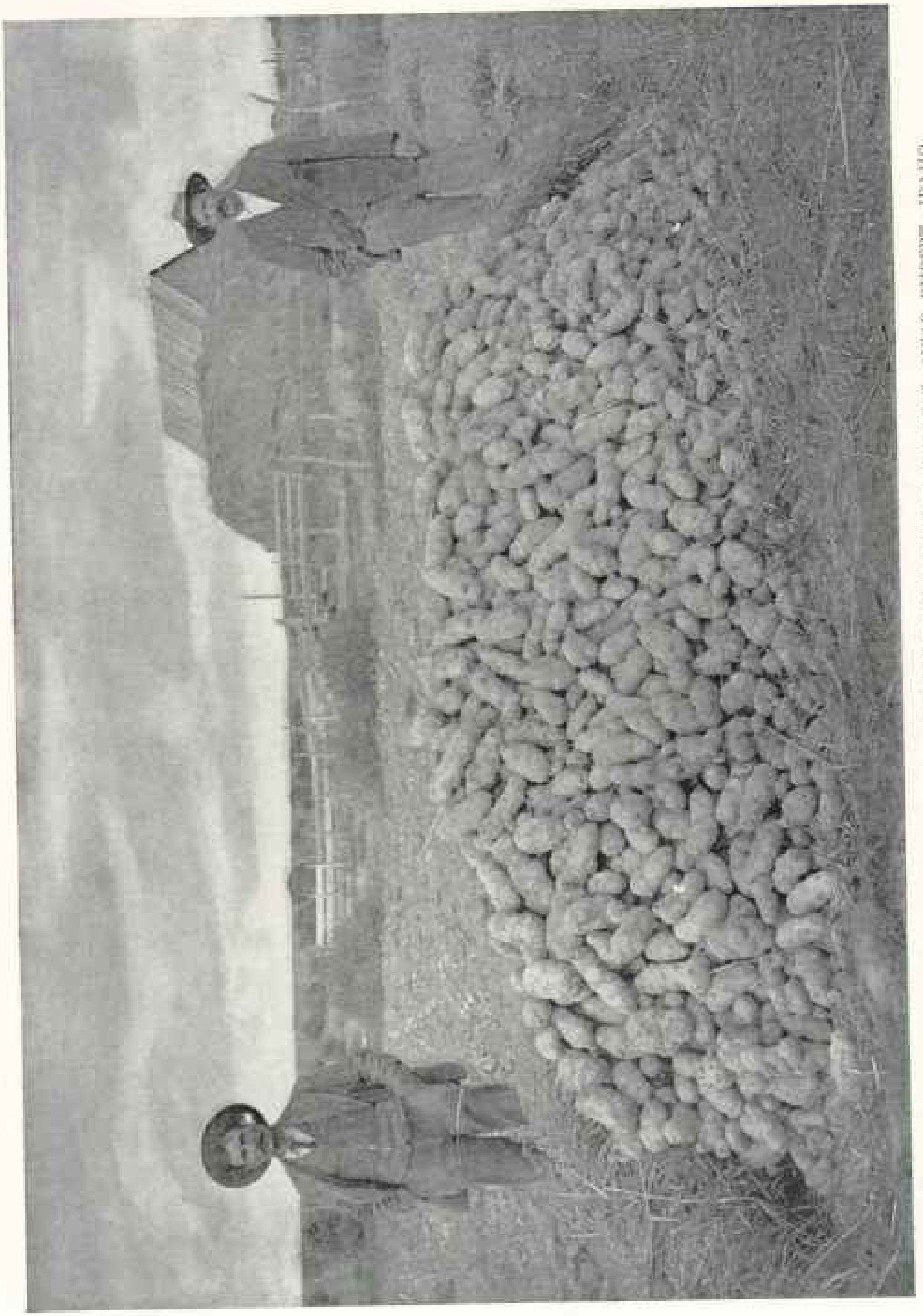
The gross value of crops produced on the lands irrigated by the Government projects in 1910 was $14,038,000. As a result of the work of the Government it is estimated that land values have increased more than $105,800,000.

The Reclamation Service is entering 1910 with money and plans for completing most of its larger and unfinished masonry structures, and with about three-quarters of a million of acres of arid land under irrigation.

It will finish this year the great Roose-

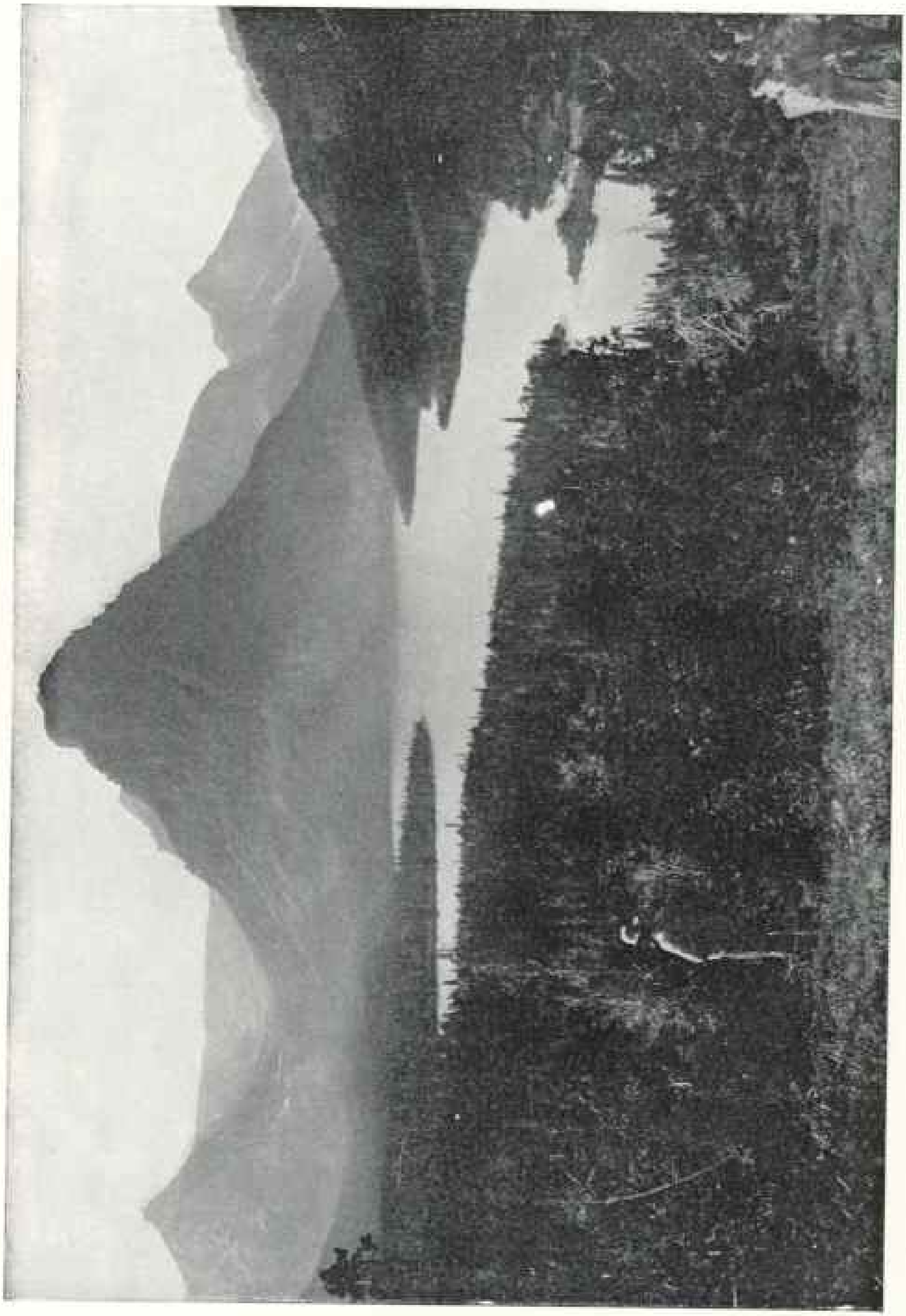


TOMATOES GROWN ON THE JAMES WARNER RANCH, NEAR SPANISH FORK, IN THE STRAWBERRY VALLEY, UTAH (SEE PAGE 355)



POTATOES GROWN ON THE A. J. SMITH RANCH OF THE MENDOSA PROJECT, NEAR RUPERT, IDAHO

Representative of the first crop of potatoes on this project



THE SITE FOR A GOVERNMENT RESERVOIR: UPPER MEDICINE LAKE, IN THE BLACK OF MONTANA

velt dam in Arizona, one of the most massive in the world. It has completed the Shoshone dam, in northern Wyoming, the highest structure of its kind ever built; the Pathfinder dam, in southern Wyoming, and the Laguna dam, in Arizona. It will for the first time utilize the Gunnison tunnel, whose completion was celebrated by President Taft last summer.

The funds available for construction are somewhat less than in previous years, and the organization, which is very elastic, has been cut down to fit reduced expenditures. About 50 skilled men—engineers, experts, and technical assistants—have either sought private employment, have been transferred to other bureaus of the Government, or put on furlough, in order to keep the overhead charges consistent with the expenditures.

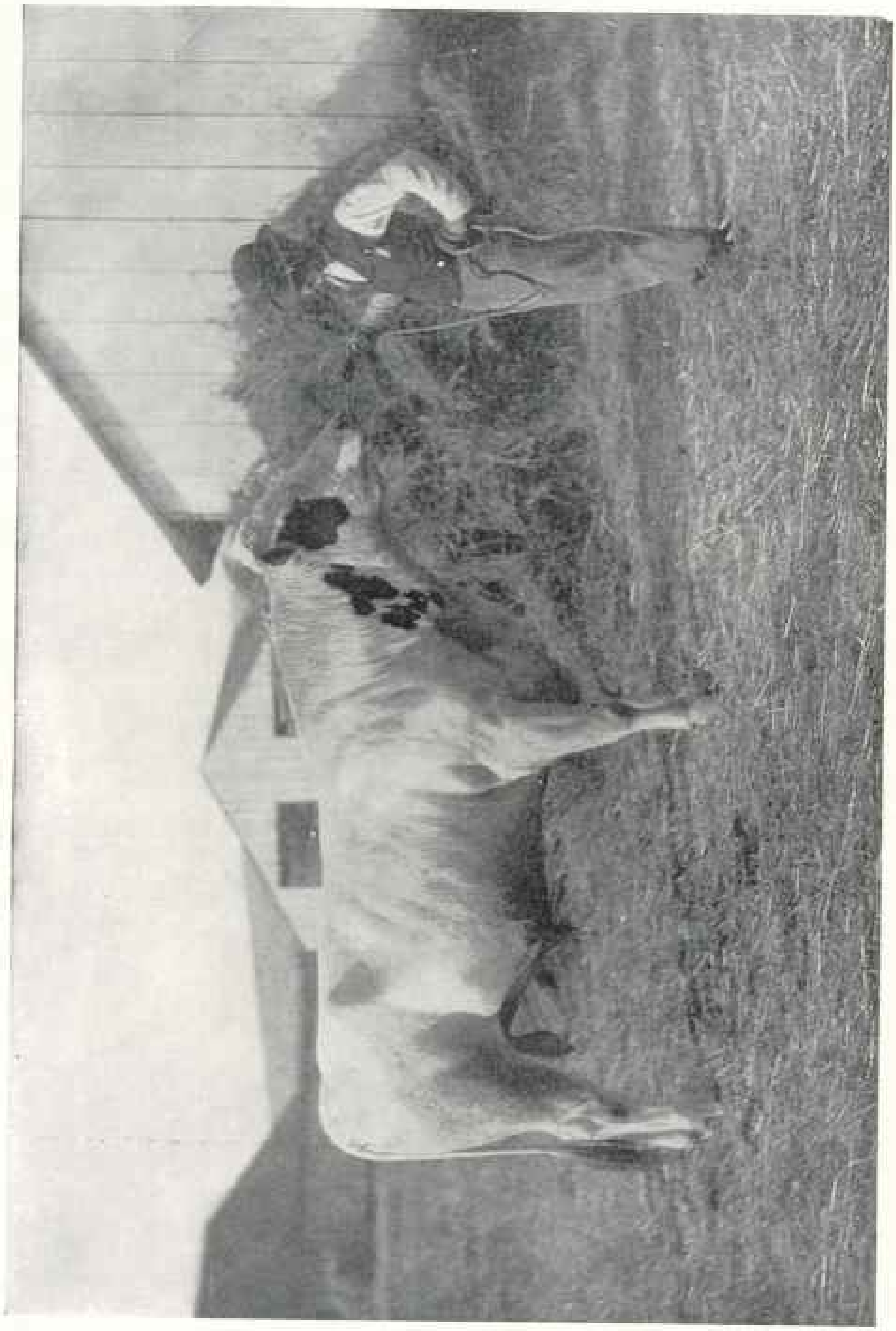
Reviewing the history of the Reclamation Service as a whole, its maximum activity and expenditures were in the year 1907. In 1902 the expenditures were less than $100,000, and in 1903 less than $1,000,000. In 1904 they were $2,500,000; in 1905, $5,000,000; in 1906, a little less than $10,000,000; in 1907, nearly $14,000,000. Then the expenditures decreased to $10,000,000 in 1908, to about $9,000,000 in 1909, and in 1910 they will be a little under $8,000,000. It is expected that in 1911 they will shrink to about $7,000,000, which sum will probably continue to be available during after years, assuming that the water-right charges are paid as they fall due.

