REPORT

ON THE

SURVEY AND PROSPECTS OF A RAILWAY

BETWEEN

HANKOW AND CANTON,

UNDER THE CONCESSION

BY THE

CHINESE GOVERNMENT

TO THE

American China Development Company,

BY

WM. BARCLAY PARSONS, *Chief Engineer.*

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CONTENTS.

INDEX.

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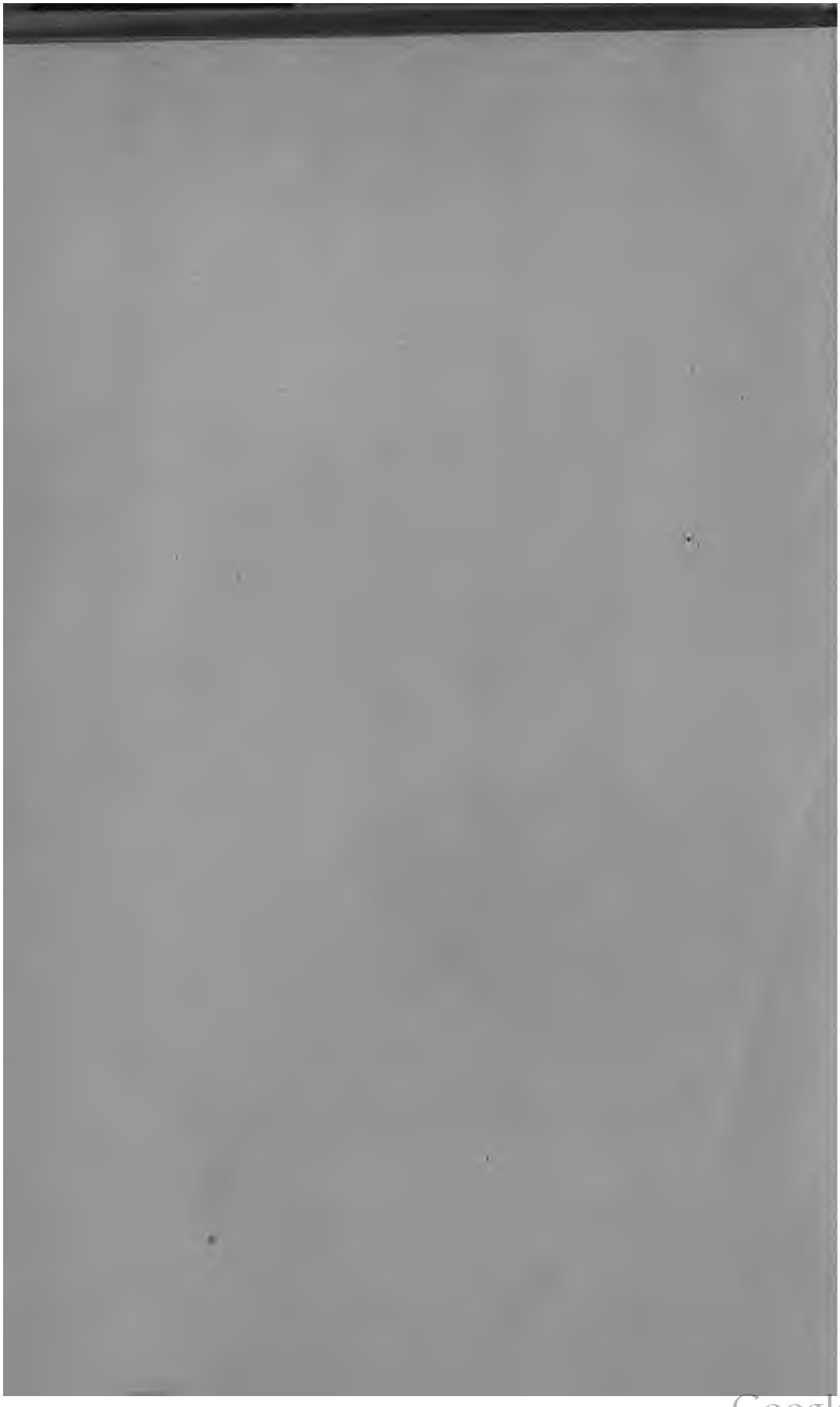

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CHAPTER I.

GENERAL ACCOUNT OF THE EXPEDITION.

Acting under the foregoing instructions I left New York on the 14th of October, 1898.

On arrival in Shanghai, November 14th, I was confronted with a totally unexpected condition of affairs on account of the *coup d'état* executed by the Empress Dowager, and as a result of which there was a decided disinclination on the part of officials to allow the party to pass through the province of Hunan, which—although not specially designated in the concession, nevertheless in all the preliminary negotiations and in all previous discussions of a Hankow-Canton railway—had always been considered as the most valuable route.

Hunan is the province where the strongest anti-foreign feeling has always existed. Except in the northwest corner where such sentiment has always been less, not exceeding six foreigners have been within its borders, and then only along the main line of travel, the Siang River. Of foreign missionary stations there are but two, one at Yo-chou, and one at Hêng-chou, the latter having been continually maintained, curiously enough, during two hundred years.

Under the liberal policy of the Governor, Chên Pao Cheng, appointed a few years ago by the Emperor, electric lighting had been introduced in Chang-sha, the capital; a school where science and other modern subjects were taught had been established, and the people were being

rapidly prepared to accept the development of western civilization. On the return of the Empress Dowager to power, however, the governor was removed and one representing the extreme conservative element appointed in his stead. This official immediately set about to undo what his predecessor had so well begun. The school was closed; officials friendly to foreign ideas were removed, and an attempt was made to have Hunan and the Hunanese return to their previous anti-foreign attitude.

It was this circumstance that complicated the situation. H. E. Shêng Tajen, the Director-General of Railways, while admitting the superiority of the Hunan route, urged your Engineer to make a survey through the province of Kiang-si, lying to the eastward of Hunan, and while that survey was in progress he would endeavor to influence the Hunan officials to permit a survey to be carried through the latter province. This request was refused, your Engineer maintaining that, as the Hunan route was by everyone recognized as being the best, and had been the only one under consideration in the preliminary discussion, no makeshift or temporary expedient would or could be considered; that as your syndicate had fully complied with its part of the contract by the sending of engineers and the making of the required deposit, the Chinese government, therefore, must fulfill its pledges and see to it that no provincial official be allowed to thwart an imperial undertaking.

As no alternative or compromise would be considered, H. E. Shêng started for Hankow to confer with the Viceroy, Chang Chih-tung, where I joined him at the end of November. At this place the situation seemed even more difficult, the Viceroy and Shêng representing that probably an imperial edict would be necessary to provide a safe pas-

sage, to secure which telegrams were sent by both officials to the Tsung-li-yamen, and by your Engineer to the United States Minister. After some delay an order was received from the Tsung-li-yamen addressed to the Governor of Hunan directing him to permit the party to enter his province to make the survey, and to furnish all the necessary protection. While these negotiations were in progress, your Engineer learned from the residents of Hankow that their opinions coincided with those of the residents of Shanghai, namely, that the journey was one of great difficulty in execution on account of the hostile feeling against all foreigners, and even against other Chinese not belonging to Hunan.

