

LIAO RIVER UNDER AN INTERNATIONAL ORGANIZATION.

By Bunkichi Okazaki, Dr. Eg, Member.

Synopsis.

The Upper Liao River Conservancy works are under charge of Dr. B. Okazaki, the Engineer-in-Chief, who studied the river since 1920 and his new proposal for improving the river was adopted by the Liao River Conservancy Board as was stated in the October number 1921 of this journal. In the present issue a short historical summary of the recent river improvement works which have been carried out by the international organization together with the details and stipulations of the new cutting known as line "A" about 14 miles long in order to explain what has been done and is to be done under the said Board.

It was on the request of the Society that actuated the author to write an article concerning the Liao River in China in the October number 1921 of this journal. In that article what are being done or contemplated under the international organization viz. the Liao River Conservancy Board have been introduced before the Members of the Society.

Since then a new enterprise was planned besides continuing to do temporary works of urgent necessity for taking back as much water as possible to Liao proper which have been going on for the last few years that is the dredging operation in the worst pass about 24 miles long of the present Liao located between "Tan-chia-wo-pu" (唐家窩舖) the point of escape of the Liao proper into what we call "Shwang-tai-tzu" (双台子) channel and "San-chia-ho" (三入河) meaning three forks river that is the point where "Hun-ho" (渾河) and "Tai-tzu-ho" (太子河) join the Liao river proper (vide plan No. 1 and 2). And the author now intends to lay this new plan which is a drastic measure for reverting as much water as possible to Liao proper together with a short historical summary before the Society.

The late Mr. Hughes, M. Am. S. C. E. Chief Engineer to the "Fen-tien" Gov. (奉天省) and additionally to the Liao River Conservancy planned some years ago to construct an overflow masonry dam all across the Shwang-tai-

tzu channel at "Lian-chia-wo-pu" (冷家窩舖) a little below the point of diversion at "Tan-chia-wo-pu" (唐家窩舖), there-by intended to dam up the water level to a certain height, letting surplus water flow into "Shwang-tai-tzu" (雙台子) channel over the dam. The late Engineer seemed not to have planned the construction of a lock to the benefit of the junks sailing in the said channel. These works were, however, made targets of criticisms and incurred a stout opposition of the local peoples concerned towards the latter stage of the work in the shape of suspension of the work by force of arms. To complete the catalogue of evils, the excitement by which the peoples along the channel were driven finally culminated in the destruction of part of its construction. The Chinese authorities concerned at that time seemed to have connived at the opposition raised by the people as may be evidenced from the fact that the dam work was wholly abandoned and the late Mr. Hughes even in the capacity of Chief Engineer to the Fen-tien Government (奉天省) was compelled to give up the resumption of the construction.

Consequently he changed the plan so as to attack the problem in another way and adopted the method of dredging the said worst pass of the main stream, quite independently of the remaining work at "Tan-chia-wo-pu". Thus the dredging operation has continued up to the present as above stated. The reasons of opposition were said to be as follows:—

(1) The work of damming up the river may give bad effect upon the upper reach in case of flood; (2) lack of lock in parallel to the dam construction might cause a fatal blow to the navigation in Shwang-tai-tzu channel; (3) the taking away of a greater volume of water to the Liao might deal a telling blow to the irrigation enterprises then established along the lower Shwang-tai-tzu.

By seeing that the said dredging which is only a temporizing measure to fight against the natural tendency of the worst pass to silt up to an undrainable extent the Board decided at the end of 1920 to instruct the Engineer-in-Chief of the Upper Liao River Conservancy to make close investigation about proposing a new scheme which might prove to be a radical measure of relief to the difficulty in question. The Engineer-in-Chief prepared 3 alternative plans to meet the request of the Board and the latter decided to adopt the plan of new cutting in what we call "line A" at the end of 1921.

NEW SCHEME.

In the new scheme adopted by the Board it is contemplated to build a weir and lock at "Erh-tao-chiao" (二道橋) in the Shwang-tai-tzu channel and to make a new cut along "line A" from Erh-tao-chiao to Chia-shen-tzu in the Liao river (see plan 1 & 2) 13.8 miles long in order to regulate the flow of Shwang-tai-tzu channel and to revert as much water of both high and low water to Liao as possible for the benefit of the regime of the lower river and navigation in general, at the same time facilitating the junk navigation existing in the Shwang-tai-tzu channel through the lock; the latter navigation being mainly to depend upon tide in the reach below the lock.

