MOUNTAIN PANORAMAS

FROM THE

PAMIRS AND KWEN LUN

WITH INTRODUCTION AND DESCRIPTIONS

BY

DR. STEIN

MOUNTAIN PANORAMAS FROM THE PAMIRS AND KWEN LUN

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PAMIRS AND KWEN LUN

PHOTOGRAPHED AND ANNOTATED

BY

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INTRODUCTORY NOTE

THE photographic panoramas from the Kwen Lun range south of Khotan, and on the Pamirs, of which a selection is here published, date from my journey of 1900–01 in Chinese Turkestan, made under the orders of his Majesty's Indian Government. They were taken with a Bridges-Lee photo-theodolite, primarily with a view to supplying photogrammetric materials which would usefully supplement the surveys by plane-table and theodolite carried on, under my direction and with my assistance, by Surveyor Ram Singh, of the Survey of India Department, along the routes followed. Subsequent to the publication of the maps embodying these surveys and of my 'Sand-buried Ruins of Khotan,' in which I have described for a wider public the main results of my expedition, geographical friends, who had examined the original records of my photogrammetric survey work, represented to me the advisability of reproducing a series of my panoramas, on account of the interest they possessed, from a geographical and geological point of view, as illustrations of typical features in the orography of those regions.

It was a source of special gratification to me that, with the assistance of a grant sanctioned by his Majesty's Secretary for India, the Council of the Royal Geographical Society in 1903 undertook the relatively expensive task of reproducing and publishing the series of selected panoramas here presented. The work of preparing positives suitable for reproducing, which was commenced by Mr. H. W. Simpson, of the Royal Geographical Society's office, towards the close of that year, has proved a distinctly difficult one. Among the technical reasons for this it will suffice to mention two of which I have personal knowledge. Owing to the trying conditions under which the photo-theodolite had to be worked, generally on great heights and in exposed positions, the taking of a complete round of accurately levelled photographs with that exact but delicate instrument was a slow process. Intervening changes in atmospheric conditions and light have thus often caused the negatives of the same panorama to vary greatly in intensity and photographic value. The negatives had suffered further from the fact that, owing to the great pressure at which my archæological explorations had to be carried on, and owing to my prolonged camping in the desert, their development had to be delayed for a long time, in some cases for nearly a year.

The preparation of positives capable of effective reproduction by half-tone process from negatives affected by these and other deficiencies must have greatly taxed Mr. Simpson's skill, and I appreciate all the more the patient care and attention he has bestowed on the work. Though, owing to my absence on the Indian North-West Frontier, I had no opportunity of examining the finished prints from which the process-blocks have been produced, I have convinced myself by a comparison of the latter with my original photographs that no essential feature

of the photographic records has been omitted or modified by the operations necessary for joining them into continuous panoramic views, etc.

The proofs of the plates thus prepared were furnished to me in the summer of 1905. But the necessity of devoting whatever leisure I could spare from official duties to the final publication on the archæological results of my journey * and to the preparations for a new expedition rendered it impossible for me until now to find time for the lettering of these plates and for explanatory notes on them. Much as I must regret this delay, it has not been without a compensatory advantage. My return to the Khotan region has enabled me to revisit the mountains which the main series of panoramas illustrates, and to check on the spot, and materially to supplement, the topographical data needed for the explanation of the latter. Those who know from experience the difficulty of identifying in photographs topographical details, even where accurate surveys are available, will realize the advantage I now enjoyed by being able to compare the plates with the actual mountain views before me.

In the statements accompanying each plate I have endeavoured to indicate those topographical features which seemed to me essential for the geographical comprehension of the views presented. But reference will also be needed to the map illustrating my explorations of 1900–01, which has been reproduced here from the *Geographical Journal* of 1902. For greater facility the positions from which the several panoramas were taken have been marked in it by corresponding Roman figures and in a distinctive fashion. As far as the panoramas from the Kwen Lun range are concerned, I must specially recommend also reference to the map of the Khotan region accompanying my 'Ancient Khotan,' which, being on the scale of 8 miles to 1 inch, reproduces our surveys in far greater detail. It is a matter of special regret to me that my want of geological training did not allow me to record observations which might help to make the panoramas more interesting to geologists. Not being qualified for geological work in the field, I have thought it safer to abstain from noting interpretations of topographical features which occasionally suggested themselves, but in reality might prove misleading.

This modest contribution to the geographical records of a region which, on historical grounds, has long claimed my special interest could not have been published without the assistance of the Council of the Royal Geographical Society. For the favour of being allowed to present it under their auspices, and for much generous encouragement accorded to me otherwise I wish to express here my sense of sincere gratitude.

M. AUREL STEIN.

CAMP PISHA, KHOTAN,
August 30, 1906.

* Now ready for issue by the Oxford University Press, under the title of 'Ancient Khotan,' two volumes 4to.

CONTENTS

CONTENTS

MAP SHOWING PORTIONS OF
CHINESE TURKESTAN

Surveyed under the direction, and with the assistance, of

M. A. STEIN, Ph.D.,

H.M's Indian Educational Service,

By Sub-Surveyor S_____ R_____,

Survey of India Department,

1900-1901.

From the Map on the Scale of 1 : 760,000, published by the Surveyor General of India.

SCALE OF MILES

0 10 20 30 40 50 60 70 80 90 100

Natural Scale 1 : 1,500,000 or 23·67 miles to 1 inch.

Heights in feet.

Route ——— *Ancient Sites* . KARADONG

Newly triangulated points . . . △ 12000

Survey „ „ . . . △ 17000

Other heights 9760

Cultivation . . . . . *Dark Green.*

Sandy tract with scrub or jungle . *Light Green.*

Moving Sands . . . . . *Yellow.*

Roman Numerals thus IV *indicate positions from which panoramas were taken.*

Dawan . Pass	Lr. Langar . Rest House
J. Jilga . Valley	M. Mazar . Tomb
Karaul . Watch Station	Oghil . . . Shepherds Station
Kul . . Lake	Tagh . . . Hill, Peak
Kum . . Sandhill	Ustang . . Canal
Kurghan . Fort	

NOTE.

This map is from a plane-table and photographic survey adjusted to triangulation points of the Survey of India.

PORTIONS OF KHOTAN OASIS

Scale of Miles.

0 1 2 3 4 5

Nat. Scale 1:250,000 or 3·9 miles = 1 inch.

Scale of Miles.

0 100 200 300

Nat. Scale 1:20,000,000 or 316 m. = 1 inch.

T A K L A M A K A N D E S E R T

K U N L U N M T S.

T I B E T

Published by the Royal Geographical Society

Stanford's Geogl. Estabt. London.

MOUNTAIN PANORAMAS FROM THE PAMIRS AND KWEN LUN

THE first series of panoramic views illustrates the configuration of that portion of the Kwen Lun range which rises due south of Khotan, and comprises the western headwaters of the Yurungkash river, besides the valleys of the eastern-most feeders of the Karakash. Chapters xiv., xv. of my 'Sand-buried Ruins of Khotan,' describe the journey which in October–November, 1900, I devoted to the survey of this interesting mountain region. A briefer account of the explorations then effected will be found in my paper published in the *Geographical Journal* of December, 1902.

The route followed led first over the western part of the Tikelik range (Ulugh Dawan pass, 12,180 feet), and thence over the plateaus drained by the valleys of Buya and Pisha to Karanghu Tagh, the highest permanently inhabited place on the upper Yurungkash. I then ascended the latter to Issikbulak, the furthermost accessible point in the gorge by which the Yurungkash breaks through the main Kwen Lun range. For the return journey I utilized the only alternative route leading over the high spurs which separate the valleys of the Kash, Nissa, and Chash rivers to the watershed towards the Karakash. After crossing this by the Yagan Dawan (*circ.* 10,800 feet), I descended the valley of the Mitaz stream, and finally emerged from the mountains near the debouchure of the Karakash. There a comprehensive view of the difficult region traversed was obtained from the high spur known as Ulughat Dawan. Photo-theodolite work was favoured throughout by the commanding positions which were ascended above the various passes for the sake of plane-table survey and triangulation. The panoramic views here reproduced have been arranged in the order of the route followed.

The second and smaller series comprises a selection from the photo-theodolite panoramas taken by me during July, 1900, in different parts of the Pamirs. One panorama shows the head of the Ab-i-Panja valley, below the Wakhjir pass, with the glaciers which Lord Curzon in his well-known memoir on the Pamirs has recognized as the source of the Oxus. The view there presented may claim special interest, not only on the ground of the identification just referred to, but also as showing the approach to the Wakhjir pass which, as I believe to have proved in my 'Ancient Khotan,' has served as an important route between the Oxus and Tarim basins from very early times.

The other panoramas reproduce complete views of the surroundings of Lake Little Karakul, with the great Muztagh-ata peak and the equally imposing glacier-crowned Kongur-debe range as seen from spurs flanking opposite sides of the

lake. The utility of these panoramas for cartographical purposes has been proved by the detailed 'Map of Muztagh-ata and Lake Little Karakul,' which was prepared from them and some additional photo-theodolite records at the Trigonometrical Survey Office, Dehra Dun, by the late Captain F. B. Tillard, R.E., of the Survey of India Department. For a description of that part of my journey and for a record of some observations on the physical aspects of these interesting regions I may refer to chapters iv.–vii. of my 'Sand-buried Ruins of Khotan.'

PANORAMA I.

View from Tope Ridge above Karanghu Tagh.

THE view comprised in the complete round of photographs taken from this triangulated position (13,950 feet) extends from the Tikelik Tagh in the north to the glacier-clad main range in the south, a distance of over 50 miles in a straight line. Eastwards it is bounded by the *massif* of the great ice-crowned Muztagh, Kwen Lun peak No. 5, and by the meridional range which connects the latter on the north with the Tikelik Tagh and on the south with a line of high snowy peaks rising above the Lingzi Thang plateau and trigonometrically fixed from the Ladakh side. The snowy ranges enclosing the Kash and Nissa valleys and those forming the watershed towards the Karakash drainage limit the horizon westwards. The high ridge known as Tope forms the watershed between the Yurungkash and its last snow-fed tributary, the Pisha river. On the north it overlooks a series of undulating plateaus covered with gravel or loess rising with easy slopes from the foot of the Tikelik Tagh. To the south of the Tope ridge and just below its crest the ground falls off very precipitously, partly in sheer rock walls, to the deep-cut bed of the Yurungkash, which, though only about 4 miles distant horizontally, lies fully 6500 feet below Tope. The configuration briefly indicated explains the striking contrasts seen in this panorama.