The first 100 miles of the route, however, was in the province of Hupeh, where no trouble was to be anticipated, and so your Engineer immediately applied for permission to allow the party to undertake the survey of this portion while he remained in Hankow to conclude the Hunan negotiations. This permission was secured, and the party left Hankow on December 10th. The very evident anxiety of the Viceroy and Director-General, coupled with the statements and fears of the foreign residents, impressed your Engineer with the seriousness and responsibilities of the situation, as not, on the one hand, to risk your financial interests by showing a lack of firmness, nor, on the other, the personal safety of the party by being unnecessarily rash. Just before leaving Hankow he doubled the supply of ammunition in order to be prepared for any contingency that might arise. It is amusing to record this, as subsequently the trip proved to be practically without incident, except for one case of mobbing when the chief engineer was alone, and undoubtedly with less personal inconvenience than would

be experienced by a party of Chinese engineers making a survey of equal length in the United States, and yet the journey was through the most anti-foreign section of the whole empire, where for fully 500 miles of the territory covered no white man had ever been seen before. The officials were found courteous, polite, and with an evident desire to do all in their power to facilitate the work, while the people themselves—although, of course, intensely curious—as a general thing were very friendly, and when the nature of a railroad was explained to them were anxious that it should be built, and be built once.

On December 17th your Engineer left Hankow, accompanied by W.W. Rich, Consulting Engineer to H. E. Shêng, and on the evening of the following day overtook the survey party on the banks of the Yangtze 35 miles from Hankow. The expedition as then constituted and which went through to Canton consisted of Wm. Barclay Parsons, Chief Engineer; Rufus C. Hunt, Engineer in charge of survey party; A. E. Coulter, Topographer; H. B. Magor, Instrument Man; W. Kirkpatrick Brice, Front Flag; W. S. K. Wetmore, Rear Flag; Charles Denby, Jr., Interpreter and Manager; E. R. Jellison, M. D., Doctor, and, on behalf of the Imperial authorities, W. W. Rich, Consulting Engineer, Woo Yung-fo and Lo Kwok-shui, American educated Chinese Secretaries in the Department of Railway Administration.

Topographically, China is divided into two great interior basins, those of the Yellow and Yangtze rivers, whose major axes run east and west from the mountains of Tibet to the Yellow Sea, with two smaller water-sheds on the north and south. The greatest of these drainage areas, both in size and importance, is that of the Yangtze,

which covers more than one-half of the whole Empire, extending north and south between the 25th and 35th parallels of latitude, and reaching westerly from the ocean, not only the whole width of the Chinese Empire to Tibet, but including that latter country and even some of central Asia beyond. On the south this valley is sharply cut off from the drainage of the China Sea by the Nan ling range of mountains, which run east and west and contain peaks with an elevation ranging from 5,000 to 7,000 feet. This valley includes the bulk of Chinese mineral wealth, has a fertile soil, good climate and will be the theatre of great material development. Your concession, running westerly from Hankow, in the first instance along the Yangtze, practically controls the railway development of the western half of the valley, including the rich province of Sz-chuen, and the semi-political routes to Burma, in which the English are interested, for any railway built to the western half of the Yangtze Valley will tap your line 125 miles from Hankow.

The route followed by the survey commences at Hankow, in the Province of Hupeh, or rather at Wu-chang immediately opposite Hankow on the south bank of the river, and runs thence practically southwest along the Yangtze for about 100 miles to the borders of Hunan, whence it deflects inland and reaches the Siang River at Siang-yin, a point about 40 miles south of where the Siang flows into the Yangtze. From there the course was substantially due south, following the Siang for 180 miles to the mouth of the Lei Ho, and then the Lei Ho up to the Nan-ling Mountains, where a hitherto unknown pass was discovered permitting the range to be crossed with moderate gradients. On getting over the mountains the

survey followed the Wei Ho and then the Pei Ho across Kwangtung to within 50 miles of Canton, where a direct line was made for the latter point across the open country. The provinces served, Hupeh and Hunan, are in the Yangtze Valley, while the third, Kwangtung, is in the water-shed of the China Sea. The total distance surveyed was 742 miles from Wu-chang to Canton, but in addition the Chief Engineer made reconnaissances for a branch line from Lukou, on the Siang River, to Ping-hsiang, 66 miles, the coal mines belonging to H. E. Shêng in Kiang-si, and thence along the eastern part of the Province of Hunan, to determine the feasibility of a route there, strongly urged by certain Hunan officials; and from Tsing yuan, the point on the Pei Ho, where the survey left the river to go direct to Canton, following the river to Sam-shui and thence *via* Fat-shan to Canton.

As the route, for the most part, lay along water courses navigable for junks or small boats, it was possible as a general thing to maintain headquarters afloat, the boats moving on each day according to the progress of the survey. It was only where the route according to local conditions lay some distance from the stream, or where there was no navigable water, or when crossing the mountains, that recourse had to be had to sleeping on shore.

On reaching the borders of Hunan the officials endeavored to restrict the party to the highway, a line for the most part impracticable for railways, and much patience with firmness was necessary to convince them that the direction of affairs and the location of the route were not in their hands. On reaching Chang-sha, the capital, a city with a population claimed by Chinese statistics to amount to 1,000,000, and which boasts of not permitting

foreigners to enter its walls, your Engineer sent his card to the Governor announcing his arrival and requesting an appointment the next morning, when he, accompanied by the whole party, would call to pay his respects. The Governor, partly on the general principle of keeping foreigners out of the city, and partly from fear of consequence if they entered, sent word that it would be impossible to receive the party. As the Chinese set great store on matters of etiquette and outward appearance, it was deemed very essential that the party should enter the city and be formally and publicly received and recognized with full Chinese honors by the Governor, especially as he was the representative of the conservative or anti-foreign party. Not only would the strongest tradition of the province be thus broken, so simplifying all future trips, but the knowledge that the Governor had officially entertained the party would have its direct and immediate effect on all other officials and secure better present treatment. The Governor's offer to call was therefore politely declined, and likewise all sorts of evasions and tempting concessions, such as that the Chief Engineer might call alone, or call accompanied by any three members of the staff to be selected by him. By rejecting all such propositions, and after twelve hours of sending and receiving messages, the Governor yielded and appointed eleven o'clock the next morning as the time of meeting, when he sent official chairs and bearers and a large escort to convey the party from the junks through the city to the official yamên, where he received them in full state surrounded by all the provincial officials and by every formality in accordance with Chinese etiquette. There is no doubt that this reception secured for the party much better consideration from all the other officials that were afterwards met.

