RECORDS OF THE
SURVEY OF INDIA
Vol. XXV

SURVEYS
IN
SWAT, CHITRAL & GILGIT
AND
NEIGHBOURING TERRITORIES

CARRIED OUT BY
'A' SURVEY COMPANY
FROM
1925 TO 1931

BY LIEUT.-COLONEL C. G. LEWIS, O.B.E., R.E.

PUBLISHED BY ORDER OF
BRIGADIER H. J. COUCHMAN, D.S.O., M.C.
SURVEYOR GENERAL OF INDIA

PRINTED AT THE GEODETIC BRANCH OFFICE,
SURVEY OF INDIA, DEHRA DŪN, 1934.

Price One Rupee and Eight Annas or Two Shillings and Six Pence

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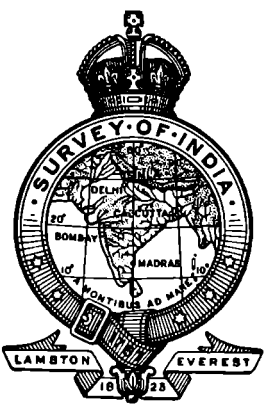

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CONTENTS

INTRODUCTION

With the creation of the Frontier Circle in 1925 to meet the vastly increased needs of the Army in survey matters since the Great War, a new focus of survey activities came into being on the North-West Frontier. 'A' and 'E' Survey Companies were formed at Murree and Quetta respectively with the essential objects of providing close co-operation with the Headquarters of the Northern and Western Commands in matters of map policy and peace training, and enhanced facilities for rapid mobilization in war. It was not however contemplated that these units should be employed solely on duties which from the point of view of a civil map-making department could only be considered as unproductive, and it became necessary to initiate a programme of active topographical surveys.

At the outset the useful work available for the employment of 'A' Company was not immediately evident. The reorganization of 1905 had resulted in intensive surveys throughout the N.-W. Frontier Province and the Punjab and almost the whole of the accessible areas in the former province had been mapped. The southern and western parts of the Punjab plains, unsurveyed since the middle of last century, were in a state of rapid development by irrigation projects, and the time was not ripe to carry out surveys in a terrain which has since changed out of recognition in the course of a few years. The earlier modern maps of the Punjab and Frontier Province were however becoming sufficiently out of date to warrant a general revision and there remained large areas of tribal territory beyond the administered border which had hitherto been considered closed to all save military expeditions. An investigation of the conditions in the Dīr, Swāt and Chitrāl Agency and in the territory adjacent to Hazāra district showed that there was ample scope for work, and that political relations with the tribes were favourable to the entry of survey parties. In addition to revision surveys in the plains, 'A' Company from October 1925 to October 1931 completed some 21,000 square miles of original survey in the extreme northern corner of India. It is with this latter work, in country lying between 3,000 and 25,000 feet above the sea, that this volume is concerned.

The period under review is an important one in the history of the survey of the mountain frontiers of India. It is the first occasion on which the rigorous survey of the higher massifs and glacier systems has been undertaken by a regular unit.* This has resulted in the systematic training of Indian surveyors in the

* The 1-inch survey of Kashmīr by No. 1 Party in 1911–12 did not include any of the higher mountain groups or large glacier systems.

specialized technique of high alpine work, and in the adaptation of European methods to the needs of Indian cartography. The first introduction of rigorous survey and modern mapping in high Himālayan regions was made on the Everest expedition of 1921. Since then the symbols for ice, snow and rock features have been standardized and brought into use in the mapping of the Hindu Kush and neighbouring ranges. The close of the summer season of 1931 coincided with the reduction of the department under the Government of India's scheme of retrenchment, which has put an end for the time being to the survey of Himālayan areas.

During this period the survey of the remaining areas of tribal territory, in Bājaur, Mohmand, Tīrāh and Wazīristān, inaccessible to the plane-tabler, was being carried out by air photography, compiled by No. 18 Party. Thus with the exception of the unadministered tracts of the Gilgit Agency, of Swāt Kohistān and parts of Dīr, still closed to the ground surveyor and unsuitable for air survey, the whole of the N.-W. Frontier mountain belt from Gilgit to Quetta has now been accurately surveyed.

From the formation of 'A' Company in 1925 its recess headquarters have been at Murree, and the field headquarters at Rāwalpindi, partly with the object of being in close touch with the Headquarters of the Northern Command. At the close of the recess season of 1931, the field headquarters moved to Peshāwar, where certain alterations in the office of No. 18 Party rendered it suitable for the accommodation of both units. The move was chiefly due to the temporary office in Rāwalpindi being no longer available and also to the advantages accruing from the location of the two units side by side.

The arrangement of this volume is in chronological order by survey years (from 1st October to 30th September) commencing with a precis of previous surveys and exploration. It consists of a general summary of each year's work followed by separate reports of individual officers. For details of areas surveyed and of the personnel of the company, reference should be made to the annual General Reports, which also contain reports of the surveys by 'A' Company not covered by this volume. No reference has been made to the work of officers and surveyors of 'A' Company who have been attached to exploration parties in the Karakoram during the period 1925 to 1931, as this was outside the regular work of the unit.

C. G. L.

1. PREVIOUS SURVEYS AND EXPLORATIONS

The following brief references to previous surveys and explorations in the area under review are arranged in chronological order. No attempt has been made to include journeys or expeditions on which no topographical work was carried out.

1852–53 Black Mountain Expedition against the Hasanzais, sketch surveys.

1863 Survey of Kashmīr by the Great Trigonometrical Survey under Capt. T. G. Montgomerie, R.E., ¼-inch cis-Indus surveys in Astor, Bunji and Rondu.

1863 Ambela Expedition in Buner, 1-inch surveys under Major H.C. Johnstone.

1865–69 Revenue Survey of Hazāra District, Kāgān Valley, ¼-inch sketch survey.

1868 Black Mountain Expedition, ½-inch surveys.

1870 Reconnaissances by Hayward in Gilgit and Yāsīn.

1870 The "Havildār's" route survey from Peshāwar via Bājaur, Dīr and Chitrāl, over the Nuqsān Pass to Faizābād in Badakhshān and return by the Dorah Pass (Chitrāl).

1873–74 The "Mullah's" route survey from Jalālābād via the Kunar River, Asmar, Baraul, Dīr, Lawarai Pass, Chitrāl, Mastūj, Baroghil Pass, to Sarhad-i-Wākhān and return to India via Yārkand and the Karakoram Pass.

1876 The 'Mullah's' route surveys: the Indus valley from Amb to Bunji and side valleys. Yāsīn to Mastūj via the Shandur Pass. Mastūj to Yāsīn via the Tui Pass. Sor Laspur to Dīr via the Tal Pass and the Panjkora River.

1878 The 'Mullah's' explorations in Swāt, Kāna, Ghorband, Chakesar, Kālām, Kandia and Patan.

1878–81 Reconnaissances in Ashkumān and Nagar by Captain Biddulph, the first Political Agent in Gilgit.

1878–81 Route surveys of the explorer "M.S." from Yāsīn over the Darkot and Baroghil Passes and to the source of the Yārkhūn River, on his way to and from explorations in Badakhshān.

1879–81 Lt.-Col. H. C. B. Tanner's triangulation and ¼-inch surveys, round Gilgit from Bunji to Hupar and in the Bagrot, Hunza and Naltar valleys.

1882–83 Sub-surveyor Ahmad Ali Khan's ¼-inch sketch survey in Dardistān (Chilās, Darel, Sazin etc.)

1883 W.W. Mc. Nair's and the "Saiyid's" explorations in Dīr, Swāt, Chitrāl, Kāfiristān and Gilgit.

1885–86 The Gilgit–Chitrāl Mission under Col. Sir W. Lockhart, Col. R. G. Woodthorpe's route surveys in Gilgit, Hunza, Chitrāl, Wākhān, Badakhshān and Kāfiristān, controlled mainly by subtense traverses.

1888, 1891 & 1892 Black Mountain Expeditions, 2-inch and smaller scale surveys under Capt. R.A. Wahab.

1893 Lieut. J. A. Douglas' sketches on 1-inch scale of the Indus valley below Hodar and the Thor valley subsequent to the Chilās operations of 1892–93.

1895 Captain J. A. Douglas' 1-inch sketches between the Tal Pass, Laspur and Gilgit.

1895 Surveys on the 1-inch, ½-inch, and ¼-inch scales in lower Chitrāl by detachment under Capt. Bythell with the Chitrāl Relief Force.

1895 Pāmir Boundary Commission, ½-inch and ¼-inch surveys under Col. T. Holdich.

1895 1-inch sketch surveys of the Swāt and Panjkora valleys by Lce. Dafadar Sikandar Shah and Private Ghulam Nabi of the Guides.

1897–98 Mohmand, Malakand, and Buner Expeditions, ½-inch surveys in Bājaur, Jandol, Dīr, Malakand, Swāt and Buner by detachment under Captain C.L. Robertson.

1899 to 1901 ½-inch surveys in Chilās, Astor, Bunji and Gilgit and 2-inch route survey from Chitrāl to Gilgit by No. 15 Party under Capt. Beazeley.

1901 ½-inch survey by Surveyor Lal Singh of the Bashgol valley of Kāfiristān and of S. W. Chitrāl, partly new, and partly revision of the Gilgit Mission work of 1885–86.

1902–03 ½-inch revision sketch survey of Kāgān valley by No. 15 Party under Capt. Beazeley.

1924 Route survey on the ½-inch scale of the Malakand–Dīr-Chitrāl road by Surveyor Sardar Khan accompanying the Chitrāl relief column.

2. SUMMARY OF SEASON'S WORK, 1925-26

Officer Commanding:

Lieut.-Colonel R. H. Phillimore, D.S.O., R.E., from 12th November to 2nd March.

Capt. W. J. Norman, M.C., R.E., from 1st October to 11th November and from 3rd March to 30th September.

During the first field season of the newly formed company a small programme of revision work in the districts of Peshāwar, Hazāra and Rāwalpindi was undertaken, and as soon as Lt.-Colonel Phillimore was able to get into personal touch with the Government of the N.-W.F.P. enquiries were instituted as to the possibility of surveys in the tribal territories of Swāt and Buner and of Hazāra district. During the previous decade the Miān Gul of Swāt had extended his dominion over the whole of Buner and adjacent territories and had established a strong and stable government. A ruler of progressive ideas, he was anxious for the development of his country and welcomed the proposed survey. At the same time negotiations for survey in Nandihār and the east slope of the Black Mountain were put in hand. Triangulation in these areas was necessary before detail surveys could be carried out. It was therefore decided to commence triangulation immediately in order that data would be available for the summer season.

Triangulation. *Hazāra, Buner and Swāt.* Mr. C. M. Aslam had in the meantime commenced work in November in sheet 43 F/10, with the object of triangulating the Kāgān valley. Early falls of snow prevented his reaching the higher summits and soon proved the impossibility of winter work in this area. He was therefore instructed to continue work in lower ground in the Black Mountain and Nandihār in sheets 43 B/14 and F/2 and 6. This area was completed by mid-February in spite of considerable opposition from the tribesmen. Mr. Aslam then commenced operations in Buner and Swāt in sheets 43 A and B, the triangulation of which he completed during July. This work was computed *pari passu* at Rāwalpindi thus enabling plane-tabling to be commenced during May.

Kāgān. In April Lieut. J. B. P. Angwin, R.E. commenced triangulation in the Kāgān valley in sheets 43 F/5, 6, 9, 10, 13, 43 E/12, 16, I/4 and J/1. As Mr. Aslam had had difficulty the previous November in effecting a good junction with the old triangulation, Lieut. Angwin broke off from a G.T. base in sheets 43 F/8 and 12 and in addition made a connection with Mr. Aslam's work. It was hoped that the work might be extended into Jalkot,

but the political authorities were unable to arrange this, nor have negotiations in subsequent years been any more successful though sufficient points have since been fixed from outside for the survey of the whole of sheet 43 E.

The weather in this area was exceptionally bad. Lieut. Angwin was seriously delayed in April and May by rain and snow and again in August and September. Thunderstorms interfered with the work frequently and members of the party were struck by lightning on five different occasions and by more than one discharge on each occasion. Luckily there were no worse results than burns on the leg sustained by Lieut. Angwin and a *khalāsi*.

This triangulation was completed in September, but Lieut. Angwin was unable to effect a junction with the G. T. station at the head of the Kāgān valley so that the adjustment of his series might be carried out. This connection was made during the season of 1930, at the time of the detail survey.