SECTION Ia.

View from Tope Ridge above Karanghu Tagh to North-East and East.

THE valleys of Pisha and Buya appear in the foreground. Behind them, on the left, rises the Tikelik range (18,780 feet), connected by the lower Khan Ilese range with the northern snowy spurs of the great Muztagh peak K_5 (23,890 feet), which are seen on the extreme right. Over the gap crossed by the Igin Dawan show distant snowy peaks over 21,000 feet in height overlooking the headwaters of the Chira and Nura rivers. The maze of curiously eroded hills encircling the foot of peak K_5 is a notable feature.

SECTION Ib.

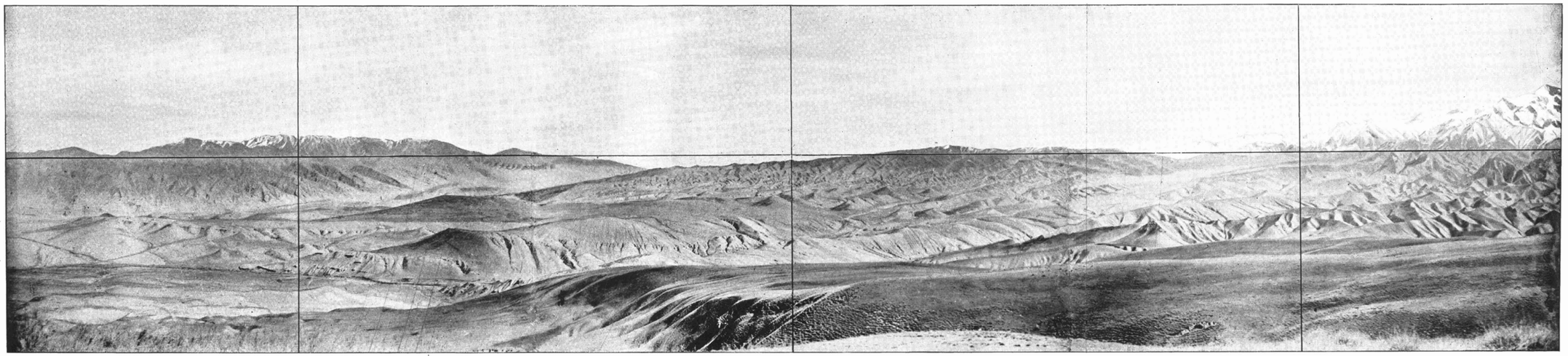
View from Tope Ridge above Karanghu Tagh to South-East and East.

THIS plate shows on its extreme left the culminating point of the Muztagh *massif* (23,890 feet), with portions of the great glaciers descending from it to the west and south-west. Past its southern buttresses the Yurungkash river, coming from the high Aksai Chin plateau above Polu, has cut its way in a deep gorge which is impenetrable above a point near Zilan (see Panorama II.). Distant snowy peaks, among them one triangulated from the Indian side, appear in the dip formed by the Yurungkash valley. Beyond this, to the right, stretches the glacier-crowned main range forming the watershed towards the Lingzi Thang plateau of westernmost Tibet. The triangulated peaks on this part of the range rise to over 22,000 to 23,000 feet, and the crest-line probably falls nowhere much below 20,000 feet. The photographs show the topmost portions of unexplored side valleys of the Yurungkash which drain the extensive glaciers and permanent snow beds of the range. On the extreme right of the plate appear the glaciers of the Busat (map wrongly Turgap) valley explored in 1906. The course of the Yurungkash lies too deep to be visible in the photographs.

I. *a*.—VIEW FROM TOPE RIDGE, ABOVE KARANGHU TAGH, TO NORTH-EAST AND EAST.

SNOWY RANGE OF TIKELIK TAGH.

△ 14,900. Ulugh Dawan 12,180. △ Tikelik Peak 18,780. KOCHKARBOINAK PASS (TO KARATASH R.). KHAN ILESE RANGE. SNOWY PEAKS ABOVE GENJU AND NURA RIVERS. Igin Dawan. NORTHERN SPURS OF "MUZTAGH," K.5.



Continued from Sec. I. d.

BUYA VALLEY.

PISHA VALLEY.

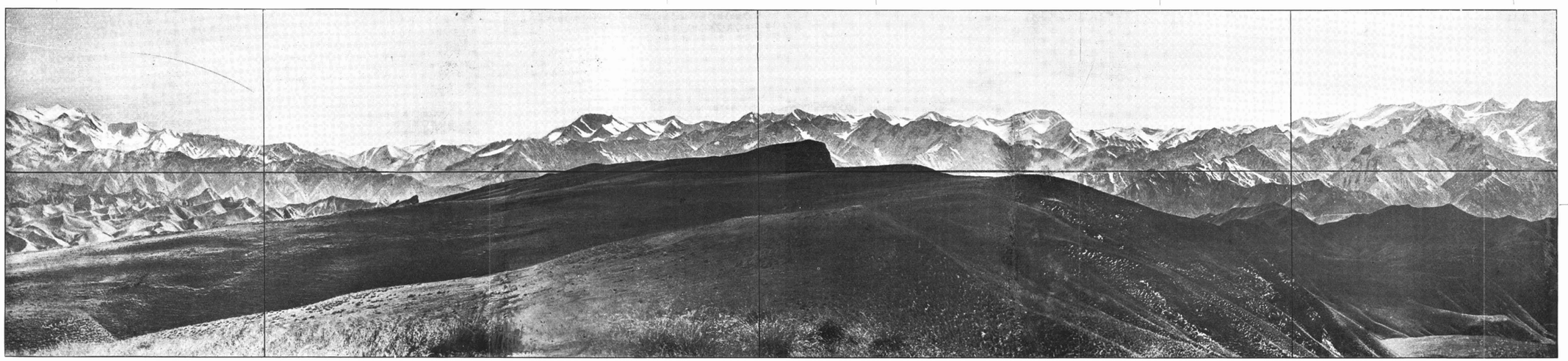
Continued in Sec. I. b.

Achchikaghzi, Pisha.

I. *b*.—VIEW FROM TOPE RIDGE, ABOVE KARANGHU TAGH, TO SOUTH-EAST AND SOUTH.

MAIN RANGE OF KWEN LUN.

"MUZTAGH" PEAK, K.5. △ 23,890. GORGE OF YURUNGKASH RIVER. ZOKPUTARAN PEAK. △ 22,640. CHOLPANGLIK PEAK. △ 23,310. GLACIERS AT HEAD OF CHOMSHA VALLEY. GLACIERS AT HEAD OF BUSAT VALLEY.



Continued from Sec. I. a

Continued in Sec. I. c.

YURUNGKASH VALLEY.

SECTION Ic.

View from Tope Ridge above Karanghu Tagh to South-West and West.

THE left half of the plate shows in its upper portion the glacier-clad high spurs which are drained by the several branches of the Kash river, one of the chief feeders of the Yurungkash. The corresponding side valleys bear the names of Busat, Koraz, Khanyailak, and Giz. Among the high peaks which rise at their heads, two have been fixed by triangulation at 21,750 and 21,960 feet respectively. The positions of the junction of the Yurungkash and Kash rivers is indicated on the plate. *Circ.* 4 miles above it lies Karanghu Tagh village on the Kash river. Below this point, *circ.* 7400 feet above sea, the valley of the Yurungkash is lined by precipitous cliffs and so confined as to leave no practicable route except when the river is frozen. The loess-covered rim of the plateau overhanging the river gorge from the north appears in the foreground furrowed by typical erosion ravines. Towards the right of the plate is seen the debouchure of the Nissa valley. Its higher portion (see Section IIIB.) is hidden by the spurs of the Kash Nissa watershed. Still further to the right the view shows the range marked by the Chankul and Mudache Tagh peaks (18,790 and 17,220 feet) which divides the Nissa and Chash valleys.

SECTION Id.

View from Tope Ridge above Karanghu Tagh to North-West and North.

THE great part of this plate is filled by a view of the easily sloped plateau which ascends from the Pisha valley in the general direction of east to west towards the Yurungkash. The steep, cañon-like fall which the western rim of the plateau shows towards the river is hidden from the observer on the ridge. The debouchure of the Pisha stream towards the Yurungkash lies through a similarly deep-cut gorge. On the extreme right is seen the westernmost offshoot of the Tikelik range.

I. *c*.—VIEW FROM TOPE RIDGE, ABOVE KARANGHU TAGH, TO SOUTH-WEST AND WEST.

GLACIERS OF BUSAT VALLEY.

KHANYAILAK GLACIER, KASH VALLEY.

GLACIERS AT HEAD OF KASH VALLEY.

KARANGHU TAGH (IN KASH VALLEY).

SNOWY PEAKS OF KASH NISSA WATERSHED.