On reaching Lu-kou, 47 miles south of Chang-sha, and 280 miles from Hankow the expedition was divided. The survey party in charge of Mr. Hunt continued along the Siang River to the junction with the Lei River, and thence along the latter stream to its head waters, while the Chief Engineer, with Mr. Rich, took an easterly course along the Lu River through Li-ling and into the province of Kiang-si to examine the coal mines at Ping-hsiang and the possibility of building a branch from the mines to the main line. After inspecting the coal mines, the Chief Engineer returned to Li ling and struck south from there on a route substantially parallel with and distant by about 60 miles from the Siang River. The Governor of Hunan and certain other officials had forced the consideration of this line upon the Director-General with such insistence as to its advantages over the river line, that it was deemed advisable to examine it. The country, a description of which is given below, was such as to condemn it for railway construction. This line joined the Lei Ho at Yung-hsing, where the Chief Engineer arrived four or five days in advance of the survey party. From Yung-hsing he made an investigation of the large coal field, both anthracite and bituminous, of which Yung-hsing is the centre, and then, keeping in advance of the party, pushed on to the Che-ling Pass, the summit of the range, in order to locate the route over the divide. In this work he was attended with great good fortune, in that he discovered a hitherto unknown pass nearly 150 feet lower than the one used by the highway for many centuries, and over which was carried, until the opening of the Yangtze, all the traffic between south and central China. This highway, one of the monuments of China's greatness in the past, is a paved road about 15 feet wide and 30 miles in

length, connecting the head of small-boat navigation on the Wei Ho with the head of small-boat navigation on the Lei Ho, so that goods or passengers from Canton could reach any point in the Yangtze Valley with but 30 miles of land journey. The survey party joined the Chief Engineer at Che-ling, where the survey across the range was made under his direction down to the Pei Ho.

On reaching Canton very careful and elaborate investigation was made of terminal sites; the feasibility and desirability of constructing a line between Canton and Hongkong, or rather to Kow-loon, the point on the mainland immediately opposite Hongkong; the feasibility of reaching the sea at Macao, the Portuguese port on the western end of the Canton River, corresponding to Hongkong on the eastern side, and the nature and extent of the present business of both Canton and Hongkong. The whole party then proceeded to Shanghai, where headquarters were established and the survey notes and estimates of cost worked out, after which the estimates, together with a map of the survey in compliance with the terms of the concession, were submitted to and received the approval of the Director-General, as expressed by him in writing on the face of the map, a copy of which is attached to this report.

CHAPTER II.

DETAILED DESCRIPTION OF THE COUNTRY PEOPLE AND RESOURCES.

The principal, in fact almost the only, means of internal communication in China are the water ways, which are utilized to an enormous extent. Even small streams which in other countries would be considered as worthless, are here made use of by small boats which are hauled up against the current and, at times, literally over rocks by men with ropes. Such transportation is necessarily expensive, tedious and attended with frequent loss both of boat and cargo, but there being roads it is the only means at hand.

The chief artery of traffic is the Yangtze with its tributaries. Between Hankow and its mouth, a distance of about 700 miles, the Yangtze has a width varying from one mile to five miles, and a minimum depth, at extreme low water, of 12 to 13 feet. The river has a normal annual rise of at least 45 feet, and in some years of over 50 feet, which high water occurs during the summer when tea is being shipped. Large ocean-going steamers can ascend as far as Hankow during the busy season, and vessels of fair draught can go up there at all stages of the river. Daily service by good steamboats is maintained between Hankow and Shanghai throughout the whole of the year, and a tri-weekly service in smaller vessels is maintained from Hankow up the river to I-chang, the present head of steam navigation, a distance of 1,050 miles from the sea, although

from I-chang, large junks are able to ascend to Chung-king, a distance of 350 miles more, and practically the outpost of civilization, but where foreign nations, including the United States, maintain consulates. Small boats go still farther into the interior.

Hankow, substantially the geographical centre of the Empire, is the great tea market of China and the metropolis and distributing point of the central part of the country. At Hankow the Yangtze, about one mile broad, is joined by the river Han from the north, the latter stream having a width of about one half mile. On the north bank of the Yangtze and on the east bank of the Han is Hankow. This city has been opened to foreign trade since 1861. It has a large and well-laid-out foreign concession, with an extensive foreign population. It contains several brick tea pressing plants in the hands of the Russians, a match factory and other industries. The population of Hankow is estimated, according to the Chinese authorities, at about 1,000,000; its actual population is probably about 600,000. Immediately across the Han, and in the acute angle formed by that river with the Yangtze, is Han-yang, with a population of about 150,000. It is a much less important point than Hankow, although it contains the Han-yang Iron Works, consisting of two blast furnaces and complete rolling mill plant with a daily capacity of about 100 tons of rails or other rolled shapes. Directly opposite Hankow and Han yang is Wu-chang, the capital of the province of Hupeh, and the official residence of the Viceroy of the "two Hu's" (Hupeh and Hunan). Wu-chang contains probably 500,000 people, with two government mints, a large cotton mill, silk filature works, and other industries. The population of the three cities—which are, however, practically one, occupying the relative posi-

tion towards each other of New York, Jersey City and Brooklyn—is something over 1,000,000 people (although the Chinese make claims of 2,000,000 or more), and therefore Hankow divides honors with Canton and Peking in claiming to be the most populous city in China. The relative commercial importance of Hankow will be referred to later.

From Hankow, and running northward, the Belgian concession for the Peking-Hankow line commences. Although our concession covers a line of railway from Hankow, the survey was commenced at Wu-chang, where construction would undoubtedly begin, the river to be crossed by a boat ferry if transfer connections are necessary with the Belgian line. Such a ferry could do all the business that will be required for many years.

The general characteristics of the Yangtze River resemble those of the Mississippi. It is an alluvium bearing stream, subject to erosion, and on account of its great rise its banks are at nearly all points liable to be overflowed, to protect their lands from which the Chinese have erected an incomplete system of dikes. The land next to the river is very flat. Back from the river, a distance of 10 to 20 miles on the south side, is a range of hills, between which and the river there is a chain of small lakes. The railway line must either follow the edge of the river where, as in the case of the Mississippi, the land is higher than farther back, or it must lie to the south of the chain of lakes along the foothills. Our survey was made following the dikes on the river's edge; but reconnaissance work was done along the foothills to determine the feasibility of construction there. As the result of the investigation, I am inclined to favor the route along the foothills and so avoid the expense of constructing a high embankment, because the dikes, on ac-

count of their irregularity, can be utilized but to a small extent. The foothills are generally unproductive, although coal has been found in them, notably at one place about 35 miles from Wu-chang. This coal, however, is very high in sulphur and could be used only as a low-price domestic fuel.

The land between the foothills and the river, on account of the frequent deposits of alluvial material by the river, is, like the Mississippi Valley land, exceedingly fertile, and, by a proper system of dikes, could be developed to a much greater extent than it is at present. The belt of country, however, is narrow, and owing to the presence of the lakes and the portions not protected against inundation probably not over 35 per cent. of the surface is under cultivation. The total amount of produce that could be raised from it to be shipped to market is small, and this can find a fairly satisfactory method of reaching Hankow by the river boats. This produce consists chiefly of rice, but in addition cotton, beans, and bean oil. In the first 100 miles there are no places of any importance, although numerous small villages.

On reaching Hunan the route unquestionably should lie well back from the river, in order to get any tributary country at all, for next to the river and between it and some large lakes, there is but a narrow tongue of land. This country is a very much richer and more productive section than that passed through Hupeh, being a great tea district.

