

THROUGH WESTERN YUNNAN

F. Kingdon Ward

Map following page 240.

DURING the last twenty-five years the main east and west road across Yunnan from Bhamo to the capital has been traversed to and fro by so many Europeans, that the theme, as a traveller's tale, is well-nigh exhausted. But apart from this, and one or two northern roads, there are many corners of the province, especially bordering on Tonking and the Shan States, as well as in the north, which are yet scarcely known. A journey from Lashio, the terminus of the Northern Shan States Railway in British Burma, to Muli over the Szechwan border took me through some of the less-known parts of Yunnan, and it is of an unfamiliar route that I write.

I left Lashio on April 11, travelling north-eastwards to the Salween. Much of the country here consists of rolling grassland plateaux, only the streams being fringed with forest. Everywhere the rock is limestone, giving rise to a rust-red soil, and to typical scenery. One remarkable result is the formation of sinter terraces in the streams. In the upper reaches of the Nam Yao, for example, there are scores of these natural weirs, each terrace ending in a ledge over which the water pours; a deep pool forms below, and shoals gradually to the next terrace. Each ledge has a wavy outline, and hollow tongues project downstream. The ledges tend to work upstream as the lip is worn away, and more sinter is deposited in the shallows behind. As to the origin of the terraces, the heat of the sun would no doubt precipitate lime in solution; but they are especially formed under trees where the water is coldest. Hence it is not improbable that acids derived from decaying vegetation play a more important part in their formation. One stream, overshadowed by magnificent horse-chestnut trees then in full bloom, was a network of terraces, ledges, and crimped basins.

At the village of Mōngyaw, three stages from Lashio, a disused stretch of cobbled road is seen. This is clearly of Chinese origin, and was probably in use at the time when the Chinese worked the silver-mines in the Shan States. It is interesting to observe that on their side of the frontier the Chinese are again actively engaged in making a good road in this direction. Just beyond this village the Nam Yao disappears underground amidst a wilderness of sinter boulders, which at this season are carpeted with the graceful little *Primula Forbesii*.

From Mōngyaw we proceeded up a broad grassy valley, flanked by the towering Salween divide on our right; then crossing a low pass we descended into the basin of that river. The country is sparsely populated, with small Shan villages below, Maru villages above. This poverty is no doubt largely due to the limestone formation, which weathers to a

stiff clayey soil difficult to work. The underground drainage also is inimical to cultivation, and the hills, though well wooded, are steep and frequently broken by scarps.

The descent to the Salween from the crest of the divide is not less steep than it is on the Bhamo route, 100 miles further north. The Salween is here a mighty stream, flowing swiftly between high sandy banks covered with jungle. Several ferry boats ply to and fro during the open season. Mules are conveyed across in a big barge, while passengers and loads are paddled over on a raft, consisting of two canoes lashed together and decked in. A glutinous heat pervaded the valley, but daily rain-storms, accompanied by lightning and strong gusts of wind, swooped out of a clear sky and cooled the atmosphere.

After leaving Kunlong, a small village on the left bank, we marched up the valley of the Nam Ting. *Nam*, by the way, means "river." On the second day after leaving the ferry we crossed the Chinese frontier, and fording a stream from the north emerged on to a plain covered with high grass, evidently a swamp during the rains.

We had scarcely started next morning when we were overtaken by a Chinese merchant returning from Lashio to his home in Shunning. Invited to join his caravan, we gladly did so, as the road was said to be infested with brigands, and his party were well armed; indeed, every caravan went armed. Our friend led us by a direct road to Shunning, instead of crossing to the left bank of the river and following it up to Lünchow (Yunchow), as we should otherwise have done. At mid-day therefore we left the river and entered the mountains to the north.

For the next two days we travelled parallel to the Nam Ting valley behind a range of limestone peaks, well wooded on our side, but steep and bare towards the south. When one reflects what a vast area of Yunnan is composed of limestone ranges, uplifted from 10,000 to 20,000 feet above sea-level, and further, that this rock must all have been laid down in a moderately deep sea, one begins to realize what tremendous forces have been at work in this country. Nor is that all. The limestone is frequently interstratified with belts of slate and schist, originally deposited in shallow water, indicating an alternation of upheaval and subsidence.

The country was still thinly populated, the villages poor; but the valley we were ascending was well cultivated, and astonishing quantities of opium poppy were hidden away in the remoter nooks.

Crossing a pass at about 6000 feet we turned more to the north, and descended into a fairly big valley dotted with villages. Here the vegetation underwent a marked change, monsoon forest giving place to a more Chinese type, in which pines and scrub oak predominated. Though not yet out of the Salween basin, clearly we were approaching the dividing line between the Indo-Malayan and Chinese floras, which corresponds roughly with the range separating the Mekong and Salween basins.



1. KUNLONG FERRY, NORTHERN SHAN STATES



2. RICE TERRACES IN SOUTHERN YUNNAN



3. THE MONASTERY, YUNGNING



4. ROCK TEMPLE IN SOUTHERN YUNNAN



5. CHAIN BRIDGE OVER THE MEKONG

Already the flora, though the Indo-Malayan influence was not yet entirely eliminated, was predominantly Chinese.

On April 25 we continued down this valley by a remarkably good road to the paddy plain below, where stood the wretched Shan village of Chenkang. There was a dilapidated temple here, occupied by ten equally dilapidated soldiers, ostensibly guarding the road; but as they smoked opium and gambled all night: as moreover, though armed with ten antique muskets no two of them alike, they had omitted to supply themselves with ammunition, I expect that their job was a sinecure. That brigands haunted the road was likely enough, but who shall say that these warriors, with whom we passed a restless night in the profaned temple, were not cause for greater alarm?