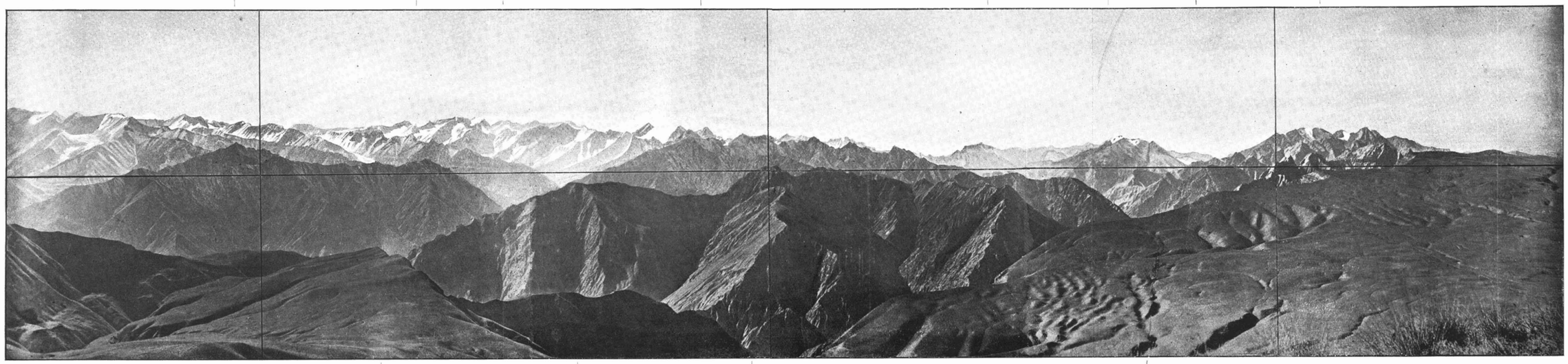
NISSA VALLEY.

CHANKUL PEAKS. △ 18,790.

BRINJAK PASS.

MUDACHE TAGH. △ 17,220.

Continued from Sec. I. c.



Continued in Sec. I. d.

JUNCTION OF YURUNGKASH AND KASH RIVER.

KARAKIR RIDGE (overlooking Yurungkash River).

POINTAGH DAWAN (behind ridge intersected).

JUNCTION OF YURUNGKASH AND NISSA RIVER.

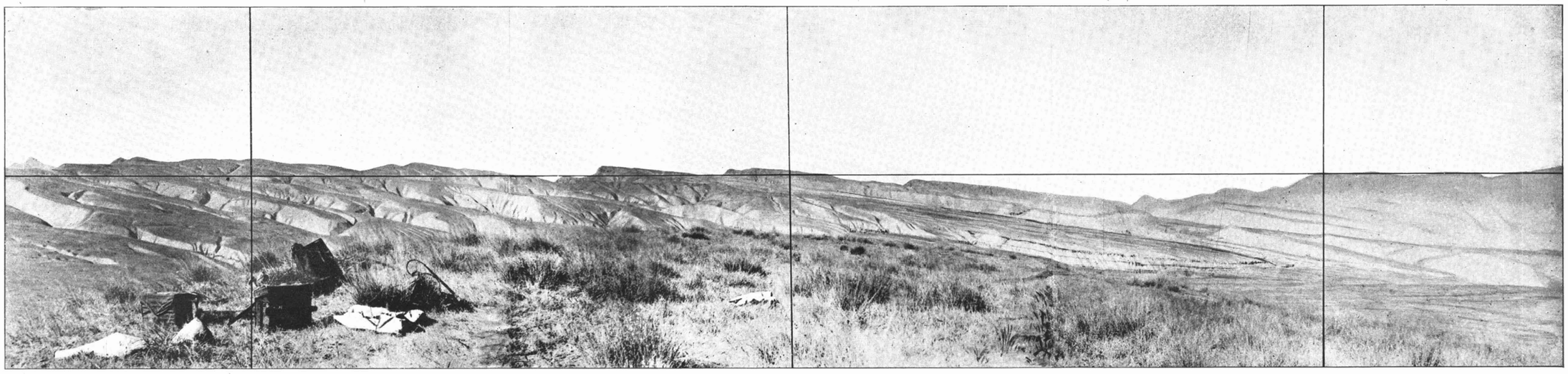
I. *d*.—VIEW FROM TOPE RIDGE, ABOVE KARANGHU TAGH, TO NORTH-WEST AND NORTH.

RIM OF PLATEAU OVERHANGING GORGE OF YURUNGKASH RIVER.

DEBOUCHURE OF PISHA VALLEY.

WESTERN SPUR OF TIKELIK TAGH.

Continued from Sec. I. c.



Continued in Sec. I. a.

PANORAMA II.

View from Zilan Ridge, Yurungkash Valley.

THE views reproduced in the two sections of this panorama illustrate the configuration of the Yurungkash valley close to its highest accessible point above Karanghu Tagh. They were taken on October 26, 1900, from a grass-covered small spur known as *Zilan*, which rises about 1200 feet above the right bank of the river, *circ.* 7 miles as the crow flies to the south of Tope station. About 3 miles higher up, close to some hot springs, the cliffs lining the Yurungkash gorge on either side become impracticable for the local hillmen. The elevation of Zilan is approximately 10,200 feet.

SECTION IIA.

View from Zilan Ridge, Yurungkash Valley, to South-East and South.

ON the extreme left appear the ice-covered west slopes of the Muztagh peak K_5 (23,890 feet), together with some of the rugged spurs which descend from it to the river. The bed of the latter is too deeply cut to appear in the photographs, nor can these convey an adequate impression of the extremely difficult ground presented by the rocky sides of the river gorge. The snowy peaks lining the crest of the main range are hidden by the high spurs which the latter send down to the left bank of the river. Among the side valleys enclosed between these spurs the Sawarma Jilga, seen to the right of the plate, is the last for which a specific name is known to the scanty settlement of herdsmen and exiled criminals at Karanghu Tagh. The river being quite impassable during the summer, the side valleys do not appear to be ever visited for grazing purposes.

SECTION IIB.

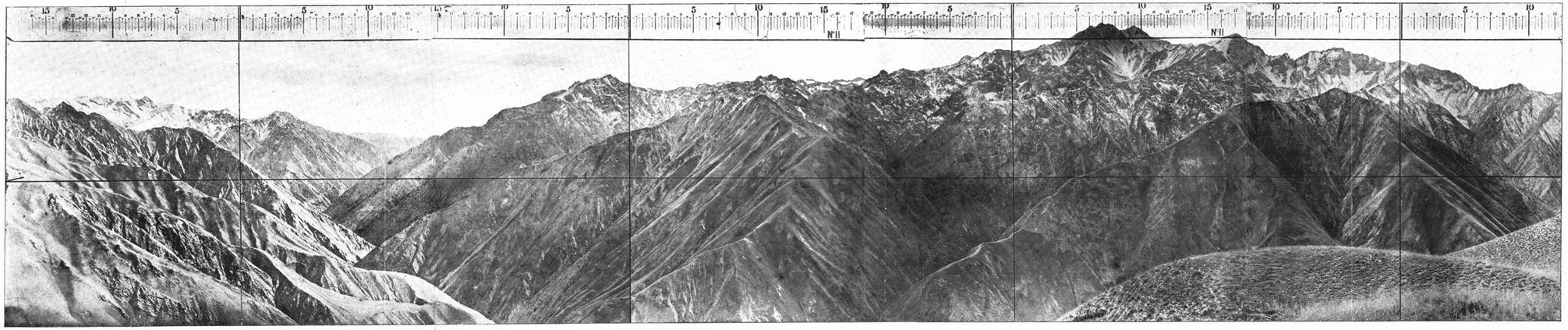
View from Zilan Ridge, Yurungkash Valley, to South-West and West.

ON the left of the plate appears the debouchure of the Chomsha Jilga, a large side valley, which, as seen from Tope station, is encircled at its head by a series of mighty glaciers. No route to this valley could be ascertained, and from the very confined appearance of the gorge by which its waters reach the Yurung-kash it is probable that its higher portion is quite inaccessible during the summer period. To the west of the valley appears a portion of the glacier-covered ridge which divides it from the Busat valley westwards. The junction of the latter with the Kash valley lies behind the Boinak spur, which is intersected by the cross-hairs of the last photograph on the right. Over this ridge leads the winter route to Zilan-Issik-bulak, and possibly also to the mouth of the Chomsha valley.

II. *a*.—VIEW FROM ZILAN RIDGE, YURUNGKASH VALLEY, TO SOUTH-EAST AND SOUTH.

"MUZTAGH" PEAK, K.5.
△ 23,890.

GORGE OF YURUNGKASH RIVER.



ISSIK BULAK
(in river gorge).

SAWARMA JILGA.

Continued in Sec. II. b.

II. *b*.—VIEW FROM ZILAN RIDGE, YURUNGKASH VALLEY, TO SOUTH-WEST AND WEST.

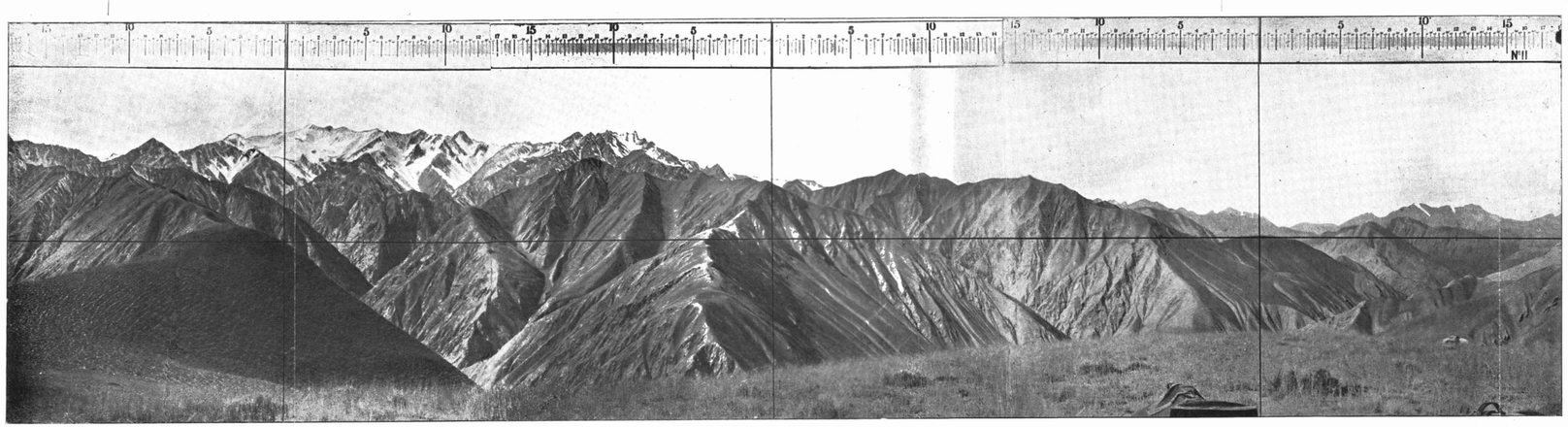
SNOWY PEAK ON
KWEN LUN WATERSHED.