The route that was surveyed, and which would substantially be the best route to follow, would pass out of the valley of the Yangtze into that of the Siang and reach the Siang River at Siang-yin. This line would miss the city of Yo-chou situated substantially at the junction of the

Siang and the Yangtze by about 25 miles. It appears to be more economical to run the main line to the eastward of Yo-chou and to reach it by a branch. Yo-chou has a population of probably 40,000, and is an important place, not only on account of being at the junction of the Siang and the Yangtze, but also at the junction of the Siang and the Yuen, which drains the western part of the province of Hunan, and so serves as a distributing point for a large area. By an imperial decree it has been declared a treaty port, and a custom house is about to be established and the place thrown open for foreign settlement and trade.* Between Yo-chou and Hankow there is at all seasons of the year a depth of water of at least 6 feet.

The Siang River in its general characteristics is similar to the Yangtze, except that the level ground adjoining the river is narrower than that along the larger stream, the hills in many cases running directly to the river's edge. Wherever there is any level ground it is highly developed by cultivation, and this is true of all the smaller valleys running into that of the Siang. The chief products of cultivation are rice, tea, cotton, tobacco, millet, bean and tea oil, vegetables and timber, pine and bamboo.

The hillsides sustain tea-oil plants, a shrub growing to a height of 6 to 10 feet, and producing a nut from which the Chinese extract an oil used both for cooking and lighting purposes. It is interesting and somewhat surprising to notice that in many cases the Chinese have taken up arbor culture on a large scale, and were setting out groves of pine trees. This is a work well adapted to the Chinaman with his patience in waiting for a result. Through it the hill sides can be made productive and a supply of timber for

* A recent news cable reports this as having been done.

mine props secured. The river has a rise of about 30 feet, which in some cases is sufficient to overflow the banks, except where they are protected by dikes.

The possible route along the Siang is subject to but small modifications, the general location being of necessity near the river's edge. This would involve heavy embankments across the valleys and lowlands to keep the rails above the flood line, and with side cuttings on the hills, but with the exception of the heavy earthwork, construction would be comparatively simple, there being no important features. During the winter months the river, although with a width of 2,000 feet, is very shallow. Above Yo-chou a depth not exceeding 2½ feet can be secured. Above Chang-sha this available depth would be decreased to 2 feet, with numerous shoals, and above Lo-kou to not over 1 foot to 1½ feet. At present there is a large volume of trade by junks on the Siang. Small boats called sanpans bring coal, rice, tea and other products down the little tributary streams, which are then loaded into larger junks and shipped to Hankow, while they bring back a return cargo of petroleum, cotton goods and other foreign-made articles. On account of the shallow water these boats frequently go aground, and navigation at all times is slow, tedious and attended with much risk.

On leaving the Siang for the valley of the Lei, the topography becomes much more broken and rugged. The valley of the Lei is narrow, with but a small amount of bottom land, and construction would be almost entirely side-hill work; but as far as a revenue-producing country is concerned, this territory would probably be the best encountered, as this is the coal district. Along the main line the northern limit of the coal field is at about Hêng-

shan, but there is not much serious work in the development of the coal measures until the Lei River is reached, the greater part of such development lying between Lei yang and Chêng-chou. I made an investigation of certain portions of the field as would become at once directly tributary to the railroad. To make a full investigation of this field would require many months' work and a diamond drill. Chinese mining methods are most crude, consisting merely of a single drift driven down the vein until water is encountered, or until the depth becomes too great for men to carry up the coal on their backs. The mine, so called, is then considered as worked out and is abandoned, and a new opening is made for the process to begin over again. There seem to be three and possibly more workable veins, varying in width from 2 to 10 feet. These veins are not horizontal, but have a dip of from 30 to 35 degrees. The quality of the coal is somewhat peculiar, most of it being exceedingly soft and easily crushed between the fingers. For local Chinese purposes this is not objectionable, as the Chinese prefer to have their coal crushed into dust and then mixed with clay into balls.

There were found, however, several deposits of a harder coal sufficiently so to bear transportation. In fact, there was found one mine producing coal exceedingly hard in character, low in both phosphorus and volatile matter and sufficiently good to be used in blast furnaces for the production of pig iron, the same as anthracite is used in some of the Pennsylvania works. This coal is marked "Ping-chow" in the analysis of coals which will be found below under the general discussion of coal traffic.

The anthracite field as developed extends practically continuously from Hêng-shan southerly to Yung-hsing

and from the Lei eastward certainly to the borders of Hunan and probably beyond, a distance of at least 75 miles.

West of the Lei River coal is said to exist, but the limited mining work has not been sufficient to develop its extent.

South of Yung-hsing there is a change in the geological structure of the country, and there is found a large deposit of coking bituminous coal. This coal has been known and worked for over one hundred years, and is now being mined and shipped to the Han-yang Iron Works for the production of steel. There are five mines, or rather five groups of Chinese mines, on this deposit, demonstrating that this bituminous basin has a length of at least 13 miles, and probably considerably in excess of that, but exactly how much can be foretold only by a very careful geological sur vey. There appear to be five or six workable seams with a thickness varying from three to ten feet. The coal is coking, but apparently does not clinker. It is somewhat tender, but will stand transportation, and as it coalesces quickly under heat, it can be used in grates, even in the fine state.

South of this bituminous basin—which is really but a small deposit in the larger anthracite field—anthracite or semi-anthracite is again discovered, and continues in workable quantities, but in poorer quality, as far south as Chêng-chou. The total length of the southeastern Hunan coal field, as actually developed along the line of the railway, is about 125 miles.

More important than this deposit in Southern Hunan is the Ping-hsiang basin, lying just out of Hunan in the Province of Kiang-si, which basin, as said above, is now owned by H. E. Shêng. To reach this field a branch would have to be run from Lu-kou, following the valley of the Lu River,

one of the most, if not actually the most, highly cultivated sections that was visited. This branch would have a length of about 65 miles, with an exceedingly good tributary country, the chief product of which would be rice. The Ping-hsiang coal is bituminous, consisting of five veins, with a thickness of from four to six feet. This coal has been tapped in a number of places by Chinese mines; but H. E. Shêng is now spending considerable money, under the advice of a German engineer, for the development of his property according to European methods, and is putting in a very elaborate plant which has a capacity of 1,000 tons per diem, and which could be readily increased to about 2,000 tons per diem at any time within three months. The Ping-hsiang coal is a high grade bituminous coking coal, its only fault being tenderness, making it easily broken in transportation. Certain parts of the field, however, showed coal considerably harder than that being actually sent to market. In ash it is low, very low in fact for a Chinese coal, while the sulphur is so low as to permit its generous use in steel manufacture. For consumption at the Han-yang Iron Works, the various manufacturing industries at Hankow and Wu chang, for steamer use on the Yangtze and at other points, Ping-hsiang can be depended on for a steady business of 1,000 tons of coal per diem. In addition, there will be a good local agricultural business and a general merchandise traffic with the cities of Li-ling, Hsiang-tung and Ping-hsiang. At the time this section was visited in the month of January, the streams were at the lowest stage and almost dry, so that this coal had to be carried in baskets by coolies to the city of Ping-hsiang, a distance of about twelve miles, and there stored until there should be enough water in the river to float small boats down to Lu-

kou; the small boats would then continue their journey to Siang-tan, where transference would be made to larger junks, and thus to Hankow.