If Congress should make a loan to the fund it would, of course, be possible to increase or even double the outlay and finish extensions of various systems in half the time otherwise required.

This is the most critical period in the history of national irrigation since the passage of the Reclamation Act, in 1902. By public notices of the Secretary of the Interior, issued last year, hundreds of water-right installments, involving approximately $1,000,000, became due on April 1, 1910. That date is a memorable one, not only to the settlers, whose entries are liable to cancellation for failure to make the payments due, but also to the Reclamation Service, which is concerned in securing the return of its investment in the engineering works. It is also a matter of interest to citizens of the number of sections containing feasible projects, the construction of which cannot be undertaken without additional funds. As the repayments are made through the local land offices and not directly to the Service, some time must elapse before the actual amounts collected are known. On a number of the projects, like Sun River, Shoshone, and Huntley, the settlers have already made their initial payments, and will not be delinquent on the second installment until April, 1911, which enables them to market two crops between payments. On several other projects, such as the Minidoka, Klamath, Lower Yellowstone, Belle Fourche, Carlsbad, Truckee-Carson, North Platte, and others, the first settlers have had the use of water for two crops, and it is probable that a majority will be able to meet their obligations without difficulty.

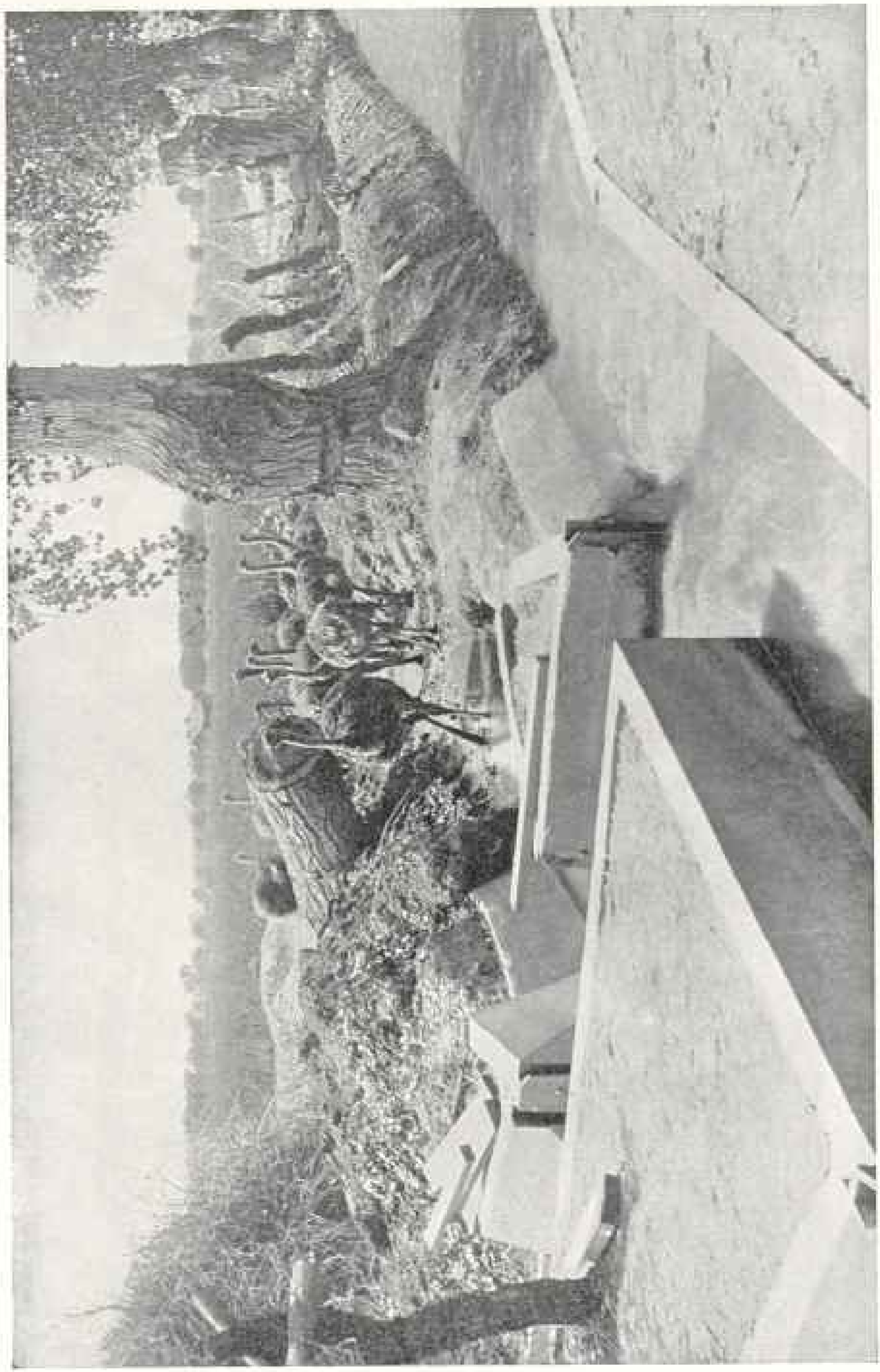
Detailed reports from various sources on each of the projects have been received at Washington. The conditions as a whole are described as favorable for a large return to the Reclamation fund. On several of the projects there will be no delinquents. On a number of projects the engineering work is not fully completed, but water is ready for large areas, and is being supplied on a rental basis pending the announcement of the actual cost of water right. The Reclamation Service has derived considerable revenue from these sources, and at the same time the farmers have been enabled to increase the areas in cultivation. The following financial statement is interesting as showing the status of the Reclamation fund and the amounts which thus far have been credited to it through the operations of the Reclamation Service:

Total moneys received and transferred to the Reclamation fund from sales of public lands under Reclamation Act to February 28, 1910, $58,342,617.02. Ap-



STEER MEASURES FAT, BORN JULY 14, 1904; WEIGHT, 1,800 POUNDS, AND VALUED AT $1,000

Owned by Dr J. C. Kloever, Yakima Valley, Washington. Exhibited at the Yakima fair



A HAND OF OSTRICHES COMING DOWN TO VIEW THE NEW CONCRETE TURNOUTS ON A LATERAL IN THE SALT RIVER PROJECT, ARIZONA (SEE PAGE 350)

proximately $4,500,000 are still in the Treasury of the United States, but not yet available.

Moneys received under operations of Reclamation Act from all sources, in cash and credits, for work done, $2,379,475.04, divided as follows: Town-lot sales, $103,673.91; miscellaneous sales, water rentals, etc., $1,694,844.77; collections on water rights, $814,145.34. This does not include any of the moneys collected for the water rights which were due and payable April 1, 1910.

THE HIGHEST DAM IN THE WORLD

Among the several large projects, one of especial interest is located in northern Wyoming. When the springtime showers and sunshine fall upon the snowy peaks of the lofty mountains on the eastern rim of Yellowstone Park, a thousand streams will rush downward to fill to brimming the swift-flowing Shoshone River. An important physical change will occur at that time. The flood that once, unchecked and uncontrolled, swept madly through the rock-walled gorge, will beat itself to stillness against a massive wall of concrete with which man has blocked the canyon. A beautiful lake, 100 feet deep and covering ten square miles, will appear.

In this wonderful gash in the mountains, with perpendicular walls a thousand feet high, the Government has erected the highest dam in the world. It is a wedge of concrete 328 feet from base to top. Its height can only be appreciated when compared with that of some well-known structure. New York's famous Flatiron Building would not reach within 47 feet of the top of the dam, and the tip-top of the dome of the United States Capitol would fall short 21 feet of the parapet.

In the summer, when the crops are thirsty, the big gates will be opened and the pent-up floods will be released into the river below. Another dam, a low structure of concrete, will divert the waters through a tunnel three and one-quarter miles long into a canal which for 40 miles passes along the upper edge of a broad and fertile valley containing 150,000 acres.

Two years ago it was a desolate waste. Today it contains more than 200 farm-houses and three thriving towns. Ten thousand acres produced crops last year on this project. With 16 farm-houses along each mile of the main highways, the valley already has a suburban appearance.

More than 250 farm units of 40 to 80 acres each are now available to entry, and offer exceptional opportunities for men of moderate means to secure homes in a prosperous and growing country.

BELLE FOURCHE PROJECT, SOUTH DAKOTA

Close to the Black Hills, in South Dakota, lies the beautiful valley of Belle Fourche, containing 100,000 acres of grass-covered prairie. Many miles of canals have been laid across its level surface, and what was only a short time ago the finest free cattle range in this country is rapidly becoming a compactly settled agricultural community.

An impressive engineering feature of this project is the Owl Creek dam, one of the longest and highest earthen embankments in the world. This structure, now nearing completion, is 6,200 feet long, has a maximum height of 115 feet, and contains 1,600,000 cubic yards of material.

The reservoir created by it will be the largest lake in the State. By means of a deep and wide canal six and one-half miles long, the entire flow of Belle Fourche River is turned into the reservoir, to be taken out again in the irrigating canals, which will supply 100,000 acres in 1911.

On the second unit, containing 10,000 acres, opened to entry March 1, there are about 60 Government farms awaiting settlers.

MONTANA PROJECTS

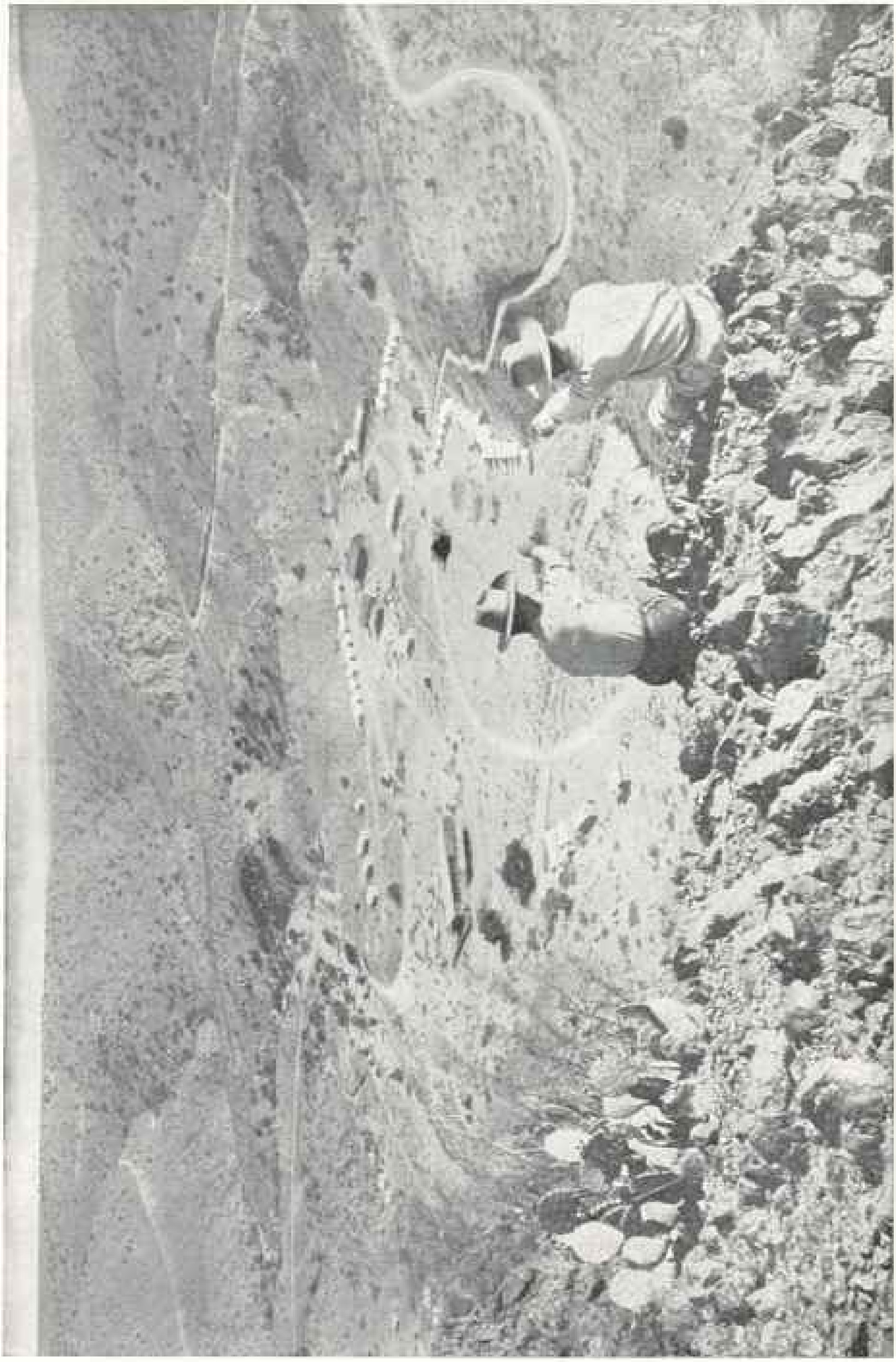
The activities of the Reclamation Service in Montana have resulted in the completion of two large projects and the partial construction of several others. The present plans provide for projects in this State as follows:

A FAMILIAR TYPE: THE OPTIMISTIC PROSPECTOR

	Acres
Huntley	28,931
Lower Yellowstone	64,622
Sun River	276,000
Milk River	248,000
St. Mary	100,000
Blackfeet (Indian)	132,000
Flathead (Indian)	150,000
Fort Peck (Indian)	130,000
Total	1,129,543

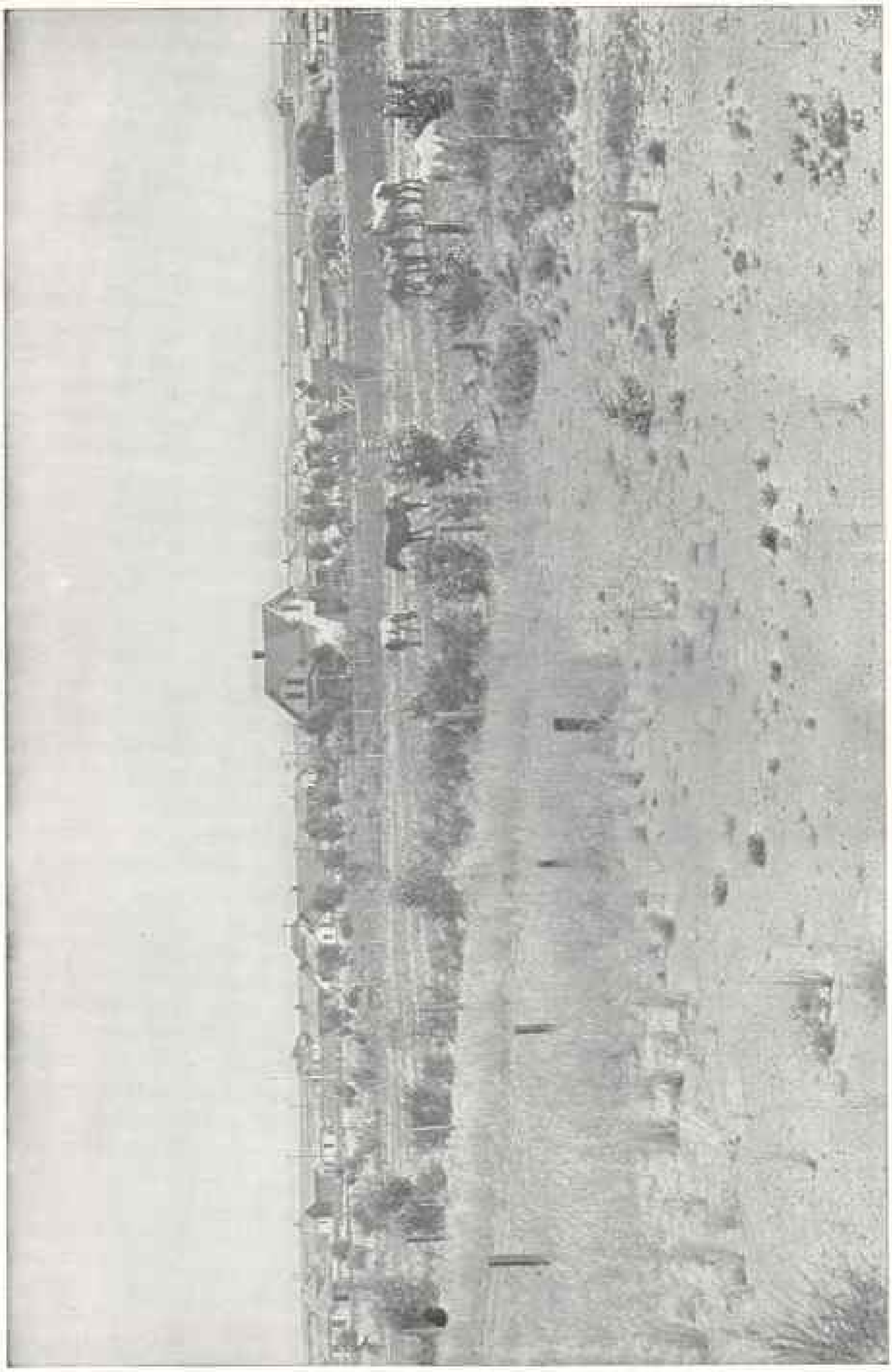
The Huntley and Lower Yellowstone projects are completed, and an important unit of the Sun River project was opened to settlement in 1908. Actual construction has begun on all the other projects, except the Fort Peck. On the Flathead project several units have been completed and water is now available for 13,500 acres, which will be allotted to successful entrymen on May 7.

On the Sun River and Huntley projects there are first-class opportunities for homeseekers to secure farms for which the water is now ready. The Sun River project contains 85 unentered farms, and the Huntley project 224. With the present rate of settlement, however, both projects will be fully taken up before the close of the crop season of 1910.



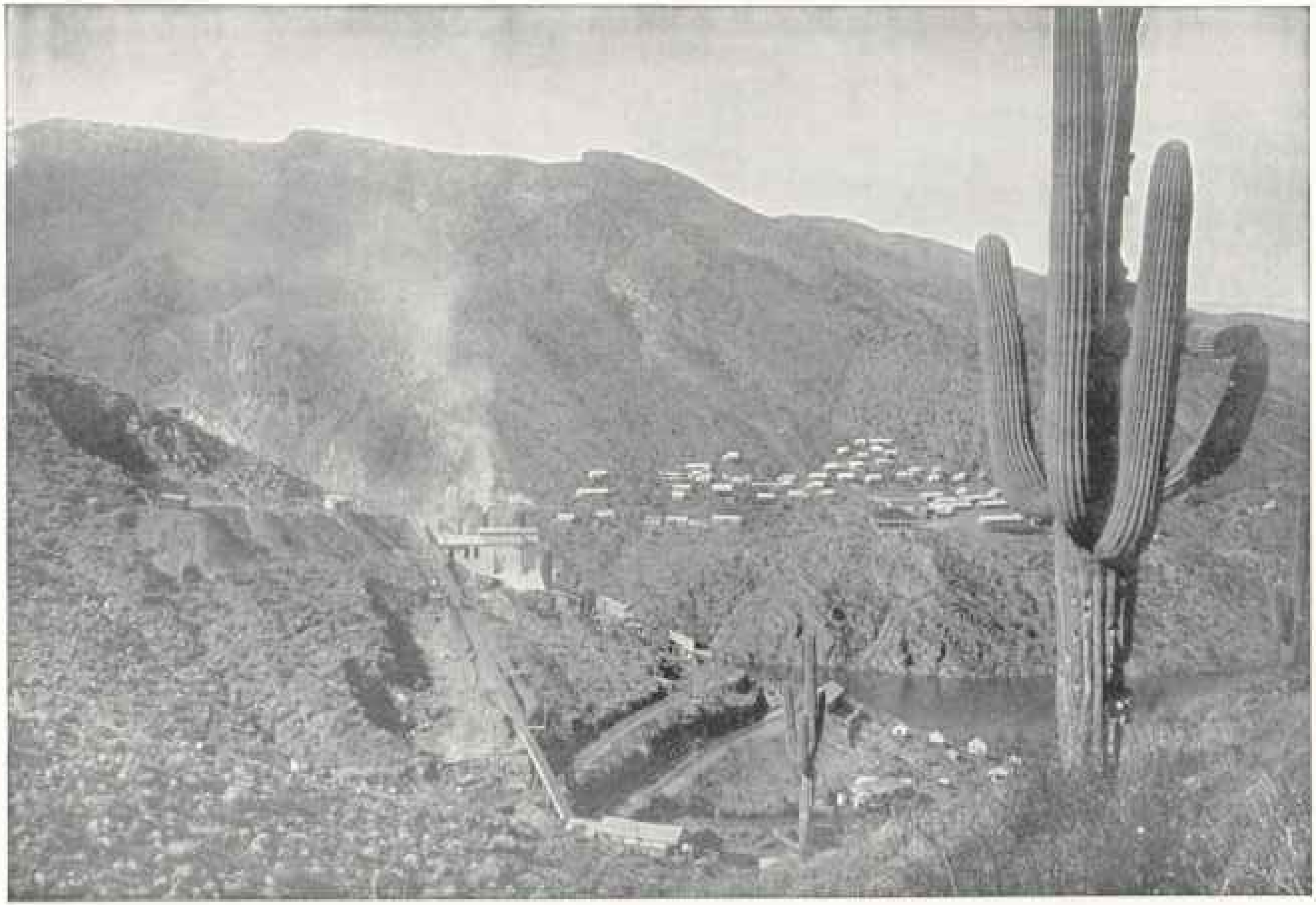
BEGINNING OF THE GREATEST PROJECT OF THE RECLAMATION SERVICE: THE NEW CAMP AT ENGLE DAM SITE, RIO GRANDE VALLEY, NEW MEXICO

The Engle dam will create the largest artificial body of water in the world



A region of immense small farms intensively cultivated in high-priced products. In 1906 this was a sage-brush desert (see page 355).

COMMUNAL LIFE ON UMATILLA PROJECT, OREGON



U. S. RECLAMATION SERVICE CEMENT MILL, CONTRACTOR'S CAMP, AND THE ARIZONA GIANT CACTUS: SALT RIVER PROJECT, ARIZONA

Nearly 350,000 barrels of cement have been manufactured in this mill. It completed its work on April 28 at 4 p. m., having saved the government more than $650,000

While all the Government land on the Lower Yellowstone project has been entered, a considerable area of railroad grant land is available at a maximum price of $2.50 per acre. The development of the valley since the beginning of the work of reclamation has been very rapid, and the time is not far distant when it will be one of the most prosperous districts in the Northwest.

A HARVEST-FIELD 20 MILES LONG AND 6 MILES WIDE

In the southern part of Wyoming, where the North Platte River flows in a deep granite-walled canyon, another masonry dam has been erected. It rises 215 feet above bed-rock, and back of it there is a lake with a capacity great enough to cover Rhode Island a foot deep.

Located 45 miles from the nearest railway, its construction was expensive and difficult. All machinery, cement, and provisions for men and horses were brought over the long miles of sage-brush desert.

Down the river many miles another structure of concrete turns the stored water into a canal 95 miles long, whence it is conveyed to the gently sloping valley lands in Wyoming and Nebraska.

In the beginning of the work I visited the valley, and at one particular point I gazed over a broad stretch of prairie. Within the radius of my vision I could count only six farm-houses.

Last year, from the same point, I saw a harvest-field 20 miles long and 6 miles wide, and counted 600 homes. Today on the North Platte project there are more than 1,500 families living in homes of their own. The construction of this irrigation system has already increased land values in the valley more than $4,520,000.

THE MOST SPECTACULAR PROJECT IS IN COLORADO

Among the valleys of the western slope, two in Colorado have focused the attention of the citizens of the country for the past few years. These are the Uncompahgre and Grand valleys, in the drainage basin of the Grand River, the most important tributary of the Colorado River of the West. Situated on one of the main traveled transcontinental highways, in the midst of the grandest scenery on the continent, no section of the West is more generally known.

It is only within the past few years that the agricultural importance of these valleys has impressed itself on the public mind. Surrounded by a rich mineral zone, the development of mines served to obscure the far greater wealth which is hidden in a soil of wonderful fertility and in a climate adaptable for the production of high-priced crops.

In the Uncompahgre Valley the Government has one of its most spectacular projects. The progress of construction has been widely advertised. For several years two large forces of men have been burrowing night and day through a mountain 2,000 feet high and 6 miles thick, excavating a tunnel, one portal of which is in a profound canyon 3,000 feet deep and the other at the upper end of a broad and fertile valley. The work is nearly concluded; a great underground waterway 6 miles long and capable of carrying a whole river has been excavated.