At some period a wave of religious fervour must have swept over Yunnan, washing even to the confines of the province, where the humblest village boasts its Buddhist temple. But the priesthood have long since sunk into disrepute, the people grown apathetic, the temples fallen to ruin. In the villages the latter are now schools, inns, or stables; only in the cities are they used for religious purposes. Yet the flame of religion still burns brightly in a few quiet spots, where it has somehow been protected. Here and there you may find a rock temple perched up on an almost inaccessible cliff, lovingly tended by some hermit priest who daily performs the rites of his office. Such picturesque fragments suggest that the triumph of Buddhism in China corresponded with the most artistic age, when the idea of beauty was embedded in the hearts of the people.

From this point to Shunning our road lay in a general easterly direction, crossing a succession of hill ranges, separated by valleys which grew deeper and narrower as we penetrated further into the interior. As for the road, it was the best I have ever seen in western China.

On April 27 we passed through a crowded country market, held at a little temple on the hillside. Here, every five days, the scattered Chinese and Shan families of the district assemble to buy and sell. In the evening we reached Yingpankai, the first Chinese village worthy of the name.

Yingpankai, as its name suggests, is modestly fortified, being partly protected by a wall and ditch. It boasts a number of tiled houses, a school (in the temple), and a yamen, but no magistrate. I rubbed my eyes next morning when I saw the broad road contoured round the mountain to turn a spur beyond. Could this be Yunnan? Most roads in western China take every mountain by frontal attack and no nonsense. Yet here was a fine mule road, though to be sure some of the gradients were steep.

Having reached the summit of the range we descended into a deep valley and crossed the river by a rustic bridge. The following day we began the ascent of the Mekong divide, and spent the night at a poor little village about halfway up. I slept in the new school-house, which

was complete in all respects save one—there was no schoolmaster ; consequently the attendance was negligible. On April 30 we reached the pass—about 8000 feet—and descended by a road, still remarkably good, to the valley where stands the city of Shunning-fu. Here we put up at a miserable hostelry, for though a district capital, Shunning is nevertheless a small and mean city, boasting no industry and but little trade in tea, which is grown on the neighbouring hills. One can walk round the city wall in half an hour.

On May 2 we proceeded on our way, marching up the well-cultivated valley and so into the mountains again. Amongst wooded hills the road now wound, with doll-like fields pecked out of the valley heads below. We had heard in Shunning that a new road was being engineered, and there was ample proof of it here ; for the new alignment crossed and recrossed the old road, which, as usual, was only a water-worn gutter. A mass of shrubs, many of them peculiar to Yunnan, clothed the crumbling granite slopes. The Indo-Malayan flora to the west had been finally shaken off, and it does not creep up the Mekong valley from the south even to this latitude.

Crossing the low pass we descended towards the Mekong, halting at the village of Sintsun, perched on the very brink of the gulf ; from here we could just glimpse the river, about 2000 feet below. The steep valley reflected the setting sun in flights of silver steps—paddy-fields.

The road down to the river is partly paved, and approaches the gorge on a long slant. For a mile before the bridge is reached it has been cut out of the solid rock, stepped, and protected by a parapet. The chain bridge also is in first-rate repair, and looks far more durable than the bridge on the Bhamo route. It bears the fanciful name "Bridge of the Green Dragon." The ascent on the left bank is not so good, being horribly steep and rough.

Two more ranges have to be crossed before the Yangpi river is reached. On the second night after crossing the Mekong we slept at Alushih, a considerable market village built on the hillside. From there we descended to the Yangpi, which is provided with a ferry only. The mules however swam across, the river being only about 50 yards broad at this season, and very tranquil just here. The Yangpi valley is arid and stony, relieved only by a few pallid shrubs drooping in the grim heat. Below the ferry the river burrows deep into the mountains, and disappears between high cliffs.

Ascending the next range we got back on to the limestone (round Alushih the rock is slate), and presently came upon a most picturesque temple. The road dipped sharply into a narrow ravine by a flight of steps passing under a high cliff. Embowered in trees, now foaming into flower, was the temple, crowning the cliff and difficult of access. The country continued sparsely populated, but well wooded. On May 7, however, came a change, when crossing another range we descended to

the narrow plain at the sources of the Red River and reached Mênghwa-t'ing, six marches distant from Shunning.

There is no bridge here, because there is no river. Lack of water is one of the troubles of Mênghwa in the dry season; nevertheless the plain is well cultivated. We crossed a backwater by a mud bund and climbed a river terrace, and that was all we saw of the Red River. Passing through fields golden with wheat and carefully tended market gardens, we reached the city wall and found an inn in the large suburb outside the north gate.

Mênghwa looks more prosperous than most *t'ing* cities, and the wall is in good repair; but I had no time to go inside. A guardian pagoda stands on a cliff above the gorge to the south, where the mountains close in and the streams unite to form a river; its influence is doubtless responsible for the prosperity of the city. It was a market day, and the streets were crowded with Lolos from the surrounding hills.

On the following day we turned due north, and by evening had reached the foot of the mountains at the upper end of the valley. On May 9 we climbed the divide separating the basins of the Red River and the Mekong, and from the summit looked down on to the Tali lake (Erh Hai). This range is a favourite haunt of brigands, who flourish despite a watch near the pass and a constant stream of traffic between Mênghwa and Siakwan, or perhaps because of these. Descending to the lake we reached Siakwan that afternoon, and Tali the same evening.

A few days later we took to the road again, marching to the head of the lake, where there is a cave in the limestone. On the 15th of the eighth month (*i.e.* about September) a fair called the Yü-t'ang-huei, or "fair of the fishes' hall," is held here, when the fish emerge from the cavern and are captured in basket nets. Only one kind of fish lives in the cave, and it is found in no other part of the lake, so I was told.

