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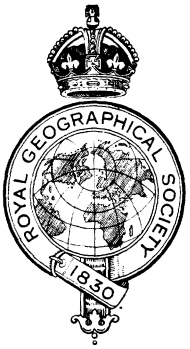

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MAPS.

It is a curious continent of apparent contradictions. Any one can traverse the continent east to west or north to south by the recognized trade routes, with some discomfort, perhaps, but with no great risk. Yet within 15 leagues of Sta Cruz, the capital of a province, and close to a main trail, are hostile savages in the stone age, who necessitate half a dozen small garrisons for the protection of the traveller. Within 3 leagues of the much-navigated upper Mamore, on the Lake of Cusi, is a tribe of over (reputed) a thousand hostile Indians, quite unapproachable. The right bank of the lower Mamore, near the confluence of the Itenes, is closed by savages to all but a large force. The river Heath, an international boundary river, successfully defied the entry of boundary commissions. The Parecis Indians near Matto Grosso city may be entered with impunity by the white man, but are deadly enemies of the negro. They, however, are renegades from civilization. The populations of the Northern Chaco are little known, and difficult to visit.

Brutality has alienated some of the tribes. Only lately the "kultur" of a Peruvian official in the Madre de Dios inspired him to wipe out the harmless and amiable "chunchus" of the middle Tambopata. We who knew them regret it deeply. A curious bearded tribe in the river S. Martin in East Bolivia resented ill treatment by burning the rubber trees and disappearing, no one knows where. Many of these tribes, it is true, are intractable, hopelessly brutal, but others, like our friends of 1914, are brave and intelligent, deserving much consideration.

In closing I gladly acknowledge the services of my companions. Mr. Costin, who accompanied me four years, is at the front with the Rifle Brigade; Mr. H. Manley, who accompanied me two years, has enlisted; and Mr. Brown elected to remain in South America. That they formed so small a party is a recommendation of their worth.

DR. F. DE FILIPPI'S ASIATIC EXPEDITION.

FOURTH REPORT.

EARLY in September, 1914, the expedition left the Suget station in the valley of the Kara Kash, to the north of the Karakoram, to cross the Kug Art pass (16,160 feet) into the upper Yarkand or Raskem Daria valley. On reaching the river at Kirghiz Jangal we again divided into two parties. Major Wood went up the valley to join at Kufelang Mr. Spranger and Petigax, with whom he proceeded to explore the two western tributaries which they had seen in the preceding month.

Dr. De Filippi, Prof. Abetti, and Marchese Ginori went down-stream with the intention of reaching the Oprang by crossing the Aghil pass.

The hope that the bad weather experienced in the summer would

cease with the autumn was not realized. Every day fresh snow fell on the mountains, with rain in the valleys. The moist atmosphere hid the view of the peaks and ranges, rendering the topographical work most difficult. The most serious consequence of this persistent bad weather was that the summer floods did not decrease, as we had expected. On this fact we were counting, as the road follows the river-bed, and it is impossible to travel in these valleys when there is much water in the rivers.

During the two first days after leaving Kirghiz Jangal we were obliged to ford the Yarkand river eight times, but this was only possible in those parts of the valley where the river flowed in several channels; further on the valley, closing in, became a long gorge, and as the river flowed in one deep stream we were obliged to keep to the higher ground. With much difficulty we succeeded in passing over spurs on the right side of the valley, and six days from the time we had left Kirghiz Jangal we descended one of these more precipitous than usual, opposite the valley by which we were to ascend to the Aghil pass. But in front of us ran the swollen river, turbid, swift, and full of whirlpools. After wasting a whole day in vain efforts, we came to the conclusion that it was hopeless to get the caravan across. Some of the strongest horses managed to swim to the other shore, but the camels were carried away by the current. On account of this, to our great regret, we were compelled to give up the proposed exploration of the Oprang valley.

In the meantime Major Wood's party explored in succession the western tributaries of the Yarkand, mentioned above. Contrary to our surmises, these did not rise on the northern slopes of the Karakoram, but from a snow-bound chain to the north of it, which probably separates the basin of the upper Yarkand from that of the Oprang. When the map is drawn, we perhaps shall be able to judge what relation this chain has with the Aghil and the Karakoram.

In the northern of these tributary valleys, 5 miles above its junction with the Yarkand, the party found the deserted baggage of a previous traveller, including some copies of the Koran and a few letters. This valley is so narrow and gorge-like that for the entire length of it you have to travel in the stream-bed full of water, and it seems impossible, therefore, that it should ever have been used as a regular road of communication. Still, this discovery seems to tally with the tradition of a short cut between Kufelang and the Nubra valley, of which many ancient explorers make mention (G. W. Hayward, etc.), but which no one has verified up to the present. With the aid of the letters found by us, we are now having inquiries made at Yarkand and Kashgar, in the hope of gaining further information.