Plane-tabling. *Buner and Swāt.* During the winter season a commencement was made of the survey of Swāt, in sheet 43 B/2, where 70 square miles were surveyed, no extra triangulation being necessary. Early in May sufficient triangulation had been computed to make a start in the southern part of Buner, and Mr. Muhammad Husain Khan with 6 Surveyors, later increased to 8, commenced work there on the 1-inch scale. The political authorities at that time were somewhat doubtful as to the possibility of resuming operations in successive years, and it was therefore decided to push the survey through with all speed and continue it without interruption until completed. The result of this policy, which in subsequent years proved unnecessary, was that accuracy was sacrificed to outturn; one Surveyor (Torabaz Khan) completed no less than 360 square miles in 3 months. Work was carried on throughout the summer and into the following year.

In March Surveyor Torabaz Khan was detailed to accompany Sir Aurel Stein in his archæological explorations in Buner and Swāt. During April and May he completed 1,800 square miles of sketch survey on the ½-inch scale and in addition made three plans on the 4-inch scale of sites of archæological interest, including that of Aornos, famous for its siege and capture by Alexander and now identified for the first time by Sir Aurel Stein. The area sketched by Torabaz Khan was subsequently surveyed in greater detail on the 1-inch scale during the same year as part of the programme in Buner and Swāt.

3. SUMMARY OF SEASON'S WORK, 1926-27

Officer Commanding:
Capt. W.J. Norman, M.C., R.E.

Triangulation. *Dīr.* The triangulation of western Dīr and Jandol was carried out by Mr. C. M. Aslam between November and January in sheets 38 M and N. The admission of surveyors into Swāt appears to have acted as a stimulus upon the Nawāb of Dīr, who was not to be outdone in the matter of modernization, and gave all possible assistance. Entry into the upper Panjkora valley and Bashkār was not however permitted owing to the uncertain control of the Nawāb over the tribes in these areas. It was largely due to the pioneer work of the triangulator in Swāt and Dīr and to the determination and tact with which he pushed his work through that the subsequent detail survey was extended very much further than was thought possible by the political officers at the outset.

Agror. Mr. T. M. C. Alexander carried out some subsidiary triangulation for 4-inch forest surveys of Agror in the Hazāra District during December.

Chitrāl. It was now proposed that the survey of Chitrāl should be initiated during the following summer (1928). Hitherto owing to the uncertainty of the attitude of the tribes, no British officers had been permitted to enter tribal territory, except for one tour of inspection by Captain Norman in Swāt. But in Chitrāl no such restriction is necessary and Europeans travel freely throughout the state. Lieut. I. M. Cadell, R.E. was selected to commence the triangulation in continuation of Mr. Aslam's series through Dīr. He left Rāwalpindi on the 24th April and returned there about the 15th November, leaving 4 stations unobserved. He had only been able to complete 800 square miles in sheet 38 M. His stations lay upon the outlying buttresses of the Hindu Kush and Hindu Rāj ranges and their increasing heights as the work advanced northwards gave a foretaste of what was to come in succeeding seasons.

Plane-tabling. *Swāt.* The programme of 1-inch survey in Swāt and Buner commenced in the previous year was continued without interruption by K. S. Muhammad Husain Khan, whose camp was now increased to 10 surveyors, and completed by the end of February after nearly 9 months of continuous work in the field. The area surveyed comprised the whole of the Miān Gul's possessions up to that date, leaving unsurveyed certain areas on the right bank of the Indus in Kāna and Chakesar and in the territories of the Chagarzai, Hasanzai and Madda Khel, which have been surveyed piecemeal in subsequent years as opportunity arose. An agreement

had been concluded for the survey of the Madda Khel country (43 B/11 and 15) in March, but on the arrival of Surveyor Muhammad Ayub Khan the tribe retracted its consent and the surveyor was obliged to return without having accomplished anything. (In the following season he was more successful). Capt. Norman made a tour of inspection through Buner and Lower Swāt.

Agror. Mr. Laltan Khan with 4 surveyors surveyed the Agror reserved forests, 20 square miles on the 4-inch scale in sheets 43 B/14, F/2, 3 during March to May.

Dīr. After a short intermission of about six weeks K. S. Muhammad Husain Khan with four surveyors left Rāwalpindi at the beginning of May and took up the detail survey of Dīr and Jandol. As already stated permission could not be obtained to enter the eastern and northern part of the Nawāb's territory, which still remains unsurveyed up to the end of the period dealt with in this report. The authorities for the existing map of the upper Panjkora valley are the explorations of the Mullah 1876 and Private Ghulam Nabi of the Guides in 1895. Mr. Muhammad Husain Khan completed such work as was possible, not without difficulty and opposition, and the accuracy of the work, in common with that in Swāt, was consequently not up to the standard required in normal circumstances.

4. SUMMARY OF SEASON'S WORK, 1927–28

Officer Commanding:

Capt. W. J. Norman, M.C., R.E., from 1st October to 30th April.
Major C. G. Lewis, O.B.E., R.E., from 1st May to 30th September.

Triangulation. *Chitrāl.* The triangulation commenced by Lieut. I. M. Cadell, R.E. in the previous year was completed by him in sheet 37 P in the early part of the summer season. His northernmost stations in the Arkari region, near the Nuqsān Pass involved serious climbing and the satisfactory completion and computation of the work in time for plane-tabling the same season, was due to this officer's exceptional energy and physical fitness. It is unfortunate that the only report he wrote on his two seasons' work in Chitrāl contains no reference to his professional work or to the difficulties he encountered, but is merely a brief account of the characteristics of the country and its people. It is not reproduced here. It is highly probable that the exceptional physical strain which he underwent during those two years so far undermined his constitution, that he succumbed the more readily to the pneumonia by which he lost his life in Burma two years later.

The triangulation of Chitrāl in sheets 42 D&H was continued in the summer season by Lieuts. D. M. Burn, R.E., I. H. R. Wilson, R.E. and Mr. Chiragh Shah. The difficulties experienced by Lieut. Cadell the previous summer lead to the despatch of this stronger party in 1928. This year again the work had to be abandoned before completion owing chiefly to the exceptionally bad weather and to the great climbing difficulties experienced in establishing stations at altitudes of 18,000 and 19,000 feet. A good deal of time was expended in trying to climb peaks of over 20,000 feet which proved inaccessible with the resources available, the snow-line in this latitude is as low as 15,000 feet on north aspects and the climbing of any peak over 18,000 feet requires considerable preparation; while observation for several hours at the summit, frequently in a high wind and with a temperature many degrees below freezing point, is a great strain. The fixing of 24 stations by these three officers who had no previous experience of climbing was a fine performance of which an outstanding feature was Mr. Chiragh Shah's feat of spending a night at 19,000 feet just below the summit of Gharqāb peak without food or bedding and of completing his observations the next day still without food. Lieut. Burn's report on the work of this and the following season will be found in Appendix I.

Capt. W. A. J. Coldstream, I.M.S. was attached to the triangulation camp, as medical officer.

Plane-tabling. *Madda Khel.* In November and December K.S. Muhammad Husain Khan with surveyor Muhammad Ayub Khan surveyed 25 square miles on the 1-inch scale in Madda Khel country in sheets 43 B/11 and 15.

Chitrāl. Lieut. Cadell had charge of the plane-tabling camp of 8 surveyors with K.S. Afraz Gul and K.S. Muhammad Husain Khan as assistant camp officers. The area of Chitrāl in sheet 38 M was completed on the 1-inch scale, and most of that in 37 P on the ½ and ¾-inch scales. The area in the latter sheet, north-east of Tirich Mīr, which had not been triangulated, and a small area near the Dorah Pass which could not be completed before the advent of the winter snow, had to be left for completion the following summer.

This was the first time that a regular survey unit had been employed on the survey of extensive glacier systems, and a drastic revision was necessary of the symbols which had hitherto been in use in high mountain work. Rock work could no longer be shown conventionally: it was necessary to survey its varying features and interpret them suitably on the plane-table. New symbols had to be evolved for ice features and for screes, and moraines and rock falls. During this first season the younger surveyors began to acquire some idea of the nature of a glacier, but it was necessary to have a good deal of revision carried out in such of the areas as the officer in charge had been able to check during his inspection. After four seasons of experience some eight or nine Upper Subordinate officers and surveyors are now, in 1931, fully trained in high mountain and glacier work.

5. SUMMARY OF SEASON'S WORK, 1928–29

Officer Commanding:

Major C. G. Lewis, O.B.E., R.E.

Triangulation. *Chitrāl.* Lieut. D. M. Burn and Mr. Chiragh Shah completed the observations of their triangulation of the previous season early in the summer of 1929 and computed the work in the field in time for the use of the plane-tablers. This completed the triangulation of the whole of Chitrāl.

The experience of these two officers, marooned by bad weather for four days at the summit of Chapakhgār peak, 19,000 feet, should be read in Lieut. Burn's report (App. I). His modest account gives but little idea of the anxiety they must have felt and of the great difficulties they must have overcome in the successful completion of work at this station. The climbing of this peak would constitute an ascent of the first order in the Alps.

Gilgit. The triangulation of sheet 42 H and of the northern portion of 43 E was carried out by Mr. P. A. Thomas during the same summer. He broke off from a side of Lieut. Burn's Chitrāl series, astride the Shandur Pass and closed at the westernmost station, Gakuch Roshan, of Colonel Tanner's Gilgit series of 1879–81. From his stations on the southern watershed of Kuh Ghizar and Puniāl he was able to fix a number of intersected points as far south as the Indus in Darel and Tangir, thus providing sufficient trigonometrical data for the survey of sheet 43 E.

He was unable in the time available, to fix any points in the Ashkumān valley, but the existing work in addition to his own proved sufficient for the survey of that area in the following season. Mr. Thomas following instructions, profited by the experience of previous seasons in Chitrāl, where much time was expended, not always fruitfully, in preliminary reconnaissance. By reducing this to a minimum and by trusting to his ability to climb forward stations and to identify the particular point previously observed to, he was able to cover the large area assigned to him, in the comparatively short time at his disposal. The altitudes of the stations and the climbing difficulties were considerably less than in Chitrāl. Mr. Thomas' report forms a section of Lieut. Burn's in App. I.

Plane-tabling. *Hazāra district, Nandihār and Black Mountain.* During the winter season Mr. C. M. Aslam assisted by Mr. Sajawal Khan with 12 surveyors, mostly under training, completed the survey on the 1½-inch scale of sheets 43 F/2 and 6, and of the eastern slopes of the Black Mountain in sheets 43 B/13 and 14. The latter area was surveyed by Mr. Sajawal Khan after protracted

negotiations with the tribes and considerable opposition, which culminated in his being fired upon on one occasion. He was eventually obliged to abandon the territory of the Pariari Saiyids, unsurveyed.

Chitrāl. During the summer season Lieut. Burn with Messrs. Chiragh Shah and Muhammed Akbar and 9 surveyors completed the whole of the remaining area of Chitrāl and part of the Kuh Ghizar district of Gilgit, on the $\frac{3}{4}$-inch scale in sheets 37 P, 42 D and 43 A, and on the $\frac{3}{8}$-inch scale in 42 H. The weather during August and early September was exceptionally bad and it seemed impossible to complete the programme. The surveyors were concentrated so as to make certain of completing the Chitrāl area. Later the weather conditions improved and a determined effort on the part of all enabled practically the whole of the area to be finished, with the exception of about 60 square miles in the Gilgit Agency in sheet 43 A, which had to be abandoned owing to an insufficiency of trigonometrical points.

The surveyors had now gained further experience in high altitude technique and the quality of their work had considerably improved. It is therefore unfortunate that the surveyor who, on account of his zeal and physical fitness, was selected for the difficult Tirich Mīr and Istoro-Nāl massifs, should have been considerably below the standard of the others in professional qualifications. Thus this important and interesting group, containing the two highest peaks of the Hindu Kush, has not been mapped with the same accuracy of detail which is to be found in the other parts of Chitrāl.

6. SUMMARY OF SEASON'S WORK, 1929–30

Officer Commanding:

Major C. G. Lewis, O.B.E., R.E., from 1st October to 24th November 1929.

Major K. Mason, M.C., R.E., from 25th November to 3rd April 1930.

Lt.-Col. C. G. Lewis, O.B.E., R.E., from 4th April to 30th September 1930.

Triangulation. *Swāt Kohistān.* This interesting and little known region (in sheet 43 A) comprising the head-waters of the Swāt river is inhabited by independent non-Pathān tribes. Its valuable *deodār* forests had brought it into prominence in recent years, and arrangements were made with the Political Agent at Malakand for triangulation during the summer of 1930 with the object of carrying out detail survey on the 1½-inch scale in 1931. Unfortunately the disturbed political situation throughout India during 1930 spread to this remote valley and Mr. Chiragh Shah who was sent up in April to do the triangulation, was unable to enter the area owing to the armed resistance of the Kohistānis and accomplished nothing beyond the reconnaissance of one or two stations in continuation of Mr. Aslam's Swāt series. After spending 4 months of enforced inactivity, he returned to Murree in September 1930.