As an evidence of the defective methods of Chinese inland transportation, and of the attendant expense, the manager of the mine, himself a Chinese, stated that it was a known fact that, at certain places where the coolies stopped to rest on the road, coal would be abstracted from the basket by them and its place taken by the addition of dirt. Again, when the coal was put on the small boats, the boatmen would sell the coal while in transit, again substituting black dirt to make up the weight, and likewise the boatmen in charge of the junks between Siang-tan and Hankow would do the same. Coal which was known to have ash running from 5 to 8 per cent., by the time it reached the works would contain 30 to 40 per cent. In confirmation of this the chemist at the Han-yang Iron Works submitted a statement showing that the coke that was received from these mines contained about 20 per cent. of ash, whereas the coal contained from 30 to 40 per cent. According to the wasteful Chinese methods of burning, two tons of coal are required to produce one ton of coke, and therefore the coal should contain not exceeding one-half of the ash found in the coke; whereas, as a matter of fact, the ash in the coal was nearly twice that of the coke. This is explained by the circumstance that the coal can be easily adulterated, but not the coke.

Shipments of coal from the mines to Han-yang, a distance of nearly 400 miles by water, consume from two weeks to two months, according to the stage of water in the river or the prevailing winds. It will thus be seen that a railway would offer great inducements to trade in

the matter of safety and quickness of dispatch, irrespective of nominal transportation charges, although on account of the difficulties of river navigation the railway charges, as will be shown further on, need not exceed the present junk tariff.

As has been stated above, a reconnoissance was made for a line from Li-ling south. The eastern part of the country over which this reconnaissance was made in order to determine its feasibility for a railway is not worthy of serious consideration. The surface is much broken, and, as the drainage lines run westerly to the Siang River, the railway would be an undulating one, with gradients exceeding one per cent. Except the bottom lands along those streams large large enough for small-boat navigation, and thus affording an opportunity to trade, the back country is not developed, and the population is correspondingly thin. Coal of good quality was found along the road, indicating the continuance to the eastward of the field above described as now developed along the Lei Ho.

Of other minerals in Hunan, there are known to exist iron, copper, lead, antimony, mica and probably silver. These minerals are found chiefly in the southwest corner of the province, but have never been developed owing to the lack of transportation facilities; and the extent and values of such deposits can be determined only after a careful geological survey. That they exist there is no doubt and probably in paying quantity.

Of the cities along the route between Hankow and the southern borders of Hunan, Hankow, Wu-chang and Hanyang, have already been mentioned, and there are no others of importance in the province of Hupeh. In Hunan, especially worthy of mention, are Yo-chou, at the junction of the Siang and Yangtze rivers, with a population of prob-

ably 40,000; Siang-yin, with 20,000, at the south end of the Tung-Ting Lake; Chang-sha, the capital of the province, 500,000; Siang-tan, the commercial metropolis of the province, with 600,000 population; Li-ling and Ping-hsiang, on the Ping-hsiang Branch, with 20,000 people each; Lei-yang, the distributing point for the coal trade on the Lei River, 4,000 population, and Chêng-chou, at the head of small-boat navigation and the distributing point for the southern portion of the province, with 10,000. These places are all on the line of the railway; Yo-chou and Siang-tan being reached by separate branches of 25 and 8 miles in length respectively. They are all walled cities, with narrow paved streets, and with every evidence of a good and satisfactory mercantile trade. The shops are large, containing a great variety of goods, luxuries as well as necessaries, many of which were bearing European and American marks.

There are in Hunan, in addition to the above-mentioned places, and which would become tributary to the railway, Chang te in the northwest corner of the province, with probably 400,000 reported population whose trade comes down the Yuen River to Yo-chou; and Hêng-chou, on the Siang River, being only 10 miles southwest of the railway near the mouth of the Lei River, with 200,000 population. this place is at the head of medium-size junk navigation, and thus has become a distributing point for the south-western part of the province. The area of Hunan is about 75,000 square miles, or, say, one and one-half times that of the State of New York, which latter has a population of 6,000,000, as against 22,000,000 claimed by Chinese authorities for Hunan. The latter figure, as with all other Chinese figures regarding population, I believe to be

exaggerated. I prefer to deduct from one-third to one-half in all cases.

From the section that has just been described, the principal agricultural products would be rice, tea, tea-oil, cotton, tobacco, oranges from Southern Hunan, and timber. The mineral shipment is, of course, coal, the amount of which that now goes to market cannot be ascertained, but probably amounts to 300 tons daily. Of manufacturing industries there are several of minor importance, such as bricks, paper, and one which has reached considerable proportions, namely, the making of earthenware jars, pots and other similar articles. Clay for the production of these articles is found in several places along the Siang River, where large pottery works are found in operation, the products of which are loaded on junks and sent up and down the river to various points. These kilns now burn wood or brush for fuel, but with the advent of the railway would undoubtedly use coal refuse, and would ship their products much more extensively than they do now, as these jars are used for the storage of water by the Chinese, but, on account of their weight, are difficult to transport, except immediately along the rivers. There was also found one large granite quarry employing many hundred men, the production of which was said to go as far as Shanghai.

From Chêng-chou, in southern Hunan, to Lo-chang, in Kwangtung, a distance of 77 miles, would be the most expensive and the least productive part of the route. From Chêng-chou begins the ascent of the dividing range. This part of country is very mountainous, with a very small population, and capable of producing nothing unless it be that coal should be discovered. The distance from Chên-chou to the Wei Ho, at the southern foot of the

divide, is 39 miles, and from this point to Lo-chang, a distance of 38 miles, the line will lie along the river in a continuous canyon.

Lo-chang is a prosperous-looking place of 6,000 population, and is the head of small junk-navigation, although very small boats are able to go up the river 45 miles more. From Lo chang to Tsing-yuan the country is fairly open, broken, however, with small hills. The population is very thin, there being only one place of importance, namely, Shao-chou, at the junction of the Pei and Wei rivers. It has a population of about 15,000 and owes its importance to the dividing of the waterway and so enabling it to be a distributing point for the northern part of Kwangtung province. This country produces enough crops to supply the people with food, and, in addition, mulberry trees and leaves for the silk industry. Coal, however, of a very fair quality has been discovered near Lo-chang of anthracite, and near Shao-chou of bituminous variety. Owing to the lack of proper development, it is again impossible to discover the geological structure of either of these fields. The veins, however, appear to have a thickness of about five feet. The coal was sampled, and the results of the analysis will be found below. This would seem to indicate a continuous coal area from Hêng shan, in Hunan, to Shao-chou, in Kwangtung. The Shao-chou and Lo-chang coal has not been taken to market, owing to the absence of transportation facilities. Analysis indicates that they should both find a good sale at Canton, the former for steam and the latter for domestic purposes. They are harder than the Hunan coals, and so will stand transportation.