From the Yarkand river (Raskem Daria) both topographical parties crossed the western Kuen Lun by different passes leading to Kargalik and Yarkand.

From September 27 to October 10 our gravimetrical and magnetic observations were made at Yarkand. Here we received quite clearly the longitude time signals by wireless telegraphy from Lahore. On October 15 we reached Kashgar, and were received with European hospitality by the English and Russian consuls. We remained there eleven days to finish our geo-physical work. By means of the wireless apparatus we were able to obtain with great exactness the longitude of Yarkand and of Kashgar, two important stations which have served as base for all previous topographical work in Chinese Turkestan.

On October 27 we left Kashgar for the last caravan stage of our journey. In eleven days we crossed the mountainous region between Chinese and Russian Turkestan, finding the highest pass (Terek Dawan) already covered with the first autumn snow. At Andijan we reached the railroad after a journey lasting fourteen months.

In the observatory of Tashkent was made the last of the series of gravimetrical stations which had begun at Dehra Dun, and thus the Indian system was connected with that of Asiatic Russia.

The Tashkent Military Topographical Institute kindly consented to take charge of the scientific equipment of the expedition, and to keep it for us until normal means of communication—at present interrupted on account of the war—have been re-established. The expedition has brought back to Italy with it only the chronometers, the photographic lenses, the gravimetric instruments, all the scientific and topographic records as well as the exposed photographic plates.

Commander Alessio and Prof. Abetti are now busy making gravimetric observations at the Hydrographical Institute of the Royal Navy, Genoa, with the same instrument that was used during the expedition. This station was the starting-point of all our observations. Thus the whole of the system of stations in India, Central Asia, and Asiatic Russia will be united to a fundamental station of the European system.

General Outline of the Work of the Expedition.

The expedition was able to complete the whole of its programme in sixteen months and a half.

In the domain of geophysics, the gravimetrical survey (made by the Survey of India) in the plains of Hindustan has been joined to that of Russian Turkestan (made by the Military Geodetic Institute) by means of a chain of stations across the mountainous regions between Northern India and Central Asia, and through Chinese Turkestan. In addition the complete system has been connected with the European Gravimetrical Survey through the fundamental station of Genoa.

Fourteen stations were made, and in spite of the difficulties met with on account of the exceptional conditions under which we had to make our observations, they were carried out by the most precise scientific methods. Eight pendulums were always observed. The gravimetric

apparatus was always used without support, and usually rested on a large rock embedded in the ground, and with this method we obtained very small variations in the value of the flexion. Where buildings were lacking, a large tent specially constructed was used, in which temperature variations could be maintained within the necessary limits. The geographical co-ordinates of each station were rigorously determined, and topographical data of the neighbourhood were collected, with addition of photographic views and panoramas. The expedition was provided with chronometers and astronomical instruments.

On account of the peculiar features of the regions crossed by the expedition, the analysis of the results should lead to interesting conclusions on the influence that mountain masses, altitude, etc., exercise on the value of gravity. The stations were made at heights varying from 5000 to 17,000 feet above sea-level.

At all stations observations were also made to determine magnetic inclination, declination, and force—and at Skardu, taking advantage of the length of our sojourn, the daily magnetic variation was studied.

Wherever the expedition stopped to make geophysical observations, regular meteorological data were collected and pilot-balloons sent off, and, weather permitting, observations of solar radiation were made by means of various pyrheliometers. Particularly remarkable in this respect is the station of Skardu, which was open during four months of the winter 1913–14, and the one on the Depsang plateau at an altitude 17,500 feet, where uninterrupted observations were made for two and a half months.

In collaboration with us, pilot-balloons were sent up from various stations of the Indian Meteorological Department at similar hours, and it is hoped that these observations may lead to some conclusions concerning the circulation of the winds, more especially in regard to the monsoon.

Without the aid of maps and illustrations it is difficult or impossible to describe the geographical work, therefore I limit myself to a few short observations. The Eastern extremity of the chain of the Karakoram mountains was, previous to this expedition, very slightly known. About 1865, a topographer of the Indian Survey, Mr. Johnson, had made surveys of the caravan routes between Ladakh and Central Asia. He had seen the front of a glacier, from which rises the Shyok, one of the principal tributaries of the Indus, and had given it the name of Remo. But he had been unable to show either its extension or the direction and the position of the valleys through which it flows. Nor was he able to ascertain the position of the watershed. The exploration of this glacier and of the neighbouring portion of the Karakoram was the work that the Expedition accomplished last summer. The Remo is a glacier of unexpected size and importance. Its area is more than 300 square miles in extent and is formed by three large rivers of ice, each about 20 miles in length and 3 to 5 miles wide. The glacier has many peculiar

characteristics, and its basin is, as it were, a transition between valley and plateau. This is only an instance of a more or less general phenomenon which we found prevalent in our explorations of the region. The most interesting fact, undoubtedly, is that from the Remo rises the river Shyok, a tributary of the Indus, discharging its water into the Indian Ocean, and also the Yarkand, one of the large rivers that loses itself in the sands of Central Asia.