Kāgān. In order to connect, for purposes of adjustment, Lieut. Angwin's Kāgān triangulation of 1926 with the G. T. Gilgit series of 1911, Mr. Muhammad Akbar, assistant Camp officer, Kāgān Camp, carried out the necessary observations at the head of the Kāgān valley in sheets 43 E and I.

Plane-tabling. *Kāgān and neighbouring territory.* The survey of the Kāgān valley, which forms part of the Mānsehra *tahsīl* of Hazāra district was first carried out by the Revenue Branch of the Survey between 1865 and 1869 on the ¼-inch scale. It was subsequently revised in 1902–03 by No. 15 Party, but the work on both occasions was little better than reconnaissance. The lower portion of the valley in sheet 43 F/6 had been surveyed on the 1½-inch scale in 1928–29, and the remainder was taken up in the summer of 1930 on the same scale by Mr. A. A. Graham, with Mr. Muhammad Akbar, Lieut. Sams, R.E. (under instruction), and 6 surveyors. (Appendix III).

Tribal Territory, Swāt and Hazāra District. An attempt during this summer was made to complete the survey of the Black Mountain and of the Wali of Swāt's territory on the right bank of the Indus.

Surveyor Sher Gul proceeded through Malakand in May and was able to complete the blank area of Kāna in sheet 43 B/13 and to survey a small area cis-Indus in the same sheet. During April and May surveyor Mir Abdullah revised the Akazai area of the Black Mountain surveyed during the Expeditions of 1888 to 1892, but he was unable to do any further work as the remaining tribes refused admission*. Surveyor Ghulam Muhammad I was kept standing by at Oghi for some time pending negotiations with the Pariari Saiyids but as a result of the general unrest, these also broke down. The two last named surveyors were then transferred to the Kāgān Camp.

It had been intended that these three surveyors should proceed with the survey of Allāi, but the political situation put this out of the question.

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* The survey of the whole of the remaining area on the western slopes of the Black Mountain has since been completed from air photographs. (This is the area in sheet 43 B 14 left uncoloured in the map at the end of this volume).

7. SUMMARY OF SEASON'S WORK, 1930–31

Officer Commanding:

Lt.-Col. C.G. Lewis, O.B.E., R.E., from 1st October to 14th August.

Mr. W. H. Strong from 15th August to 30th September.

Triangulation. *Allāi and Indus Kohistān.* Mr. C. M. Aslam completed the triangulation of some 240 square miles in the area known as Chor, which upto now has been shown on our maps as in Indus Kohistān but actually belongs to the Allāiwāls. The computations were done on the spot and data supplied to the surveyors.

Gilgit. Mr. P. A. Thomas' triangulation brought through from Chitrāl in 1929, closed on Gakuch Roshan, the most westerly of Col. Tanner's station of his 1879–81 Gilgit series. This series was unconnected with the G.T. Indo-Russian Connection Series of 1912–13 which crossed it. In order to correct the value of Gakuch Roshan and to adjust Mr. Thomas' series thereto, a connection between Col. Tanner's and the G.T. series was carried out by Messrs. Chiragh Shah and Muhammad Akbar, who were in charge of plane-tabling camps.

Plane-tabling. *Tribal Territory, Swāt and Hazāra district.* During the winter season surveyors Ghulam Muhammad I and Mian Muhammad were sent out on independent work in tribal territory. At the request of the N.-W.F.P. Government, the former surveyor assisted in the settlement of a boundary dispute between the Hasanzai tribe and the Wali of Swāt during November and December and on completion of this work the opportunity was taken for him to re-survey the trans-Indus territory of the Chagarzai in sheet 43 B/14 and to complete certain areas in the territories of Amb, Pitao Amazai, and Hasanzai in sheets 43 B/14 and 15 which previously had only been sketched.

Surveyor Mian Muhammad, after waiting for over a month at Oghi pending negotiations with the Pariari Saiyids was able to survey some two-thirds of their area, but was obliged to leave one valley unsurveyed. This was subsequently completed during the summer season by Mr. Aslam.

Allāi and Indus Kohistān. The plane-tabling as well as the triangulation was done under adverse conditions, as the tribes refused to allow the survey to take place. Mr. Aslam who before and during the survey had been in close touch with the Deputy Commissioner, Hazāra, the local political authorities, and the *khāns,* could make very little progress. He then resorted to

personal negotiation with each section of the tribes, and although this improved matters it did not prevent tribesmen from firing on the camps; the men were fortunate to escape injury, for on three occasions bullets entered boxes placed round the tents as protection.

The total area surveyed was 297 square miles on the 1-inch scale in 43 B and F.

Gilgit and Kashmīr. Mr. Chiragh Shah, S.A.S. with 4 surveyors and Mr. Muhammad Akbar, S.A.S. with 3 surveyors formed the two camps. The Camp officers also plane-tabled. Original survey was done on the $\frac{3}{8}$-inch scale in sheets 42 H and 43 I, extending up to the Hunza watershed in 42 L and up to the unadministered tribal area of Darel and Tangir in 43 E and to the limit of the Gilgit Wazārat in 43 M. Total area surveyed was 7,943 square miles.

The area comprised the Gilgit Wazārat of Kashmīr and Jammu state and the Political districts of Chilās, Kuh Ghizar, Puniāl, Ashkumān and Yāsīn of the Gilgit Agency.

The country under survey ranged from 3,000 feet to 26,000 feet above the sea and included the Great Himālayan range in the south, with the massif of Nanga Parbat, 26,660 feet; the north-western extremities of the Karakoram, with Haramosh, 24,270 feet; and to the north and west the Hindu Rāj range. The latter is 10 to 15 miles south of the Hindu Kush and here at their eastern end is considerably the more elevated of the two.

8. NOTE ON THE MOUNTAIN AND GLACIER SYSTEMS IN CHITRAL AND GILGIT

The Chitrāl survey by Woodthorpe in 1885–86 carried out in one season by a political mission, was perforce confined to the main routes and valleys. The $\frac{1}{4}$-inch maps compiled from this survey have been in current use for 45 years and are in the main accurate in the inhabited areas. The survey of Kashmīr and Gilgit by Montgomerie in 1855 to 1863 was more deliberate and covers large areas which have never since been revisited by surveyors up to the present day. It is remarkable that the survey of so inhospitable a region as the mountain ranges of Ladākh and Gilgit should have been undertaken at a time when mountaineering as a sport had scarcely been recognized in Europe, when the majority of the peaks of Switzerland were still unclimbed, and when the survey of the High Alps of the "Playground of Europe" was still in progress. This is often forgotten when the maps made by the early surveyors in the Himālaya and Kashmīr are criticized.

The increasing interest in mountaineering in India, and the search for new fields has created a demand for more detailed maps in the mountainous areas. The traveller bent on shooting or "trekking" is not interested in the possible approaches to high peaks, but the climber wants to study these beforehand to avoid wasting time in reconnaissance. The survey of 1928–32 aimed at accurate and detailed mapping of the mountain systems as well as that ot the main valleys and inhabited areas.

The main changes in the map effected by the new survey are in the position of the Hindu Kush watershed between Tirich Mīr and Lunkho and in the survey of the glacier systems at the head of the four valleys of Tirich, Atrak Gol, Ziwar Gol and Uzhnu Gol; none of these glaciers had previously been shown. The three latter valleys extend from 6 to 12 miles further north-west, thereby adding some 250 square miles to the supposed area of Chitrāl, mostly above the snowline. At the western end of the Karakoram the Karambar glacier, taking its source at peak 23,434, captures for Ashkumān at the expense of Hunza, territory that has hitherto been shown as comprising the headwaters of the Tutu Uns River (Bola Das R.) flowing into the Hunza River at Chalt.

The aggregate length of the glaciers surveyed in Chitrāl and Gilgit amounts to about 1,200 miles, excluding minor lateral

glaciers less than about 2 miles in length. The more important ones are tabulated below:

	Glacier	Range	Length in miles	Altitude of snout
1	Chiantar	Hindu Rāj	20·5	11,900
2	Tirich*	Hindu Kush	18	11,800
3	Atrak	,, ,,	18	11,400
4	Karambar	Karakoram	15	9,300
5	Kotgaz	Hindu Kush	12	10,500
6	Noroghikuh	,, ,,	10	10,100

It is interesting to compare the altitudes of glacier snouts in the Hindu Kush and Hindu Rāj with those in the Karakoram. The latter all descend much lower. This must be to a certain extent due to the higher average altitude of their supply area, which would result in a greater volume of snow being delivered to the glacier. In the cases of the Tirich glacier in the Hindu Kush and the Batura in the Karakoram the conditions are almost exactly similar in respect of the extent of the catchment area, the average altitude of the surrounding watershed, the altitude of the snowline, and the probability of avalanche supply below the snowline. Yet the snout altitude of the latter is 3,000 feet lower. This can be accounted for by the presumption of a greater precipitation in the Karakoram or of a higher average temperature in the Hindu Kush, or a combination of both. The average altitude of the Hindu Kush and Hindu Rāj glacier snouts is between 11,500 and 12,000 feet. If these glaciers descended as low as those of the Karakoram their length would be increased by 75%. The Noroghikuh glacier is shown in the table because it descends to 10,000 feet, which is considerably lower than any other in Chitrāl; there are others of equal length.

The glaciers of Chitrāl are in a period of retrogression, and most of them show marked signs of degeneration. In the Sohnyoān glacier for instance, at the head of the Phargam Gol in Laspur (Hindu Rāj), the main stream in the summer of 1929 had become exposed for a distance of two miles above the snout, dividing the glacier into two parts; while below the snout on the right bank of the stream, an isolated portion of dead ice remained, covering many acres. The location of the snouts in many of the larger glaciers was a source of difficulty to the surveyors, by their being engulfed in a tumble of terminal moraine to such an extent as to be almost unrecognizable to the inexperienced. Almost all minor side valleys

* Treating the Upper and Lower Tirich glaciers as one, which is the case in periods of advance, when the former joins the latter.

which emanate from ridges at about the height of the snowline, and which are now dry, contain immense terminal moraines of comparatively new material standing at abrupt slopes, as evidence of recent occupation by glaciers. This drying up appears to be of an older date than the degeneration of existing glaciers.

In Chitrāl, only one lateral glacier, the Chhatiboi, forms a lake by the damming of the main valley of the Yārkhūn (Chitrāl) River. In the Karambar valley two such lakes are formed by the Chhatiboi (another) and Karambar glaciers. The name "Chhatiboi" in Khowar, the language of Chitrāl signifies literally "There will be a lake".