CHOMSHA VALLEY.

SNOWY PEAKS ON CHOMSHA BUSAT
WATERSHED.

BOINAK PASS.

BUSAT VALLEY.



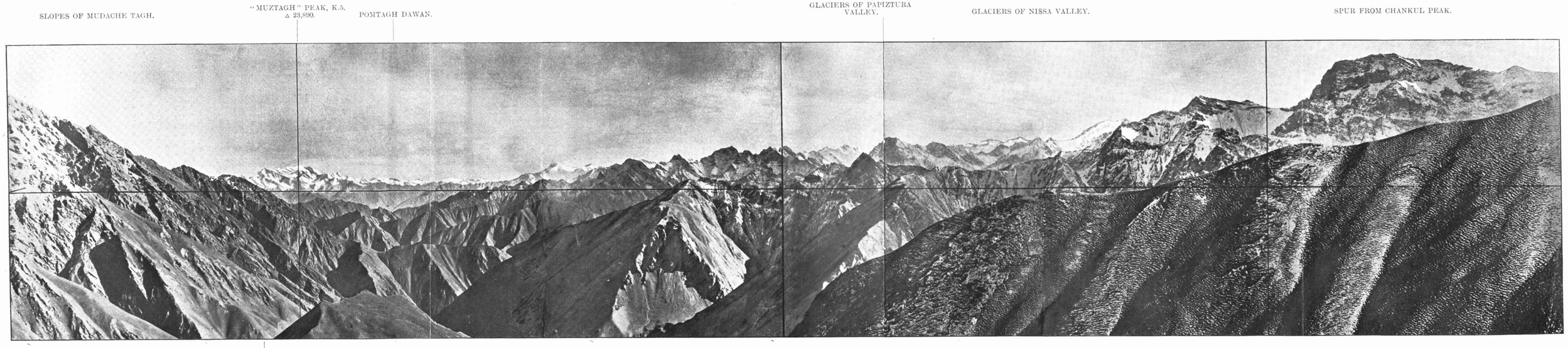
Continued in Sec. II. a.

PANORAMA III.

View to South-East and South from Boskai Ridge below the Brinjak Pass.

THIS plate shows the view obtained on November 1, 1900, towards the Yurungkash and the valleys of its western tributaries from a point of the Boskai ridge (*circ.* 12,000 feet above the sea) near the southern approach of the Brinjak pass. The latter leads over the watershed between the Nissa and Chash valleys, close under Mudache Tagh (17,220 feet). On the left appears the great snowy mass of Muztagh, K_5. With its height of nearly 24,000 feet, it dominates completely the intervening ranges in spite of the distance—nearly 50 miles by the map. Between these fantastically serrated ranges lie the valleys of Kash and Nissa, containing the only small settlements of hillmen to be found south or west of the Yurungkash. Towards the right (south) the crests of some of the highest glaciers at the head of these valleys are just visible. The foreground shows the loess deposits which up to an elevation of 13,000 to 14,000 feet cover great portions of the slopes of the deeply eroded spurs. The rock lying bare lower down in the gorge, which leads to the Nissa valley, appeared to be sandstone.

III.—VIEW FROM BOSKAI RIDGE, BELOW BRINJAK PASS, TO SOUTH-EAST AND EAST.



PANORAMA IV.—SECTION IVA.

View from Slope of Mudache Tagh, above Brinjak Pass, to South-East and East.

THE panorama here reproduced in two sections was obtained on November 2, 1900, from a point *circ.* 15,300 feet above sea-level, of the rocky west slope of Mudache Tagh, which I ascended from the Brinjak pass. The angle of view presented by the photographs in Section IVA. is approximately the same as in Panorama III.; but, owing to the position being over 3000 feet higher, the view towards the main watershed range south is far more extended. The *massif* of Muztagh, peak K_5, appears here adjoined by a line of high snowy peaks lining the unexplored upper course of the Yurungkash towards the Aksai Chin plateau. Further to the right we see the ice-clad main range where it is surmounted by the triangulated peaks of Zokputaran (22,640 feet), Cholpanglik Muztagh (23,310 feet), etc., shown on the map. A considerable portion of the horizon line is occupied by the great glaciers which fill the heads of the high valleys drained by the Kash river. On the extreme right of the plate the imposing glaciers at the head of the Nissa valley came into view. The one marked with the name of Otrughul has been proved by my survey of 1906 to attain a length of over 12 miles. Above the *névé* of its most distant branch rises a peak for which our triangulation ascertained the elevation of 23,070 feet. The extremely precipitous ridge seen in the foreground on the right forms part of the Chankul Muztagh (see Section IVB.).

SECTION IVB.

View from Slope of Mudache Tagh, above Brinjak Pass, to South-West and West.

THIS portion of the panoramic view is confined to the side range which culminates in the Chankul peaks, and of which Mudache Tagh itself forms part. It does not compare in grandeur with the preceding section, yet shows some details of interest. The imposing rock-wall on the left is the north face of the Chankul (or Kiankul) peak (△ 18,790 feet). The snow appearing on and below the peak belonged partly to permanent snowbeds and partly to a recent fall. The glaciers which are seen at the extreme left were then assumed to drain into the Nissa valley, and were accordingly shown in the map. But our surveys of 1906 have made it evident that they lie beyond the watershed of the Nissa valley and probably belong to the headwaters of the Panaz river, an important feeder of the Karakash. Similarly, it has now been ascertained that the watershed seen at the head of the Chash valley (to the right of Chankul peak) leads to the drainage area of the Mitaz stream, and not to the valley wrongly marked as Iskuram Jilga, which in reality represents the valley of the Panaz river. On the steep rocky mass of the Yumakhun peak the loess deposits are seen to reach to an unusual height.

IV. *a*.—VIEW FROM SLOPE OF MUDACHE TAGH, ABOVE BRINJAK PASS, TO SOUTH-EAST AND EAST.

SNOWY PEAKS ON UPPER YURUNGKASH.

MUDACHE TAGH.

"MUZTAGH" PEAK, K.5. △ 23,890.

POMTAGH DAWAN.

ZOKPUTARAN PEAK. △ 22,640.

CHOLPANGLIK PEAK. △ 23,310.

GLACIERS OF KASH VALLEY.

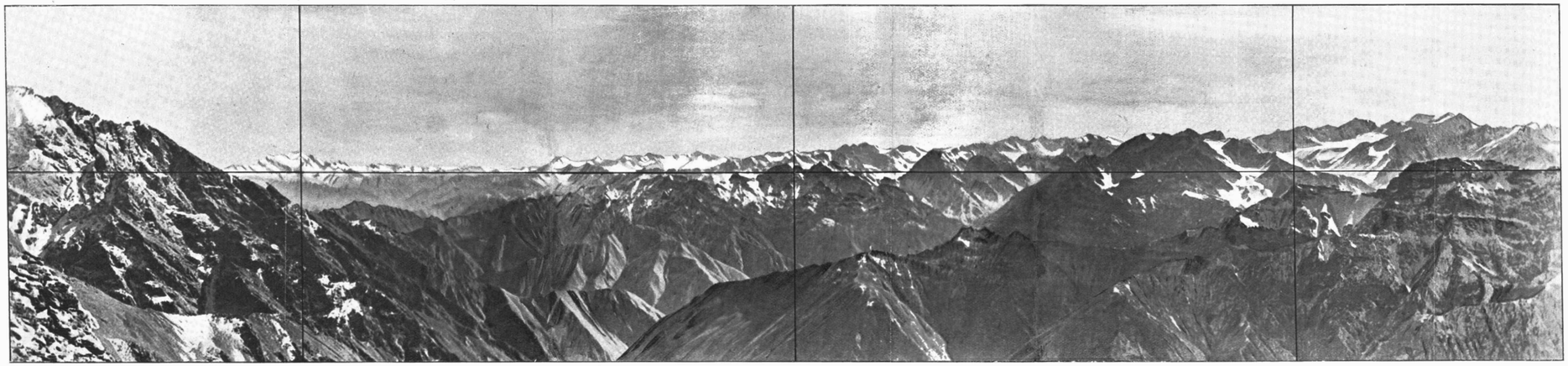
GLACIERS OF PAPIZTURA VALLEY.

GLACIERS AT HEAD OF NISSA VALLEY.

OTRUGHUL GLACIER.

PEAK. △ 23,070.

KASHKUL GLACIER.



Continued in Sec. IV. b

PANOGHIL JILGA (route to Nissa).

YULDUZKAYA RIDGE.

IV. *b*.—VIEW FROM SLOPE OF MUDACHE TAGH, ABOVE BRINJAK PASS, TO SOUTH-WEST AND WEST.

GLACIERS ON NISSA PANAZ WATERSHED.

CHANKUL PEAK. △ 18,790.

WATERSHED BETWEEN CHASH AND MITAZ RIVERS.

CHAPEDONG JILGA.

ISKURAM JILGA.

YUMAKHUN PEAK.

Continued in Sec. IV. a.

KOLA JILGA.

BRINJAK PASS. Circa 12,500.

PANORAMA V.

Panoramic View from Station West of Yagan Dawan.

THE complete round of photographs taken on November 4, 1900, from a hill-top (elevation *circ.* 11,500 feet) above the Yagan Dawan pass shows striking changes from the scenery of the preceding panoramas, and illustrates certain features characteristic of the ranges near the debouchure of the Kara-kash. The drainage area of the latter is reached by passing from the Chash valley over the Yagan Dawan to the Mitaz stream. As we leave behind us the valleys descending from the main Kwen Lun range, the great well-defined spurs with their bold peaks give way to a maze of narrow, serrated ridges and deeply eroded gorges. The higher slopes of these ridges exhibit all marks of extreme disintegration, while their lower portions are usually covered with thick loess deposits producing peculiar rounded forms. In striking contrast to the valleys of the main range, which are supplied with abundance of water by the great glaciers at their head and a relatively considerable fall of rain and snow, the gorges of the lower Karakash are for the most part extremely arid. This makes the ample marks of erosion both on the rock and loess slopes all the more curious.