The discovery of the source of the river Yarkand led later to a systematic exploration of all its upper basin. This work was much hampered by persistent bad weather. Nevertheless, thanks to the sustained efforts of all, it was possible to triangulate and survey about 5000 square miles of country.

Particularly interesting was the determination of the differences of longitude by means of time signals sent by wireless telegraphy from the wireless station at Lahore, and received simultaneously at the headquarters of the Trigonometrical Survey of India at Dehra Dun, and by us at our various stations. Before and after the transmission local time was determined by star observation. Thus, the difference of longitude could be calculated very exactly, and so it will be possible to show—with the help of the latitudes—the deviation of the plumb-line at all our stations situated in the valley of the Indus, and on the Depsang plateau. Also exact co-ordinates of the Karakoram and Central Asia stations have been obtained, and this should be of the greatest use to correct the old maps, and for all future topographical work in the region.

The vast mountainous zone situated between Western India and Central Asia did not interfere with the transmission of signals, which were always received quite clearly, even in the distant stations of Yarkand and Kashgar.

I have still to mention the geological researches. These covered a much vaster area than that included in the itinerary of the expedition, viz.—a large portion of Baltistan and of Ladakh, some of the high plateaux of Western Tibet, and the Eastern extremity of the Karakoram. A large quantity of fossils was collected, which will make it possible to assign a date to the formations crossed by us; the extension and the limit of the past periods of glacial age were also especially studied. It is hoped that with the material collected it will be possible to form some sort of a rational classification of this complicated system of mountains based on their geological composition.

Prof. Dainelli, in his numerous geological excursions, also collected abundant material for the study of the anthropo-geography of Baltistan and of Ladakh. Up to the present time this has not been systematically studied, and so many contradictory assertions regarding the races that inhabit these regions have been circulated.

In addition, the expedition has brought back abundant illustrative matter referring to all the fields of its activity.

(Rome, December 15, 1914.)

them are given in sufficient detail to satisfy even those who are unfamiliar with the localities. The general treatment is designedly geological, but occasional anthropological and geographical notes add some human interest to the story of the Croydon Bourne, of the wind and water gaps of the North Downs, and to the descriptions of the views from the Addington Hills, Worms Heath, and Leith Hill. Excursions XVI.–XVIII. are almost purely geographical and will be useful to students of the English scarplands. It is interesting to note that a section at Upminster shows the most southerly exposure of boulder clay now visible in England. The book is illustrated by photographs, sketch-maps, sections, and a geological map of the south-east of England.

J. D. F.

ASIA.

The Last Indian Census.

'The Census of India.' Vols. 1 and 2. By E. A. Gait, C.S.I., C.I.E. Calcutta: Superintendent of Government Printing. 5 *Rs.* or 7*s.* 6*d.*

The International Geographical Congress has devoted its attention on more than one occasion to the desirability of extending the census, in however simple a form, to tracts where the conditions do not allow of a detailed enumeration. The authorities in British possessions abroad have not lagged behind in this respect, and in the case of the outlying tracts of India their efforts at each succeeding census have resulted in the omission, in 1911, of none but a few mountain regions on the frontiers. The Indian census would stand out from other operations of this sort by reason of the magnitude of the numbers involved apart from other considerations, but, in the light thrown upon the figures by the admirable comment and analysis contained in this Report, it will be seen that the unique characteristic of the population of India is not its numbers so much as the variety of race, creed, language, and other social traits which it comprises, together with the marked differences in the physical conditions in which its life is passed. This is not the place, however, for touching upon the statistical aspects of Mr. Gait's review, which have received cordial recognition from experts here and in other countries. But those to whom the exposition of this almost overwhelming array of figures does not appeal will find ample compensation in the perusal of the first eighty or ninety pages of the Report, which deal with geographical features having a close and influential bearing upon the main factors of life in India.