Travelling round the head of the lake, we crossed the low divide to the east and entered the basin of the Yangtze. The descent to the river, down a gradually broadening valley, takes two days. Villages are scattered at intervals, but there is not much population, the slopes above being little cultivated; they are clothed with a variety of shrubs, but there are no trees. Above the village of Hwangkiaping is a high cliff, with a Buddha set in a niche near the summit. "Men cannot reach it," said one of the villagers, pointing it out to me. "Then how did they put it there?" I asked. "It flew there!" said a muleteer, and every one laughed. The practical Chinese have few superstitions of this sort.

We reached the Yangtze on May 17, and continued a few miles down the right bank to the ferry opposite Kinkiangkai. After the brawling Mekong the Yangtze always looks immense, spacious, and noble, as of course it is. The ferry-boat is of the usual type, a big barge high in the bows and stern, like a junk. Kinkiangkai is the highest point on the

Yangtze at which boats are in use, a sort of sampan being employed for trips downstream.

We now entered a valley running almost due north. The lower part is stony and rather barren, but from the village of Heiniukwang as far as the lake it is entirely cultivated and fairly thickly populated. The largest villages are Chila, towards the lower end ; Chingyukai, about halfway up ; and Chikwang, at the foot of the lake.

A little way up this valley we came upon a picket guarding the road, so concluded that it is a route much used by caravans going to Szechwan, though we met none at this season, and few on our return in December. Although the narrow valley—which in places does not exceed half a mile in breadth—is intensely cultivated, with many little villages embowered in trees, the surrounding hills are bare of timber and utterly dried up. At mid-day on May 18 we reached the small lake called Heiwu Hai (“lake of the black mist”) occupying the head of the valley.

This lake is about 10 miles long by half as many broad. It has no visible outlet southwards down the valley—indeed owes its existence to ponding, the valley having been blocked by rubble cones shot out from either flank. But the underlying rock is limestone, so that the water no doubt filters through, to reappear lower down the valley.

The western mountains rise steeply from the water, and only a few small fishing villages crouch in the deep bays on that side. On the east the shore slopes more gradually to the hills, and is terraced for rice cultivation. Here villages are more thickly clustered. Much of the foreshore has been recently reclaimed, and the crops are irrigated from the lake by means of wooden scoops attached to ropes, which are swung like a skipping-rope between two persons.

A sharply defined line at the base of the western mountains appears to be a raised beach, and this lake, like so many in Yunnan, is no doubt slowly disappearing ; but I was not able to examine it. The lake teems with fish, which are caught in circular hand-nets cast from the shore, or by floating nets set further out.

From Heiwu Hai the road ascends steeply, and crossing the hills, here clothed with pine trees, drops down to Yungpeh-t'ing, six stages from Tali.

Yungpeh is a forlorn-looking city with ruined gateways and ragged walls ; like most *ling* cities in western China, it is out of a job since the neighbouring hill tribes saw the advantage of intercourse with the dominant race. The plain is surrounded by mountains, those to the east rising some 1500 feet above the city. A stream from this range has cut a deep trench across the paddy land (invisible till one is on the brink), and flows through a conspicuous gap in the western ridge, below which is another plain. Beyond that are the high mountains which enclose the Yangtze.

The country lying immediately to the east of the great bend of the Yangtze is unsurveyed, and I had no certain knowledge of a road northwards from Yungpeh to Yungning. Nevertheless it was probable that

such existed, and so it proved. On May 22 therefore we continued our journey. From the pass which crosses the eastern range a splendid view of the Likiang snow peaks, 40 or 50 miles away to the north-west, is obtained. This snowy range rises very abruptly from the Yangtze, but soon sinks to lower altitudes again. It is the southernmost of the numerous widely scattered snow massifs of Chinese Tibet.

The whole region lying between the loop of the Yangtze and the Litang river is composed of limestone, with occasional bands of slate or other metamorphic rocks. The well-wooded ranges run north and south, and their slopes are sparsely populated with various mountain tribes, chiefly Lao-p'ang and Lisu. The Moso occupy the higher and narrower valleys, while the Chinese have settled to some extent on the few tiny plains met with.

Rocky bulkheads, tying range to range, divide the intervening corridors up into a series of compartments more or less isolated from one another. The streams, after flowing quietly parallel to the main ranges for a space, turn and rend their way through them to join the Yangtze to the west or the Litang river to the east. Thus it was northwards up and down these narrow corridors, from valley to valley, over a succession of bulkheads that our route lay. For the first three days the road threads its way through wooded hills, almost uninhabited except for lonely Lao-p'ang huts high above the valleys. These Lao-p'ang, or Lo-lo as the Chinese contemptuously call them, are said to be great robbers; but unless they rob each other it is difficult to see how they can make ends meet, since so few caravans pass this way. However, patches of cultivation on the steep slope indicate that they have other less precarious sources of livelihood.

After crossing the pass above Yungpeh we descended to a marshy valley, where were a few scattered huts; then ascending another valley, reached a pass and descended through a wooded ravine, camping for the night as soon as the valley began to open out. Just below us were a few huts.

On May 23 we continued down this valley, crossed a stream, and climbing the steep wooded hillside reached another pass at an altitude of 9891 feet. In the valley below us a beautiful orange-flowered *Primula* was coming into bloom. There were no signs of habitation here, except a small child with some goats; the Lao-p'ang huts are well concealed, and usually high up. The valley we now descended was one of the prettiest we had seen, full of trees and bushes, many of which were in flower. Following the stream down till it turned away to the west, we crossed a spur and presently came down into a wide grassy valley, where we camped again.