At Tsing-yuan the expedition was again divided, as has been previously explained, the survey line being run

directly to Canton in order to save distance, and to keep the railway out of the district which is liable to overflow. This country proved to be an exceedingly good section, fertile, well developed, with a constant succession of prosperous-looking villages, and every appearance of being able to furnish a local traffic that would pay well. While the survey was in progress by that route, the Chief Engineer, accompanied by Mr. Rich, made an inspection of a line along the river by the way of Sam-shui. Between Tsing-yuan and Sam-shui there was little that he saw to warrant the construction of a railway, but after reaching the latter conditions change radically.

Sam-shui is now a treaty port, with a custom house, but a place in itself of no importance, except that it marks the junction of the West and the North rivers, and a line from there to Canton would control the continuation of a line up the West River, which will undoubtedly be built at no very distant day, and when built will be an exceedingly good line, as it develops the Southwestern quarter of the empire. The Director-General has decreed, over his signature on our official map, that the line of the railway shall run from Canton to Sam-shui. This is an important thing for the Syndicate, as it will control the future of the West River business between Canton and Sam-shui, and, therefore, of the West River line. The line would have to be built and operated as a separate branch, as it is cut off by the Canton River from making a direct physical connection with the line running direct from Tsing-yuan to Canton. The terminals, however, that have been tentatively selected are conveniently located, so that a car ferry can be run connecting the two roads. The bulk of the business of the two lines, however, would be traffic

into and from Canton itself, and not so much with each other.

Between Sam-shui and Canton, however, there is a country that railway operation would pay handsomely from the start. This country is fertile and the most thickly populated that was seen upon the trip. The distance was 28 miles, but in that distance there were found several places of importance, the chief of which were Hsi-nam, a good trade point, with a population of about 8,000, and and Fat-shan, a manufacturing centre, where articles of all kinds, and which are known throughout China as Canton-made articles, are turned out. Fat-shan is well built, has an air of prosperity second to no other place visited, including even Canton, and has a population that can safely be estimated at 750,000 This country is perfectly level, and railroad construction would be cheap, except as to a number of small bridges crossing the canals and other waterways.

Canton, the southern terminus of the concession, is a place so well known by frequent description as not to require much said about it here. It has a population, as claimed by the Chinese, of 1,500,000, but probably 1,000,000 would be nearer the mark. It was the first place in China opened to foreign commerce, and foreigners have been received there and active trade carried on for over three hundred years. An extensive examination was made there by your Engineer, accompanied by Mr. Rich, into the possibility of obtaining good terminals. A satisfactory site was found on the water front, where a depth of 22 feet can be obtained, which is the limit of vessels coming up the Canton River.

At Canton there is a choice of two things, either to make

the terminus of the road at Canton, or to actually reach the sea. Although your concession did not so actually state, the general plan was to extend the line from Canton to Hongkong, or rather to Kow-loon. The only two ports on the sea within reach of Canton are the British possession of Hongkong and the Portuguese possession of Macao.

I made an examination of Macao and its harbor. Although this place is of ancient date, having been in the hands of the Portuguese for nearly 350 years, and was the original base for foreign trade with China, it nevertheless is quite inadequate to meet the demands of modern commerce. The harbor is small, with but seven feet of water at low tide on the bar, nor is it possible to improve the same so as to make it available for deep draught vessels. Macao can therefore be dropped entirely out of consideration as a railroad terminus.

Since our concession was granted, the English have obtained from the Chinese Government a large increase to their territory at Kow-loon, so that it is impossible to get a line within 15 miles to the harbor of Hongkong.

From an investigation of the territory, however, your Engineer is in great doubt whether, after all, a line to Kowloon is very desirable. In the neighborhood of Canton the country is flat, and is intersected by many small streams. On approaching the coast the surface of the ground becomes much broken, and on reaching the coast mountains, with the exception of one or two places, the line would have to follow the indentations of the shore, and would be longer than the river line (100 miles) by probably 20 miles. Through the mountainous country, practically half of the route, there would be no local or tributary business whatever as against the competition of the river boats, which would have the

great advantage of delivering passengers and freight directly into Hongkong itself, whereas the railroad would simply deliver them at Kow-loon with the necessity of a long ferry transfer.

Hongkong has no value except as a port of entry, but such business is enormous and second to no other place in the whole Orient. The city, with a population of 250,000, of which about ten thousand are white, is built on a mountainous island, between which and the mainland is a magnificent roadstead. It is the terminus of some of the steamship lines and a port of call for all of them. The Harbor Master's report for 1898 gives:

HONGKONG SHIPPING STATISTICS.

	1896.	1897.	1898.
Foreign Ships.....	9,352	9,944	11,058
Junks—Foreign Trade.....	39,576	57,803	58,936
" Local "	11,535	9,546	9,635
Foreign Tonnage.....	12.333,396	12,124,599	13,252,733
Junk Foreign Tonnage.....	3,767,403	3,441,295	3,626,754
" Local "	415,154	372,280	386,293
Total Tonnage.....	16,515,953	15,938,174	17,265,780

From the above it will be seen that the average daily entries or clearances are over 30 foreign vessels and 180 Chinese junks.

The traffic which Hongkong has consists in foreign goods arriving from America and Europe for distribution to the southern part of China, and the shipment from Hongkong of various products of the latter territory. With the construction of your line, making a vastly increased area tributary to Canton, and therefore to Hongkong, the ship-

ping business would be correspondingly increased. Vessels arriving at Hongkong discharge and receive their cargoes in two ways; firstly, by going to the warehouses of the Kow-loon Wharf and Dock Company, and there placing their cargoes in the go-downs of that corporation, where they are held until sold or delivered to the consignee, or, secondly, by lying out in the stream and lightering their cargoes to and from the shore. The former is the usual course followed by vessels whose terminus is Hongkong. Vessels, however, that make Hongkong a port of call, such as the lines plying between Japan and Shanghai and Europe, and the American lines, such as the Canadian Pacific, Pacific Mail, and the Oriental and Occidental companies' ships, whose terminus is Hongkong, follow the second. Vessels that thus operate constitute the largest cargo carriers that go to Hongkong. Access to these vessels would have to be had by lighter, no matter whether the railroad stopped at Canton or at Hongkong. It is perfectly possible to procure at Canton a good terminal site, where, as said above, a depth of 22 feet can be obtained—the limiting depth in the Canton River between Hongkong and Canton—where foreign ships, drawing not exceeding that amount, can come directly alongside and save the terminal charges at Hongkong. For the deeper draught vessels and the regular liners, which, as has been pointed out, lie out in the harbor at Hongkong, connection can be made by lighters and tug boats from Canton almost as conveniently as from Kow loon. The bulk of the passenger business would terminate at Canton anyway. Passengers between Hongkong and Central China can be taken to the train at Canton from Hongkong by the present fast running steamboats, and at a cost in time of probably not more than an hour or an hour and a half.