The astonishing range of the variety to which reference has just been made is indicated briefly but clearly in these introductory pages. Geologically, for instance, India includes the most modern and some of the most ancient formations, with samples of most of those intervening between those periods. The soil varies, of course, accordingly. The great extremes of heat and cold in the north may be contrasted with the equable but intensely hot temperature which prevails in the peninsula. Over large tracts the annual rainfall is no more than 5 inches, whilst elsewhere it averages 300 inches or more. Nearly three-fourths of the inhabitants live by agriculture or pasture. The distribution of the population on the land, therefore, is in direct relation to the sum total of the physical conditions upon which those means of subsistence depend, that is, upon the configuration of the tract, its soil, and its water-supply. While, therefore, the administrative purposes which the census has to fulfil necessitate the grouping of the statistics by the artificial divisions of provinces and states, the natural divisions of the country have been judiciously

co-ordinated with these when the density of the population is being considered. In determining these groups, the main factor which Mr. Gait, in consultation with the meteorological authorities, has taken into consideration, is the annual rainfall. He is careful to point out, however, that an abundant fall is not by any means an infallible indication of the ability of a tract to support a dense rural population, since it may be counteracted to a greater or less extent by the conformation of the country, the nature of the soil, or political or social circumstances, not to mention the ill-distributed or irregular character of the rainfall itself. The water-supply, again, in an area annually being extended, is no longer dependent upon the rain, and the striking instance is here given of a region in the Panjab, which supported a nomad population of about seven to the mile in 1891, when a large canal system was introduced, and which, in 1911, returned a population averaging 272 per square mile and still on the increase. Here the rainfall is only 13 inches. To take a case in the contrary direction, Lower Burma, with a rainfall of nearly 120 inches, and with large alluvial tracts, falls considerably below the average Indian density, on account of the comparatively recent introduction of settled government and security of property. Taking into account all the disturbing factors, the only general conclusion at which it is safe to arrive is—that in India proper the density of population tends to be greatest where rice is most grown. Mr. Gait draws an interesting comparison between East and West on a text furnished by a German economist to the effect that in his country, and apparently in England also, agriculture alone is unable to support more than 250 persons per square mile. In India, where two-thirds of the people are agricultural, the above proportion is well exceeded in the case of 55 per cent. of the population, and in several regions a large and purely rural population is massed in the ratio of 1000 and over to the mile. It is worth noting, in conclusion, that whilst practically all the net increase of population in India in the last decennium took place amongst densities of less than 450 per mile, and most of it where there were less than 150, there are instances in the most thickly peopled tracts where the growth was greater in the more dense areas than in the rest. Mr. Gait has had the supervision of Indian census operations on three occasions, and the volumes under review bear unimpeachable testimony to his experience, knowledge, and interest in his gigantic task.

J. A. B.

The Philippine Islands.

'The Philippines, Past and Present.' 2 vols. By Dean C. Worcester. London: Mills & Boons, Ltd. 1914. *Illustrations.* 30s. *net.*

The author has been so intimately connected with the subject-matter of these two volumes, both in the capacity of an official and as a resident for the entire space of eighteen years, that a better authority could hardly have been found. His former book, 'The Philippines and their Peoples,' published some sixteen years ago, embodied the results of a naturalist's tour through the islands. The present two volumes read more like a blue-book, describing the long negotiations and relations between the American authorities and the insurgents. There are various points and details into which the general heads ramify, which are handled, as it seems to us, at almost excessive length. For instance, "Was independence promised?" is a question which at an earlier stage may have aroused attention and inquiry, but which in this, a book of the present day, seems to be refuted with superabundant detail and unnecessarily long quotations from official documents and commission reports.

becomes almost appalling. Our ideas of this region were refreshed this year by Mr. Roosevelt, and I think we must have been struck by the similarity in many respects in the descriptions of the rivers given us to-night with that Mr. Roosevelt gave us in his lecture on the River of Doubt, which we can now read at greater length in the very interesting volume he has just presented to our Society. It seems to be a country engrossing for the zoologist. Mr. Roosevelt's book is full of the extraordinary and interesting animals he came across. But if it is a paradise for the zoologist, it seems to be still more so for the entomologist, though the ordinary traveller may not regard it in the same light. We can hardly hope that the boundary now laid down, which I have no doubt will prove an excellent boundary between the two states, will fulfil one requirement which our professors suggested a week ago. It is hardly likely to be a meeting-place of nations, but as a dividing-place between nations, which after all has been hitherto the idea of a boundary, it appears to be admirably suited. It is a source of pride to ourselves, to our Survey officers, and to this Society, that Englishmen should be selected as the best fitted to do this sort of work for other countries. We have all listened to Captain Edwards's lecture with the greatest interest, and have got many new impressions from it. I will now move a vote of thanks to him, which I am sure you will accord unanimously.

SIR AUREL STEIN'S EXPEDITION IN CENTRAL ASIA.*

As soon as a short halt in the Tun-huang oasis had allowed men and animals to recover from our trying winter campaign in the Lop-nor desert, I started by April 2 for the explorations planned eastwards. Their objectives lay mainly in the deserts which fringe on the south and east the vast region of barren hills known as the Pei-shan Gobi. The distances to be covered were great, and short the available season before increasing heat would stop work on waterless ground. So but little time could be spared for my renewed visit to the cave temples of the "Thousand Buddhas" near Tun-huang, which in 1907 had yielded so much antiquarian and artistic spoil. But rapid as my visit had to be, it proved once more fruitful.