Descending through the woods on May 24, we reached the Sha Ho in an hour. It is at this season a shallow stream, 15 yards wide, which flows west to the Yangtze. Once upon a time there was a good bridge

here; the central pier and abutments are intact, but the stone slabs which spanned them are missing, and have been replaced by a few logs. Consequently animals have to ford the stream, which, though easy enough at this season, might present some difficulty during the wet summer months. From the Sha Ho we marched up a broad grassy valley similar to that in which we had camped the previous night. Presently the forest began again, and we reached another pass, from which a high and barren limestone range, running more or less north and south, was visible to the north-east.

From the pass we descended into a charming wooded valley, diversified by open grassy glades, falling water, and broken cliffs. In front of us lay another valley, the stream from which turned west, and up this valley we marched to a camping ground a few miles below the pass. A couple of hours' climb on May 25 brought us to the top of the valley, on the watershed between the Yangtze and Litang rivers, all the streams crossed after this flowing to the east. Close by rose the high range seen the previous day, and far away in the north the tip of a snow peak was visible.

So far our general direction had been N.N.E., but we now turned more to the west. A great change came over the country, for the valley below us, instead of being well wooded, was very barren. Descending this valley we reached a few huts called Meikanho, where the Szechwan road turns off. Up to this point we had been on a highway which, whatever its defects, had at one time been of some importance. Parts of it were stone paved. By the Sha Ho were the ruins of villages long since deserted. What curse has overshadowed this fair country, that men should have abandoned it?

From Meikanho, however, we followed a mere track, descending another dried-up valley to the Lapa Ho, which is a considerable stream. For a few miles we could follow with the eye the Szechwan road on the other side of the valley, and see the white houses of Shingyingpan through which it passes; but after reaching the Lapa Ho, which here flows in a gorge, we saw it no more. By the Szechwan road Taifang is reached the first day from Meikanho, Tiechang on the second day, and Wumuho on the third; beyond that I could get no information. Continuing down the right bank of the Lapa Ho on May 26, we passed several Moso villages, and presently crossed to the left bank by a good wooden bridge opposite the village of Wakai. The river here makes as though to turn off to the east, but after wriggling through the mountains it returns to its former northern course, flowing through the plain of Paichupa.

The Yungning road simply crosses a low spur and descends straight to the plain, near the head of which is the Chinese market village from which the plain derives its name. The Paichupa plain is about 6 miles long by 2 broad, and is the first serious cultivation met with north of Yungpeh. Near the lower end of the plain is the village of Paochukai,

where we found a market in progress. The narrow street was filled with a picturesque throng of Lisus, Moso, and Lolo.

Soon after leaving Paochukai the mountains closed in again, and we were forced out of the valley. The Lapa Ho, after making another S-bend, entered a gorge and presently turned off to the east, while we ascended the limestone range to the west. Again the scene changed. Here were rock-strewn slopes ill clad with ragged shrubs, dry gullies, angular scarps to which the grizzled vegetation clung, tortured by thirst. Ash-grey mountains, fretted into queer shapes, rose against the blue sky, but in the west were higher ranges, their summits furred with pine forest. Up and down rude flights of steps beneath the shadow of the cliff we climbed, till dusk brought us to a few miserable huts set in a natural amphitheatre, from which valleys opened in several directions. This poor place rejoiced in the alluring name of Kinshakow, "the gully of golden sand." Apparently once upon a time gold really had been obtained here. Much more recently iron was mined in the valleys, and large heaps of slag remain to prove it. But this industry too has dwindled, and now there are only two or three mines a few *li* down the valley. Nothing remains to the place save its resplendent name. On May 27, after crossing a pass we descended to another fair-sized plain called Kanpatze, where there are several Chinese villages of the poorer class; the largest is called Paêrhchao. Though the plain is well cultivated, producing rice, maize, wheat and opium, the people seem miserably poor.

Turning east again we crossed a low wooded range, and presently rejoined the valley below in order to continue our march northwards. There was a small river here, but it was not the Lapa Ho; that had already turned to the east, cutting a passage for itself through the ranges. This stream flowed south to join the Lapa Ho, and together they burrowed into the mountains to flow to the Litang river. Crossing this stream, which came from the west, we marched up a valley along either side of which small Moso villages were scattered; then, entering a gorge, camped at the foot of a high range which forms the southern boundary of the Yungning basin.

May 28 was a long day. Climbing the range in front of us we reached a pass 11,260 feet above sea-level, and from the summit obtained a fine view over the mountains of Chinese Tibet, the sharp white towers of the Muli range being very conspicuous. Descending the wooded slopes by an abominable path hacked out of the limestone we reached a shoulder from which the tips of a snowy range west of Yungning rose into view; right below was the Yungning lake, a vivid sapphire lying at the bottom of a pale blue bowl of mountains.

The road now improved, and we quickly descended through pine woods, bright with flowers, to the lake-side. The lake is of irregular shape, its longer axis lying east and west, parallel to the dip of the strata. It is cut almost in two by a spur from the high range to the north-west, off

the end of which is a small rock crowned by a white monastery, the peaceful home of the high lama of Yungning. Here and there along the south-west and north-west shores are deep land-locked bays; the western shore too, along which our road runs, is much indented, but affords a little interrupted cultivation between the mountain foot and the water, where several more villages are buried in the trees. The largest of these is called Laoshuheiko, which means simply "the village by the lake." At the eastern end is a large marshy plain, evidently a silted-up part of the lake, but on three sides bold mountains are rooted in blue water.