Geographically, it is possible to run a line from Canton across country and strike the sea at the northern end of the Kow-loon border and still remain wholly in Chinese territory, and not interfere with the claims of Messrs. Jardine, Matheson & Company. Such a line would have no value; it would reach the sea, where there is at present no town and no regularly constituted harbor, and foreign traffic would have to be developed in the face of Hongkong competition. Such a course should not be considered seriously for a moment.

The results shown by the survey in brief are:

First.—That a line can be secured between Hankow and Canton with a length of about 710 miles, which, for about 700 miles, will follow rivers, where the maximum gradient will not exceed one-half of one per cent., or 26.4 feet per mile, and that the dividing range can be crossed with five miles of continuous ascent on both sides, where the maximum gradient will be one per cent., or 52.8 feet mile, being an extraordinarily feasible line to operate. A profile of the line is attached to this report.

Second.—The topography of the country at both the termini is open, but gradually getting more broken as the Nan-ling Range is approached. In no case does the topography present difficulties that can not be overcome within a reasonable cost, and, as the line does not cross a single stream of importance, the bridging will be exceedingly light.

Third.—The rivers are practically the sole existing means of inland communication. They, therefore, are the established trade routes, and traverse the best developed sections. On account of variations in water and frequent shoals, they

cannot be considered as competitors to railway traffic, whenever the latter is established.

Fourth.—The line traverses a country which, for the greater part of its length, is fertile and well populated, and for 150 to 200 miles runs through a continuous coal-bearing formation, both anthracite and bituminous.

CHAPTER III.

COST.

To ascertain in advance the cost of such a railway as has been here outlined is a matter of considerable difficulty. In order to guide him as to conclusions, your Engineer procured all possible information from the cost of such lines as have been constructed in China and Japan, and took into consideration the cost of earthwork and masonry in the way of dikes and bridges that he discovered in his journey across the country.

The cost of day labor in China, as compared with our own, is very low, but such figures must not be accepted at their face value. The wages of a farm hand in the interior are, with keep, about one gold dollar per month. The wages of day laborers on contract work in the country vary from 7 to 10 cents gold. In the treaty port cities where the price of labor has risen, the cost of a day laborer is about 12 to 15 cents. Such men, however, have been taught to work with the crudest of implements, refuse to adopt modern methods as fearing to decrease the demand for labor if such methods are once inaugurated, and therefore accomplish but a portion of the result that a day laborer would accomplish in our own country. In Shanghai, where the most intelligence in the way of handling men was found, it is estimated that it requires four coolies to do as much as one foreign laborer; and certainly at least the same ratio can be figured on for work in the interior. In the North, in the early days of railroad construction, a day laborer

could be obtained for the minimum figure that has been mentioned above. At present his rate of wages is probably twice that.

There were found in several places in Hunan very extensive earth works in progress in the building of dikes, work that, in its general character and expense, compares relatively with that of a railway embankment. The wages that were paid to the laborers on this work were about 8 to 9 gold cents per day, and the cost per cubic yard of work done was in several pieces of work, which were of sufficiently large magnitude to be taken as examples, 5 cents silver or 2½ cents gold. The cost in silver of earth work per cubic yard on the railway near Peking has varied lately from 4 to 8 cents, or 2 to 4 cents gold, according to special difficulties, and whether in embankment or cutting.

The Chinese, even in the interior, understand the principle of sub-contracts, and therefore the above statistics were obtained without much difficulty, and can be taken as fair examples, especially as there was a close agreement in cost stated, although the places where these figures were obtained were many miles apart, and there was no possible connection in management between them. Such figures, however, represent the cost of embankments where the material is taken from a borrow-pit immediately alongside. In the work of constructing the railway under consideration the earth work would be at all points heavy. In the low and flat lands high embankments would be necessary in order to keep the rails above the regular summer overflow. In the undulating country a succession of deep cuts and fills would be required. On account of the comparatively low cost of earth work, it would be economical to build wider embankments and cuts than is the usual practice in the United

States, in order to provide a surplus of material against slides, to keep the ballast from rolling down the bank, and to provide ample drainage space in the cuts to take care of the heavy torrential rains. All these facts will tend to make the "quantities" greater than on a line of similar character in the United States.

The cost of the dike work as given above can be taken as a fair price for sub-contract work on the railway embankments. In the country under consideration, however, there are no horses, and, when it comes to handling the earth in long cuts the same conditions for low-price work will not obtain. If the cuts are very large so as to warrant the initial expense, material can be handled by cars pushed by men on light portable railways. In the smaller cuts all of the earth would have to be carried in baskets on men's backs.

The price, therefore, that has been estimated for earth work is very largely in excess of the prices that were in vogue, and which appear to be fair. This is done to compensate for the cost of removal of the earth from cuts, and also to provide a contingency fund for slips and wash-outs during construction and leave a surplus for contingencies.

Loose rock and solid rock, of which there will be a large quantity in the mountain sections, will be most economically removed by hand. Labor that is accustomed and trained to do rock work by hand can be obtained in sufficient quantity. It would probably not pay to introduce mechanical appliances.

The prices that have been named in the estimate below are, for loose and solid rock, 25 and 65 cents gold respectively. The cost of similar work on the railways in the North are 18 and 62 cents, but the amount of solid rock

encountered was small. The increased rates have been named to provide a margin of safety, but the actual cost should not exceed the northern experience, in fact owing to the greater quantity of rock to be handled the cost per cubic yard should be decidedly less.

The other work that would be done by local labor would be masonry, and the work in connection with the stations and track-laying. All other disbursements would be for imported material.

After a very careful consideration of the problem, your Engineer has become convinced that it is absolutely impossible to undertake what is known as the American style of railway construction—that is, to build a railway with a small initial expense, with temporary work, and to improve and develop the same as traffic may warrant; nor, if it were possible, is the same desirable. This railway is to be paid for by Government bonds, and it will not be possible to issue a junior mortgage for improvements and betterments in the future.

Therefore it is necessary to estimate on the fullest possible construction at the outset. It is not possible to introduce temporary work economically; because timber and such materials as would be needed for such work would have to be imported from Oregon or other countries, and the cost of the same when laid down in the interior of China would be almost as much as the cost of a permanent structure in steel or stone. Ties would also have to be imported from Australia, Java, or our own Pacific Coast, and will range in cost from 75 cents to $1.50 gold when laid down. This would render it economical to use a heavy rail and to reduce the number of ties.

There is, however, another reason for constructing a

well-built road. This railway will have to be operated by Chinese train men and maintained by Chinese track men. Such men are, of course, not of the intelligence that corresponding men are on American railways, and with them it is impossible to take any risks whatever. The railway over which a Chinese engine man runs a train must be perfectly and solidly constructed, with no weak spots which would require exercise of judgment on his part.

Rails, ties, bridges, rolling stock and other equipment will all have to be purchased abroad, shipped to Shanghai, or, if the state of the river permit, to Hankow, and there put on barges and shipped up the Yangtze and the Siang to points where the same are to be used. In the matter of rails such freight and handling charges would cost $15 a ton. A locomotive that would cost $10,000 here would cost $15,000 by the time it was placed upon the rails in China, and, in like manner other portions of the rolling stock and equipment will have their cost increased.