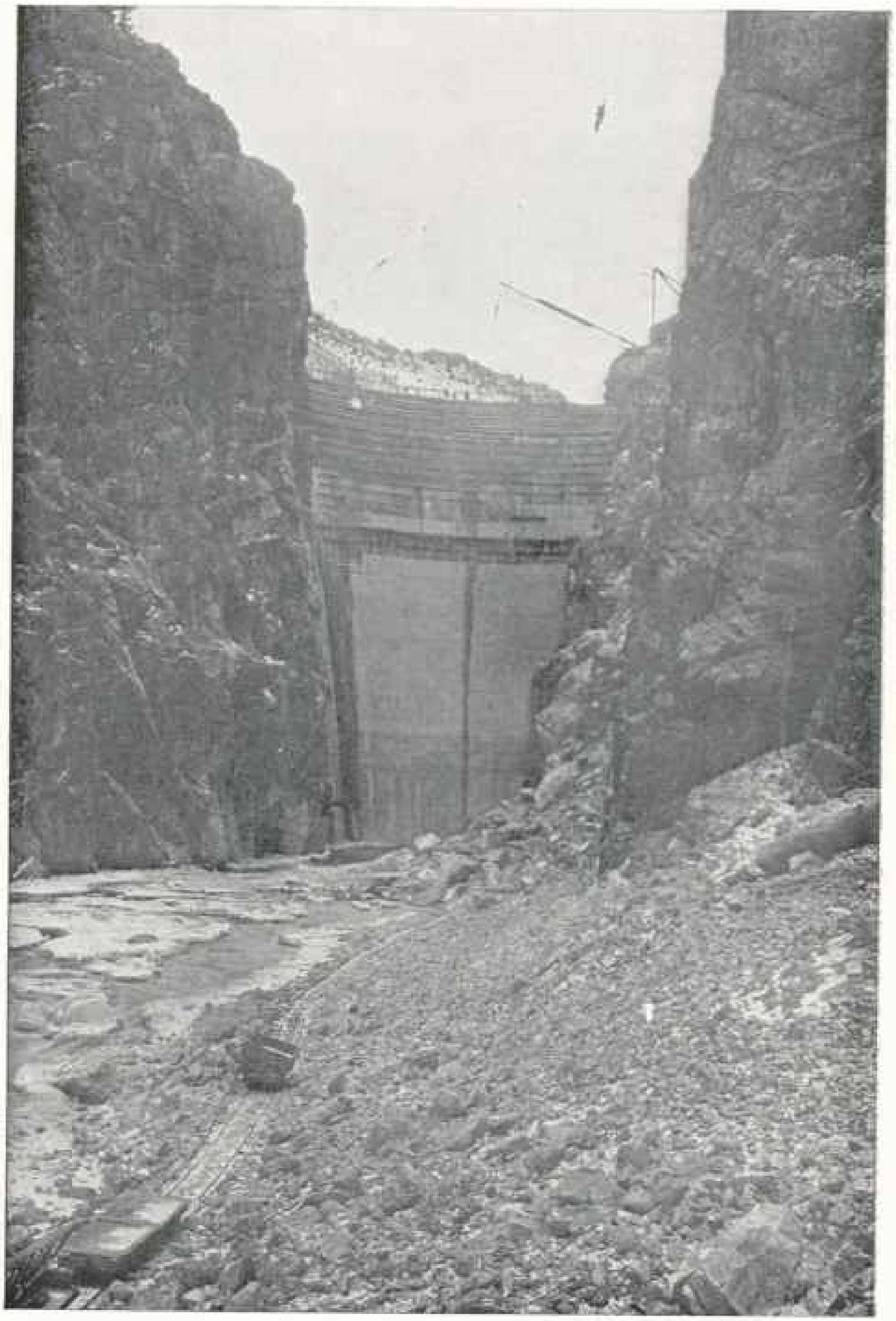
President Taft, on September 23, 1909, presided at the formal ceremony. He placed a gold bell on a silver plate and the electric connection released the pent-up floods of the Gunnison, and its waters, passing through the mountain, flowed out upon the Uncompahgre Valley to fructify a thirsty desert. The tunnel is lined with cement, as is also the main canal for several miles.

The irrigable area of the Uncompahgre Valley is 140,000 acres, of which 36,000 acres were public at the beginning of the work. Approximately 15,000 acres are yet unentered, but are not at this time open to settlement. Due announcement of the opening of these lands to entry will be made through the public press when the canals are constructed to furnish water to them.

TRAMWAY IN THE TIETON CANYON AT CAMP NO. 1: YAKIMA PROJECT, WASHINGTON

Length of tram, 1,800 feet; elevation, 600 feet; 33 1/3 per cent grade utilized for the transportation of men and material in connection with the construction of Tieton Canal, which is laid along the upper edge of the canyon, Tieton unit (see page 356).

LOOKING DOWN INTO TIETON CANYON FROM LOWER HEADING OF TIETON TUNNEL, ON MAIN CANAL, THE RIVER LYING 600 FEET BELOW: YAKIMA PROJECT, WASHINGTON



THE HIGHEST DAM IN THE WORLD, THE SHOSHONE DAM, WYOMING, COMPLETED JANUARY 20, 1910: 328.4-10 FEET (SEE PAGE 346)

Creates a large reservoir which will serve 150,000 acres in the valley below

GRAND VALLEY PROJECT, COLORADO

The preliminary plans have been made for the beginning of construction of a project in Grand Valley to irrigate 53,000 acres, of which 35,000 acres are public. It is expected that two years will be required to complete the works. The irrigable area in the project, in the opinion of horticultural experts, includes some of the finest fruit land in the country. The engineering works proposed include a diversion dam of masonry, with a movable crest; maximum height, 13 feet, and 450 in length; 71 miles of canals and 12,000 feet of tunnels.

FOUR PROSPEROUS TOWNS CREATED IN IDAHO

In the spring of 1904 I camped for the night on the banks of Snake River, Idaho. My companion, the engineer, confided to me his plans for a great work in this section which was to create in the desert a garden covering 25 square miles. He drew his plans roughly in the sand as we sat by the camp-fire.

"Here," he said, "I shall build a dam to turn the waters into huge canals on either side." When I returned another year the dam was finished. Pointing to a landscape of desolation, whose outer ends touched the sky, and on which there was no sign of human habitation, he said: "This desert will one day become a show place—a garden rich and productive, and supporting in comfort a thousand families."

Last year, standing where I did three years before, I realized that the engineer's dream had come true. Look where I would in any direction, I saw no desert. Cultivated fields, with harvests ready for garnering; pleasant little homes on each 40 and 80 acres; children playing in the sunshine, sturdy and happy; the garden crops being gathered for winter storage, gave abundant evidence that the soil was productive and, when watered, gave generous rewards to the farmer.

Twenty-two hundred families are living here today, when only a short time ago there was no sign of human life. Four prosperous towns, soon to become cities, have sprung up along the new railroad. This is a transformation to make you rub your eyes with wonder and amazement.

IN STRAWBERRY VALLEY, UTAH

Bringing water, which now flows into the Gulf of California, into Utah's great interior basin, from which no streams reach the sea, is an engineering work which is engaging the attention of the Government.

In a camp situated near the snowy summit of the Wasatch range a large force of men is driving a tunnel four miles long through the mountains, which will bring a tributary of the Colorado River into the Salt Lake Valley. A diversion dam in the stream below now diverts the water into a canal for several miles to a point where a power plant has been erected. The water is dropped through a pressure pipe upon the turbines, and the power generated is transmitted to that camp, now almost buried in the snow, where it is utilized to excavate the tunnel.

Far below a beautiful, sunny valley awaits the completion of the work. It lies at the foot of a lordly range of snow-capped mountains, and, with the present irrigation systems, is one of the richest agricultural districts of the State. Its crops are varied, and many are high-priced. Peaches and apples do exceptionally well here, the fruit being finely flavored and highly colored.

UMATILLA PROJECT, OREGON

On the banks of the Columbia River and in the valleys of its numerous tributaries in Washington and Oregon, there has been a phenomenal development of irrigation in the past four years. It is only a marker for what is due to follow in the coming years. Here is our true Inland Empire, a region vast in extent, drained by the noblest river in the West, with soil of great depth and fertility and a climate unsurpassed for the growing of fruits of unrivaled color and flavor, for vegetables of all kinds, and for the cereals and forage crops of the north temperate zone. In parts of this region

the growing season is as long as that of many favored valleys in California.

Located on the south bank of the Columbia River, in Oregon, and extending up the valley of the Umatilla River, the Service has partially completed the Umatilla project, embracing 20,000 acres of land having an average elevation of 470 feet above sea-level. In the beginning of the work, in 1906, this region was largely a sage-brush desert, unattractive and uninviting.

On the occasion of my first visit there, before construction had begun, one could drive for miles and never see a habitation. Where the thriving young city of Hermiston now stands, with its solid blocks of brick buildings, its fine schools and churches, and its charming bungalows, there were exactly three houses in sight. Today there are probably 700 people residing here.

An attractive feature about life in this community is due to the fact that the farms are small. Many homes have been esablished on five and ten acre farms which are located all about the town. Trees have been planted to shade the streets and lawns, and thousands of acres of orchards are being laid out.

The question of a municipal water supply is being agitated in Hermiston. Near the new city a tract of land embracing 40 acres has been reserved. It contains a spring which will furnish a water supply for a city of 50,000 inhabitants, and its water can be carried in pipes by gravity to any part of the town. A reservoir site has been found on the side of the high butte just outside of town into which the spring water can be readily pumped. This will insure a water system with sufficient pressure to furnish protection from fire.

While land values have increased rapidly, as the result of the Government's work here, the prices are not regarded as unreasonable when compared with other irrigated valleys in the Columbia Basin.

THE LARGEST PROJECT IS AT YAKIMA

The largest irrigation project of the Government is in Washington, on the eastern side of the Cascade Mountains, in the valley of the Yakima River. A number of beautiful lakes have been acquired by the Service and are being utilized as storage reservoirs to supplement the stream flow.

An interesting feature of the work here has been the construction of the Tieton canal, which for several miles hugs the edge of a precipice several hundred feet above the river. This is a cement-lined ditch, and the placing of the lining was a difficult task.

Cement forms made in the valley near the stream were carried up the steep canyon side on cableways, or by means of cars, and then set in place. More than two miles of the canal is in tunnel, and for several miles it winds around the edge of a perpendicular cliff.

In the Yakima River the Government has a concrete dam which diverts the water into the Sunnyside canal and irrigates today 45,000 acres, but which ultimately will supply 94,000.

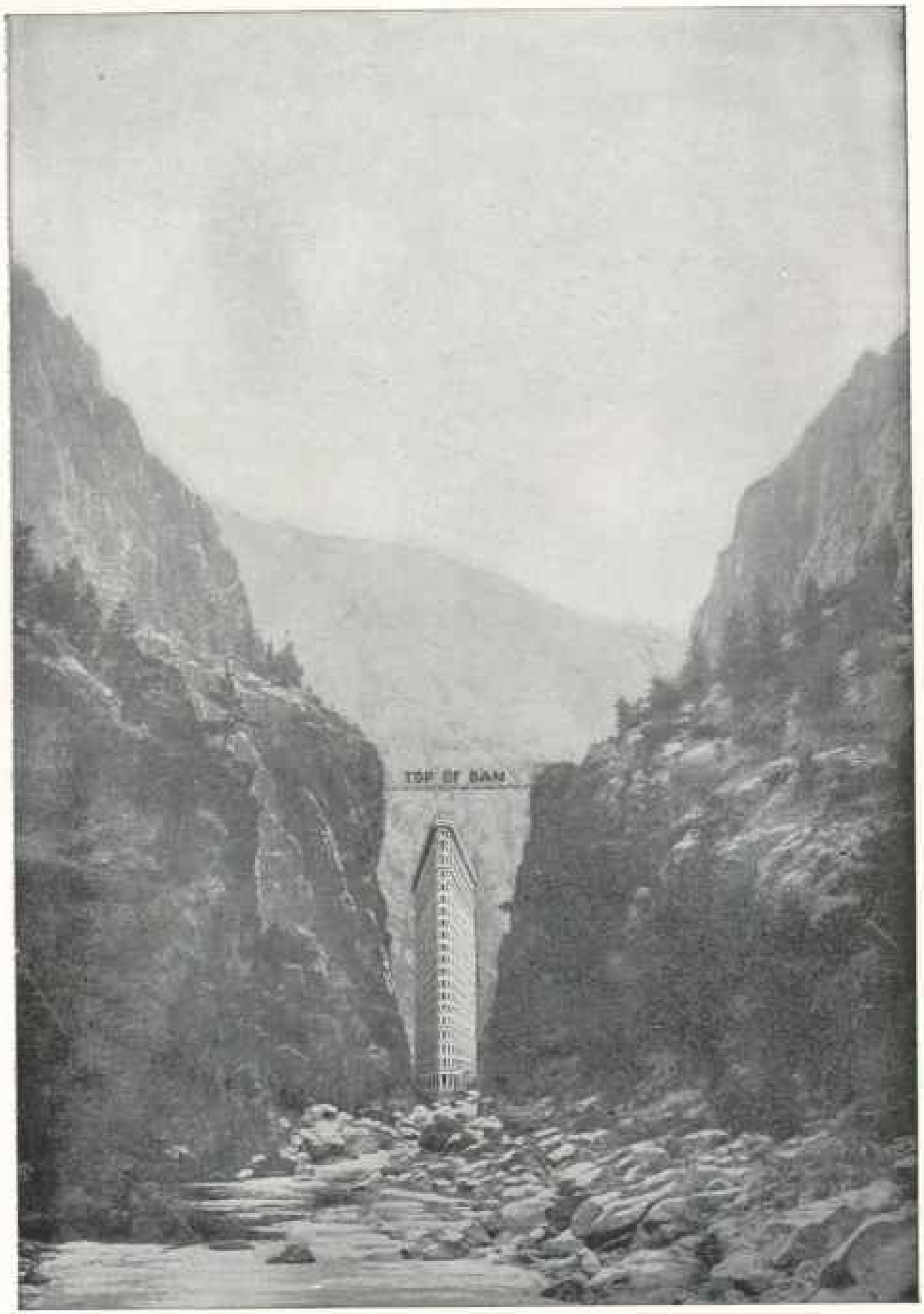
The Yakima Valley is probably the best advertised agricultural district in the Northwest, and contains some of the most valuable agricultural and fruit lands in the world. It is today a region of small farms intensively cultivated.