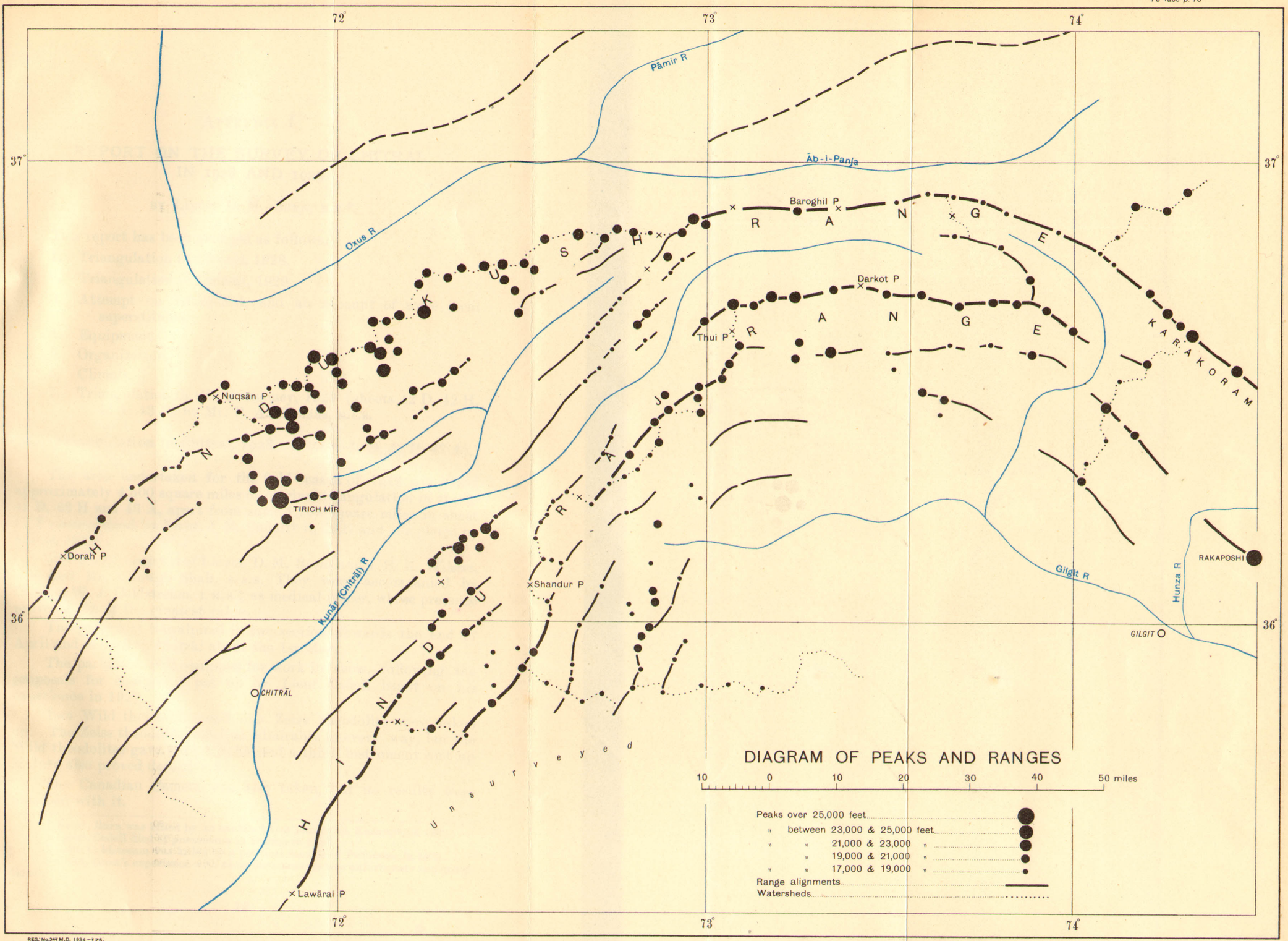
In 1885 Woodthorpe recorded the name "Hindu Rāj" for the range forming the south-eastern watershed of the valley of Chitrāl. This range, which may be considered to extend from the Karambar River on the east (Long. 74°) to the Lawarai Pass on the west*, a length of 160 miles, has not hitherto been named as a whole on Survey of India maps. Parts of it have been shown as the "Shandur or Mashabar Range" and the "Sakiz Jarab". That portion between Long. 73° and 74° lying parallel to the watershed of the Hindu Kush and 10 miles south of it, and containing the Darkot Pass, has generally been held to be a part of the Hindu Kush. It has however no very obvious continuation west of the Chitrāl River with which to support the contention that this river—elsewhere longitudinal throughout its whole course to Jalālābād—has broken through a range at this point (Lat. 36° 40′). From Long. 73°, the range trends south-west to the Shandur Pass and forms a continuous watershed of peaks, many of whose summits exceed 20,000 feet. It may be that the main backbone of the Hindu Kush originally continued north-~~west~~ east from Long. 72° 30′ to the range which divides the Ab-i-~~Wākhān~~ Panja from the Pāmir River and that the former flowed into the Chitrāl valley over what is now the Baroghil Pass, before being captured by the Oxus. The Baroghil is a low pass standing only 800 to 1,000 feet above the Chitrāl and Ab-i-Wākhān valley floors. The Hindu Kush proper, between Long. 73° and 74°, is a puny range overshadowed by the Hindu Rāj to the south. So long as the latter name was not in current use it was natural to include both ranges in the Hindu Kush in this area. But with the adoption of the new name it seems reasonable to apply it to a well-defined and continuous alignment of peaks which is also a watershed.

South-west of the Shandur Pass the range is broken up into three main crests separated by the Laspur valley and the Phargam and Golen Gols. The southern of the three is the watershed and the boundary between Chitrāl and the Gilgit Agency. The diagram opposite shows the alignments of high peaks and the range names.

* Its axis continues south-west from the Lawarai Pass forming the frontier between India and Afghānistān.

All the more important glaciers have been given names. Where no local name was forthcoming that of the valley at the source of which they lie has usually been adopted. Peak names as usual present difficulties, few have any local name. Lunkho is not known locally in Chitrāl and was omitted from the first edition of the new map, but will be retained in future editions and on the smaller scale maps. The peak name Sar Istragh (old height 24,171, new height 24,110) on the old ¼-inch sheet 42 D, was purposely omitted to avoid confusion with Sad Istragh named after the well-known pass close to it in sheet 37 P. It is unfortunate that no name was found for this important massif, lying between the Rosh Gol and the Ziwar Gol. The peak situated 9 miles NNE. of Tirich Mīr and also named Tirich Mīr on the old map (37 P) was named by Lieut. Burn "Istoro-Nāl" which means the "horse-shoe", after the shape of its summit. This name has been adopted.

To face p. 18



REG. No. 249 M.D. 1934—175.

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Appendix I

REPORT ON THE SURVEY OF CHITRAL IN 1928 AND 1929

BY LIEUT. D. M. BURN, R.E.*

This report has been grouped as follows:

1. Triangulation in Chitrāl, 1928.
2. Triangulation in Chitrāl, 1929.
3. Attempt on Istoro-Nāl, and an account of some local superstitions.
4. Equipment.
5. Organization.
6. Climate.
7. Triangulation in Gilgit Agency, 1929 (sheets 42 D, 42 H, 43 A, 43 E) by Mr. P. A. Thomas, E.A.S.

1. Triangulation in Chitral, 1928. (*Sheets 42 D, 42 H, 43 A*).

The area undertaken for the field season of 1928 comprised approximately 4,500 square miles of original triangulation in sheets 42 D, 42 H and 43 A, apart from some 1,200 square miles in sheet 37 P reconnoitred by Lieut. I. M. Cadell† in 1927 and completed by him in 1928.

The party consisted of Lieuts. D. M. Burn, and I. H. R. Wilson, R.E. and Mr. Chiragh Shah, S.A.S. They were accompanied by Captain W. J. Coldstream, I.M.S.‡ as medical officer, whose presence proved to be of the greatest value.

The party left Rāwalpindi in two sections towards the end of April and arrived in Chitrāl about the 1st May.

The party was well equipped for work in snow, following the proposals for equipment put up by Lieut. Cadell based on his experience in 1927.

Two Wild theodolites and one Zeiss theodolite were taken up. The Zeiss theodolite behaved admirably in every way, but the Wild theodolites gave some trouble and a third instrument sent up in July also proved defective.§

The Canadian Camera was also taken, but no results were obtained with it.

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* Lieut. Burn was killed by an avalanche on Panjtarni, Kashmīr, in 1932.

† Lieut. Cadell died of pneumonia in Burma in 1930.

‡ Capt. Coldstream was killed by a political fanatic in Peshāwar in 1932.

§ Lieut. Burn's experience with these instruments was unfortunate and exceptional.

The party left the town of Chitrāl on 14th May, the first object in view being to make a rough reconnaissance to determine the common stations of adjoining triangulators. It had been early decided that it would be necessary to employ all three officers on separate triangulation if the work was to be completed that year. As it turned out it might have been better to omit this reconnaissance and trust to being able to join up the work as opportunity offered. In the course of reconnaissance the party soon discovered that the main difficulty would be the actual climbing, and any ideas of climbing peaks of over 20,000 feet were abandoned.

The work was divided up as follows: Lieut. Burn to join up Lieut. Cadell's work of 1927 to two stations, one south of Mastūj on the Gilgit boundary where the latter turns sharply to the south and the other at Chumar Mal on the ridge between the Tirich and the Turikho rivers: Lieut. Wilson to complete from these two stations to be found later on the eastern edge of sheet 42 D, and Mr. Chiragh Shah to complete thence the Chitrāl portion of sheet 42 H and, if possible, to plane-table in that area on a scale of $\frac{3}{8}$ inch to 1 mile.

Lieut. Wilson and Mr. Chiragh Shah left Lieut. Burn on the 11th June. By this time the party had found their climbing feet and were all extremely fit. The first month therefore produced little useful work save making the party fit to tackle reasonable altitudes.

Lieut. Burn's area being comparatively low presented no serious difficulties, and connection was made to Lieut. Wilson's work by the 20th August. Some time was wasted in an endeavour to make a station at 21,494 feet on Buni Zom in the Hindu Rāj south of Buni. A camp at 19,000 feet was established at the head of a glacier leading to a col directly below the peak. By dint of step-cutting for three days, he reached approximately 19,500 feet. The ice was now so hard that progress had reached the rate of some ten feet an hour. This was largely due to inexperience in that the ice-axes were not really sharp. Earlier in the year this stretch would have presented little difficulty. The peak was abandoned in disgust on the fourth day and was subsequently used as a pivot station in the triangulation. After Major Lewis' inspection which lasted from 20th August to 1st September, Lieut. Burn proceeded to Shandur to complete his area south of Laspur in 43 A. This was completed by the 4th October. The weather broke badly in the second half of September and climbing became dangerous owing to the prevalence of snow-storms. Some trouble was experienced from stone shoots and one Chitrāli was injured in the leg.

On completion of the work, Lieut. Burn proceeded independently to India.

On leaving Mastūj on the 11th June Lieut. Wilson and Mr. Chiragh Shah, accompanied by Captain Coldstream, continued up the Mastūj-Yārkhūn valley to decide their common stations. This reconnaissance developed into a search for "climbable" peaks that would fit in with the triangulation. The peaks in their area best suited for triangulation were all over 20,000 feet and it proved extremely difficult to find suitable peaks of lesser height. Towards the end of July it became imperative to start observations, and only a very sketchy idea of possible stations had been obtained. It must be remembered that the valleys of Chitrāl are very deep and at relatively low altitudes. The main Mastūj-Yārkhūn valley rises from 6,000 feet at Chitrāl to 8,000 feet at Mastūj, and to 10,000 feet at Lasht below its glacier source. This gives little chance of acclimatization to heights and though the party found that after a couple of months' climbing, little discomfort was felt at altitudes up to 18,000 feet above this height trouble from shortness of breath and mountain-sickness added greatly to the difficulties of the work. In this area too, weather conditions were not favourable and observations were hampered by occasional snow-storms and clouds. Lieut. Wilson started actual observations on 26th July and Mr. Chiragh Shah on 10th August.

At his first station, Shahbang h.s. 18,210 feet Lieut. Wilson had to stay in his top camp at 17,500 feet from the 26th July to the 2nd August in continuous snow and clouds before he was able to complete his observations. He observed at Bahushtar h.s. 18,746 feet but was only able to get in a few hours' work before the weather broke and as a result of his exposure on Shahbang was not fit enough to wait until it cleared again.

Meanwhile Mr. Chiragh Shah had succeeded in observing at Karambar h.s. 18,860 feet where he was badly hampered by weather conditions. One of his escort sepoys contracted pneumonia as a result of exposure on this peak and died a few days later. This man, though obviously suffering from the cold and the height, was reluctant to leave his officer until ordered to do so.

Mr. Chiragh Shah then went to Darkot East h.s. 17,264 feet which he observed after much trouble from snow and clouds. He was altogether ten days in the vicinity waiting for the weather to clear.

He then proceeded to Gharqāb h.s. 19,460 feet. This peak presented difficulties from a climbing point of view, but it was the only peak that would fit in with the scheme of triangulation as it then was. He was unable to establish a camp within reach of the top, so on the 5th September was compelled to spend a night on a rock shelf with two men at nearly 19,000 feet with no food or bedding. The next day he observed at the station, having to rely on his memory for his points, it having been impossible to get a

plane-table up as well as the theodolite. In the course of observation he was hindered by snow-storms and clouds over the peaks he wished to observe. As a result of their exposure for the night, both he and the two men developed slight frost-bite and Mr. Chiragh Shah had some trouble with his eyes. This climb necessitated his taking things slowly for a week or 10 days.

The next step was for Lieut. Wilson and Mr. Chiragh Shah to observe Chapakhgār h.s. 19,267 feet together, but Mr. Chiragh Shah was in no fit state to do this, and Lieut. Wilson having had a bad time in his first attempt on this peak, he decided to visit Uzhnu Gol h.s. 17,132 feet while Mr. Chiragh Shah was to make a resection station at Zischo Zom, 17,800 feet. The other joining station Chucho Gol had failed from his side owing to an intervening high ridge in Gilgit. Thus the object of the resection station was to fix a point in Lieut. Wilson's area which the latter could also fix.

At Uzhnu Gol h.s., having completed station observations, Lieut. Wilson had to wait a week to observe intersected points but was eventually forced to come down owing to heavy snow and a shortage of rations for the coolies. Mr. Chiragh Shah also experienced bad weather on Zischo Zom but was able to complete a resection. They met below Chapakhgār h.s. on the 2nd October.

Had they been able to reach the top, Lieut. Wilson would have reobserved at Shahbang h.s. and the work would have been completed.

The recent heavy falls of snow made the going very heavy and on their first attempt the party were not able to reach the col below the peak which was their objective. The weather broke once more and the party waited two days at a 15,000 feet camp hoping that the snow would stop. It had become increasingly cold; climbing at any height was dangerous, and the coolies were unwilling to stay in a high camp. There seemed little or no chance of any improvement in the weather, as subsequently proved to be the case. It was therefore decided to abandon the attempt and to leave Chapakhgār h.s. to be observed next year.