SECTION V$_A$.

View from above Yagan Dawan to South-East and South.

THIS section shows the ridges adjoining the pass in the direction of the Chash valley and of the higher ranges towards the Yurungkash drainage. Mudache Tagh is seen on the extreme right, while over a depression in the line of spurs accompanying the Chash valley there appears in the distance the great peak K_5 with the snowy spurs descending from it northward. The ridge forming the watershed between Yurungkash and Karakash, which the pass crosses, is seen in the centre of the plate.

SECTION V$_B$.

View from above Yagan Dawan to South-West and West.

THE valleys on the left of this portion of the panorama drain into the Yurungkash, those on the right into the Karakash. The rounded forms resulting from loess deposits are peculiarly noticeable on the ridges nearest to the point of observation. The coarse grass covering them does not form a continuous turf, but grows in detached tufts. Narrow but extensive fissures in the covering loess, facilitating erosion of the hill sides, were noticed in numerous places. No surface water was found in any of the valleys between the Chash and Mitaz streams either in November, 1900, or in August, 1906.

V. *a*.—VIEW FROM ABOVE YAGAN DAWAN TO SOUTH-EAST AND SOUTH.

KALAKUZ PEAK.

AZGHANLIK PEAK.

KISEN DAWAN.

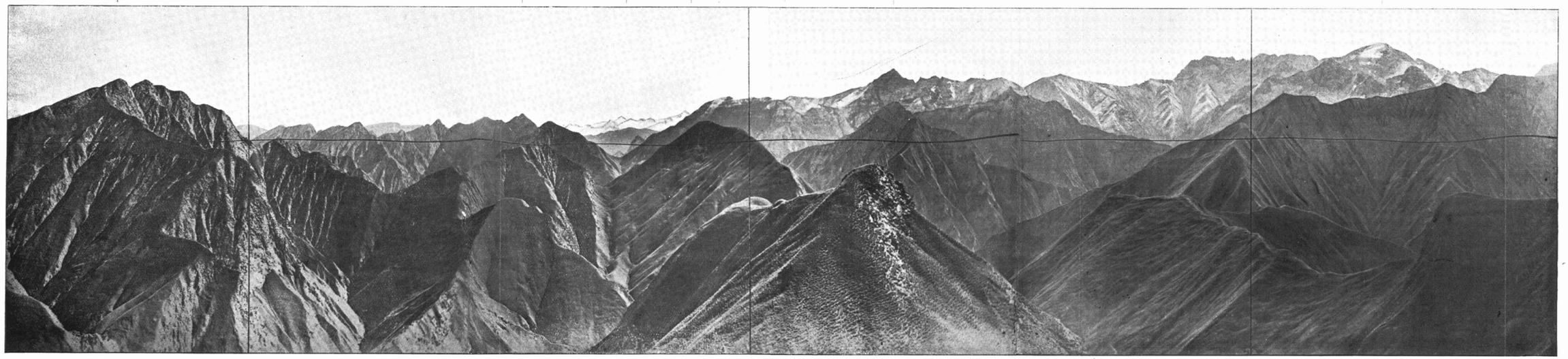
"MUZTAGH," K.5. △ 23,890.

CHASH VALLEY.

TAPIZ PEAK.

MUDACHE TAGH. △ 17,220.

Continued in Sec. V. d



Continued in Sec. V. b.

Route to Chash Valley and Brinjak Pass.

V. *b*.—VIEW FROM ABOVE YAGAN DAWAN TO SOUTH-WEST AND WEST.

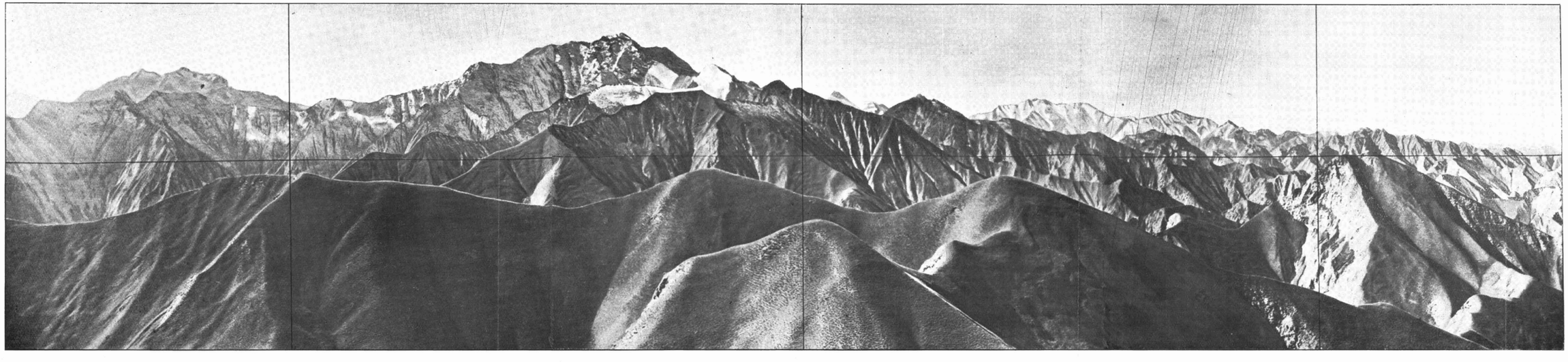
JAIDUWENNING TURA.

KUNE PEAK.

TAZKURAM PEAK.

USTUNKOL PEAKS.

Continued in Sec. V. a.



Continued in Sec. V. c.

KUNE RIDGES.

SECTION Vc.

View from above Yagan Dawan to North-West and North.

THIS section exhibits in a typical form the mazelike appearance of the narrow rocky ridges and deeply eroded gorges between them which extend to the north of the Yagan Dawan as far as the plain. They are so closely packed that the course of the Mitaz valley, into which they drain, cannot be made out even from the commanding height occupied. The photographs show only the loess deposits close to the crests of the ridges, where, owing probably to the steepness of the ground, they are far less considerable than on the lower slopes.

SECTION Vd.

View from above Yagan Dawan to North-East and East.

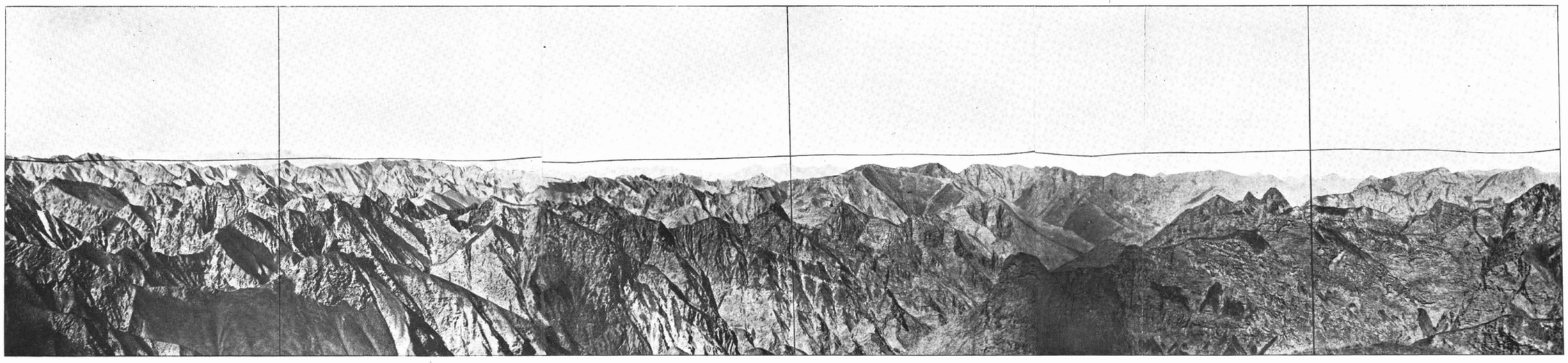
THE view here presented comprises the valleys draining from the east into the Mitaz stream, as well as the low range forming the watershed towards the Yurungkash. The physical features agree closely with those observed in the preceding two sections of the panorama. The loess cover seems to be more frequent on the north slopes of the ridges, *i.e.* those facing towards the plain from where the dust composing it is mainly carried up.

V. *c*.—VIEW FROM ABOVE YAGAN DAWAN TO NORTH-WEST AND NORTH.

SNOWY RANGE BEYOND KARAKASH RIVER.

TASHLAK JILGA.

Continued in Sec. V. b.



Continued in Sec. V. d.

TETRAGHU JILGA.

KOKACH JILGA
(Route N. from Yagan Dawan).

V. *a*.—VIEW FROM ABOVE YAGAN DAWAN TO NORTH-EAST AND EAST.

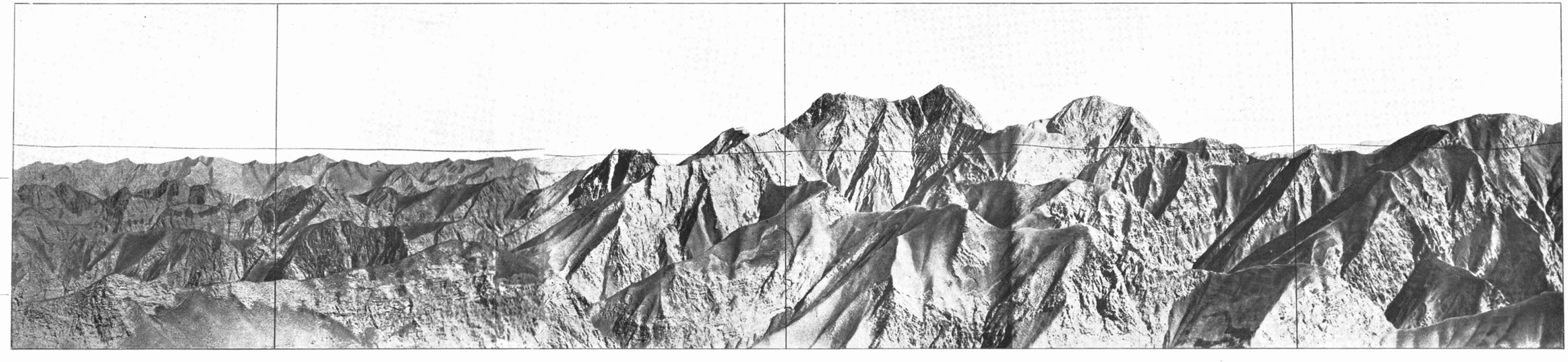
TONTON PEAK.