The character of farm homes is as attractive here as can be found in any farming region in the world. In variety of crops it is not excelled by southern California, while in profitable yields it probably ranks with that favored section of the Southwest. A crop census of the lands irrigated by the Sunnyside canal in 1909 showed a gross average yield per acre of $70.

Some of the crop yields reported are difficult to credit.

Strawberries....	$150 to	$400 per acre
Cherries.....	150 to	350 per acre
Peaches.....	200 to	1,000 per acre
Apples.....	200 to	800 per acre

A strong organization of fruit-growers has been in existence here for a number of years, and as a result the fruit of the Yakima orchards finds a market today all over the world. We are glad to pay $1.50 per dozen in Washington now for



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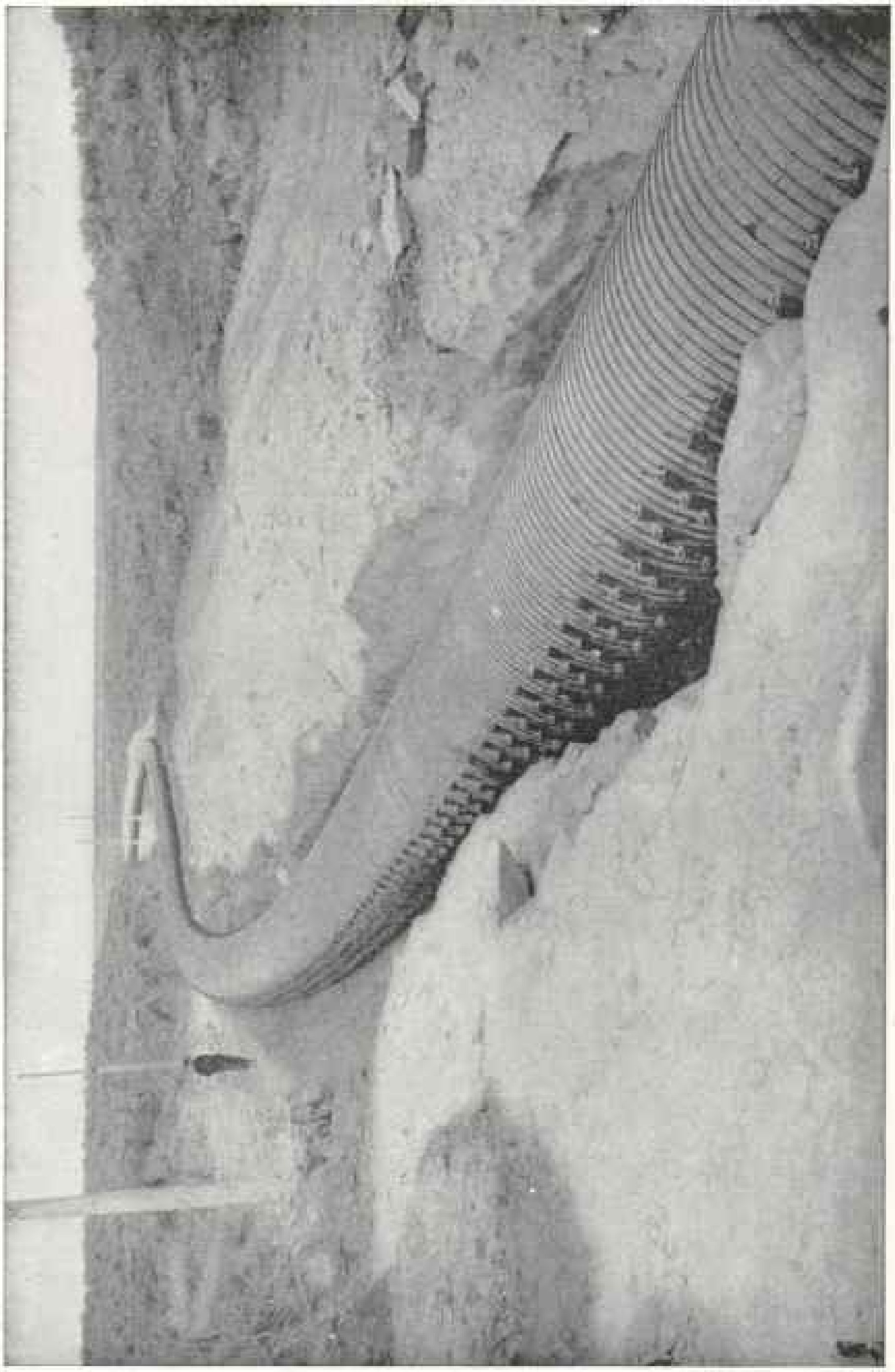
THE "FLATIRON BUILDING" COMPARED TO THE SHOSHONE DAM (SEE PAGE 346)



55-INCH WOOD-STAVE PIPE FOR CARRYING WATER ACROSS BOGGY CONNECTICUT VALLEY, YAKIMA, WASHINGTON

Yakima Winesaps and Spitzenbergs, or about three times what we pay for oranges.

OKANOGAN PROJECT, WASHINGTON

One of the most interesting sections of the Northwest agriculturally is the Okanogan Valley, in northern Washington. While the project now being built in this valley by the Service is classed as one of the minor works, it is destined in the near future to add 10,000 acres of the most valuable land in the West to the cultivated area of the State. The orchards of this valley are among the most attractive in the world, and the fruit grown ranks with the best on the market.

For many years the valley has been so remote from transportation that its development has been slow. The Great Northern is now building a branch northward into it, and before this season's crops are gathered the Okanogan country will be in position to market its products in competition with the other celebrated fruit-growing districts of the Northwest.

TEN APPLICANTS FOR EACH FARM IN THE YUMA PROJECT

The wonders of the delta of the Colorado River have been described so often that the public is now quite familiar with the valley of the American Nile. As proof of the public's interest in this region, nothing better can be mentioned than the recent opening of the first unit of the Yuma project, in California, on March 1, 1910. On that date 174 farms, averaging 40 acres each, were thrown open to entry, and there were approximately ten applicants for each farm. Successive units, to be opened as the work proceeds, are likely to prove as attractive as the first to homeseekers.

Just now the engineers are boring a tunnel under the river, in which it is proposed to lay a concrete-lined siphon 1,000 feet long, with an internal diameter of 14 feet. In this siphon a portion of the waters of the big canal on the California side will be passed under the river to the canal on the Arizona side. Considerable power will be developed at the outlet of the siphon, which will be utilized to lift water to the lands above the gravity system.

SALT RIVER PROJECT, ARIZONA

I shall never forget my first impression of the Salt River Valley. There was a whisper of spring in the soft and fragrant air that morning when I stepped from the Pullman car. After a dusty and tedious journey across the desert, the picture that greeted my eyes was that of another and a tropical land. In the early dawn the summits of the distant hills were glowing "like a Catherine pear the side that's next the sun."

In the grounds about the Capitol the vegetation was almost tropical in its luxuriance and variety. Here and there were wide avenues of magnificent palms, or shapely umbrella trees, with pleasant homes almost hidden by vines and flowers. Almond trees in blossom filled the air with fragrance. In succeeding visits to this sunny valley I have been impressed and fascinated with its future possibilities. The wide variety of crops which may be produced profitably here must attract agricultural experts from all parts of the country.

There is not a single day in the year when nature is not ready and willing to respond to the industry of the husbandman. The oranges are of superior quality and flavor. Dates yield abundantly, as also do figs, lemons, grape fruit, olives, and peaches.

Five to seven cuttings of alfalfa are grown, averaging seven to ten tons per acre.

OSTRICH FARMING IS VERY PROFITABLE

Ostrich farming is proving a very profitable industry, and nearly 8,000 birds are now owned in the valley. I am told each full-grown bird is good for $30 worth of feathers annually. An infinite variety of small fruits and vegetables, harvested early when the markets are best, make the truck industry a profitable one. For eight months in the year the climate here is unsurpassed.

The activities of the Government, which began in this valley almost immediately after the passage of the Reclamation law, have resulted in a large increase in population and in land values.

As an engineering task, the irrigation work laid out here by the engineers, and now nearing completion, is perhaps the most interesting as well as the most important yet undertaken. To provide an adequate water supply for 240,000 acres of land which, when irrigated, jump in value from nothing to $100 or more an acre is a task well worthy of consideration. This is especially true if an investment of $8,500,000 will accomplish it.

Difficult and trying indeed has been the task, owing to the physical conditions and the extremely erratic character of the river which furnishes the water. To understand the problem it is necessary to view the work on the ground.

The journey from Mesa, in the valley, to the scene of the big work covers a distance of 62 miles, 20 miles of which are across the desert. Here is a region quite unique in itself and differing materially from the deserts to the north. Its vegetation is more varied and interesting. The giant cactus here attains a great height and is often found in groves. A hundred species of thorny plants grow here.

At the end of the road across the desert we come upon a range of mountains whose pinnacled peaks rise straight up from the plain. Here our road leaves the desert and we enter a region rugged, upended, with rocks painted in wonderful colors.

The Government has carved this highway for many miles from the walls of rock. It is an inspiring trip, which would be terrifying but for the fact the road is broad and the grades are gentle.

At the end of our journey we stand on the brink of the wonderful gorge Salt River has cut through the mountains. Far below us the stream winds its way in a deep and shadowy canyon. Across the entrance to that gash in the sandstone cliffs the engineers have thrust a massive dam of rock and cement, which for all time will check the floods of the turbulent stream.

THE ROOSEVELT DAM

The Roosevelt dam, which is about completed as you read the story today, is in many respects the most remarkable structure of its kind in the world. Its towering height, 280 feet, its length on top, 1,080 feet, the inspiring scenery in which it is located, and the enormous capacity of the reservoir created by it combine to make it one of the most stupendous engineering works of modern times.

Conceive, if you can, two valleys—one 12 miles, the other 15 miles in length, and each from one to three miles wide—transformed into a lake 200 feet deep in places, and containing enough water to cover Delaware a foot deep.

The Salt River reservoir, when full, has a capacity sufficient to fill a canal 300 feet wide and 19 feet deep extending from Chicago to San Francisco. It would submerge the entire city of Chicago, which embraces 190 square miles, a depth of 11½ feet.

My one regret is that the space allotted me is too little to permit me to describe the charms and advantages of other projects of the Government. I should like to tell you of the opportunities on the Klamath project, located in southern Oregon, in a region of unrivaled scenic beauty; of the wonderful progress made in the Boise Valley, in Idaho, and the promise of even greater advance as the work of the Government nears completion; of the Orland project, in the Sacramento Valley, the land of fruits and flowers; of the Rio Grande Valley, where there will one day be erected the most stupendous dam in the West—a region in which irrigation began before the Spanish invasion, which will become fruitful and prosperous.

The beacon of hope shines brightly in the West. It beckons the landless man to the manless land.