The party were unfortunate in that the weather broke earlier than usual. The last half of September and the first half of October can normally be relied on to be fine. The second detachment reached Rāwalpindi on the 27th October.

The party was fortunate in having only two serious casualties. One was the sepoy who died from pneumonia below Karambar, and the second was a Gilgiti coolie. The latter fell with his load into a crevasse on the Darkot glacier. Another Gilgiti volunteered to

descend on a rope and succeeded in getting the man out. Captain Coldstream fortunately being at the scene of the accident, was able to save the man's life. The man was suffering from compound fractures of the skull and jaw.

Various minor accidents occurred but without serious results. On one occasion a party of four men roped together, slipped on a snow slope while trying to avoid falling rocks. They fell altogether some five hundred feet, but being only slightly dazed, they had the consolation of arriving in camp, some two hours before the rest of the party who were descending by a more conventional route.

2. Triangulation in Chitral, 1929. (*Sheets 42 D, 42 H, 43 A*).

The programme undertaken for the field season of 1929 comprised the survey of the Chitrāl and Gilgit portions of sheets 42 D and 43 A on a scale of $\frac{3}{4}$-inch to one mile, an area of 4,059 square miles, and the survey of the Chitrāl portion of sheet 42 H on a scale of $\frac{3}{8}$-inch to one mile, an area of 524 square miles. Lieut. D. M. Burn, R.E. was in charge of this work with Mr. Chiragh Shah as his assistant. This involved the completion of the triangulation left unfinished in 1928.

In addition Mr. P. A. Thomas was to carry on triangulation from Lieut. Burn's work round Shandur and complete the Gilgit portion of sheets 42 D, 42 H, 43 A and 43 E, for a survey on a scale of $\frac{3}{8}$-inch to one mile. This comprised an area of approximately 4,500 square miles.

The surveyors would not be able to do any useful work before the first week of May, so it was arranged that they should leave Rāwalpindi under the charge of Captain W. J. A. Coldstream, I.M.S. on 25th April. Acting on this assumption the triangulation party left Rāwalpindi on 20th March; this allowed a clear month for the completion of the triangulation and its computation. It was also probable that the climbing conditions at the higher altitudes would be good although some trouble might be expected in reaching the lower stretches.

The party left Sanoghar, the headquarter camp, on 7th March. Mr. Thomas broke off for his Gilgit work at Chapalli on the 8th April. Lieut. Burn and Mr. Chiragh Shah reached the 17,500 camp below Shahbang h.s. (18,210 feet) on 13th March and after three nights spent there, were able to complete observations at the station on the 16th. As had been expected snow conditions were exceptionally good, but continual clouds hindered the work and the identification of peaks was difficult. The night temperature at the top camp was 22°F. The base camp at Garagar which in summer

is a pleasant grassy spot, with clear pools and wild flowers and butterflies in profusion, was deep in snow. The chief cost of this climb was in the provision of wood for personnel and coolies at all camps.

In the next few days there were heavy falls of snow and the base camp at Shahjinali below Chapakhgār h.s. was not reached until the 25th. The last three miles to this camp proved very difficult for the coolies. They were waist deep in soft snow and all available personnel were employed in stamping a road for the kit. A second camp at 16,500 feet was established on the 27th at the foot of the glacier leading to the col below the summit.

On the 28th a start was made with ten light loads, and after a slow grind of three hours in soft snow some two-thirds of the way to the col had been covered. On closer inspection of the ridge from the col to the summit there seemed little chance of surmounting the several gendarmes which barred the way. It was therefore decided to strike off from the glacier up a couloir which led straight to the summit. The last five hundred feet were very steep but fortunately the snow here was firmer and a point on the main ridge about 200 feet below the summit was attained after some four hours. The route to the summit was now barred by three gendarmes some forty to fifty feet high and it proved impossible to traverse round these. It was decided to make the station at the point then reached, and by sending down all the sepoys they were able to get the loads up to the crest. Tents were erected by scraping out snow on a thirty degree slope just below the crest.

The next morning it was snowing and most of the sepoys were sick. The *jemadār* was suffering from severe frost-bite in his feet, so he and the sick men were sent down, leaving only two Chitrālis and Lieut. Burn's bearer Faqir Mohammad. The snow increased and by noon the route down had become impassable. The wood had been finished and there was no chance of getting up any more. Faqir Mohammad spent his time brewing tea and cocoa on the Primus and this helped to keep up the spirits of the party. The next morning the tents were half buried in snow but before sunrise a few observations were possible and after sunset by using the electrical illumination a few more rounds were observed. Intermittent snow fell and the cold was intense. The minimum temperature recorded was 17°F. The following day was the same and observations were again made before sunrise and after sunset. As soon as the sun got up the station was submerged in cloud. On the fourth day, the 2nd May, observations were completed in the early morning and leaving the kit, the party made the descent. The route was now covered in deep soft snow which while presenting little difficulty to the descent, made it extremely tiring and difficult for the coolies who were sent up to bring down the kit. By dint of sending up

about three times the number actually required aided by all the spare sepoys, the kit safely reached the 16,500 feet camp that evening.

After resting one day at Shost in the main valley the party left for Sanoghar, arriving there on the 8th May. Captain Coldstream with the surveyors from India arrived at Sanoghar on the 10th May, and computations had by that time been completed. The height of the station on Chapakhgār worked out at 19,043 feet.

Had it not been for the very excellent work of *Jemadār* Ashrar Khan and his sepoys this work could not have been completed to time. The *Jemadār* slowly recovered the use of his foot, but it was many weeks before he was able to march again.

3. Attempt on Istoro-Nal (Peak 24,271) and an account of some Local Superstitions.

In the course of triangulation in 1928, I had occasion to penetrate the Tirich glacier which is fed from the northern slopes of Tirich Mīr and from the southern slopes of the high peaks a few miles to the north. Second only to Tirich Mīr the biggest mountain mass in that neighbourhood consists of a horseshoe of peaks of over 24,000 feet three of which were fixed by triangulation. It has no local name, and we have therefore named it in the local dialect, Istoro-Nāl, "The Horseshoe".

While climbing from the glacier up the lower shale slopes of this massif, it appeared from a casual inspection that these peaks might be accessible to a properly equipped party. There was no time then for a full reconnaissance, but I was determined that if I should be sent to Chitrāl the following year that I would explore the possibilities of an attempt on one of them.

I was again sent to Chitrāl to finish the survey in 1929, and was fortunate in having enlisted the aid of Captain Culverwell, R.A. who had much experience of alpine climbing. He arrived in Sanoghar, my headquarter camp on the 1st July, bringing with him Major Dutton, R.A. The latter although not an experienced climber, had spent many months on trek at high altitudes and had marched at altitudes of 20,000 feet without discomfort. The fourth member of our party was Captain Coldstream, I.M.S. who was attached to the Chitrāl Camp both in 1928 and 1929.

The party left Sanoghar on 4th July, all arrangements having been made and stores and equipment for the high camps sorted and packed. On reaching Ataq (Bandok) village at the foot of the Tirich glacier, the first setback occurred. The coolies who the previous year had willingly taken my equipment on to the glacier and who came from the village of Kosht, refused flatly to

move a step in the direction of the glacier. It was impossible to compel them, and moreover with unwilling labour we would have had little chance of success. There was nothing for it but to send to the nearest villages in the sparsely populated Tirich *nāla*. By the time that the Tirich coolies had collected rations and reached Ataq much time had elapsed; it was the 9th before Culverwell could proceed on to the glacier for his reconnaissance. As more coolies arrived the rest of the party were able to proceed in dribblets. We had with us a trace of the season's plane-table on $\frac{3}{4}$-inch scale and the first route selected from this was reconnoitred by Culverwell and found to be impracticable. The head of the glacier by which we had hoped to reach the main ridge was hemmed in by a steep rocky wall. There was no time to waste on seeing whether this was climbable or not.

On the 17th Surveyor Sher Gul arrived on the glacier to have his work inspected and he was able to suggest a route from his previous knowledge of the area. Accordingly the Base Camp was moved up a third stage from Ataq and on the 18th Culverwell and I reached Camp 1 at 17,900 feet. On the 19th Culverwell with three Chitrālis reconnoitred the route for Camp 2. This route lay up a snow gully and struck the main ridge leading to peak 24,271 at an altitude of about 20,200 feet. Above this was a piece of difficult rock-climbing before the snow ridge could be reached. At least, one can consider this rock as difficult at that altitude, but Culverwell has since told me that it would be classed as "easy" in Switzerland. Owing to mist hanging over the ridge, Culverwell was unable to reach the top of the gully but had seen enough to convince him that it was practicable. Alternative routes on to the main ridge were examined through field glasses but offered no easier approach.

Accordingly on the 21st we set out for Camp 2 with fourteen loads of from 15 to 20 lb. each, which made up the total for Camps 2 and 3. These loads included a Wild theodolite and stand which it was decided to take with us. The coolies started in fine style and we ourselves reached the summit of the gully confident that the first step had been successful. Unfortunately, the coolies, although reasonably fit, had subsided in the snow about half-way up the gully and nothing would persuade them to make a further effort. At the summit of the gully a wonderful view was obtained; the north side of the ridge was found to be precipitous, with a slope of not less than seventy degrees in many places. Below lay a scarred and twisted glacier the northern branch of the Upper Tirich glacier.

Culverwell spent some two hours on the rocks above with one Chitrāli and had passed the most difficult pitches by the time it was necessary to return. We spent the next few days in reorganizing the coolies and succeeded in getting ten loads up to Camp 2,

as well as four loads of wood. Beyond there we would, of course, depend entirely on spirit. The weather had however broken and owing to the conditions at Camp 1 we had perforce to descend to the Base Camp after nine nights spent at 18,000 feet. We hoped against hope that the weather would clear in time to allow of a second attempt, but after several days' continuous rain and snow, Culverwell and Dutton were unable to stay longer and the attempt had to be abandoned. The coolies too, refused to stay on the glacier any longer.

The spirit of the Chitrālis which had without exception been at its lowest ebb, at once soared up on the order for returning being given. The party reached Sanoghar on the 31st July after an extremely interesting if unsuccessful effort.

We were surely defeated by the quiet non-co-operation of the Chitrālis and finally by the time factor aided by a bad break in the weather. This is not to say that we could have climbed the peak given better conditions; but at least on our first reaching the Camp 2, the outlook was rosy and we considered the chances were good. The last two thousand feet of the climb may present insuperable obstacles, or may be only honest plodding, but in my opinion, no one will climb the peak in the near future if he has to rely on Chitrāli help.

Like all hill people who only touch the fringe of civilization the Chitrāli is steeped in superstition. He peoples the mountains with malevolent fairies and the glaciers with strange monsters. Ruined houses and graveyards are the abode of *jinns* and spirits.

The home of the fairies is Tirich Mīr and on first seeing the great mountain it is easy to understand the strange fears and imaginings of this childlike people. High up on the slopes of Tirich Mīr exists a marble-lined tank in which the fairies bathe, and it would be certain death for anyone fool-hardy enough to approach it. Strangely enough one may visit with impunity a pool quite low on the approaches of Tirich Mīr above Ojar, where the fairies come to wash their clothes, for the one attribute of the fairies, on which all are agreed, is their scrupulous insistence on cleanliness. After some months in the country we were approached by the escort *Jemadār*, who said that while he had not liked to say so before, we were extremely foolish to keep so many dirty coolies at high Camps if we wanted fine weather for our observations. The filthy clothes of those coolies apparently incensed the fairies and we were very lucky that they did not show their resentment in any more marked way than by sending clouds and snow to induce us to descend. Doubtless their clemency was due to the presence of a white man, for being white-skinned themselves, they were known to have a preference for sahibs. He himself was always careful to wear clean clothes before a high climb.

The writer took the *Jemadār's* advice and after four days of snow the weather changed to bright sunshine the day after the coolies were sent down, and the work was soon completed. I was pleased, the *Jemadār* was pleased, and the coolies no doubt were the most pleased of all.

There is a quaint superstition about the Thui Pass which is a fairly difficult route from Yārkhūn to the Yāsīn valley in Gilgit. If any one is killed while attempting to cross this pass, there will be clouds on the pass for three days which is the time taken for his spirit to reach heaven. This was well borne out last year when a member of our party was camped in the neighbourhood. A Gilgiti lost his life on the pass; he fell into a crevasse and was killed instantly. Sure enough on the fourth day the clouds lifted and perfect weather ensued.

The fairies are popularly credited with rolling rocks on to any one who approaches their fastnesses and they have even gone so far as deliberately to dislodge a man's hands from a rock and thus precipitate him to a fearful death below. This must have been the fate of the one or two hardier Chitrālis who have been lost to the ken of man since venturing on the peaks surrounding Tirich Mīr.