Ever since my first discovery in 1907 of the ancient Chinese *Limes* to the west and north of Tun-huang, I had been anxious to follow up its line as far as possible eastward, and to explore whatever ruins might have survived along it. The work was successfully started, when, after striking across a difficult belt of salt marshes, we came upon the ancient border wall halfway between Tun-huang and An-hsi. From there we were able to follow its line for close on 250 miles eastwards. Along almost the whole of this distance the wall, with its watch-towers and small military stations, had been built across what already in ancient times was absolutely sterile desert. The immunity from human interference thus assured had helped greatly to preserve its remains; but the wall owed even more to its remarkable method of construction. Built of carefully

* Communication from Sir Aurel Stein, K.C.I.E., PH.D., D.SC., dated Turfan, November 22, 1914. See *Geographical Journal*, vol. **44**, p. 69.

secured fascines of reeds or brushwood, with layers of clay or gravel between them, the wall was specially adapted to withstand that most destructive of natural forces in this region—slow grinding, but relentless, wind-erosion. Even where the watch-towers, once massively built in bricks or stamped clay, had been reduced to shapeless low mounds, difficult to recognize from a distance, the direction of the wall still clearly revealed itself, stretching away in characteristic straight line across wastes of gravel or drift-sand.

Where the *Limes* ran parallel to the deep-cut bed of the Su-lo Ho much of the ground it crossed consists of bare riverine loess, and in this the erosive force of the winds, blowing here with exceptional violence mainly from the north-east, could assert itself to the full. But even where it had succeeded in completely effacing all structural features, there remained on the wind-worn surface clear evidence, in the shape of pottery, coins, metal fragments, and other hard *débris*, enabling us to determine with accuracy the position of the posts once guarding the border.

Once beyond the sharp bend made by the Su-lo Ho valley southward, the line followed by the *Limes* approached closer and closer to the foot of the Pei-shan, taking us into ground which had so far remained wholly unsurveyed. The physical difficulties met became increasingly greater owing to the distances separating the long-forgotten border from the nearest places with water. But there was reward also in the ample finds of ancient records on wood, of furniture and implements of all sorts which our excavations brought to light at the ruined stations. Conclusive archæological evidence shows that all these had been left behind by the Chinese soldiers who during the first century before and after Christ had kept guard over this most dismal of frontiers. The finds furnish an important addition to the collection of early Chinese records secured during my former explorations west of Tun-huang. Here, too, often the inscribed slips of wood thrown out of some ancient office-room turned up in refuse heaps covered only by a few inches of *débris* or gravel. Their preservation in such conditions clearly demonstrates the remarkable dryness of the climate prevailing here since ancient times. Apart from the uniform barrenness, the topography of the ground crossed by this eastern portion of the *Limes* showed considerable variety, and this helped to bring out still more clearly the skill with which those old Chinese engineers of Han times had managed to adapt their defensive line to different local conditions.

I was more than ever impressed by the remarkable power of sustained administrative effort which the construction of the wall on ground wholly devoid of local resources demanded, when some 30 miles to the north-east of the little oasis of Ying-pên we found the wall boldly carried into what since ancient times must have been a big area of drift sand. Where not completely buried by high dunes, it still rose to close on 15 feet. Obviously the garrisoning and commissariat of this section must have offered special difficulties. It was clearly in order to safeguard an important line of

supplies that a chain of fortified stations was found to extend here southward independently of the wall, but constructed at the same period. It ran in the direction of the big oasis of Suchou, and to this we had to turn ourselves at the beginning of May in order to prepare our next move northward.

My object was to follow the united course of the rivers of Suchou and Kanchou down into Southern Mongolia, and to explore what ancient remains might be found along it and in its terminal delta. Apart from the ruins which the reports of Russian travellers had led me to expect here, I was specially attracted to this ground by the interest attaching to its earliest history. There could be no doubt that this region of the Etsin-gol, as the river is known to the Mongols, had formed part of the wide dominions held by those earliest nomadic masters of Kansu, the "Great Yüeh-chi," or Indo-Scythians and the Huns, whose successive migrations westwards so deeply affected the destinies of Central Asia, as well as of India and the West.