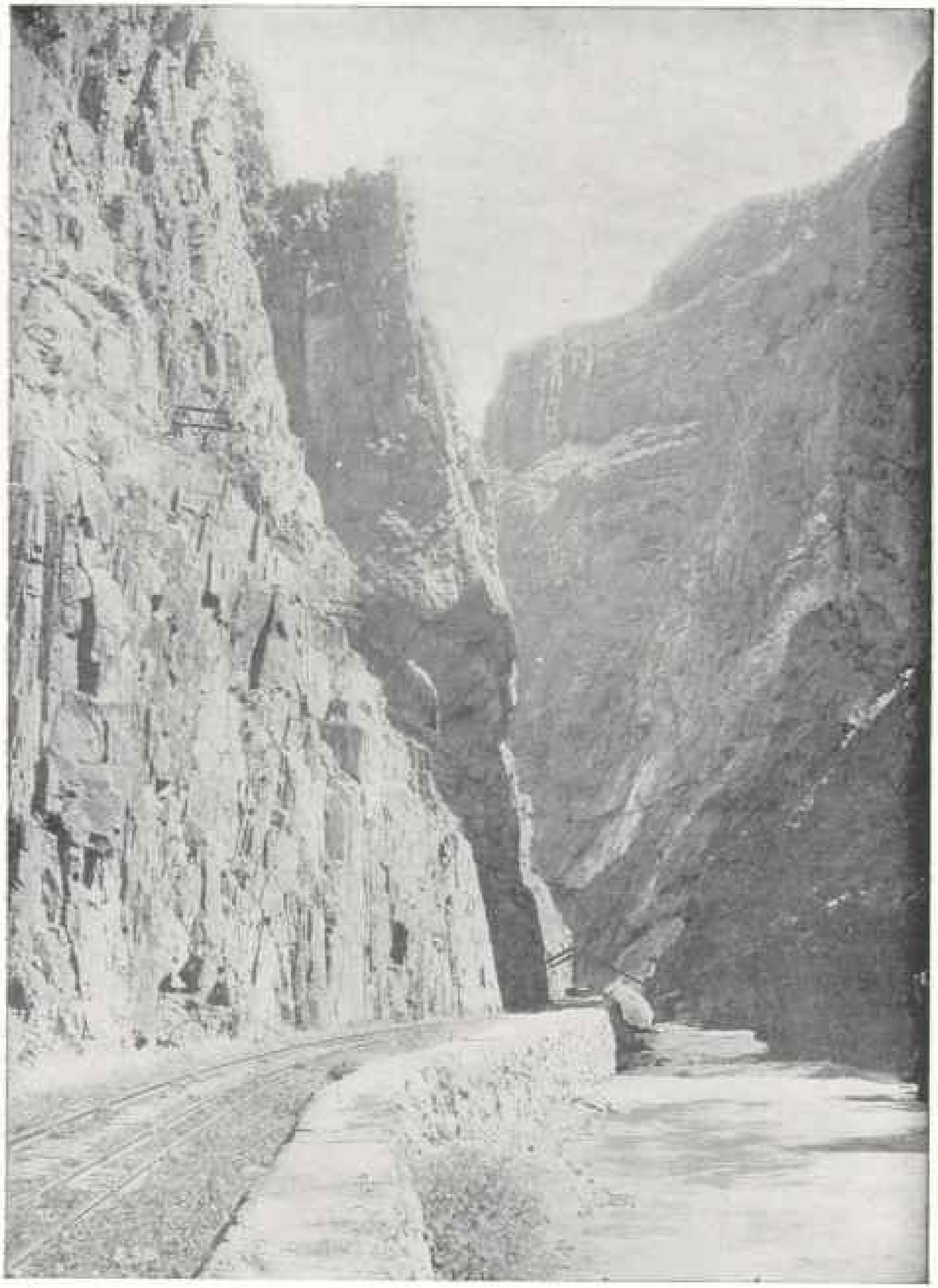
ARTESIAN WATER PREDICTIONS

THE extensive investigations of underground waters carried on by the U. S. Geological Survey have afforded a basis for predicting artesian flows in several areas, and some of the predictions have been verified in the most gratifying manner. One of the most notable of these is a well at Edgemont, South Dakota, recently sunk by the Burlington Railroad Company. This company applied to the Survey for information as to prospects, and the matter was referred to one of the Survey geologists, Mr N. H. Darton, who had made a detailed investigation of the region. He predicted that water should be expected in the Deadwood sandstone about 3,000 feet below the surface.

Accordingly the boring was begun, but, meeting with many difficulties which caused great delay and expense, there was at times a disposition to abandon the work. The engineers in charge, having confidence in Mr Darton's prediction, urged a continuance of the boring, and their faith was finally rewarded by striking a great flow of water at a depth of 2,695 feet. The well yields a half million gallons a day of tepid water satisfactory for locomotive and other uses, and, as there is no good water within 60 miles and much of the supply had to be hauled in tank cars, the value of this flow is inestimable.

This artesian well, at Edgemont, South Dakota, is a practical illustration of the value of the scientific work of the U. S. Geological Survey (see text below).

Several other notable illustrations of artesian predictions are presented along the extensions of the Chicago, Milwaukee and Saint Paul Railroad and the Chicago and Northwestern Railroad, which have recently been built across western South Dakota from the Missouri River to the Black Hills. That country has but little surface water and mostly of poor quality, so that the problem of water supply was of vast importance. A careful investigation was made of the water-bearing strata which pass underground on the slopes of the Black Hills and furnish the supply for the flowing wells in eastern South Dakota. From the data obtained Mr Darton was able to determine not only the depth to the water-bearing sandstone, but the maximum height of land on which flows could be obtained. Eight wells, from 1,395 to 2,135 feet deep, have closely verified the predictions and furnished the requisite supply of excellent



ROYAL GORGE IN THE GRAND CANYON OF THE ARKANSAS BETWEEN PARKDALE AND CANYON CITY

The gorge is about 8 miles long and is a marvelous example of river erosion

water, not only for the railroads, but for several small towns.*

Similar investigations by Mr Darton of underground water conditions along the line of the Atchison, Topeka and Santa Fé Railroad in New Mexico, Arizona, and California have resulted in successful deep wells at Nelson, Picacho, Manila, Gallup, and Chaves. These are in an arid region where the hauling of water for engine use has been a large item in the operating expenses of the railroad.

It is difficult to estimate the money value of a successful artesian well in an arid region, but where it obviates the need of long haulage $50,000 to $100,000 is a moderate figure.

*Geology and Underground Waters of South Dakota, by N. H. Darton. U. S. Geological Survey. Water Supply Paper 227. Washington, 1909.

ASCENDING MONT BLANC, THE HIGHEST MOUNTAIN OF EUROPE

The summit, shrouded by a perpetual snowfield from which descend numerous glaciers, is ascended almost daily in summer. The illustration is from the new edition of "The Playground of Europe," by Leslie Stephen, recently printed by G. P. Putnam's Sons. This book, first published about 25 years ago, comprises 13 descriptive essays of the Swiss Alps. In beauty of expression and word pictures Mr Stephen excels, so that the volume is often called an English classic. Lovers of mountains will welcome the new edition with genuine pleasure.

A FARM-HOUSE IN THE BERNESE OBERLAND

Illustrations from "The Playground of Europe," by Leslie Stephen. G. P. Putnam's Sons

THE SUMMIT OF THE TITLIS

NATIONAL GEOGRAPHIC SOCIETY

AT a meeting of the Board of Managers on April 20 the following resolution was unanimously adopted by the Board:

"*Resolved*, That as the National Geographic Society has been unable in the limited time to raise the entire amount of $50,000 required as its contribution to the proposed South Polar Expedition under the auspices of the Peary Arctic Club and the National Geographic Society, the Society with regret declines participation in the project and all subscriptions be returned to the subscribers."

The Finance Committee had reported that a considerable sum was available, but recommended that the Society should assume no obligations for the expedition until the entire amount was in hand. Meanwhile the time for preparation for the expedition was very short. While the proposed American party would have the advantage of the *Roosevelt* and the equipment of the last Peary Expedition, the Board of Managers and Commander Peary alike felt that so much time had elapsed that adequate preparations could not be made for a satisfactory American Expedition.

The Board of Managers, on behalf of the Society, expresses its hearty appreciation to all members who have shown their interest in the proposed expedition by subscribing to the National Geographic Society fund. The subscriptions will be returned during the month of May. As several thousand remittances have to be made out, members will probably not receive them much before the end of the month.

ADDRESS FROM THEODORE ROOSEVELT

On March 14 the following cablegram was sent to Mr Theodore Roosevelt at Khartoum:

"*Theodore Roosevelt, Khartoum:*

"National Geographic Society sends congratulations on extraordinary success and immense scientific value of your expedition. We rejoice at continued health of you and all your party. We hope you will honor the Society by addressing it at your convenience on your return."

On April 9 the following answer was received:

"*The Palace, Khartoum, Mar.* 15, 1910.

"*National Geographic Society.*

"DEAR SIRS: Mr Roosevelt asks me to express to you his hearty thanks for your cablegram. He will gladly address the Society, but must await his return to America before he can make a definite appointment.

"I am very truly yours,

"LAWRENCE F. ABBOTT."

Mr Lawrence F. Abbott is president of the Outlook Company.

THE ROOSEVELT COLLECTIONS FOR THE U. S. NATIONAL MUSEUM

Mr Roosevelt has summarized his African work in the following letter:

Khartoum, February 15, 1910.

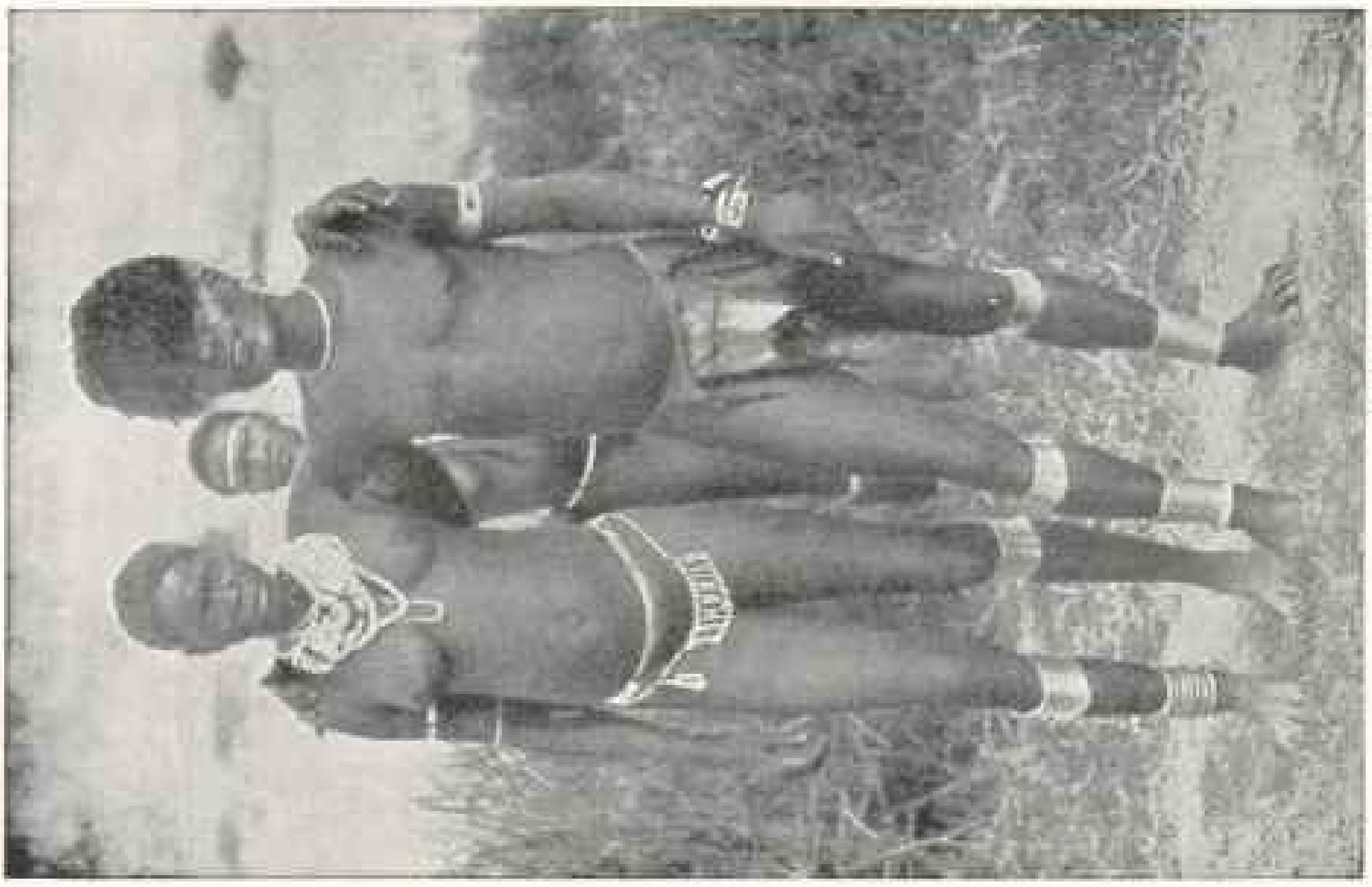
To the Hon. Charles Walcott,

Secretary Smithsonian Institution.