Crossing the rim of this basin at the west corner we descended to a small marshy plain, in reality a drying lake. The overflow from the big lake has cut a deep groove through the rock here, but the col is now 100 feet above the lake-level, and no visible water finds its way to the Yungning plain by this route.

There is a high limestone peak at this end of the lake, with a long scarp overlooking the Yungning plain. Caught up amongst a tangle of spurs lying at its foot are several small lakes and marshes, the latter now emerald-green, spangled with flowers. The Yungning plain itself, reached by a corridor winding through the hills, is clearly an ancient lake-bed, formerly fed from the upper lake. We reached the monastery on the far side of the village at dusk, having marched for ten hours; thus the journey from Yungpeh had taken seven days. However it is really eight stages for pack-mules, at any rate in winter, when the days are short. In November we took eight days over the return journey. Yungning is a straggling village, with a yamen, where the *tussu* lives, and a monastery; there are very few shops, the population being almost entirely Moso, who cultivate the plain.

From the high western range flows a river, formerly crossed by a good stone bridge, which is now destroyed; a stout wooden structure has taken its place. The monastery is quite small, and is chiefly notable for a curious blend of styles, the main architecture being Tibetan, while the roof and minor ornamentation are as distinctly Chinese. I spent several days at the monastery, and before I left the head lama, a fat jovial Moso, came over from the island to see me.

On June 2 we resumed our journey to Muli. After travelling to the head of the plain the road divides, one branch going to a village called Lichiangtze, while the other keeps due north, presently reaching a big stream from the Muli range; next day the roads reunite, as there is only one path over the divide. June 3 saw us following up this stream and beginning the great climb. Camp was pitched on a steep meadow slope, yellow with a species of *Roscoea*, growing like crocuses at home. After halting for a day to explore the cliffs, we continued the ascent on June 5, but, coming into a perfect garden of flowers just below the pass at an altitude of 15,000 feet, we halted for a couple of days. Finally on June 7



6. THE KANGKALI RANGE

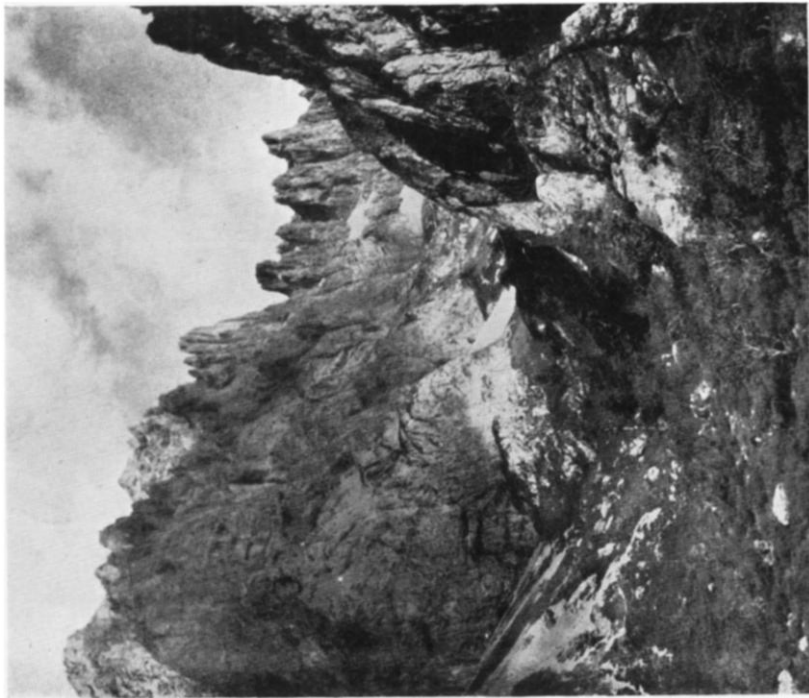
Note: Nos. 6, 7, 9, 10 illustrate more particularly Mr. Ward's paper on "The Glaciation of Chinese Tibet" in the May 'Journal.'



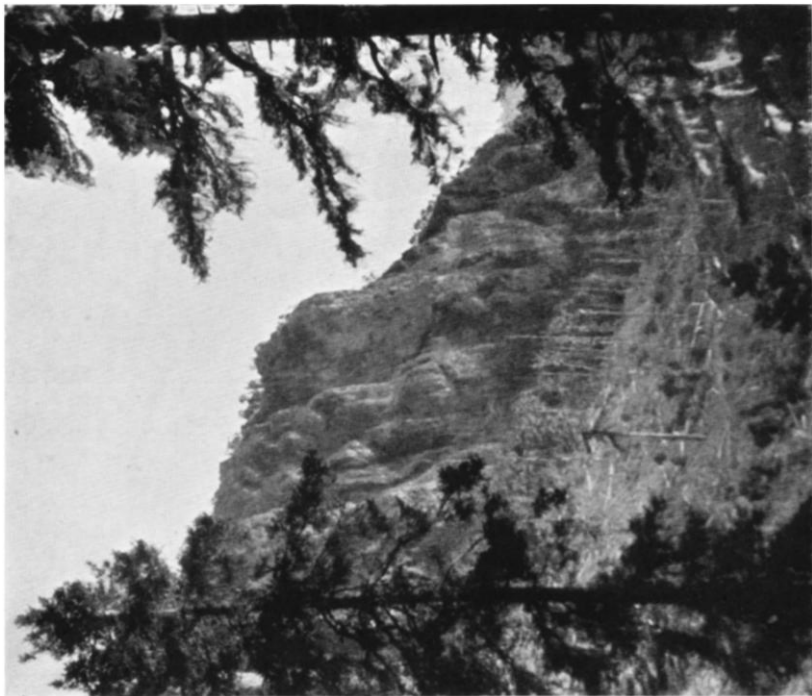
7. LIMESTONE RANGES WEST OF MULI, THE WATERSHED BETWEEN THE SHOLO AND LITANG RIVERS



8. WOODEN BRIDGE OVER THE LAPAHO NEAR YUNGNING



9. BARREN LIMESTONE CLIFFS AND SCREES ABOVE MULI:
15,000—16,000 feet



10. FIR FOREST ON THE LIMESTONE RANGES ABOVE MULI

we reached the monastery of Muli, above the Litang river, or Li Chu, as it is called there, and I was given quarters in the house of the cobbler.