Provided by the Suchou Taotai with a recommendation to the chief of the Torgut Mongols who now graze on the lower banks of the Etsin-gol, I started by May 10 northward. While Rai Bahadur Lal Singh moved to the last Chinese settlement, the oasis of Mao-mei, by the hitherto unsurveyed route along the river Kanchou, where it breaks through the westernmost hill range of the Alashan, I followed the more direct track by the river Suchou. This offered me a chance of once more approaching the area where before we had lost the line of the ancient frontier amidst high dunes. By a reconnaissance pushed into the desert north-west of the Chinta oasis, I succeeded once more in discovering the *Limes* where it emerged on less impracticable ground near the south-eastern extremity of the Pei-shan, and subsequently we tracked it right through to the north of the oasis of Mao-mei.

The course of the river Etsina, affording water and grazing, must always have served as a main route for raids and invasions directed from the Mongolian steppes against the westernmost Kansu oases and the great natural highway which leads through them connecting China with Central Asia. So it could not surprise me to find the point where this route of invasion cuts through the ancient border, guarded by ruined forts of imposing size and unmistakable antiquity. One built with clay walls of exceptional strength curiously recalled the ancient frontier station of the "Jade Gate," famous in Chinese history, and previously identified by me on the Tun-huang border. There could be no doubt that the *Limes* had crossed the river Etsina a short distance to the north of the oasis of Mao-mei, and thence continued eastwards. But when we came back in June from the Etsina delta, the heat of the season had become already too great to permit of continuing the search into the waterless desert eastwards.

Moving north in long marches we followed the sandy bed of the Etsin-gol, in places nearly a mile wide, but absolutely dry at that season. Only in wells dug in places near the banks could water be found. After passing

a rocky spur jutting out from the eastermost Pei-shan, some 90 miles below Mao-mei, the river spreads out in a delta which extends for over 110 miles to the north and terminates in a series of salt lakes and marshes. A succession of low-water seasons had caused these to dry up for the most part. The conditions observed in this delta interested me greatly, as they strikingly illustrated what the ancient Lou-lan delta north of the extant Lop-nor marshes looked like before its final desiccation. Here, too, along beds left dry for long years many of the wild poplars prevailing in the narrow belts of riverine jungle were already dead or dying. The wide stretches of ground between the several beds were either absolutely bare or showed but scant vegetation. The chief of the two hundred odd Mongol families established in the Etsin-gol delta sadly complained of the increasing difficulties caused by inadequate grazing.

Limited as are the resources offered by this extensive riverine tract, it was yet easy to realize their importance for those, whether armed host or traders, who would make the long journey from the heart of Mongolia in the north to the Kansu oases. In this respect, too, there was a striking analogy to the ancient Lou-lan delta, without which the earliest and most direct route into the Tarim basin could not have been opened for Chinese expansion westwards. This analogy impressed itself still further upon me when I proceeded to examine the ruined town of Khara-khoto, which Colonel Kozloff, during his expedition of 1908-09, had been the first European to visit. Its position and remains clearly proved that it could be no other than Marco Polo's "City of Etzina." Of this the great Venetian traveller tells us that it lay a twelve days' ride from the city of Kanchou "towards the north on the verge of the desert; it belongs to the Province of Tangut." Travellers bound for Karakoram, the old Mongol capital, had to lay in here victuals for forty days in order to cross the great "desert which extends forty days' journey to the north, and on which you meet with no habitation nor baiting place." The position thus indicated corresponds exactly to that of Kharakhoto. Though the town had probably suffered considerably when Chingiz Khan's Mongol host first invaded and conquered Kansu from this side about A.D. 1226, there was ample antiquarian evidence to show that it continued to be inhabited down to the fourteenth century. But like the agricultural settlement for which it had served as the local centre and of which we traced extensive remains to the east and north-east, the town must have seen its most flourishing times under Tangut or Hsi-hsia rule, from the beginning of the eleventh century down to the Mongol conquest.

To this period belonged most of the Buddhist shrines and memorial stupas which filled a great portion of the ruined town and were conspicuous also outside it. In one of the latter Colonel Kozloff had made his great find of Buddhist texts and paintings. But this, as a systematic search soon proved, had not exhausted the archæological riches of the site. Careful clearing of the *débris* of stupas and temples brought to light

abundant remains of Buddhist manuscripts and prints, both in the little-known old Tangut script and Tibetan, besides many fine stucco relievos and frescoes. From the large refuse heaps of the town we recovered plenty of miscellaneous records on paper in Chinese, Tangut and Uigur, also many interesting remains of pottery and household utensils. Finds of coins, ornaments in metal and stone, etc., were abundant, particularly on wind-eroded ground.

Everything pointed to the conclusion that the abandonment of the settlement must have been caused by difficulties about maintaining irrigation. The dry river channel which passes Khara-khoto lies some 7 miles to the east of the nearest branch still receiving water, and the old canals we traced leading to the abandoned farms eastwards are removed considerably further. Whether this failure of irrigation was due to desiccation in the Etsin-gol delta or to a change in the river course at canal-head with which the settlement was unable to cope, could not be determined. But so much seemed clear that the water-supply now reaching the delta during a few months of summer would no longer suffice to assure adequate irrigation for the once cultivated area.