SIR: I have the honor to report that the Smithsonian African Expedition, which was intrusted to my charge, has now completed its work. Full reports will be made later by the three naturalists, Messrs Mearns, Heller, and Loring. I send this preliminary statement to summarize what has been done; the figures given are substantially accurate, but may have to be changed slightly in the final reports.

We landed at Mombasa on April 21, 1909, and reached Khartoum on March 14, 1910. On landing we were joined by Messrs R. J. Cuninghame and Leslie J. Tarlton; the former was with us throughout our entire trip, the latter until we left East Africa, and both worked as zealously and efficiently for the success of the expedition as any other members thereof.

We spent eight months in British East Africa. We collected carefully in various portions of the Athi and Kapiti plains, in the Sotik, and around Lake



NATIVES OF PORT FLORENCE, VICTORIA NYANZA
Photo from Sir Harry Johnston

A FEMALE BABOON FROM THE SEMLIKI FOREST
Photo from Sir Harry Johnston

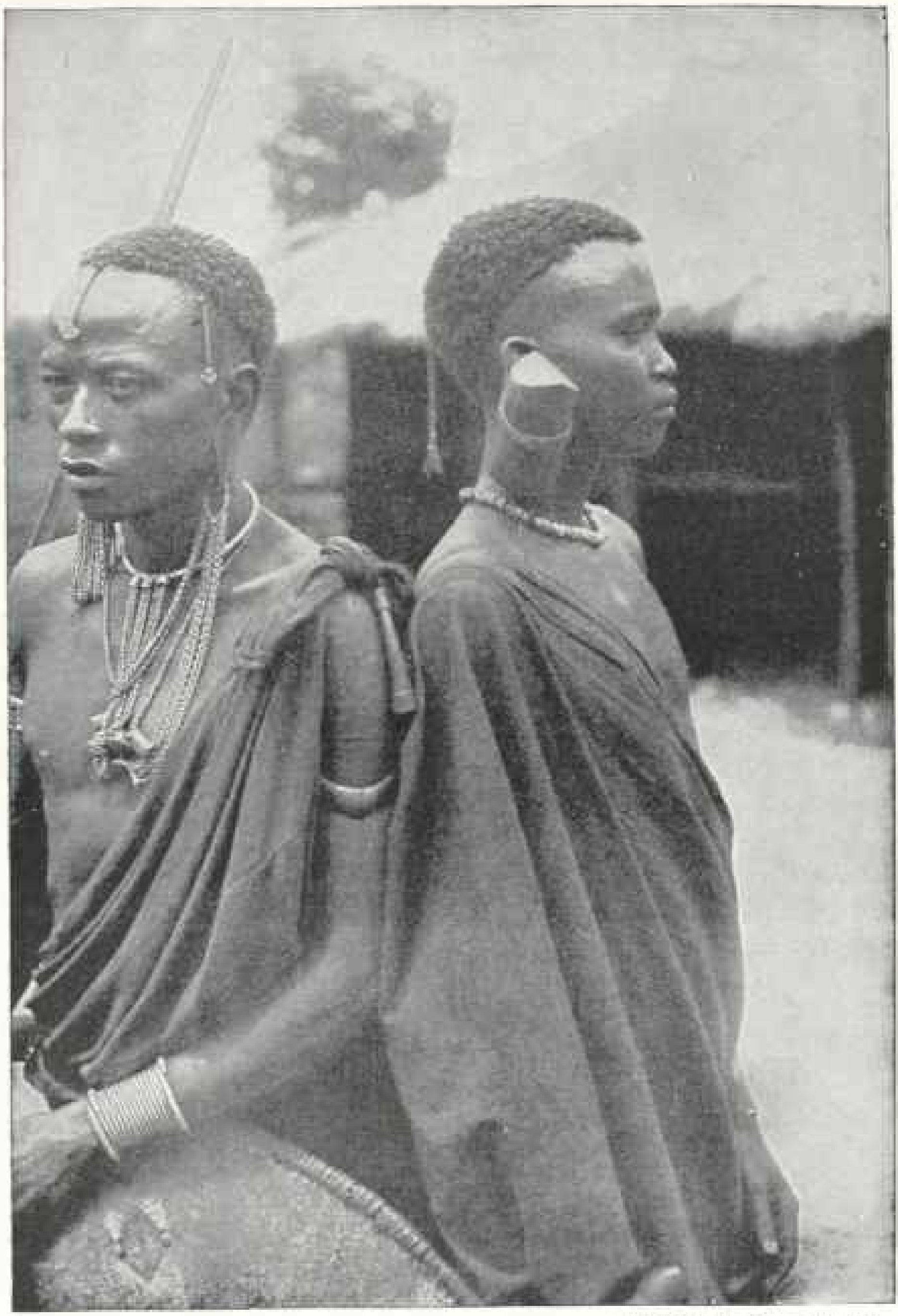


Photo from Sir Harry Johnston

ANDOROBOS OF THE RIFT VALLEY

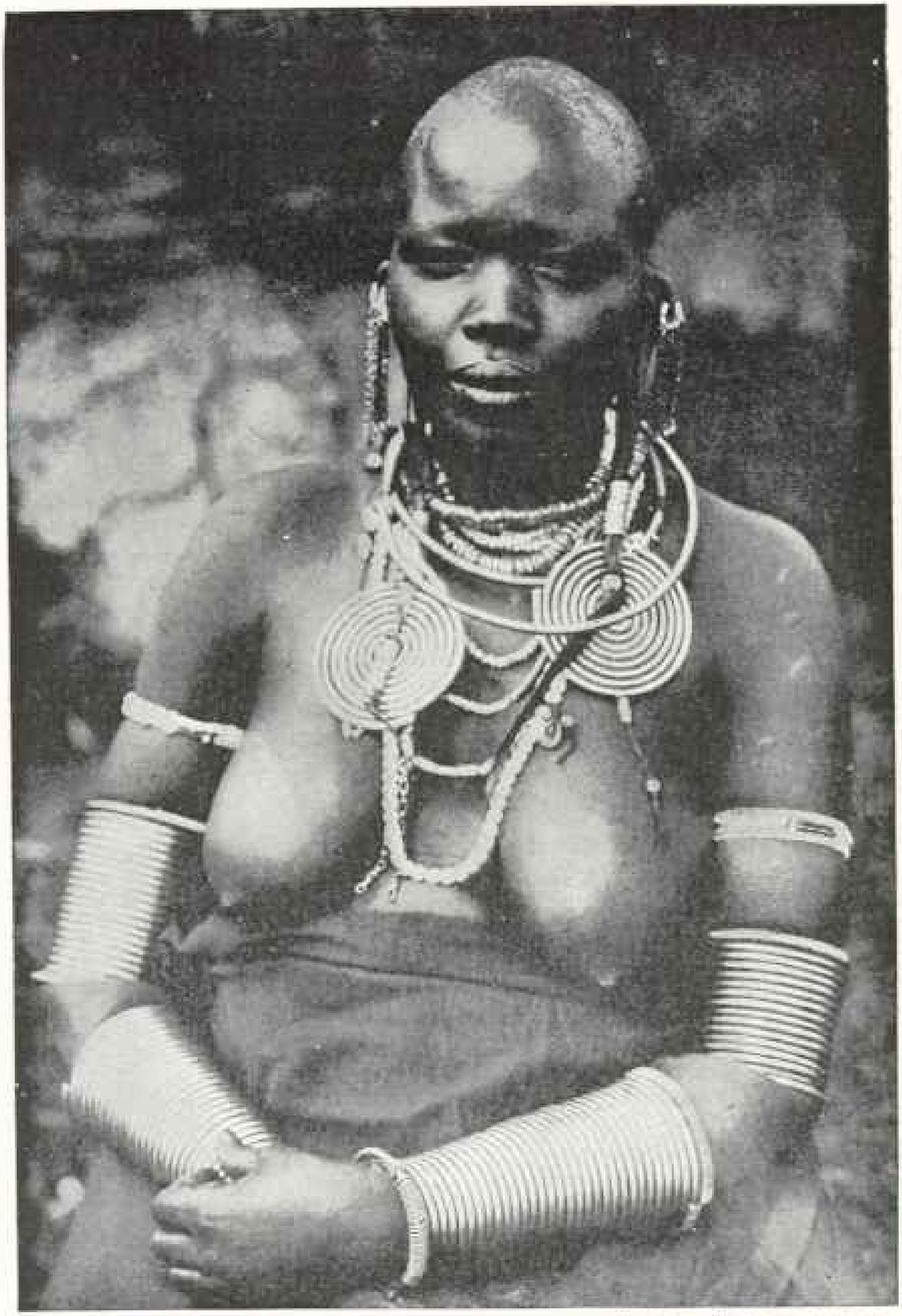
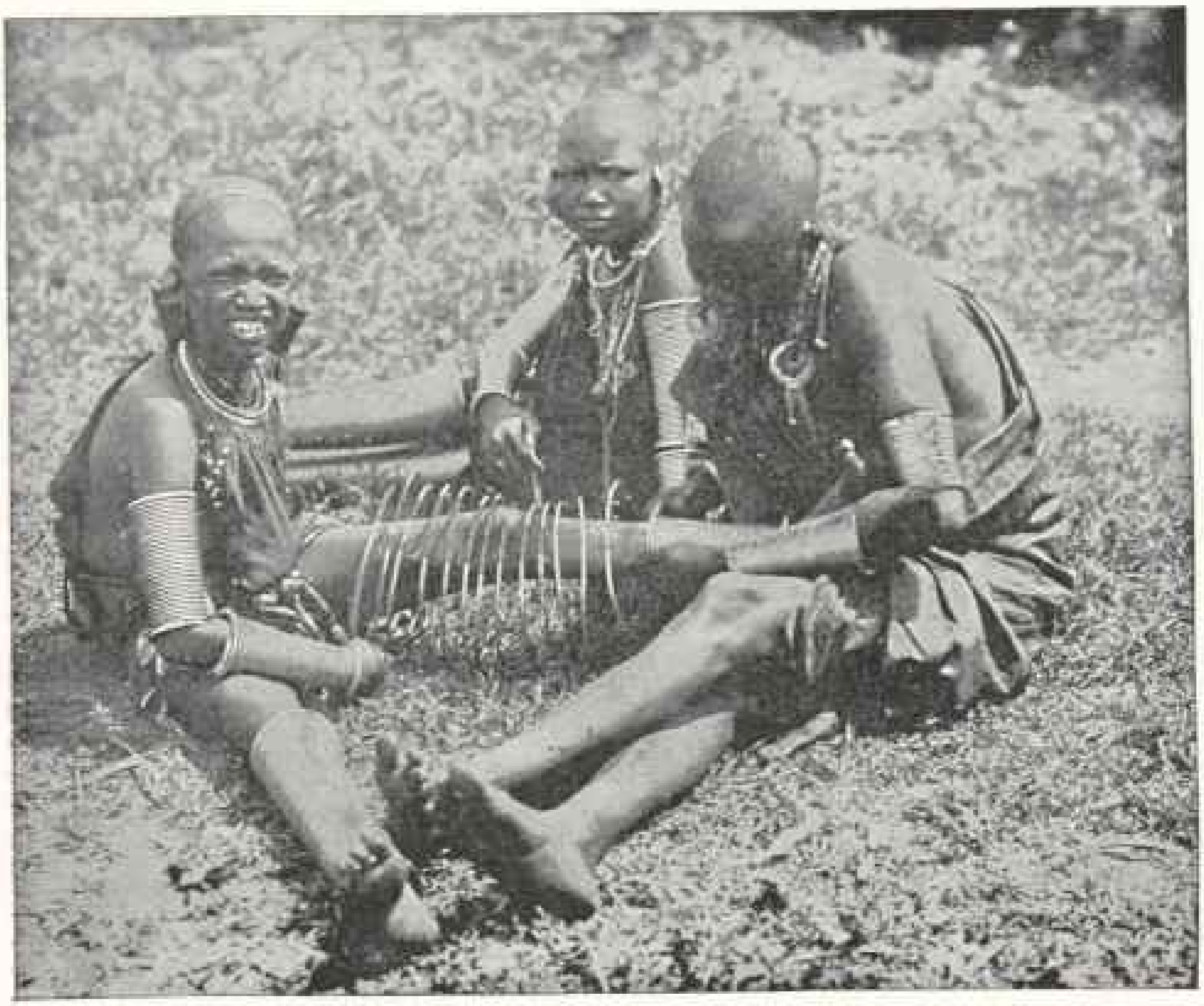


Photo from Sir Harry Johnston

A MASAI MATRON

For a description of the people and country of British East Africa, see "Where Roosevelt will Hunt," by Sir Harry Johnston, in the African number (March, 1909) of the NATIONAL GEOGRAPHIC MAGAZINE.