The line of new cutting follows generally the old river beds which were formed as the result of breach of the levee along the left bank of the Shwang-tai-tzu channel in case of the Flood of 1915 and remained as temporary river until the riparian owners closed the breach. By this new plan of cutting the river course is shortened about 7 miles and recently the petition from local people was received through "Tao-yin-yamen" (道伊衙門) urging the local wishes for opening of this new cut as early as possible. Under the new scheme the excavated spoil is to be totally embodied in the two new embankments on both sides of the cut 800 ft. apart from inside to inside so as to provide an ample capacity for taking in flood water and at the same time to make the embankments as stable as possible. The zone of land included between the new embankments inclusive that is about 13.8 miles long and 1,100 ft. wide and amounts to 12,371.47 mou (1 mou = 0.14945 acre) was purchased at the total cost of S. C. 474,483.60 including the compensation for removal of cemeteries, houses and all other objectives existing upon the said area.

The intended principal dimensions of the cut are as follows:—

Total length	73,660 ft.
Bottom width	90 ft.
Depth below low water level	10 ft. (see Plan No. 3 & 4)
Side slopes	1 : 2
Distance between insides of new embankments	800 ft.
Height of the top of embankments	8 ft. above the highest known flood mark.

The channel capacity provided with the above dimensions will be able to take back 3,000 cub. ft. per second of water at the depth of 10 ft. for the assumed slope of 1/9,000 approximately and flood discharge of 14,000 cub. ft., for the assumed slope of 1/10,000 approximately when the flood is at 117.3 ft. that is the highest flood mark at Erh-tao-chiao in summer 1921, out of the calculated total flood discharge of 30,000 cub. ft. per sec. which is a share to Shwang-tai-tzu channel, of total flood water of 50,000 cub. ft. per sec. at Tan-chia-wo-pu as calculated by us in case of the said flood.

The earth work of cutting which amounts to about 4,728,800 cub. yards is now advertised for the notice of Contractors. Further details may be seen in the following Stipulations and Plans.

The matter regarding the execution of the Shwang-tai-tzu weir and lock as above stated is under way.

GENERAL STIPULATIONS AS TO WORK.

1. General Stipulations which are to apply to the whole of the works, wherein the workmanship and materials described may be used, and which stipulations are intended to apply to the extra or unspecified works, as well as to the contract or specified works, excepting in cases where it is otherwise stated.

2. The increase in the quantity of excavation of any kind, or other matter and material which may arise, will be paid for according to the rate specified in the Detailed List of Quantities and Prices, and if any diminution shall arise in any of the quantities of excavation of any kind, or other material and matter, the difference will be charged to the Contractor at the rate specified in the Detailed List of Quantities and Prices, and no claim by him for loss of profit will be allowed or paid.

3. The Contractor shall provide and fix, at his own cost, all temporary work and materials, and he must submit drawings of any proposed temporary constructions for the Engineer-in-Chief's approval before they are erected and brought into use upon the works, but such approval shall not exempt the Contractor from any responsibility as to the sufficiency of such works or materials, and he must bear all risk in connection therewith.

Temporary Houses, &c. during the execution of the works, or any machinery for excavating or embanking, provided that the sites for such erections are obtained by the Contractor with the consent of the parties concerned.

5. The Cutting extends for an approximate distance of 73,660 English feet as shewn on Plan Nos. 1, 2 & 4. Contract Plan No. 1 is a key plan shewing the site of Cutting. Contract Plan No. 2 is a survey along the whole length of the proposed cutting shewing the centre line outside side lines of embankments nature and details of curves and general details of the country plotted to a scale of 1 to 6,000.

Contract Plan No. 3 is a longitudinal Section along the centre line of the cutting. This plan also shews Height of level of embankments in feet. Cross Sectional Area of cut at 100 feet intervals in English Square feet.

Depth of cut below ground level at 100 feet intervals at centre and sides of cut.
Ground level at centre line.
Location of centre line.
Distance in English feet.

Contract Plan No. 4 is a Standard Cross Section of cut shewing full details of cutting and embankments.
The Cutting is as under:—

Bottom width 90 feet
Side slopes 1 vertical to 2 horizontal

Width to top of embankments varies from 37 ft. to 75 ft.
Distance inside top to inside top of embankments 800 feet.
All side slopes of embankments 1 vertical to 2 horizontal.