Small wonder is it that our Chitrālis gave us less than half-hearted support in our attempt on a peak in the heart of the fairy kingdom. Even the *Jemadār* who had proved himself a tower of strength on lesser peaks and who was a born climber, himself discouraged the coolies from helping the sahibs in their mad attempt. One cannot blame him. In his implicit belief that we would all go to our deaths through a supernatural agency, he was merely doing his duty in thwarting our efforts by fair means or foul.

On a previous occasion a coolie was lost in the jumble of moraine on a big glacier. When the writer gave orders for a search party to be formed, the *Jemadār* pointed out that a search would in all probability be useless, as the man had almost certainly been devoured by a glacier dragon. While no word exists in Chitrāli for dragon his description was quite clear. He himself with some twenty coolies had seen one day or two previously. It had reared its head and neck from a crevasse and given them a nasty look, whereupon they had incontinently fled. It was useless to use his rifle as the brute was encased in hard scales which as every one knew no bullet could pierce. Its head was something like that of a horse and he would estimate the length of the whole monster to be about twenty feet. He did not notice whether it had wings, nor apparently did it breathe fire. Doubtless this breed is peculiar to Chitrāl. Failing the older coolies it is difficult to imagine what these brutes exist on, but perhaps, as the *Jemadār*

suggested, they eat stones. The coolie eventually turned up with his load which fortunately for him consisted of blankets and a 20 lb. tent.

The glacier frog which the writer believes to exist, has been seen by many *shikāris* and others who have had occasion to visit the higher moraines. A modest estimate of its size from the evidence of these witnesses would be about twelve inches long.

Finally there are the *jinns* who though much more in evidence in the olden days before the British rāj, may be said to die a hard death. They choose old deserted dwellings to live in, the larger the dwelling, the larger the *jinn* that may be expected to emerge. They have a disconcerting habit of assuming the guise of a dog or a cow until they are within a few feet of the unsuspecting traveller. They then disclose their frightful reality and the unfortunate who gets away with a withered arm or a mouth twisted almost to the back of his head, is indeed lucky. Many become hopeless idiots for the rest of their lives.

In the course of two years' work in Chitrāl the above are the only authentic superstitions with which the writer has come in contact. Doubtless there are many more and the whole subject would well repay a detailed study.

Details of stores, equipment and arrangements for the climb.

Stores.

The arrangement of stores was worked out on the following assumptions. Above the base camp on the main glacier would be three camps, of which Camp 1 was to be as comfortable as possible and contain a *khansamah.* There would be no difficulty in getting up to forty loads to this camp. It would be about 18,000 feet. Camp 2 and Camp 3 would have to be very light and while a few coolies might be able to provision Camp 2 we would have to rely on the climbers for Camp 3. The idea was to equip Camps 2 and 3 and then retire to the base camp and, awaiting a fine spell to have a five days' dash to the top.

Stores for Camps 2 and 3 were packed up at Sanoghar into approximately 20 lb. loads as under:

Camp 2

8 men for 4 nights. Indians to bring *chapatis* and cooked meat in addition.

Total 2 loads

- Primus, large, filled with petrol.
- 2 pints petrol in bottles, screw-stoppered tins would have been better.
- 2 lb. jam.
- 2 lb. tea.
- 3 lb. tate sugar.
- 2 lb. granular sugar.
- 18½ lb. slabs chocolates.
- 1 lb. cocoa.
- 3 tins vita-wheat. A very good stand-by at heights.
- 2 lb. butter.
- 2 bottles whiskey.
- 1 tin tongue.
- 6 tins sausages.
- 1 kettle.
- 6 dozen boxes of matches.

Camp 3

6 men for 2 nights (2 B.O's, 4 Chitrālis). Chitrālis to bring *chapatis* and cooked meat in addition.

Total 1 load

- 1 dozen sterno canned heat.
- 1 baby Primus and ½ pint tin of petrol.
- 1 lb. tea.
- 2 lb. tate sugar.
- 12½ lb. slabs chocolates.
- ½ lb. cocoa.
- 2 tins vita-wheat.
- 1 lb. butter.
- 1 tin tongue.
- 2 tins sausages.
- 3 tins condensed milk.
- 2 lb. jam.
- 1 kettle.
- 18 boxes of matches.

The above stores were not to be touched while provisioning the camps.

As regards the stores for the lower camps, we were not tied down to weight and were able to provide a good variety of tinned foods. In addition we took with us 7 sheep which were kept in cold storage in the side of the glacier.

Equipment.

The following equipment was set aside for Camps 2 and 3.

Camp 2

4 20 lb. tents.
8 waterproof sheets.
16 blankets.

Camp 3

2 Mummery tents.
1 "P" tent (for Chitrālis).
2 waterproof sheets.
6 blankets.

With the above stores and equipment ready placed, the climbers would have only instruments and extra warm clothing to carry.

The tentage at Camp 1 was as follows:

1 60 lb. shouldari, sleeping 2 B.O's.
1 „ „ „ Mess tent.
2 „ „ „ 8 Chitrāli climbers.
1 60 lb. tent, cook and servants.
5 20 lb. tents for coolies who would also occupy any of above 60 lb. tents that might be vacant.

The following complete the list of equipment with the party:

4 120 lb. double-fly tents.
2 60 lb. tents.
6 tarpaulins.
6 ice-axes.
2 old ice-axes for general work about camps.
1 shovel.
1 pick axe.
2 felling axes.
1 tool box.
40 pairs dark glasses.
20 pairs gloves woollen and canvas.
4 alpine ropes.
Miscellaneous country ropes.
100 blankets for coolies.
Survey equipment.

In addition the climbing Chitrālis were equipped with boots, warm *pyjamas*, jerseys, and two blankets each.

More tents would have been an advantage for the coolies and at least 20 pairs of boots should have been reserved for the stronger coolies in snow.

General.

Wood for all parties was brought from a birch jungle at the foot of the Tirich Glacier. To maintain all camps forty coolies were necessary for this work alone.

Each coolie required some 50 lb. of *ata* for the duration of the climb.

The total cost of coolies from Sanoghar to Sanoghar was Rs. 1,095. The cost of messing per member was Rs. 150.

A summary of the weather conditions for the period 4th to 31st July is as follows:

Clear days	6
Low clouds and mist	10
Rainy or snowy days	12

At that season of the year night temperatures may be expected as under:

15,000 feet	30	degrees F.
18,000 feet	20	„ F.
20,000 feet	15	„ F.

For a European four blankets and a coat would be sufficient for comfort at 18,000 feet.

Loose suits of Everest cloth were found a great boon to the climbers.

4. Equipment.

For work at similar altitudes the following lists of equipment are recommended. These lists are the result of three years' experience of triangulation and plane-tabling in Chitrāl.

1. *Triangulation party of one B.O., four khalāsis and 15 Chitrālis.*

Alcohol, pure	4 ozs.
Axe, American	1
Axes, hand	2
Axes, pick	2
Balance, spring, 200 lb.	1
Balance, spring, 25 lb.	1
Balance, country with weights to 2 seers	1
Box, cash, tin	1
Box, cash, wooden	1
Blankets	100 (for coolies)

Buckets, zinc	2	
Chisels, cold	2	
Gloves, canvas, pairs	10	(to be issued for climbs)
Gloves, woollen, pairs	10	(to be issued for climbs)
Ground sheets	20	
Hammers, iron	7	
Haversacks	4	
Ice-axes	8	(these should be of European make and kept sharp)
Lanterns, hurricane	2	
Medicine box, Survey pattern	1	(see note below)
Medicine chest, S.O. pattern	1	(see note below)
Mallets, wooden	2	
Padlock, Yale for cash	1	
Padlocks, ordinary	4	
Phāora	1	
Rope, alpine, 80 feet	1	
Rope, alpine, 70 feet	1	
Ropes, Hemp, country, new, 60 feet	4	
Rucksacks	3	
Scissors, pair	1	
Seal, brass	1	
Seccotine, tubes	4	
Sewing machine, oil	1	
Spade	1	
Tarpaulins, 8 by 12	4	
Thumb Impression outfits	2	
Tool-box	1	(see note below)
Trunks, mule	3	(3′ × 1′8″ × 1′8″ is a good size)
Water bottles	10	

Tentage

F Tent	1	
J Tents (shouldaris)	6	
P Tents, 20 lb.	4	
Mummery tent. 10 lb.	1	(with sewn in ground sheet)

Khalāsis will be clothed on "Himālayan" scale. Chitrāli sepoys should be supplied with the following clothing:

Jersey, warm	1
Pyjama, warm	1
Blankets	2
Boots, pairs	2

Notes.

(*a*) Medicine Chests, S.O. pattern. The general construction is not suitable for pack transport. The boxes are not strong. The bottles have to be kept in place by tow packing. The supply of drugs is adequate. Spirituous liquids such as Tincture of Iodine must be in bottles with *corks*.

The surveyors' boxes should include the following:

Cocaine and zinc sulphate solution, for snow blindness.

Oil of cloves for toothache.

1 pint of castor oil.

Additional Iodine.

If a doctor accompanies the party he should bring with him sufficient surgical instruments for the performance of any emergency operation. If a Sub Asstt. Surgeon only is taken, then he must be in possession of his pocket instrument case.

If no medical personnel is available, it would be as well to take the following instruments:

1 Scalpel or surgical knife.

2 needles for skin suture.

Moore's Family Medicine or some similar book.

(*b*) The following tools are recommended for inclusion in the tool-box:

Hammers Claw	1
Hand saw 16″	1
Tenon saw 10″	1
Pliers, side-cutting	1
Pliers, round nose	1
Chisel 1″ with handle	1
Chisel $\frac{1}{2}$″ with handle	1
Chisel $\frac{3}{8}$″ with handle	1
Screw-driver, large	1
Screw-driver, small	1
Tools, pad, universal carpenter's, in handle	1
File, flat 5″	1
do. round 6″	1
do. square 6″	1
do. knife edge 4″	1
do. round 8″	1
do. 3 cornered 4″	1
do. flat 8″	1
Plane, metal 9″	1

(*b*) Tools etc.—(*Continued*).

Gimlet $\frac{1}{8}''$	1
Gimlet $\frac{3}{8}''$	1
Gimlet $\frac{1}{4}''$	1
Hone, carpenter's	1
Twist drill with drills $\frac{1}{32}$ to $\frac{5}{32}''$	1
Hand vice	1

(*c*) Yakhdans of the size recommended were found more useful than the long type with trays, usually provided.

(*d*) Ground sheets made of waterproof canvas 6 feet by 3 feet were found very satisfactory in place of waterproof cape ground sheets.

2. *Plane-tabling Camp.*

The list of triangulation equipment can be modified for the Camp Officer.

Equipment for one surveyor.

Axe, hand	1	
Balance, country with weights to 2 seers	1	
Blankets, for coolies	10	
Bucket, zinc	1	
Haversack, waterproof	1	
Gloves, canvas	3	
Gloves, woollen	3	
Ground sheets	4	
Ice-axe	1	
Lantern, hurricane	1	
Medicine, box, Surveyor's	1	
Padlock, ordinary	1	
Phāora	1	
Rope, alpine 60 feet	1	(if necessary)
Rope, Hemp, new 60 feet	1	
Thumb impression outfit	1	
Trunk, mule	1	
Water bottles	2	
Rucksack	1	

Tentage

F Tent	1
J Tent (shouldari)	1
P Tent, 20 lb.	1

The surveyors' *khalāsis* and escort sepoys will be clothed as in the triangulation party.

The second pair of boots of both *khalāsis* and sepoys should be pooled at headquarter and only issued as necessary.

5. Organization.

Khalāsis from India are not suitable for work at high altitudes and the majority of the work was done by sepoys of H. H. the Mehtar Sahib's bodyguard. These men were exceptionally good if led by a reliable *Jemadār*. Once they had conquered their first aversion to climbing in snow they worked well under trying conditions.

The Chitrāli is a tireless and natural climber but few if any were of much use at an altitude of over 18,000 feet.

The following scales of pay were arranged :

Jemadār	Rs. 40/- p.m.
Havildār	Rs. 30/- p.m.
Naik	Rs. 25/- p.m.
Sepoy	Rs. 20/- p.m.

With a triangulation squad the following organization was adopted.

Indians
- 1 Tindal, responsible for stores and equipment.
- 1 Khalāsi, assistant to above.
- 1 Khalāsi, to help with the officers' kit.
- 1 Khalāsi, tradesman, carpenter and boot repairer.

Chitrālis
- 1 Jemadār, responsible for all arrangements as regards climbs and marches and all arrangements with local people as regards supply of rations and coolies.
- 1 Havildār
- 2 Naiks
- 15 Sepoys, some of these were used on dāk duties, the remainder took alternative reliefs on climbs.

In addition a local *shikāri* may sometimes be necessary as guide.

A surveyor would require two *khalāsis* and three sepoys. It was found that it was best to recruit local men from the area in which the surveyor was working.