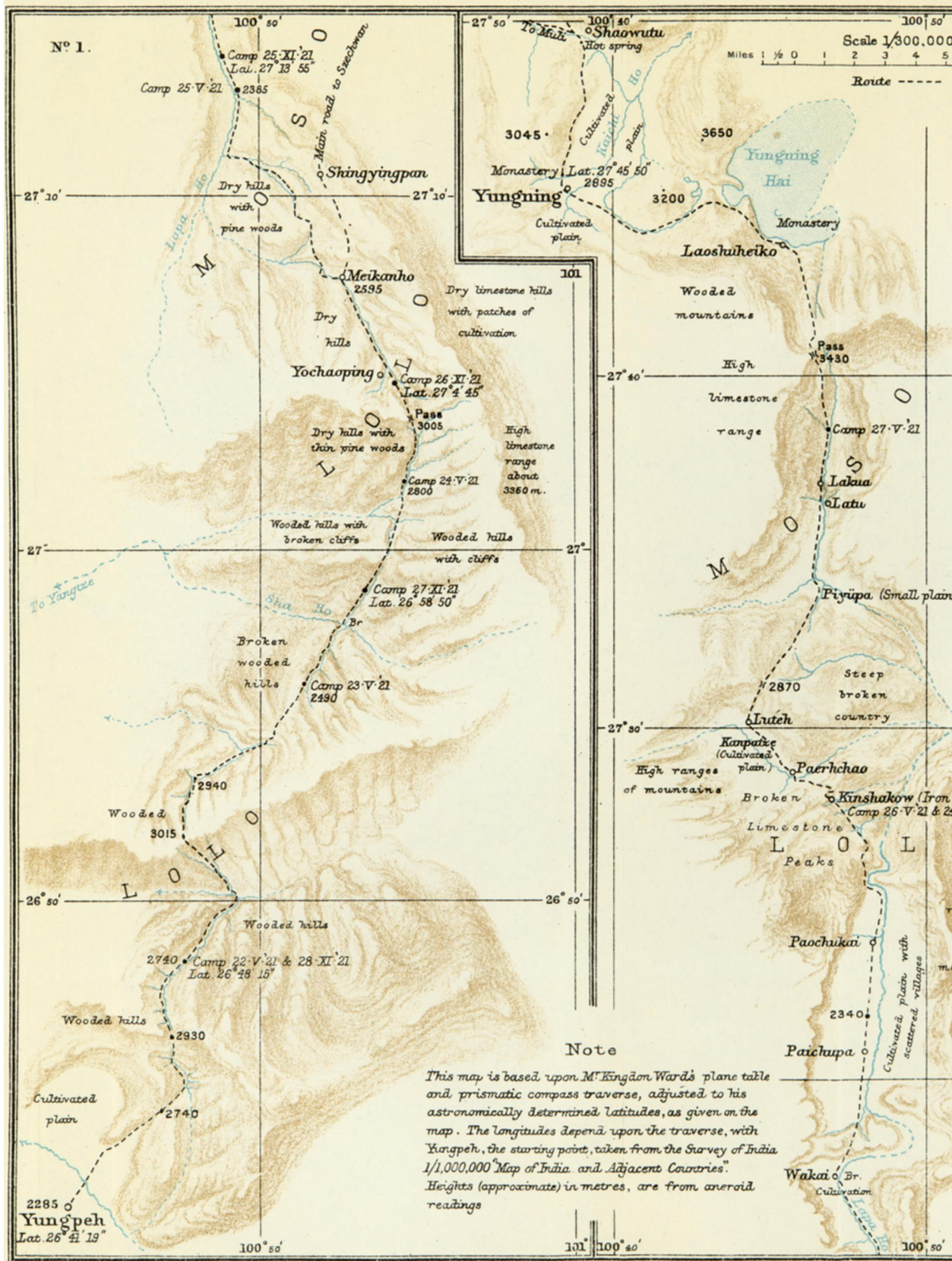
Amongst the three or four Europeans who have passed through Muli on their travels are Mr. Amundsen the missionary, General H. R. Davies, and Mr. R. F. Johnston; but I venture to think that not one of them received the welcome accorded me in 1921 at the hands of the grand lama. The story of my five months' residence at Muli however cannot be told here; I had reached my destination after crossing Yunnan.