The cut and levee (embankments) shall be in strict conformity with this Plan.
The successful or other Contractor is also at liberty to examine and copy 778 Cross Sections taken along the line of the cutting and which can be seen at the office of the Engineer-in-Chief.

The Board whilst believing all details of these surveys etc. as shewn on these plans to be accurate yet accepts no responsibility as stated in the Specification.

Survey Marks 6. Stakes or survey marks of all and any description shall not be removed or moved or in any way not to be moved interfered with without the consent of the Engineer-in-Chief or his Assistant.

7. PREPARATION OF GROUND. The base of the levee (embankments) shall be cleared of all vegetation old foundations, roots etc. and other materials detrimental to the work and shall be thoroughly broken up with a spade or plough to a depth of 9 inches.

All trees or stumps within three feet of the base shall be grubbed, cut by the roots, and removed.

8. EMBANKMENTS. Clean earth, free from vegetation and other foreign matter, will be used in constructing the embankment, unless direction are given otherwise, all earth is to be procured from the cut, and the spoil excavated from the cut is to be totally embodied in the 2 embankments 800 ft. apart inside top to inside top. No earth is to be taken from below the natural surface of the ground nearer the base of the levee (embankments) than twenty feet on the river side and eight feet on the land side, the slope of the side of the excavation nearest the levee not to be steeper than one vertical to 2 horizontal.

Building one side or the centre of the work in advance of the other parts will not be allowed. All earth shall be trampled or rammed in layers of one ft. thick. Side slopes one vertical to two base shall be made of clean loam at least one foot thick and finished by striking with a wood plank hammer.

All old embankments existing between the new ones shall be razed and leveled to the ground surface after the completion of the new embankments, at the expense of the Contractor.

All old ditches, creeks etc. existing between the line of the 2 embankments shall be filled in at the Contractor's expense.

9. SHRINKAGE AND SETTLEMENT. To provide for shrinkage or settling, all parts of the crown and slopes of the levee shall be built to a gross height exceeding the final or net height as shown on Plan No. 4 by ten per cent of the height.

10. TENPORARY WORKING DRAIN. Temporary drains shall be dug and maintained where required at the expense of the Contractor.

11. SPOIL AND FLUSHING. No spoil will be allowed to remain between the levees. Scouring by hydraulic

flushing is prohibited.

12. Before, during or after the completion of the works it may be found necessary to cut drainage ditches at one or both sides of the embankments. These will, if required, be set out and dimensioned by the Engineer-in-Chief later. The Contractor must allow a price per fang in his Schedule of Prices.

13. Whenever it becomes necessary for the drainage to be passed under the embankments this shall be done through an "ARMCO" corrugated Culvert 30" diameter and fitted at the River side with a "Calco" Automatic Drainage gate.

For 30" "ARMCO" Culverts Contractor should allow Shanghai Tael 6.95 per lineal foot C. I. F. Newchwang.
For 30" "CALCO" Automatic Drainage gates allow S. Tls. 90.00 each C. I. F. Newchwang.

Road
Crossings
14. Where required by the Engineer-in-Chief road crossings over the levees (embankments) consisting of ramps covered with a corduroy road must be built at the Contractor's expense.

Temporary
bridges.
15. Temporary bridges over the cut will be built by the Contractor as required by the Engineer-in-Chief.

These may consist of timber trestle bridges or be formed by means of that portion of the cut not being excavated. In the latter case the Contractor must provide for through drainage at his own expense to the satisfaction of the Engineer-in-Chief.

All Crossings must be of sufficient width for a single truck and of requisite strength. The ramps shall not have a grade steeper than 1 vertical to 7 horizontal with side slopes not steeper than 1 to 1. It is the Contractor's responsibility to maintain all such crossings.

Removal of
Ditches &c.
16. On the completion of the work the whole length and width between the embankments is to be left as shewn on Plan No. 4 absolutely free from all obstructions either temporary or permanent, spoil, camps, temporary structures, or other debris.

Sanitation
17. The Contractor is responsible that effective sanitary precautions are taken in and about his camps and proper latines constructed and in case of an epidemic he must comply with the requirements of the Chinese Medical Authorities.

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One fang. 18. The prices of all excavation shall be based on one Chinese fang of 110.872 English Cubic feet.
 Price for act. 19. The price for all excavation shall be per fang of 110.872 English Cubic feet excavated from the cut and embodied equally in the two embankments, one on either side as shewn on Plan No. 4. No extras will be allowed for conveying or tamping this spoil into the embankments.