Every assistance was rendered by H. H. the Mehtar Sahib of Chitrāl and his officials. Each important village is in the charge of a "Charvelu" assisted by one or more "Charbus". These men draw a small reward from Government for the work involved in making arrangements for any officer travelling through the country. In practice it was necessary to augment this reward for the more important villages. With a few exceptions these men were willing and assisted the party in every way they could.

6. Climate.

The best month for high climbing is undoubtedly April, when the winter snow is hard and has not had time to melt very much. Ascents may then be made by kicking steps in the snow, whereas in later months a similar ascent would involve long and arduous step-cutting. There is also little fear of heavy avalanches in April. As opposed to this, it is then extremely cold at heights and climbs become very expensive owing to the quantities of fuel necessary. May and June are not good, as the winter snow is still melting off the hills, and probably the next best month is July. Temperatures even at 20,000 feet are moderate and the snow is at its minimum, but one is very likely to come up against ice stretches which through alternate thawing and freezing have become so hard as to make step-cutting almost impracticable. At this season, it is as well to be beware of trusting to new snow as the old surface underneath provides little key for the new snow and the whole is liable to avalanche.

It appears to be impossible to predict the probabilities of good weather in any particular month. Below is given an approximate table of weather conditions for 1929. In 1928 July was quite clear and September was a cloudy month interspersed with many snowstorms.

Weather conditions, 1929

Month	Clear days	Cloudy days	Snowy days	Total
March	...	5	...	5
April	5	17	8	30
May	11	13	7	31
June	24	6	...	30
July	8	11	12	31
August	11	14	6	31
September	23	7	...	30
Total	82	73	33	188

For plane-tabling only five months can be relied on and a sufficient allowance for wet days should be made in allotting areas. October is really too cold for surveyors, though work at moderate heights can be done if necessary. It should be borne in mind that the correct depiction of snow features is very difficult before the winter snow has melted and also after the first snows in autumn.

7. Triangulation in Gilgit Agency, 1929. (*Sheets 42 D, H; 43 A, E*).

BY MR. P. A. THOMAS, E.A.S.

The area triangulated comprises the districts of Kuh Ghizar and Yāsīn and the semi-independent territories of Tangir and Darel. It is bounded on the north and west by the main watershed forming the Chitrāl-Gilgit boundary, on the east by the high range between the Yāsīn and Ashkumān valleys, and on the south by the Indus river and eastern border of Swāt Kohistān.

The main series is wholly in Gilgit territory, first on either side of the main Ghizar valley until connection is made with the minor Gilgit series of 1879–1881 by Col. H.B. Tanner at the station named Gakuch Roshan. Thence with a right angle it continues up on either side of the Yāsīn valley, connecting by intersection with three stations of the Chitrāl series of 1928 by Mr. Chiragh Shah, on the southern boundary of the narrow tongue of north-eastern Chitrāl. An extension was made southwards to the northern borders of Tangir and Darel from where points were thrown into the area north of the Indus river. The series emanates from the base Dodargaz–Minga Gol of the minor triangulation in Chitrāl of 1928 by Lieut. D. M. Burn, R.E.

An attempt, early in April to cross the Chamarkand Pass and so visit Dodargaz h.s. was unsuccessful; this necessitated a return and detour to the village of Laspur via the Laspur valley, whence the first attempt to visit Minga Gol h.s. (17,902) was frustrated by bad weather but the second, a few days later, was successful. Camp was pitched in the valley to the west immediately below the station at about 12,000 feet. The day of the ascent turned out very dull and cloudy, so men were sent down for small tents and other accessaries and camp pitched on the only available spot on a minor ridge at about 17,500 feet. The thermometer fell to 28° F. and no sleep could be had during the night and, due to not yet being acclimatized, considerable inconvenience due to shortness of breath was experienced. The next day dawned bright and clear and, remaining so, enabled observations to be successfully completed.

When the Shandur Pass was crossed the lake was still frozen, the telegraph poles marking the track over two feet of snow on the ground. The next station visited was Dodargaz (17,625) the other end of the base. Camp was taken up and pitched at the head of the Chamarkand *nāla* to the south-west of the station, during a snow-storm and on 15 feet of snow. The ascent is only possible from the south where a snow slope leads up to a col whence there is a short rock climb to the top. Observations were completed on the following day.

From these base stations three hills were observed to, as alternative prospective stations, to safeguard against the possibility of one or two of them being unclimbable. One (of height 19,500 feet) to the north of the Ghizar river and two to the south. An attempt to climb the first was unsuccessful and the station made on the northern and lower (17,759) of the latter two, overlooking the fairly large plain of Ghizar. For this station camp was pitched as far as possible up the first large *nāla* on the left bank of the Barkulti *nāla* to the south of the station. Extremely bad weather prevented observations on the first climb and held up work for a week, and when eventually they were completed the day was none too good.

For the purpose of points, a resection station was made on a hill at the head of the Zhozhat *nāla*, but being low and not isolated, the view to the north and east was considerably blocked, and its purpose not too well served.

The next station of the series is a snow peak (16,964) on the ridge between the Sosat and Balti *nālas*. Main camp was left at Tangai on the right bank of the Ghizar River and a small camp taken up as far as possible along a minor stream to the north of the station from where the ascent seemed possible, but an attempt proved a failure. It was observed that the east offered no route, so camp was taken up along the Sosat *nāla* to the west, from where the ascent is extremely easy, being a gradual slope of first loose rock and then snow right to the top. View to the immediate south was blocked, the continuation of the ridge being higher. From this station Gakuch Roshan was picked up and observed to, the original cairn being still existent.

A high hill to the north of the Gupis Pass on the ridge between the Balti and Gupis *nālas* was the next intended station, but was approached from the east from which side it is unclimbable, and as a further attempt from the west would have necessitated a considerable detour it was left and a neighbouring lower hill (16,380) climbed and observed from as a subsidiary station, the main series being connected up to Gakuch Roshan.

Gakuch Roshan h.s. was the next station visited and climbed from the west from a very suitable camping ground, in the valley on that side immediately below. It is an easy hill and accessible from all sides except perhaps from the north. The original mark, a circle and dot on stone, was reoccupied but found with some difficulty as the stones comprising the lower part of the cairn were stuck together by solid ice. Though the hill is not high (16,847) an extensive view is obtainable in all directions as it is more or less isolated. Observations for time and azimuth from Polaris were taken two months later.

The series now turns northwards with a station on a high peak (18,212 feet), the southern and higher of two to the east of Gindai village in the Yāsīn valley. This is a difficult hill to climb and should only be approached from the south-west. An attempt was made from the west, but camp having been left too low down by the time the route from the south-west was discovered it was rather late, and the day also having become dull and cloudy, it was realized that observations would not be successfully accomplished in time to ensure a safe return to camp before nightfall. Earlier in the day camp was signalled and directed to move into the valley below on the SW. side, by which route the return was intended, but by some misunderstanding was pitched somewhere else and missed, so the night had to be spent without food or blankets in a crude shelter erected with stones. Camp was found the next day and taken up the day following to a suitable spot higher up on the SW. route from where the ascent was made and observations completed. The top of the hill consisted of a long cornice, and the legs of the theodolite had to be rested on the heads of three local *khud* sticks driven as far as possible into the snow which served the purpose admirably. A temporary mark consisting of a wooden stake 3 feet long was driven in flush with the top of the snow.

The next station was a peak, the highest point of the ridge between the Nasbur and Thui *nālas* to the west of Yāsīn proper. It is not a difficult hill nor very high (16,947), but has the advantage of being isolated with an extensive view all round. The ascent was first attempted from the east but an almost perpendicular ice cliff on the last 500 feet off the ridge on that side prevented further progress. The best route is by the SW. where after a short rock climb, a snow couloir is the shortest way up, though there is considerable danger from falling stones. This leads up to a col after which another short rock climb brings one to the top.

The third station in the Yāsīn district is the southern of two high peaks (18,566) south of the Darkot Pass and east of the village of Amalchat. This is a very difficult hill and offers perhaps only one route to the top. Two camps were established on the way from the main valley, the second at about 16,500 feet on a minor ridge to the SW. but some distance from the station. Though only 2,000 feet had to be climbed, the difficulty of finding a route involved considerable delay the whole climb occupying 5 hours. After ascending to the main ridge and continuing along it for a short way, further progress was barred by a sudden drop to a col and an impossible and forbidding precipice on the other side, so a descent was made below the col and by traversing along the base of the cliffs, they were avoided. This was a somewhat difficult bit consisting of soft snow on ice and with a considerable slope to the edge of a precipitous drop, where a slip would have entailed serious consequences. Rounding a further succession of rock and snow

slopes, up which several attempts were made to gain the ridge, a snow slope was found further on which led eventually to the summit. There being snow about 15 feet deep on top a repetition of the method used previously for maintaining the stability of the instrument, was necessary. No permanent marking of the station was possible. From this and the station last visited the series was connected with that of Mr. Chiragh Shah of 1928, by intersection of three stations.

To ensure a sufficiency of points for the detail survey of sheet 43 E, it was necessary to throw points into the northern half of the sheet there being sufficient already in the southern portion. This area comprises the semi-independent territories of Tangir and Darel, and as these tribes are inclined to be hostile, the provision of an armed guard was necessary, and consisted of 1 section of 20 men of the Kuh Company of Gilgit Scouts. No trouble was encountered however and the work completed successfully and quickly, due largely to the good weather at the time. Points were thrown into the area north of the Indus valley from two stations, one on the northern boundary of Tangir and the other on the main watershed north of Darel. The first station visited is on the highest point of the ridge at the head of the Sheobat *nāla* and about 2 miles west of the pass of that name leading to Tangir. The hill is not high or difficult, but is best approached and climbed from the NE. up a spur on that side. The other station is the highest point of the ridge between the Kutroparao and Dobo Gah *nālas*. It is best approached from the west along a minor stream on that side, whence the ascent to the ridge north of the station is easy.

At the beginning of the series in the Ghizar area, due to the intricate nature of the country, the inexperience of the triangulator in observing without a preliminary reconnaissance, and the bad weather met with, points obtained were not numerous, but proved adequate for the detail survey which was carried out later during the same season. Later on as the country opened out more, it is well covered, especially the Yāsīn district, the identification of points becoming easier.

Weather. Unless it was an unusual year the weather proved distinctly unreliable for survey work. It was seldom that two consecutive days were alike, and when good the weather could not be depended upon to hold. The best months were June, July and September, the last being the best and August the worst. The temporary winter snow completely disappeared by the end of July as also a considerable fall during the bad periods of August which was confined to the hills and higher valleys, but a heavy fall in mid-October lingered and heralded the approach of winter. June and July were uncomfortably warm for travel in the lower valleys.

Health. Beyond an occasional attack of snow-blindness and one of frost-bite, health was very good, so also that of the whole

triangulation party. A Sub Asstt. Surgeon accompanied the party for a short period, after which the Civil Dispensary at Gupis proved handy for the few minor ailments.

Supplies. Very few supplies were obtainable locally and Gilgit is not very well stocked with European necessaries. Occasional indents were made on the I.A.S.C. store at Gupis, but the bulk of provisions were brought from India and relied on mostly. Meat, eggs and milk can always be obtained, and fruit in abundance, with vegetables during the season.

Escorts. As the work comprised four districts, four separate escorts were required. The first from Chitrāl were capable and willing and worked satisfactorily. The second from the Ghizar district, on the other hand were rather unsatisfactory and with a few exceptions not at all helpful, due probably to there being only a *havildār* in charge. The Yāsīn party formed the third and proved capable, and being better mountaineers were more suited to the work required of them. The fourth escort was armed, and accompanied the party to the borders of Tangir and Darel, and worked well; their duties included the ascents of hills as well as camp protection.

Khalāsis. Five Punjabi *khalāsis* accompanied the party from India, but they were too many for the very little work required of them; this number was later reduced to two, which proved ample.

Appendix II

NOTES ON THE DISEASES MET WITH DURING SIX MONTHS IN NORTHERN CHITRAL

BY CAPTAIN W.A.J. COLDSTREAM, I.M.S.

Medical officer attached to the Triangulation Camp in Chitrāl, 1928.

In the area of northern Chitrāl in which we were working the following diseases were met with in the inhabitants.

Simple Goitre. As might be expected goitres of various sizes are extremely common in this valley. They appeared to be most common in the main valley between Chitrāl and Mastūj and were markedly less common in the Turikho and Yārkhūn valley. In Koghozi, Maroi and Buni approximately half the adult population appeared to show some degree of goitre. Locally goitre is ascribed to dirt.

Cretinism. Only two typical cretins were seen. Cretinism is probably fairly common but I imagine that few of the cretinous children survive.