Rapidly increasing heat had rendered work at these desert sites very trying both for the men and our camels, upon which we depended for the transport of water. So I was glad when the completion of our task allowed me to send the camels for a much-needed summer holiday in the Kongurche hills north-eastward, and to move myself south to the foot of the Nan-shan. For part of the journey we were able to follow a new route which took us through hitherto unsurveyed portions of the desert hills to the east and north of the river Kanchou. In spite of serious fatigues, Kanchou was safely reached before the close of June. A short halt in that large oasis enabled me to make all arrangements for new survey work I had planned in the Central Nan-shan. Its object was to extend the mapping done in 1907, in the mountains near the sources of the rivers Su-lo Ho and Suchou, by accurate surveys of the high ranges further east which enclose the river Kanchou headwaters.

Great difficulties were encountered about transport owing to the reluctance of the Chinese to venture far into those mountains. But fortunately I found an old friend in the Chinese general commanding at Kanchou, and his opportune help allowed us to set out by the first week of July. The route followed during the first marches acquainted me with interesting Buddhist cave temples, and other remains dating from Sung times, near Nan-kou-chêng at the foot of the mountains. There, too, we struck a dividing line of distinct geographical interest. While to the west of it cultivation, whether in the plain or along the foot of the mountains, is possible only by means of irrigation, we now came upon Loess slopes and big alluvial fans which rainfall alone suffices to make fertile. This marked change in climatic conditions appropriately brought home the fact that we were now nearing the watershed of the Pacific

drainage area, and the eastern edge of that part of Kansu which may justly be considered a Central-Asian border land.

We had ascended to where the easternmost feeder of the river Kan-chou rises among snow-clad ranges, and were making our way westwards over high alpine grazing grounds, when I met with a serious riding accident. Fortunately the arrangements already made allowed R. B. Lal Singh, my ever-energetic surveyor, to carry through all the topographical tasks I had planned, and no time was lost in our programme. When after some weeks my injured leg had recovered from the worst effects of the accident, I managed to get myself carried down to Kanchou. Then by the third week of August, I set out for the long journey which was to take me back to Turkestan for the work of the autumn and winter. On reaching Mao-mei by a new route, I was rejoined by Lal Singh, who by exceptional efforts had succeeded in extending our Nan-shan surveys eastwards over an area quite as large as that mapped in 1907.

On September 2, we started to cross the desert area occupied by the ranges of the Pei-shan where its width is greatest, in the direction from south-east to north-west. The routes we followed for close on 500 miles had never been surveyed, and only at one point did they touch ground previously visited by Russian travellers. Wherever possible we moved in two parties and by different routes, thus considerably increasing the extent of the area mapped. The scarcity of wells and of grazing caused great difficulties, and we felt them even more owing to the inadequate local knowledge possessed by our Chinese "guides." Only at one place did we encounter a small party of Mongols.

It was a great relief when after nearly four weeks of continuous travel we had safely crossed the last barren hill range, without a single animal's loss. It proved an easternmost extension of the Tien-shan system, and beyond it we could descend to Jungarian ground at the foot of the Karlik-tagh. These extensive plane-table surveys, supported here as elsewhere by many careful height observations with mercurial barometer and clinometer, will throw fresh light on the morphology of the Pei-shan ranges. In addition this journey has served to acquaint me with the peculiar physical conditions of a region through which many of the great historical migrations westwards, since those of the Indo-Scythians and Huns, must have passed.

Interest of a similar character attached to the rapid journey which subsequently carried me during October along the north foot of the Tien-shan range to Barkul and Guchen (Ku-ch'êng-tzu). These territories, favoured by a climate less dry and possessed of abundant grazing grounds, have often played an important part in the history of Eastern Turkestan, and their physical and ethnic conditions differ greatly from those of the Tarim basin. The opportunity of familiarizing myself with this ground was hence a decided advantage. I was also able to survey, near Jimasa, west of Guchen, extensive remains marking the site of an ancient capital

of this region, which under the names of Chin-man and Pei-ting often figures in the Chinese historical records from Han to T'ang times.

From there I crossed the Bogdo-ula range, a portion of the Tien-shan rising to numerous snowy peaks, by a high pass hitherto unsurveyed to the deeply depressed basin of Turfan. There ruined sites of Buddhist times are abundant. A preliminary survey has shown me that their remains, though repeatedly visited by previous expeditions, and owing to their easy access exploited also by villagers burrowing for antiques, still offer scope for systematic excavations. To these I propose to devote the next few months, while my surveyors will find ample work in mapping the extensive and little-known desert ranges of the Kuruk-tagh between the Turfan and Lop-nor depressions.