20. In order to facilitate estimating the quantity of excavation the whole length of the proposed cut has been divided into 8 Sections viz:—

Nos. A. B. C. D. E. F. G. H. These are shewn on contract Plan No. 3. The following is the approximate length and quantity of earthwork in these Sections.

EARTH WORK LIST.

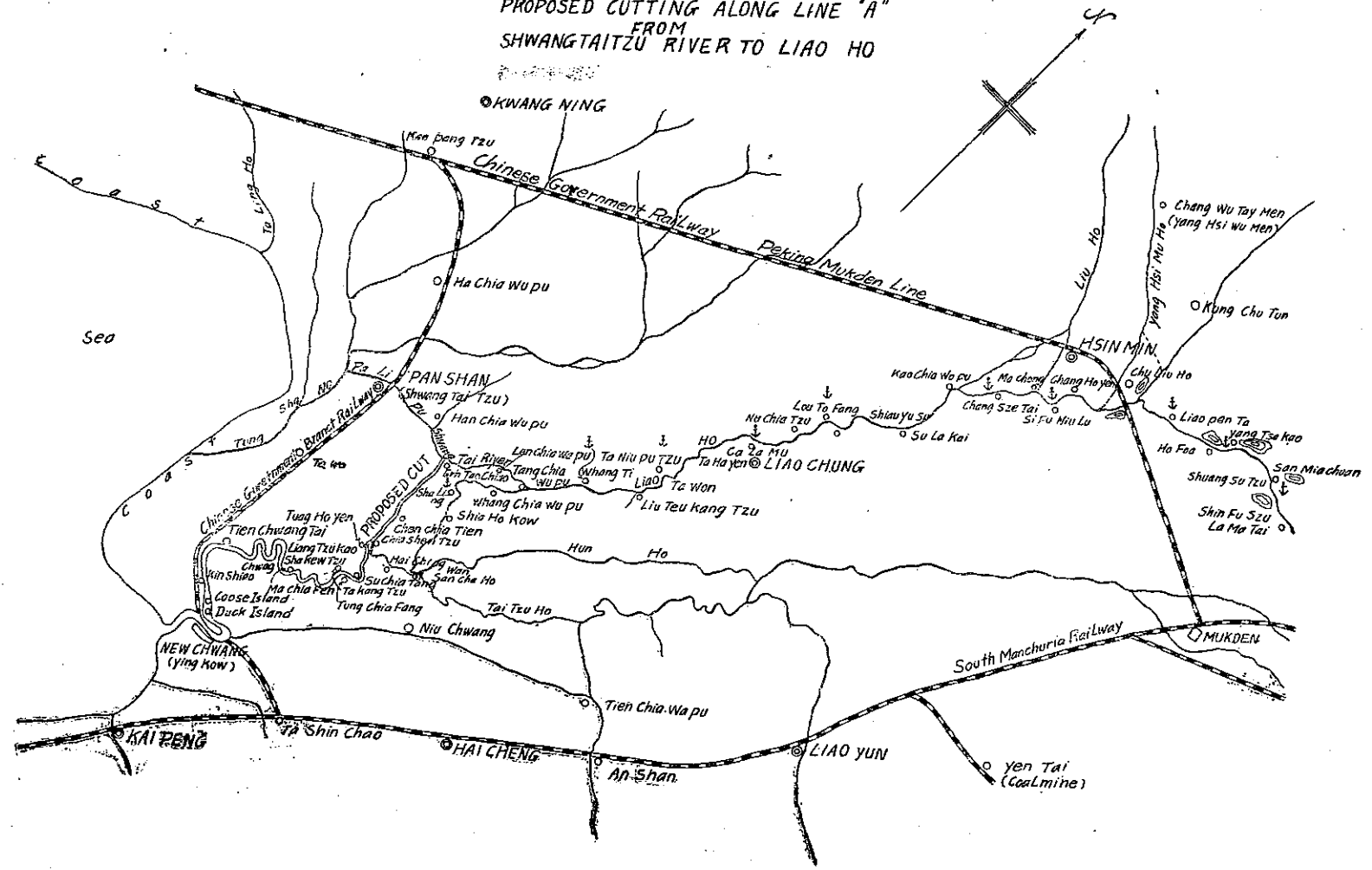
SECTION	SURVEY SECTION	LENGTH	EARTH WORK TO BE EXCAVATED
A	—300 to +9,000 ft.	9,300 ft.	175,801.2 fang.
B	9,000 "	10,100	175,225.9
C	19,000 "	19,716.6	295,848.4
D	38,500 "	6,800	106,145.7
E	45,300 "	7,800	121,100.6
F	53,100 "	6,700	101,732.3
G	58,900 "	6,800	102,492.7
H	65,700 "	6,955	103,897.6
74,071.6 Total			1,182,244.4 Fangs

Remark:— 110.872 Cub. ft. = 1 fang.