ULUGHAGHU YAILAK.

Continued in Sec. V. c.

KUMUSHLUK JILGA

PANDUSH JILGA



Continued in Sec. V. a.

PANORAMA VI.

View from Ulughat Dawan to South and South-West.

THIS plate reproduces a portion of the very extensive panoramic view obtained on November 8, 1900, from the high spur of the Ulughat Dawan (△ 9890 feet) which the route from the Mitaz valley crosses before debouching on the Karakash. Exceptionally clear weather enabled me to sight thence both peak K_5 and peak K_1 on the main Kwen Lun range about 70 miles away. Owing to the great distance, the snowy peaks visible on the main range and beyond the Karakash are not individually distinguishable in the reproduction. The cross-hair of the photographs on the left marks the direction of peak K_1 (△ 21,750 on the map). Besides giving a general view of the ranges between the watershed above Karanghu Tagh and the Karakash valley, the plate provides typical illustrations of the aspects which the outer hills near the latter present owing to the prevailing great loess deposits. The near ridges visible in the centre and right are those flanking the Mitaz valley from the west. Considering the extremely scanty rainfall of this region, the ravines which fissure the loess slopes are all the more striking. The top of the Ulughat ridge, in spite of its elevation, is completely overlain by loess, hence the undulating down-like character of the immediate foreground.

VI.—VIEW FROM ULUGHAT DAWAN TO SOUTH AND SOUTH-WEST.

MUDACHE TAGH.
△ 17,220. △ K 1, 21,750.

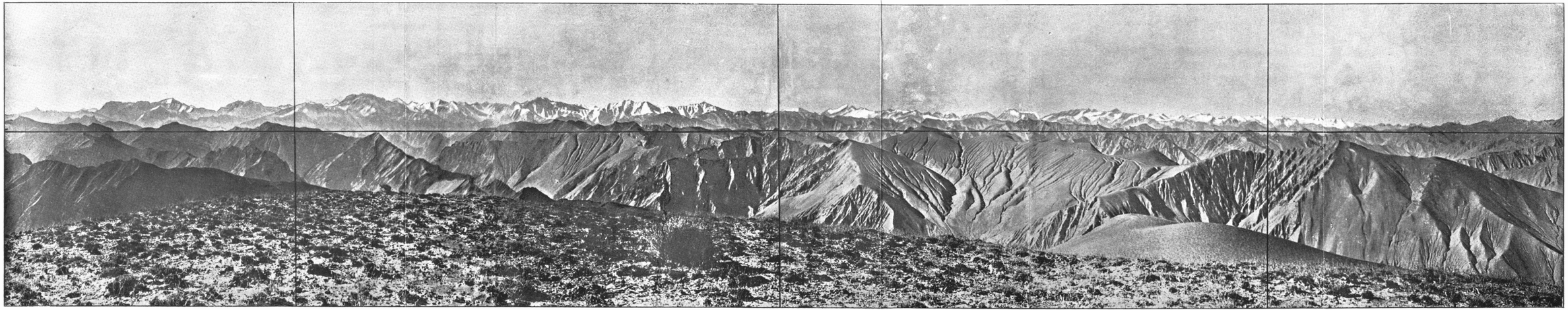
CHANKUL PEAK.

SNOWY PEAKS ABOVE PANAZ VALLEY.

SNOWY RANGE BEYOND BEND OF KARAKASH RIVER.

SNOWY PEAK.
△ 23,760 (?)

SNOWY RANGE TO W. OF KARAKASH RIVER.



MITAZ VALLEY.

PANORAMA VII.

View of the Ab-i-Panja Valley from Wakhjir Pass.

SECTION VIIA.

View from West Foot of Wakhjir Pass to East and South-East.

THIS panorama was taken on July 2, 1900, from a spur overlooking the point where the small valley descending from the Wakhjir pass meets that containing the glacier source of the Ab-i-Panja branch of the Oxus. Section VIIA. shows on the extreme left (north-east) the approach to the Wakhjir pass (16,200 feet), which crosses the watershed between Oxus and Tarim. The pass itself is not visible. Passing the rocky spur which separates the two valleys, we see some snowy peaks, over 19,000 feet high, which rise on the watershed between the Oxus and Indus, marking the border of Afghan territory towards Hunza. Below them meet the two branches of the glacier from which the Ab-i-Panja takes its rise, and at which Lord Curzon has, as I believe, rightly located the source of the river Oxus (see his Memoir, "The Pamirs," reprinted from the *Geographical Journal*, 1896, p. 32). When approaching the Wakhjir pass on May 28, 1906, from the side of the Afghan Pamirs, I found the whole of the valley here seen still under deep snow. Yet the stream issuing from below the glacier was already then of relatively large volume.

SECTION VIIB.

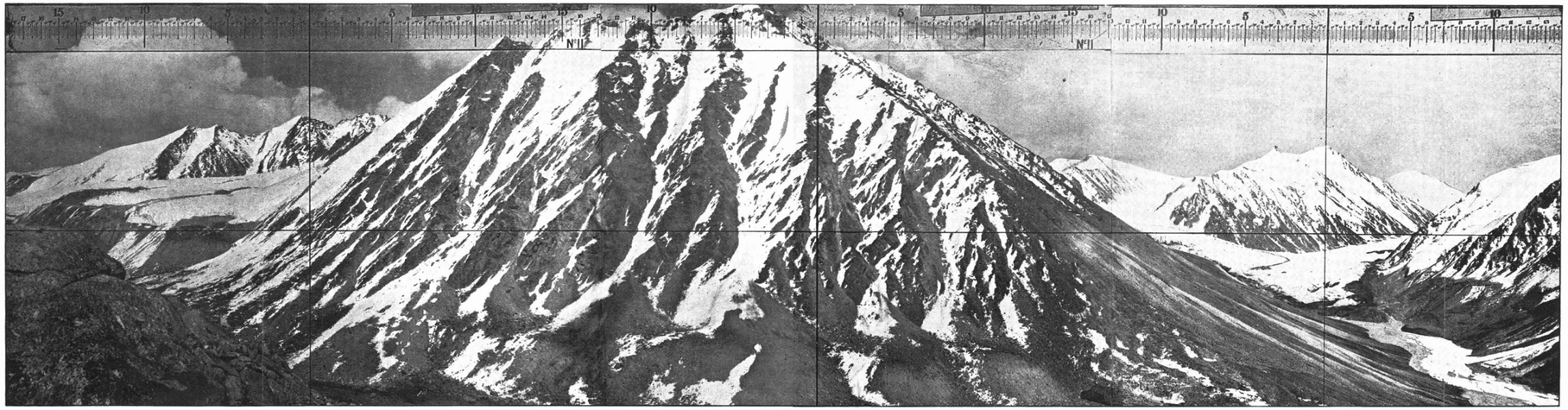
View from West Foot of Wakhjir Pass to South and South-West.

ON the left and in the middle of the plate are seen a series of side valleys which descend to the Ab-i-Panja from the watershed towards the Hunza valley. The glaciers filling their heads must, judging by the size of the old moraines projecting into the main valley, have been once far more extensive. On the right is seen the course of the Ab-i-Panja down towards Bozai Gumbaz. The cross-hair of the photographs on the extreme left intersects a triangulated peak (18,279 feet) on the range which divides the topmost portion of the Ab-i-Panja valley from the Little Pamir.

VII. *a*.—VIEW FROM WEST FOOT OF WAKHJIR PASS TO EAST AND SOUTH-EAST.

ASCENT TO WAKHJIR PASS.

SNOWY PEAKS ON WATERSHED GLACIERS AT HEAD OF AB-I-PANJA RIVER TOWARDS HUNZA RIVER.
(Oxus Source.)



Continued in Sec. VII b.

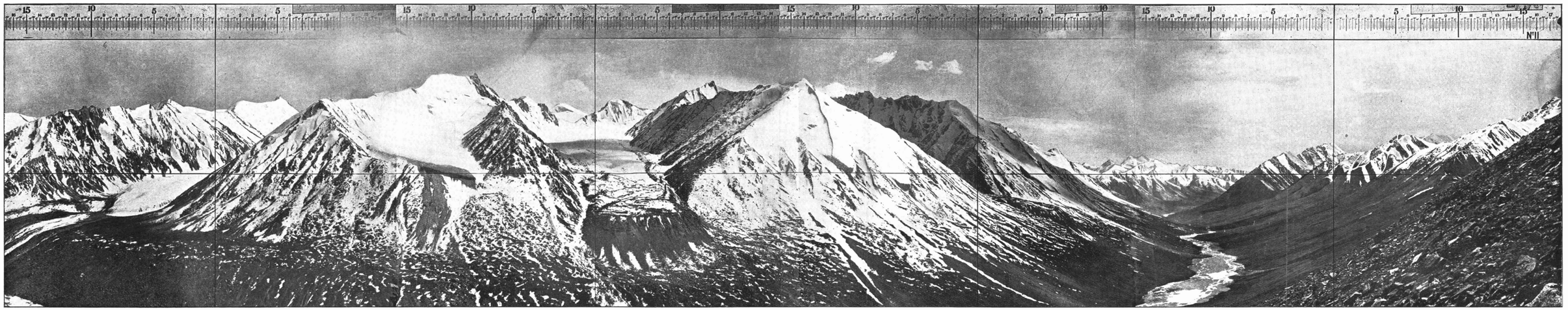
VII. *b*.—VIEW FROM WEST FOOT OF WAKHJIR PASS TO SOUTH AND SOUTH-WEST.