THE WIRELESS RECEIVING EQUIPMENT OF THE HAMILTON RICE EXPEDITION, 1919-20

John W. Swanson (communicated by Dr. Rice)

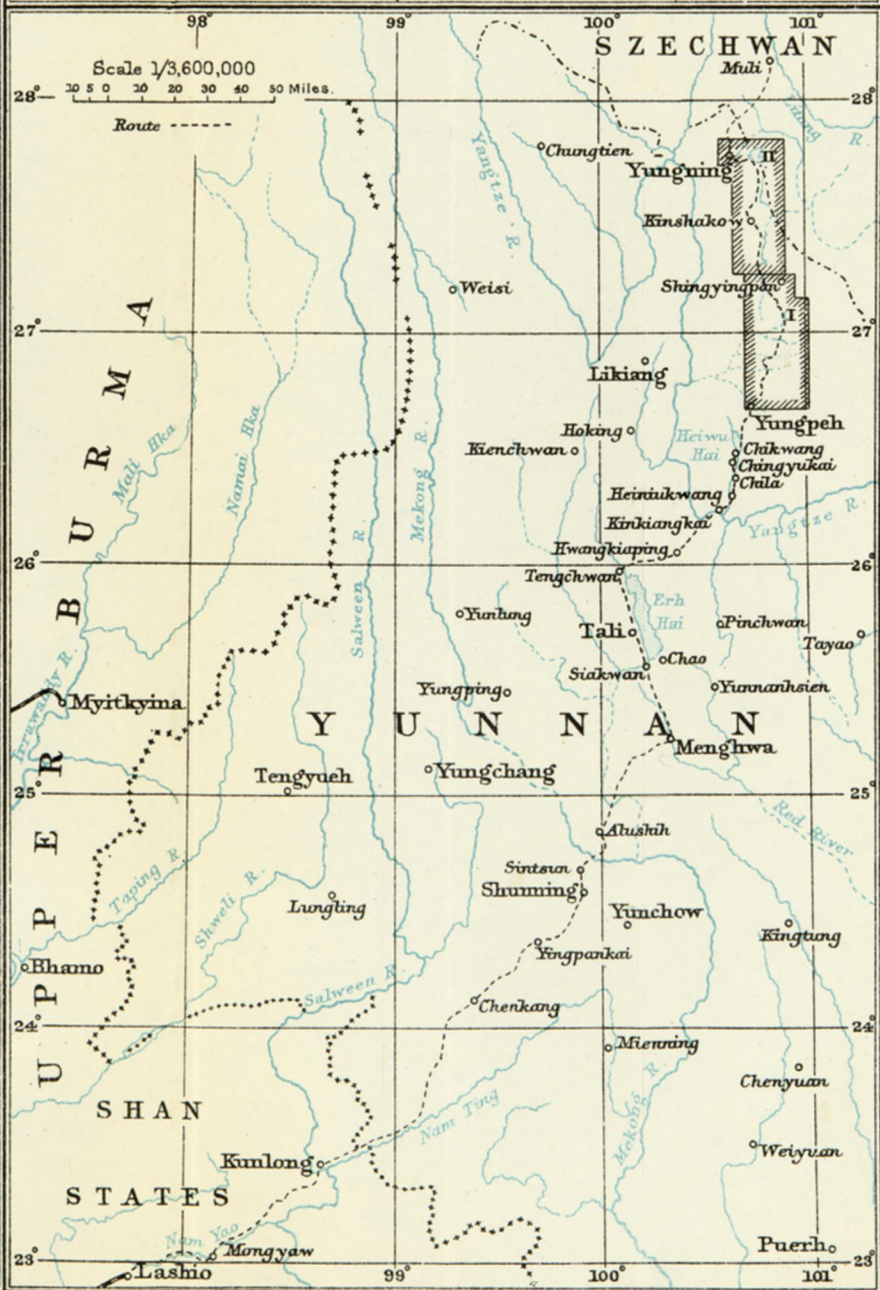
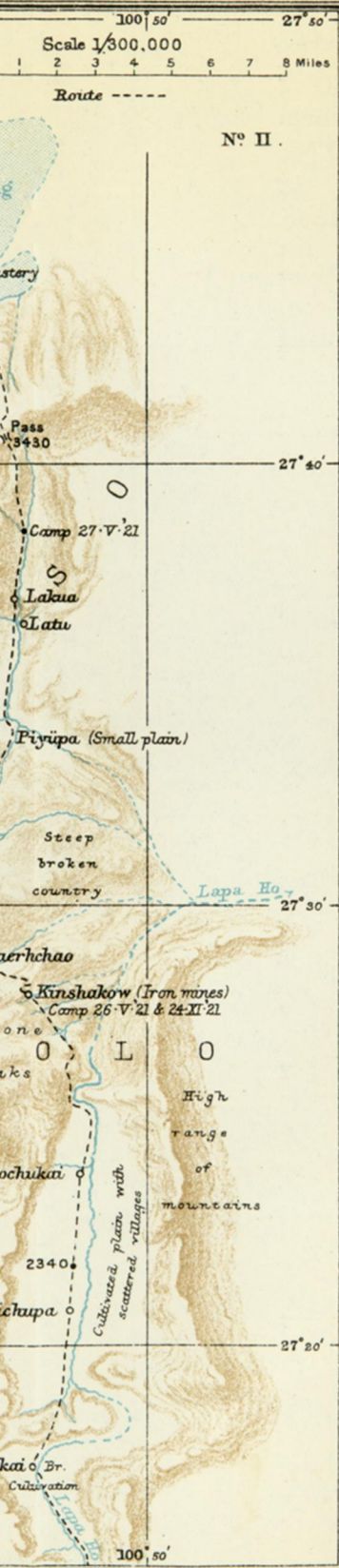
THE radio equipment of the expedition of 1916-17, while a sensitive and high-class instrument, did not fully meet the requirements of a portable receiver for an exploring expedition in tropical South America. The apparatus consisted of many pieces requiring assembling each time it was used, was weighty, bulky, delicate, and necessitated large antennæ to procure results. In the Amazon valley, the home of "static," it soon became apparent that "static traps" in the form of antennæ were not to be desired. Furthermore, it was no easy matter to erect antennæ; the trees of any height are very wide in diameter, the wood very hard, and the bark thin and slippery, making the use of climbing irons difficult and dangerous. I learned that early in the expedition of 1916, and employed Indians at every opportunity to climb for me when climbing was at all feasible. They can climb a tree monkey fashion and be at the top while one perplexes himself over the problem. But even an Indian does not care to expose himself to the excruciating pain of the sting of the large ants and other insects that infest the trees, and it was very difficult at times to induce them to climb. Another bad feature of the set was that the only means of charging storage batteries was by the means of a hand generator, a very unsatisfactory device in a tropical country.