The Board whilst believing the above figures to be correct accepts no responsibility as to their accuracy.

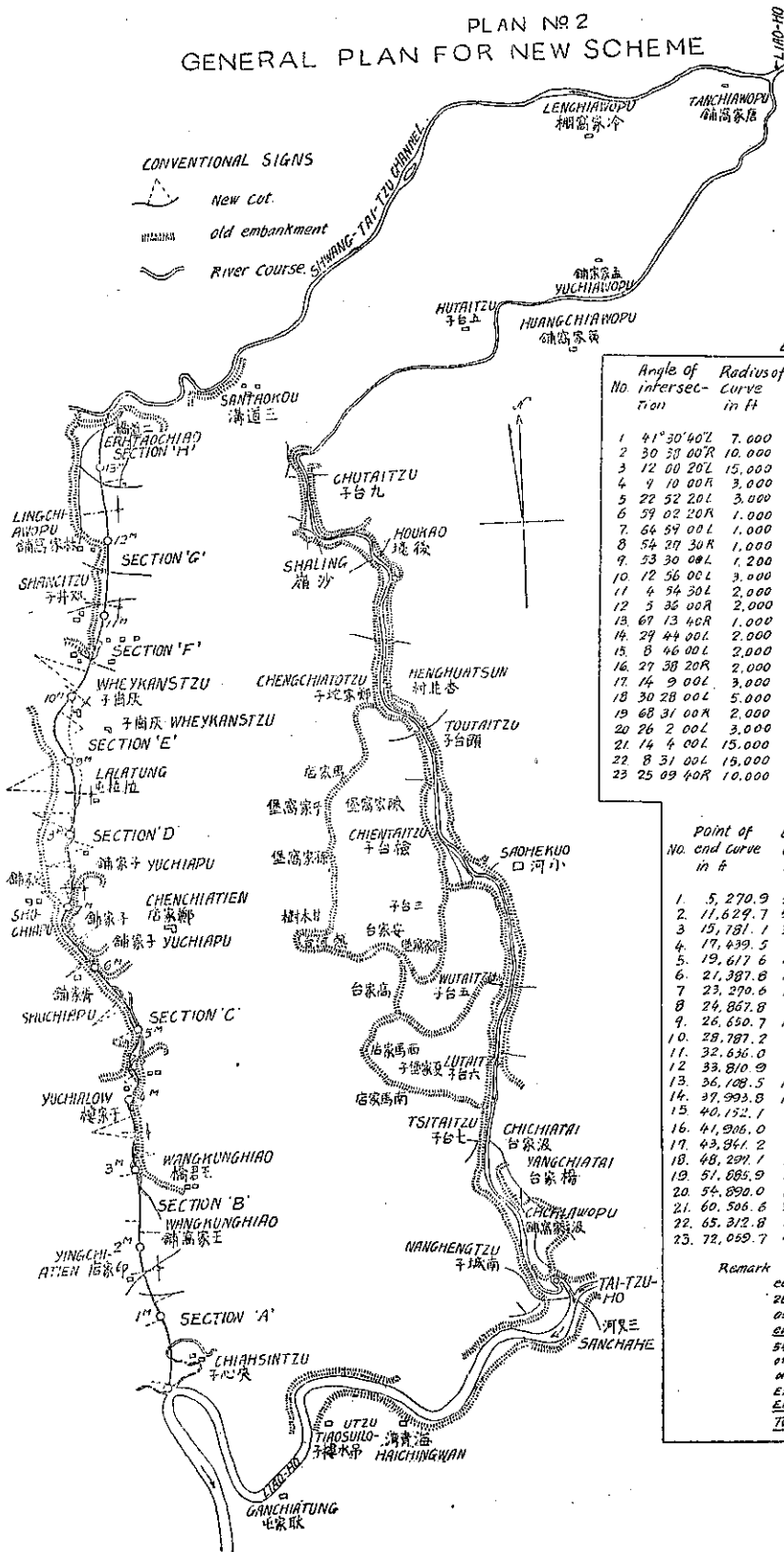
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PLAN NO 1
LIAO RIVER CONSERVANCY BOARD
SITE PLAN
OF
PROPOSED CUTTING ALONG LINE "A"
FROM
SHWANGTAITZU RIVER TO LIAO HO