PLANE-TABLE TRIANGULATION FROM ONE STATION ONLY.

By E. A. REEVES.

THE following is a short description of an attachment I have recently fitted to a plane-table alidade for rapid graphic triangulation and fixing the distance of points from one station only, with an example of work done.

Let 1, 2, 3, 4 (Fig. 1) be a plane-table over a station at A; B and C, distant points in the country, of which B is much nearer to A than C. To determine the distance and position of C by the ordinary method of plane-tabling, the distance from A to B is measured on the ground and set off to scale on the plane-table, on which it is represented by A*b*. AB now serves as a base, and after drawing rays from A towards B and C, the surveyor moves his plane-table to B, orients, and again draws a ray towards C, the intersection of which ray with that drawn towards the same point from A gives the position and distance of C. *c* represents this point on the plane-table.

However, in order to carry out this operation it is necessary for the surveyor to move his plane-table from one end of the base to the other; and if distant points such as C could be fixed and a graphic triangulation carried out from one station only, without moving the plane-table, it would frequently be a great advantage, specially in country difficult for travelling.

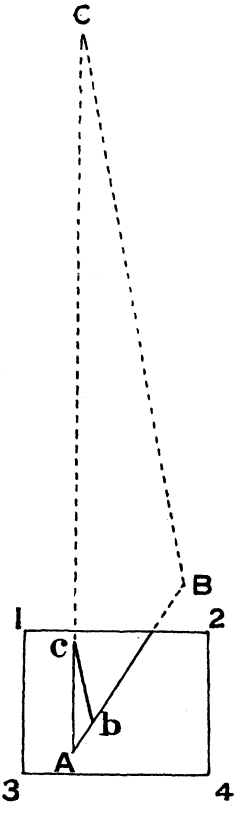

FIG. 1.

The attachment here described provides means of doing this; and it is not limited to short distances as is the case with ordinary tacheometers and range-finders, but can be

disprove Sir George Staunton's lament that there is a ubiquitous dearth of forest trees and vegetation throughout this part of the country. Readers at all familiar with the wealth of recent literature on China will understand that the present work contains little beyond the average impressions of a cultivated tourist who from the necessities of the case was unable to devote time to serious investigation. In accordance with the not very praiseworthy modern practice, the book is profusely illustrated with small photographs of a uniform size. Surely landscapes, mountains, river scenes, towns, whole stretches of the Great Wall, portraits, small groups, and elaborate but smaller objects such as the astronomical instruments on the eastern wall of Peking require some discrimina- as regards the scale of reproduction.

Although most of the localities described are fairly well known, an index map showing the line of route and positions of the places mentioned in the narrative would have added to its general interest.

Assam and the N.E. Indian Frontier.

'History of Upper Assam, Upper Burmah, and North-Eastern Frontier.' By Colonel L. W. Shakespear (2nd Gurkhas). London: Macmillan & Co. 1914. 10*s. net.*

There are few parts of India less known than those covered by the title of the present work. Most of this region which the author describes to us as more or less a *terra incognita* and at present largely covered by impenetrable jungle, was once the centre of thriving communities, and possessed at one time of important buildings such as forts and temples connected by old raised roads, the remains of which are still clearly to be seen in many parts. It is generally assumed that climatic conditions tended largely to bring about subsequent decay, for the climate is distinctly enervating, and each race that has settled there has in course of time lost its vigour and been supplanted by hardier folk, who in their turn have succumbed to love of ease and luxury. The disappearance of cities, canals, and other landmarks of the past is attributable to the soft alluvial soils of the valleys, which have often permitted the rivers to cut for themselves fresh channels, frequently destroying and carrying away the towns and buildings which history tells us did exist along their banks.

The early history of Assam is mostly legendary, but enough has been elicited by authorities like Meyer, Hannan, Bryan Hodgson, and others to connect the events of those times with historical landmarks of adjacent countries with which Assam had easy intercourse. Coming down to later times, three principal kingdoms claim notice, viz. the Kacharu, Kocches, and Ahoms, whose zenith of power arose at 1230, 1560, and 1700 respectively.

The later annals of the countries, of course, are in the main narratives of the European travellers and explorers from the east or west, who have placed on record all that has been ascertained regarding the tracts traversed. These chapters and sections are mostly dealt with geographically, and comprise the experience of Cooper in the Mishmi hills, Needham from the Sadiya side, Prince Henry of Orleans in his journey across south-west China, and various other expeditions.

As a collection of narratives and data regarding a region of unusual complexity whose literature it is often difficult and yet desirable to trace in view of the unexploited and obscure character of these frontier regions, this handbook is a useful contribution: credit being especially due for a good index, for well-selected photographs, some coloured plates, and a useful bibliography.