GLACIERS DESCENDING FROM WATERSHED TOWARDS HUNZA RIVER.

AB-I-PANJA VALLEY TOWARDS BOZAI GUMBAZ.

PEAK, △ 18,279.

RANGE TOWARDS LITTLE PAMIR.



Continued in Sec. VII. a.

PANORAMA VIII.

View taken from Karakir Hill above East Shore of Little Karakul.

This complete round of photo-theodolite views was taken on July 16, 1900, from the top of the Karakir ridge, west of lake Little Karakul (triang. height 12,400 feet). It comprises to the south the watershed between the Kashgar and Yarkand rivers (Ulugh-Rabat pass) and the great *massif* of Mount Muztagh-ata. The imposing glacier-covered range variously known as Kongurdeba or Shiwakte, with peaks 23,600 and 23,470 feet high, rises to the east and north-east. In the distance northwards a series of great snowy peaks attaining heights from 20,000 to 22,000 feet comes within view above the Yamanyar river, which drains lake Little Karakul. The view to the west shows the latter as well as the small Basikkul lakes, with the range rising behind them to the watershed towards the Russian Pamirs and the Oxus drainage. Clouds thickening while the work of photographing proceeded, hid the higher slopes of Muztagh-ata and of the Kongurdeba peaks. The atmospheric conditions of the Muztagh-ata region proved peculiarly liable to rapid changes, which greatly hampered photographic work during my week's stay there.

SECTION VIIIA.

View from Karakir Hill, L. Karakul, to South and South-West.

In the centre is seen the water-logged valley stretching down from the foot of the Ulughat Rabat pass to the south shore of Little Karakul lake. Its middle portion forms the grazing ground of Subashi. On the right are seen ridges, rising to over 15,000 feet in the direction of the watershed between Oxus and Tarim, which also forms the boundary of the Russian and Chinese Pamirs. The Shamalda hill (14,579 feet) on the left hides the west foot of Muztagh-ata with the Yambulak glacier. A portion of ice-covered slope of the peak rising above this glacier is seen on the extreme left.

SECTION VIIIB.

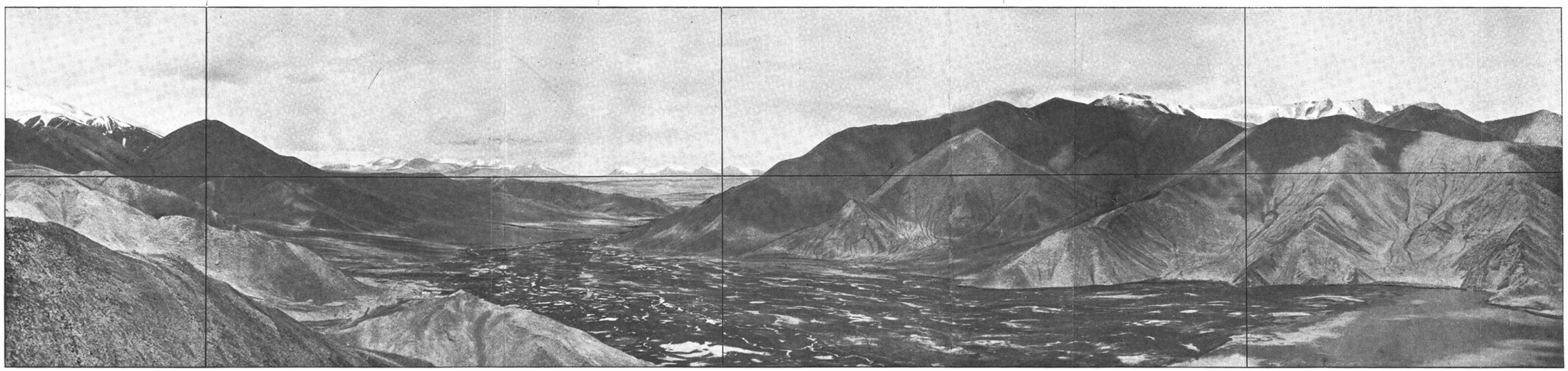
View from Karakir Hill, L. Karakul, to South-East and East.

On the right the lower portions of several large glaciers of Muztagh-ata appear below the clouds which hide the peaks of the latter. The intervening ground consists largely of detritus slopes with easy gradients. Towards the centre is seen the Toyakuyruk valley, drained by the Ekkibelsu river, which unites itself with the outflow of the lake a short distance below Karakir hill. From this valley lies the route to the Karatash pass leading towards Yangi Hissar. On the extreme left appear the southernmost portions of the Kongurdeba range, with the Karagoram and Chultmak glaciers. The whitish colour of the ground at the foot of the range as seen in this and the next plate is not due to snow, but to the prevalence of light-coloured gravel.

VIII. *a*.—VIEW FROM KARAKIR HILL, L. KARAKUL, TO SOUTH AND SOUTH-WEST.

W. SLOPE OF MUZTAGH-ATA. SHAMALDA, △ 14,570. ULUGH RABAT PASS. MUZKARAN PEAKS. GERME STATION, △ 15,450.

Continued in Sec. VIII. b.



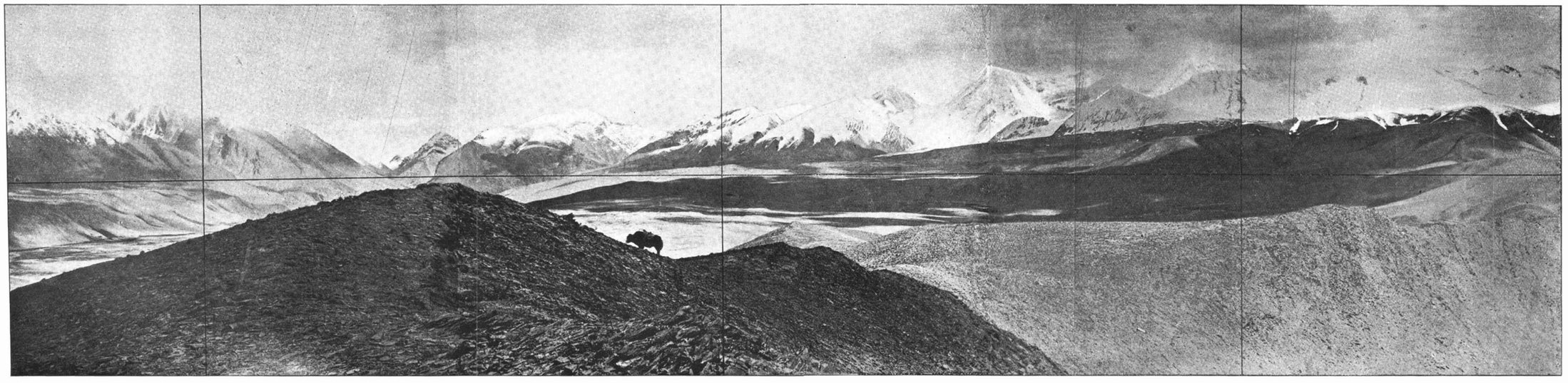
Continued in Sec. VIII. d.

SUBASHI. S.W. CORNER OF L. KARAKUL LAKE.

VIII. *b*.—VIEW FROM KARAKIR HILL, L. KARAKUL, TO SOUTH-EAST AND EAST.

TURBULUNG JILGA. TOYAKUYRUK JILGA. GORUNDA GLACIER. KOCHKORCHA GLACIER. MUZTAGH-ATA PEAK HIDDEN BY CLOUDS. SARIMEK GLACIER.

Continued in Sec. VIII. c.



Continued in Sec. VIII. a.

SECTION VIIIc.

View from Karakir Hill, L. Karakul, to North-East and North.

THIS section shows the foot of the Kongurdeba (Shiwakte) range with the succession of great glaciers descending from it. Heavy clouds hide the upper portions of the range. Sections IXA. and B of the following panorama present these under far more favourable atmospheric conditions. Extensive old moraines are spread over the grazing grounds which ascend to the foot of the range.

SECTION VIIID.

View from Karakir Hill, L. Karakul, to North-West and West.

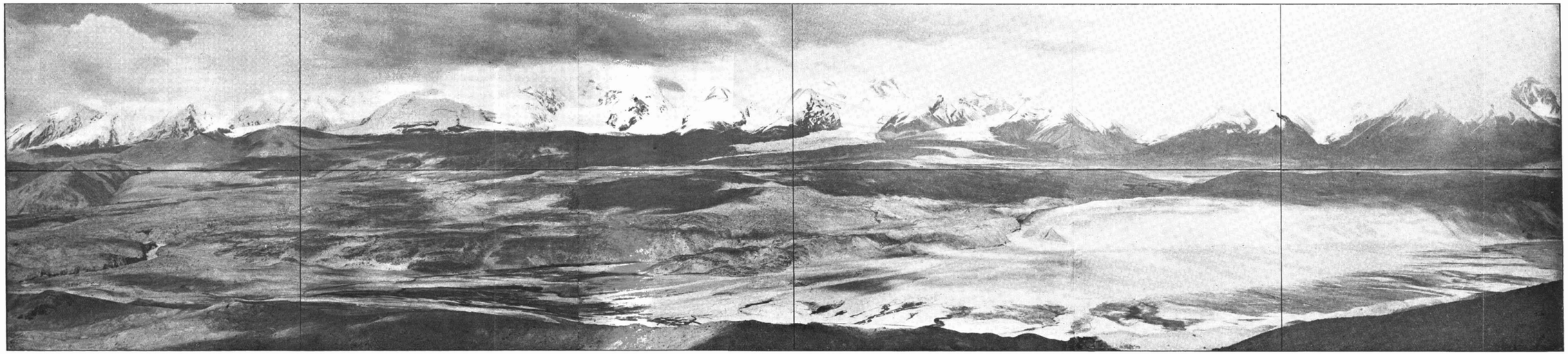
ON the extreme right there are seen the northernmost spurs of the Kongurdeba range. In the distance, and above a low ridge hiding the post of Bulunkul, the high snowy peaks of Chakragil, Karaboktor, etc., come faintly within view. In the centre appears the northern portion of Little Karakul, and beyond it the two lakes of Basikkul, communicating with each other through a narrow rock-passage. The top of the hill on the left, overlooking Little Karakul lake, is Koktumshuk station, from which the next panorama was taken.