PLAN No 2
GENERAL PLAN FOR NEW SCHEME

附圖第一



LIST OF CURVES

No.	Angle of intersec- tion	Radius of Curve in ft.	Length of Curve in ft.	Point of Tangent intersec- tion on in ft.	Point of Begin- ning Curve in ft.
1	41°30'40" L	7,000	2,652.8	3,052.8	200.0
2	30°50'00" R	10,000	2,738.8	9,022.0	6,284.2
3	12°00'20" L	15,000	1,577.3	14,215.4	12,638.1
4	9°10'00" R	3,000	260.5	19,200.0	16,959.5
5	22°52'20" L	3,000	606.7	19,024.0	18,420.3
6	59°02'20" R	1,000	566.2	20,923.7	20,357.5
7	64°59'00" L	1,000	636.9	22,773.3	22,136.4
8	54°29'30" R	1,000	514.7	24,432.0	23,917.3
9	53°30'00" L	1,200	604.8	26,135.0	25,530.2
10	12°56'00" L	3,000	360.0	28,450.0	28,110.0
11	4°54'30" L	2,000	85.6	32,550.5	32,464.9
12	5°35'00" R	2,000	94.8	33,713.2	33,615.4
13	67°13'40" R	1,000	664.8	35,600.0	34,935.2
14	29°44'00" L	2,000	530.9	37,486.8	36,955.9
15	8°46'00" L	2,000	153.9	40,000.0	39,848.1
16	27°38'20" R	2,000	491.9	41,433.0	40,941.1
17	14°9'00" L	3,000	372.3	43,432.6	43,100.3
18	30°28'00" L	5,000	1,361.6	44,000.0	45,638.4
19	68°31'00" R	2,000	1,362.2	50,856.4	49,494.2
20	26°2'00" L	3,000	693.5	54,221.3	53,529.8
21	14°4'00" L	15,000	1,850.6	58,674.5	56,823.9
22	8°31'00" L	15,000	1,116.9	64,200.0	63,083.1
23	25°09'40" R	10,000	2,231.7	69,930.0	67,688.3

Point of end Curve in ft.	Length of Curve in ft.	Magnetic Course for S.C.	Magnetic Course for E.C.
1	5,270.9	S 73°00' W	N 18°55' W
2	11,629.7	S 18°30' E	N 17°30' E
3	15,181.1	S 11°40' N	N 10°15' W
4	17,439.5	E 80°0' E	N 9°00' E
5	19,617.6	S 8°50' W	N 14°30' W
6	21,387.8	S 14°15' W	N 13°30' E
7	23,270.6	S 65°00' W	N 22°00' W
8	24,867.8	N 20°00' W	N 16°30' E
9	26,650.7	S 34°30' W	N 19°00' W
10	28,787.2	S 19°00' E	N 32°30' W
11	32,636.0	S 32°00' E	N 39°00' W
12	33,810.9	S 37°15' E	N 31°30' W
13	36,108.5	S 31°15' E	N 35°30' E
14	37,993.8	S 36°00' W	N 6°30' E
15	40,152.1	S 6°00' W	N 2°50' E
16	41,906.0	S 2°30' E	N 25°30' W
17	43,941.2	S 29°00' W	N 11°00' E
18	48,299.1	S 10°45' W	N 10°40' W
19	51,685.9	S 19°30' E	N 49°30' E
20	54,890.0	S 69°20' W	N 23°20' E
21	60,506.6	S 62°30' W	N 9°00' E
22	65,312.8	S 10°00' W	N 0°45' E
23	72,059.7	S 1°00' W	N 25°30' E

Remark Magnetic Variation 6 degrees to the West in 1920.
 25,842'6 of original Line - 27,059'2 of New Line. -- Excess of each chain 216'6
 54,564'5 of original Line - 55,666'6 of New Line (55,890'6 from the original station).
 Excess each chain 990'0
 End Point 72,341'0
 Total Length 73,657'6

PLAN NO. 3.
 LONGITUDINAL SECTION
 OF 'A' LINE
 FROM SHWANGTATZU CHANNEL AT ARHTAOCHIAO
 TO LIAO HO AT CHIASHENTZU.
 SCALE OF VERTICAL 1 / 200
 " " HORIZONTAL 1 / 40,000.