With the above obvious handicaps in the radio equipment of 1916 in mind, the writer immediately upon his return from that expedition busied himself with constructing an equipment that would eliminate these handicaps, namely, a set that was durable and in one compact unit and which required no antenna or earth for its operation. Much difficulty was met, because it was no simple problem to place all the required pieces compactly without getting reactions between the various circuits. But finally a satisfactory receiver, comprising regenerative circuits with detector and three stages of audio and radio frequency amplification, was obtained, with the valuable assistance of Mr. Paul F. Godley, radio receiver expert.



Route from BURMA TO SZECHWAN through WESTERN YUNNAN

by
F. KINGDON WARD
1921

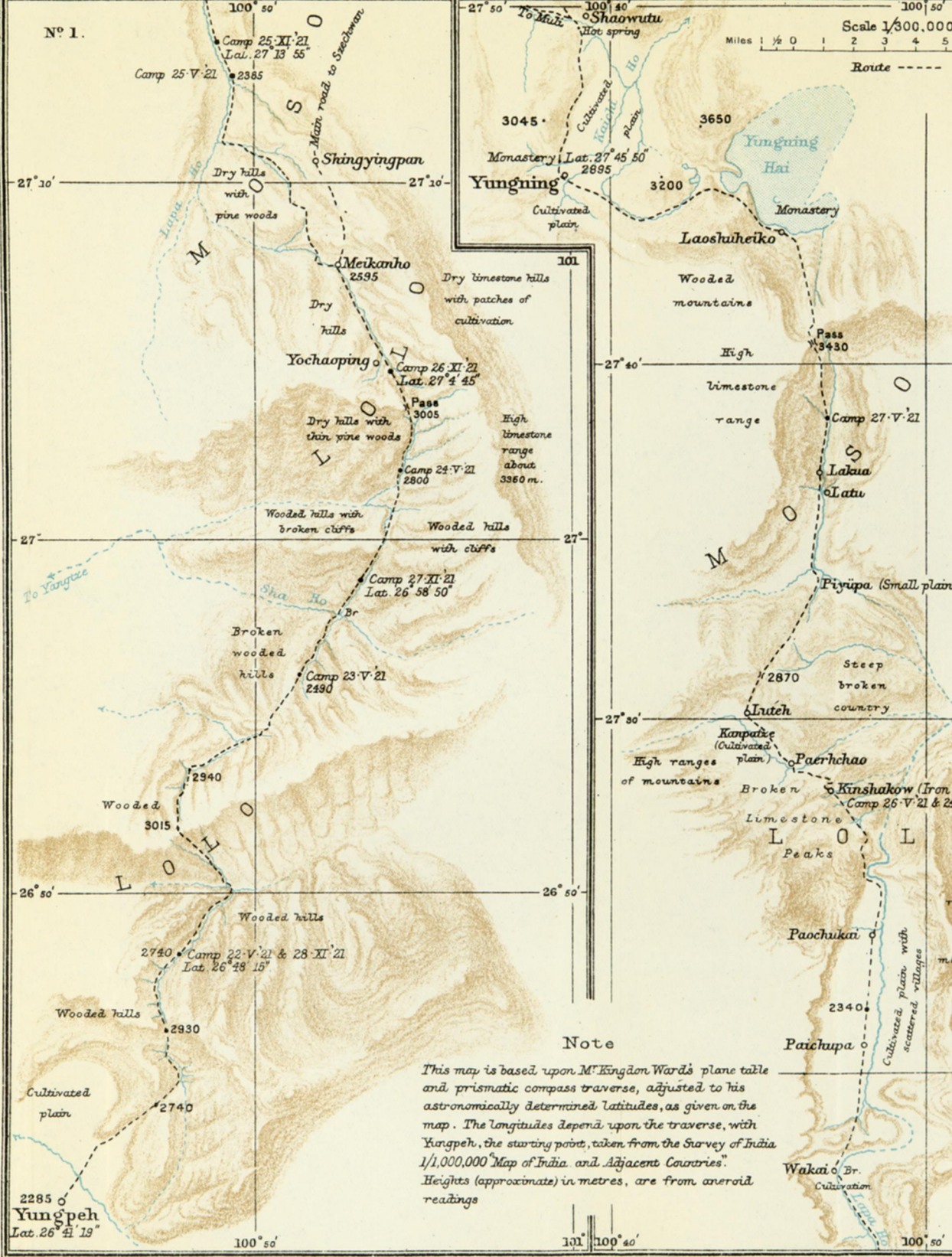


N° 1.

Scale 1/300,000

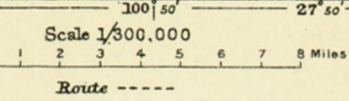
Miles 1/2 0 1 2 3 4 5

Route - - - - -



Note

This map is based upon M. Kingdom Ward's plane table and prismatic compass traverse, adjusted to his astronomically determined latitudes, as given on the map. The longitudes depend upon the traverse, with Yungping, the starting point, taken from the Survey of India 1/1,000,000 Map of India and Adjacent Countries. Heights (approximate) in metres, are from aneroid readings



Route from BURMA TO SZECHWAN through WESTERN YUNNAN

by
 F. KINGDON WARD
 1921