VIII. *c*.—VIEW FROM KARAKIR HILL, L. KARAKUL, TO NORTH-EAST AND NORTH.

KONGURDEBA RANGE.

AKSEL GLACIER. KOKSEL GLACIER. KIZILSEL GLACIER. KARASU GLACIER.

Continued in Sec. VIII. b.



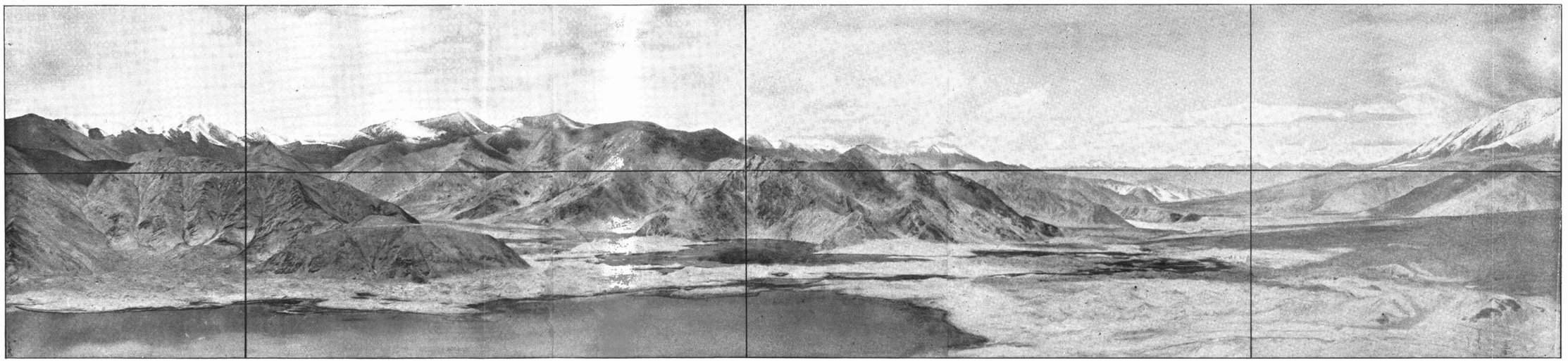
Continued in Sec. VIII. d.

EKKI BEL SU VALLEY. JAILMA (alluvial fan).

VIII. *d*.—VIEW FROM KARAKIR HILL, L. KARAKUL, TO NORTH-WEST AND WEST.

KOKTUMSHUK HILL. UPPER BASIKKUL. KARA J. LOWER BASIKKUL. OUTFLOW OF L. KARAKUL. SNOWY PEAKS CHAKRAGIL, &c. NORTHERN SPURS OF KONGURDEBA RANGE.

Continued in Sec. VIII. a.



Continued in Sec. VIII. c

L. KARAKUL LAKE.

PANORAMA IX.

View from Koktumshuk Hill, above North-West Shore of L. Karakul Lake.

THE area comprised in this panorama is substantially the same as in the preceding one. But the position of the Koktumshuk hill, from which this round of photographs was taken on July 23, 1900, and the favourable atmospheric conditions then prevailing, have helped to make the views there obtained of Muztagh-ata and the Kongurdeba peaks more effective. The height of this station was about 300 feet lower than that of Karakir.

SECTION IXA.

View from Koktumshuk Hill, L. Karakul, to South and South-East.

THE ice-covered dome of Muztagh-ata dominates this portion of the panorama. Owing to light mist resting on the top of the great mountain, its double cone cannot be made out in the plate, though faintly visible in the original negative. According to Captain Deasy's triangulation, accepted by the Survey of India, the southern cone rises to 24,321 feet. The Yambulak glacier descending from between the two cones to the west follows the line of the great rock wall visible on that side of the dome. Ascending the snow-covered slope opposite, I reached on July 20 a height of approximately 20,000 feet. On the north slopes of the peak are seen the glaciers of Kamparkishlak, Sarimek, Kochkorche, Gorundo. Beyond the gap, in the range crossed by the Karatash pass, the view shows the glacier-clad south spur of the Kongurdeba range. Below it lies the broad valley of the Ekkibelsu river, lined by remains of ancient moraines.

SECTION IXB.

View from Koktumshuk Hill, L. Karakul, to North-East and North.

THE great snowy range of Kongurdeba (Shiwakte), over 20 miles long as seen here, fills the right half of this plate. Its highest point, △ 23,600 feet, is seen near the centre. To it and to the glacier which descends from it to the south-west the name Kongurdeba is properly restricted. The full extent of this glacier, and of the probably still larger Koksu glacier further east, is hidden by ridges rising over the detritus glacis of the range. Below this is seen the outflow of lake Little Karakul and its junction with the stream draining the Basikkul lakes. The lower of these lies due north of Koktumshuk hill, and is fully visible in the plate. Above it, in the distance northward, the high snowy peaks of the Chakragil group appear. The extreme left shows the upper basin of Basikkul with its numerous small rock islets.

IX. *a*.—VIEW FROM KOKTUMSHUK HILL, L. KARAKUL, TO SOUTH AND SOUTH-EAST.

MT. MUZTAGH-ATA, △ 24,321.

KARASU GLACIER. MT. SHIWAKTE. KARAKIR HILL STATION. TOYAKUYRUK JILGA. GORUNDA GLACIER. KOCHKORCHA GLACIER. SARIMEK GLACIER. KAMPAR-KISHLAK GLACIER. YAMBULAK GLACIER.

Continued in Sec. IX. b.

Continued in Sec. IX. c.

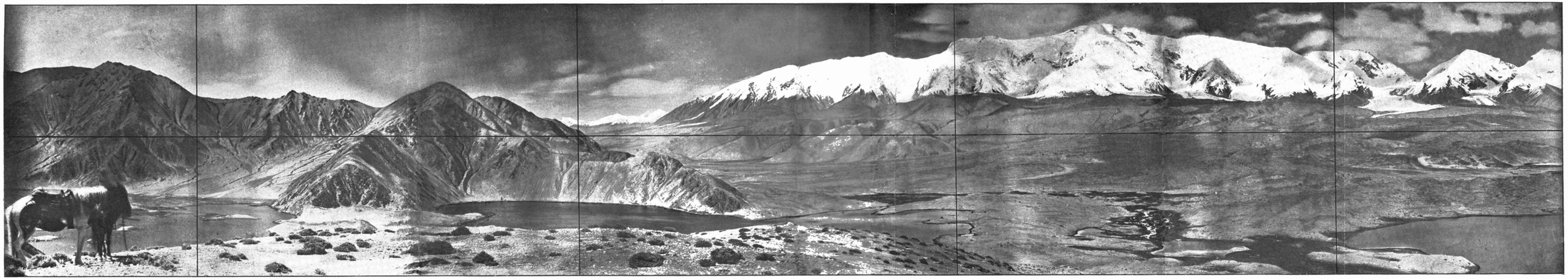
L. KARAKUL LAKE. SUBASHI.

IX. *b*.—VIEW FROM KOKTUMSHUK HILL, L. KARAKUL, TO NORTH-EAST AND NORTH.

KONGURDEBA RANGE.

JERUY SPUR. SNOWY PEAKS OF CHAKRAGIL GROUP. △ Peak, 21,480. AKSEL GLACIER. KONGURDEBA GLACIER. KONGURDEBA PEAK. △ 23,600. KOKSEL GLACIER. KIZELSEL GLACIER.

Continued in Sec. IX. c.



Continued in Sec. IX.

UPPER BASIKKUL. LOWER BASIKKUL. OUTFLOW OF L. KARAKUL.

SECTION IXc.

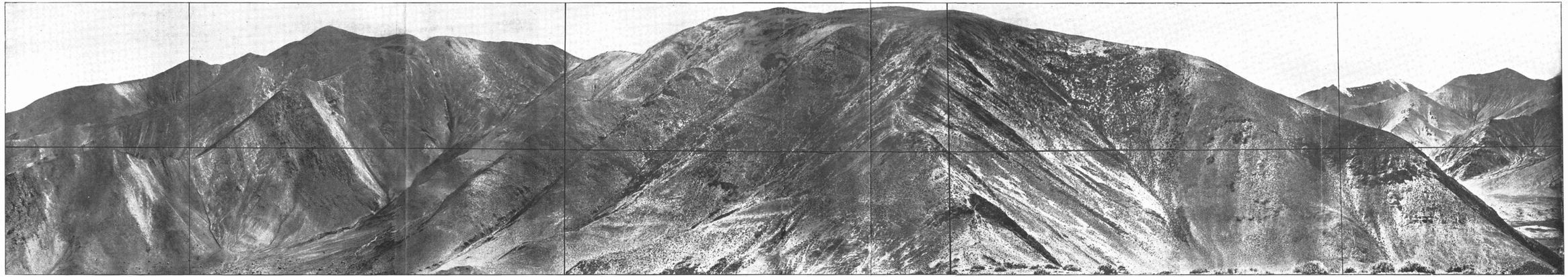
View from Koktumshuk Hill, L. Karakul, to West and South-West.

THE view presented in this plate is confined to the spurs forming the immediate background of Koktumshuk hill. On the extreme right is seen the westernmost corner of the upper Basikkul. The crosshair of the photograph on the extreme left intersects the ridge of Germe at a triangulated point 15,450 feet above sea. The spurs behind Koktumshuk are covered on their lower slopes with grass and scrub, affording limited grazing.

IX. *c*.—VIEW FROM KOKTUMSHUK HILL, L. KARAKUL, TO WEST AND SOUTH-WEST.

GERME △ STATION.
15,450.

KOKTUMSHUK SPUR.



ontinued
Sec IX. a.

Continued
in Sec. IX. b.

UPPER BASIKKUL.

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