Malaria. Only two cases of benign tertian malaria were met with—both occurring at Warsam. From reports malaria seems to be commoner in south Chitrāl but in the area in which we were working it appears to be rare. No fresh cases of malaria occurred among our own men during the six months and there was only one relapse. A spleen rate taken among the children in Mastūj gave a normal healthy figure. Potential fever-bearing mosquitoes were found in very small number (less than 1%) at Buni, Koghozi, Ishtah and Warkhub. I did not find them elsewhere.

Sand-fly fever. I did not come across a single case of sand-fly fever either in the natives or among our own men, though it is apparently very common in south Chitrāl and especially at Drosh among the Indian troops. Sand-flies were found throughout the Chitrāl Mastūj valley as far north as Brep and in the Turikho valley as far north as Lukut.

Relapsing fever. A mild louse-borne relapsing fever occurs in south Chitrāl and I saw cases at Drosh, but none in our area. Though fleas were common I can only remember one native whom I examined being lousy.

Leprosy. A few cases of active leprosy were seen in the Yārkhūn valley at Shost and one at Mastūj. The natives say that the disease is confined to a small portion of the valley around Shost.

Smallpox. Though we did not meet with any smallpox, about one in fifteen of the adult population in our area was pitted, due apparently to a severe epidemic which we were told, had occurred a few years ago.

Syphilis. Only two cases of clinical syphilis were met with, one exhibiting a secondary syphilitic throat and the other aortic valvular disease.

Tuberculosis. Three cases of clinical tuberculosis were met with, one a pulmonary case in an adult and the other two apparently *tabes mesenterica* in children.

Rickets. A single case of mild rickets was seen in a child two years old.

Eye diseases. Trachoma, chronic blepharitis, and conjunctivitis both acute and chronic were common. These are possibly ascribable to the fact that the natives in winter spend a large part of the day closely shut up in their houses sitting over smoky fires. Cataract, corneal ulcers, iritis etc., appeared to occur with about the same frequency as in the Punjab.

Teeth. There was a considerable amount of soft dental caries in the natives but little pyorrhea or gingivitis.

Ailments occurring in 'A' Company personnel.

Pneumonia. We were fortunate in only having three cases of pneumonia, of which one proved fatal.

Mountain sickness. Though mild mountain sickness involving a headache, lack of appetite, and marked lassitude was almost invariable at altitudes above 17,500 feet we only had three or four cases of more marked sickness and in these cases exposure appeared to play almost as big a part as altitude in precipitating the collapse. As the parties became used to working at altitudes i.e., towards the end of the tour—the discomfort due to height became appreciably less. We noticed that our blood pressure readings became markedly increased at altitudes, registering in some cases, over 170 mm. of mercury.

Frost-bite. A few mild cases of frost-bite occurred.

Accidents. Only one bad accident occurred, a coolie falling down a crevasse in a glacier and sustaining compound fractures of the skull and jaw.

Other ailments were all minor in character such as coryza, one-day fever due to exposure and overwork, furuncles etc.

APPENDIX III

REPORT ON THE SURVEY OF KAGAN

Summer Season 1930

Plane-tabling. The detail survey of 683 square miles of the Kāgān valley, Hazāra district, was completed on the 1½-inch scale. In addition 162 square miles of Chilās on the ⅜-inch scale, and 463 square miles of supplementary work in the adjoining Muzaffarābād district of Kashmīr, on the 1½-inch and 1-inch scales, were carried out with the object of completing to edge all the 1-inch sheets containing areas of Kāgān. It was hoped that Allāi and part of Jalkot (Indus Kohistān) would be surveyed so as to complete sheets 43 F/1, 5 and 9 and 43 E/16, but repercussions of the political situation in India among the tribes, rendered this impossible. Mr. Muhammad Akbar, S.A.S. who did the ⅜-inch survey of Chilās in 43 E/16 and I/4 was not allowed on the boundary ridge between Chilās and Jalkot and was eventually ordered to stop work by the Assistant Political Agent, Chilās, on account of the menacing attitude of the Jalkotis. The situation was further complicated by the raising of the embargo on the export of the *kuth* root from Hazāra district in the preceding year. This resulted in constant raids throughout the summer by Jalkotis into Kashmīr territory where this shrub is prevalent. The raiders followed two or three well-defined routes across the Kāgān valley and had several encounters with the Kashmīr troops who were brought over to oppose them. The root sells for about Rs. 250/- a maund, it is used for incense in Buddhist shrines throughout the East. These raiders also took toll of passing caravans in the Kāgān valley.

Forest surveys. The surveyors were provided with 1½-inch reductions of the 4-inch forest maps. These were transferred to the plane-table sections in the field, by adjustment to fixings on the boundaries. Supplementary detail and corrections were inserted on the spot.

The camp was in charge of Mr. A. A. Graham assisted by Mr. Muhammad Akbar, with Lieut. R. H. Sams, R.E. under instruction and six surveyors. The triangulation had been carried out by Lieut. Angwin, R.E. in the summer of 1926. Mr. Muhammad Akbar joined up Lieut. Angwin's triangulation with Zinghi Shish H.S. of the Gilgit Principal series of 1909–11 by observations at Zinghi Shish H.S. and Kotawāi h.s. He was to have fixed some points north of Kāgān in Chilās and Kohistān for future ⅜-inch survey, but bad weather and tribal restlessness frustrated this. There are actually sufficient points existing, but it was hoped to add a few more.

Description of country. The Kāgān valley is about 70 miles long with an average width of 15 miles, running north-east to south-west and is wedged in between Kashmīr on the east and tribal territory on the west, and separated from these by mountains 15,000 to 17,000 feet. It is the northernmost part of British India. The lower portions of the valley and side branches are well wooded up to 9,000 feet. The whole valley is steep, rocky and difficult except near the head where it opens out into gentle slopes. The snowline falls below the higher peaks on the boundaries of the valley, viz., about 16,000 giving rise to a number of small glaciers of which the bigger descend to about 12,000 or 12,500 feet. The higher peaks are difficult to climb. Mali-ka-Parbat, the highest peak of the valley is 17,370 feet.

Transport. Mules can be used, during normal years, along the main track over the Babusar Pass and up certain side valleys for five months during the year, from June to October. The main mule path is repaired annually by the P.W.D. in May and June. Before repairs, it is in many places difficult or impossible to negotiate with pack transport owing to damage by avalanches during the winter. It is one of main routes into Gilgit and Chinese Turkistān and many thousands of mules pass to and fro during the summer. Mules must be brought up from Balakot, as none are to be had locally. Up the majority of the side valleys coolies are the only means of transport, and are very difficult to procure, little or no help was given by the Kāgān *lambardārs* and as the inhabitants mostly live in isolated homesteads built on the land they cultivate, it takes time to collect enough coolies for the needs of surveyors. In the upper portion of the side valleys, nomad *gujars* are the only source of coolie supply. Families occupy the same stone shelters each year. They arrive in June and begin their exodus about the middle of September.

Supplies. The only supplies procurable locally are sheep, fowls and eggs, and in the lower parts of the valley *ghi* and potatoes. *Ata* for *khalāsis* had to be brought up from Balakot. Fully furnished rest-houses exist at each stage along the main route. A supply contractor is located at each stage. His assistance is to be avoided, as his prices are considerably in excess of those current in the local villages. The last two rest-houses in the valley, at Besal and Gittidas are no longer maintained as it was found that the wood work of doors, stairs, and shutters was removed each year and used for fuel by the first of the passing caravans. The buildings still stand and were used this year by the local levies which were specially raised for protection against the Jalkotis. The bridges at Gittidas and Besal are dismantled and buried each year by the P.W.D. at the close of the season to prevent their being used for fuel. The tree line is at about 11,000 feet and the northern limit of fuel in the main valley is about 3 miles south of Besal. The supply in the upper valleys is being rapidly decreased by the *gujars*.

Weather. The weather through the summer (1930) was unsettled, and retarded the work to a great extent, the only fine spell of any length and that of only three weeks was during July, when the snow began to melt very rapidly resulting in a daily flood in the Kunar river which washed away most of the local bridges. Early in September snow started falling at 11,000 and above.

Scale of clothing. The scale issued to *khalāsis* was:

Blankets	2
Coats, warm	1
Pyjama, warm	1
Jersey	1
Pagri	1
Pattis	1 pair
Boots	1 pair

Surveyors require specially strong boots. All boots should be nailed. Ice-axes and alpine ropes were supplied to each surveyor but are not really necessary for plane-tablers.

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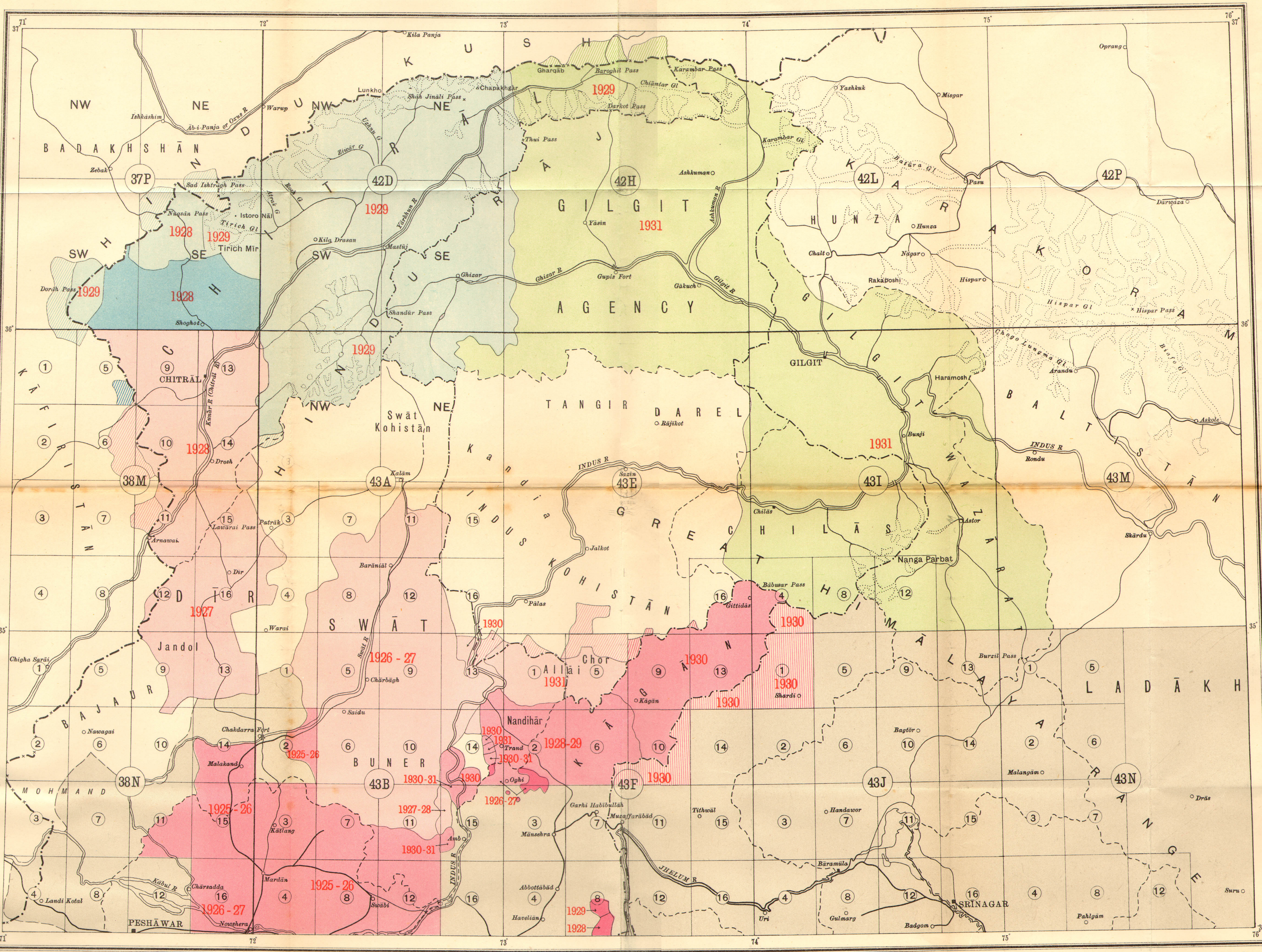
SURVEYS IN SWĀT, CHITRĀL, GILGIT AND NEIGHBOURING TERRITORIES

"A" Company, 1925 to 1931



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Helio S. I. O. Dehra Dun

Scale $\frac{1}{1{,}000{,}000}$ or 1·014 Inches to 16 Miles

Miles 10 5 0 10 20 30 40 Miles

Scales of Survey.

Previous surveys.				
Original survey.	3/8	inch		Sketch
Do.	1/2	Do.		Sketch
Do.	3/4	Do.		Sketch

Scales of Survey.

Original survey.	1	inch		Sketch
Original & revision survey.	1 1/2	Do.		Sketch
Supplementary survey.	1 & 1 1/2	Do.		
Original survey.	4	Do.		