YOUNG MASAI WOMEN COILING IRON WIRE AROUND THE LIMBS OF A FRIEND

This and the preceding four photos are from "The Uganda Protectorate," by Sir Harry Johnston

Naivasha. Messrs Mearns and Loring made a thorough biological survey of Mount Kenia, while the rest of the party skirted its western base, went to and up the Guaso Nyero, and later visited the Uasin Geisha region and both sides of the Rift Valley. Messrs Kermit Roosevelt and Tarlton went to the Lailspia and Lake Harrington, and Doctor Mearns and Mr Kermit Roosevelt made separate trips to the coast region near Mombasa. On December 19 the expedition left East Africa, crossed Uganda, and went down the White Nile. North of Wadelai we crossed and spent over three weeks in the Lado, and from Gondokoro Mr Kermit Roosevelt and I again crossed into the Lado, spending eight or ten days in the neighborhood of Redjaf. At Gondokoro we were met by the steamer which the sirdar with great courtesy had putt at our disposal; on the way to Khartoum we made collections at Lake No, and on the Bahr el Ghazal and Bar el Zeraf. We owe our warmest thanks for the generous courtesy shown us and the aid freely given us, not only by the sirdar, but by all the British officials in East Africa, Uganda, and the Sudan, and by the Belgian officials in the Lado; and this, of course, means that we are also indebted to the home governments of England and Belgium.

On the trip Mr Heller has prepared 1,020 specimens of mammals, the majority of large size; Mr Loring has prepared 3,163, and Doctor Mearns 714—a total of 4,897 mammals. Of birds, Doctor

Mearns has prepared nearly 3,100. Mr Loring 899, and Mr Heller about 50—a total of about 4,000 birds.

Of reptiles and batrachians, Messrs Mearns, Loring, and Heller collected about 2,000.

Of fishes, about 500 were collected. Doctor Mearns collected marine fishes near Mombasa, and fresh-water fishes elsewhere in British East Africa, and he and Cuninghame collected fishes in the White Nile.

This makes, in all, of vertebrates:

Mammals	4,897
Birds (about)	4,000
Reptiles and batrachians (about)	2,000
Fishes (about)	500
Total	11,397

The invertebrates were collected chiefly by Doctor Mearns, with some assistance from Messrs Cuninghame and Kermit Roosevelt.

A few marine shells were collected near Mombasa, and land and fresh-water shells throughout the regions visited, as well as crabs, beetles, millipeds, and other invertebrates.

Several thousand plants were collected throughout the regions visited by Doctor Mearns, who employed and trained for the work a M'nyummezi named Makangarri, who soon learned how to make very good specimens, and turned out an excellent man in every way.

Anthropological materials were gathered by Doctor Mearns, with some assistance from others; a collection was contributed by Major Ross, an American in the government service at Nairobi.

I have the honor to be,

Very truly yours,

THEODORE ROOSEVELT.

THE NATIONAL GEOGRAPHIC SOCIETY'S ALASKAN EXPEDITION

The Board of Managers of the National Geographic Society has made an appropriation of $5,000 for an Alaskan Expedition in 1910 under the leadership of Prof. Lawrence Martin, of the University of Wisconsin. The work will be a continuation of the glacial studies carried on by Professors Tarr and Martin for the Society in 1909, and described briefly in the January number of the NATIONAL GEOGRAPHIC MAGAZINE, and more fully in a book now in preparation.

The expedition will leave for Alaska early in June, spending three or four months in field work among the glaciers of the Alaskan coast, where the most active advances of ice tongues that man has ever seen are in progress among the greatest existing glaciers outside the polar regions.

The work will begin with a brief visit to Yakutat Bay, where it is of the utmost importance to determine what glaciers, if any, have resumed activity since 1909, and what has happened to the glaciers which were then so active. Following this the glaciers of the lower Copper River will be examined in detail.

The Columbia Glacier will then be studied to see whether the great advance in progress in July and August, 1909, has continued, and after this the other glaciers of Prince William Sound will be visited and the larger phenomena of glaciation investigated.

The party will consist of a skilled topographer, loaned by the U. S. Geological Survey, a photographer, and several other assistants. The work will include not only studies of the ice, the glacial deposits, relations to life, etc., but precise mapping, observations of nature and rate of ice motion, sounding in the fiords near the fronts of the tidal glaciers, etc.

The present time seems to be one of unusual opportunity for study of these Alaskan glaciers, for scientists might have to wait decades or centuries for a repetition of the ice-flood advances now in progress. They have already revolutionized our theories of the cause for glacier advance. The new theory explains these oscillations of Alaskan glaciers, not by climatic fluctuations, but by avalanching during violent earthquakes. The advance of at least eight glaciers in Yakutat Bay, including part of the great Malaspina Glacier, about 300 square miles of which became crevassed in less than ten months, as well as the Hidden Glacier, which advanced two miles, and many others is thus understood.

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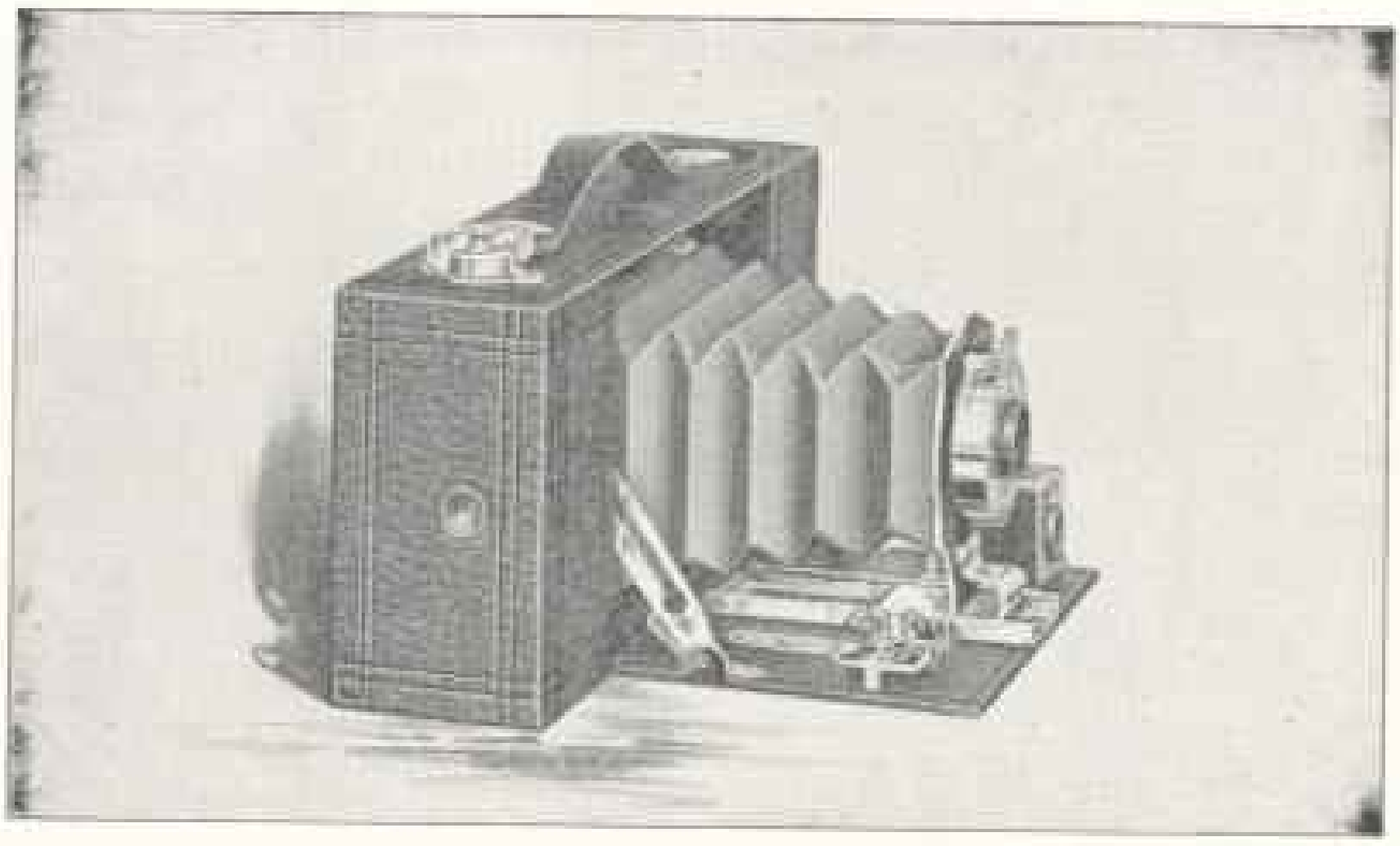

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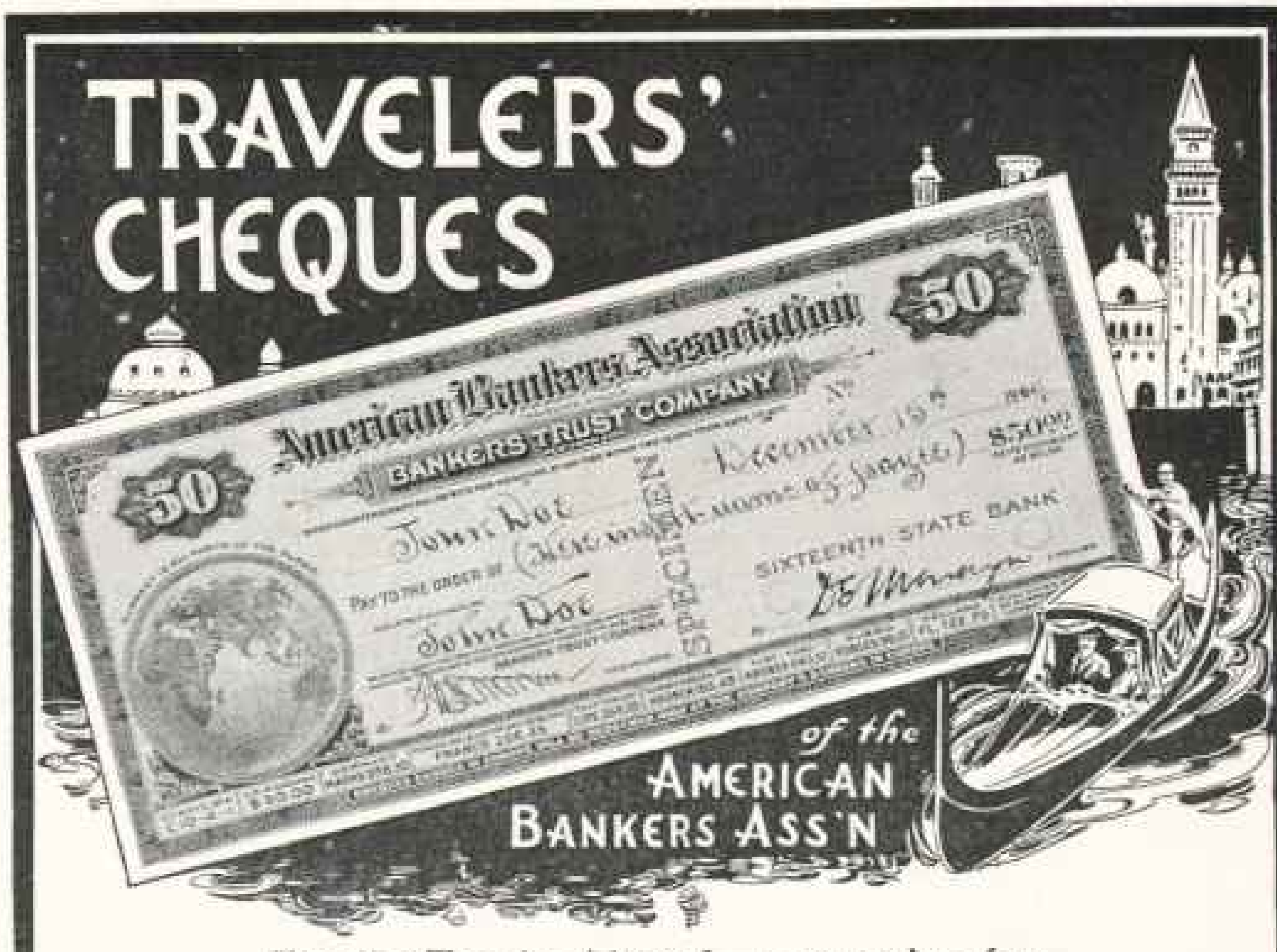

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