The bridge work will, fortunately, be light, there being no bridge of any serious consequence, in that there will be no single span exceeding two hundred feet, and most of the bridges will be short-span plate girders. Good building stone will be found all along the line, with which stone or concrete arches and bridge piers can be very cheaply constructed.

The general expense in relation to construction will be exceedingly heavy. It will be necessary to maintain in Shanghai a large and expensive general office; and to support the engineer corps in the field will cost twice as much as for similar work in the United States. Cabling, banking and other charges will assume large proportions.

Right-of-way expense has been omitted, as this is one of the details being arranged with H. E. Shêng. In any event it will not be large. The Chinese officials can arrange that. The graves of ancestors will not constitute such an obstacle as is popularly supposed. The number of graves is much less than I anticipated, and in the north a payment of about $5 per grave removes all objections.

LENGTH OF LINE SURVEYED.

Main Line *via* Sam-shui	740 miles.
Ping-hsiang Branch	66 "
Yo-chou "	25 "
Siang-tan "	9 "
Sidings	78 "
TOTAL TRACK	918 "

CHAPTER IV.

COMMERCE, AND GENERAL RAILWAY SITUATION.

The internal commerce of China is necessarily cramped by the lack of transportation facilities. Practically the only means of communication are the rivers, which are utilized to their fullest extent.

Away from the coast and in the immediate neighborhood of the rivers, the people consume what they can raise. The foreign, and, to the same extent, the home, commerce is dependent therefore upon the opening of the country. Under the circumstances the foreign commerce of China, both export and import, is remarkably varied and extensive, but, owing to the lack of system in keeping accounts, it is not subject to exact determination. All business entering or clearing in foreign ships passes through the Imperial Maritime Customs, a department under the control of Sir Robert Hart, and where accurate statistics are kept. Native vessels, however, report to the Custom houses administered by native officials, where records are hopelessly confused. The Imperial Maritime Customs report the value of foreign imports and exports for the past ten years, expressed in United States gold, as follows:

Year.	Net Imports.	Exports.	Total.
1889.....	$77,619,048	$67,863,482	$145,482,530
1890.....	88,938,437	61,001,136	149,939,573
1891.....	93,802,704	70,663,494	164,466,198
1892.....	94,570,839	71,808,467	166,379,306
1893.....	105,953,973	81,642,618	187,596,591
1894.....	113,472,038	89,673,165	203,145,203
1895	120,187,700	100,305,248	220,492,948
1896.....	141,812,996	91,756,995	233,569,991
1897.....	141,980,037	114,450,951	256,430,988
1898.....	146,705,534	111,326,004	258,031,538

From the above figures it will be seen that the foreign commerce of the country is growing steadily; but in point of fact it is growing more than the above figures would indicate. On account of the decrease in the cost of all manufactured articles during the past ten years, the volume of business shows a greater increase than the net value. To give an idea of the distribution of this commerce, both import and export, the following figures are appended—taking those items in the Maritime Customs report which for the year 1898 show a value of over 3,000,000 taels, and then expressing these items as percents of the whole traffic.

Imports.		Exports.	
Cotton and cotton goods	38.5%	Silk, raw and manufactured.	35.6%
Opium	14.0%	Tea, all kinds	18.2%
Kerosene oil	5.7%	Animals and products	7.9%
Metals and machinery	5.1%	Tobacco	2.4%
Rice	5.0%	Cotton, raw	2.0%
Sugar	4.3%	Other farm products	9.4%
Coal and charcoal	2 6%	Forest products	2.5%
Fishery products	2.6%	Straw braid.	2.0%
Woolens	1.5%	Other articles	20.0%
Other articles	20.7%		

Although the extent of the traffic passing native custom-houses, or at least not passing through the Maritime Customs, cannot be ascertained, that it is considerable is well understood, as can be shown by the single item of the export of rice. The exportation of this article was in 1898 prohibited in order to prevent a possible shortage at home. The Maritime Customs therefore report no rice as having been shipped outward during that year. The Japanese Customs, however, report having received rice from China to the value of $2,000,000 United States gold; and the American Customs report rice in the same way to the value of $557,163. The actual foreign commerce of the country is greater than the above figures indicate.

China levies on its foreign commerce a tariff for revenue only. The rate charged on nearly all articles is 5 per cent. on imports and exports alike, although there are some special rates and a number of articles on the free list. The actual average rate on imports and exports runs from 3 to 4 per cent. It is the general opinion of merchants in China that, should it become necessary, this rate could be increased without any serious detriment. In Japan the Government has found it necessary, in order to derive more revenue, to seriously increase its customs tariff, so that the present charges will run from 30 to 50 per cent. ad valorem. Foreign articles destined for consumption at the treaty ports or places of importation pay no further taxes. When, however, they are sent into the interior, they are obliged to pay internal transportation taxes called "Likin," collected at various stations along the trade routes. These likin charges, although they form a perfectly legitimate method of taxation, are objected to, however, by the Chinese, as well as foreign traders, on account of their uncertain amount which, according to Chinese custom, is left largely to the official in charge who collects as much as he can. The foreign nations, in order to obviate these difficulties, have arranged with the Chinese Government to permit foreign articles destined for the interior to pay a single tax of 2½ per cent. to the Imperial Maritime Customs and then to receive what is called a "transit pass" entitling the goods to pass the interior likin stations without further charge. Unfortunately these transit passes are not always inspected by officials in the interior, unless they think that the shipper will appeal to a foreign government, and therefore the officials are apt to levy likin in accordance with their own needs.

Foreign commerce is carried on through what are called treaty ports, where foreigners are allowed to live, and where a customs house under the Imperial Maritime Bureau is established. The number of these ports is being steadily increased as the country becomes opened up. In 1898 there were twenty-seven of such ports, and two subports or branches. Of these, three were located on the northern coast; nine, including Shanghai, in the Yangtze Valley; twelve on the southern coast; two on the West River, and three on the French Tong-king frontier. Of these twenty-seven ports, the four most important are Tien-tsin, Shanghai Hankow and Canton. In point of view of gross trade handled, Shanghai stands easily first, as practically all the traffic from and to northern points, such as Che-foo and Tien-tsin, as well as much for other places, such as Ning-po. Hang-chow and all the Yangtze ports, is received and trans-shipped here. On the basis of net imports—that is, the actual consumption for the district proper—after deducting all re-exports, the value of the trade of the four most important ports in 1898, and the ratio in other years, was substantially the same, expressed in percentage of the whole foreign commerce of the country stood thus: Canton, 22.9 per cent.; Shanghai, 21 per cent.; Hankow, 12.7 per cent.; Tientsin, 12.1 per cent. These four places, therefore, provide nearly 70 per cent. of the total foreign commerce of the whole of the Empire.

Your concession, it will be seen, joins directly Canton and Hankow, the first and third in the above list, reaches Shanghai by the Yangtze Valley, and, on the completion of the Belgian line, will be connected with the fourth, Tien-tsin, by rail. It therefore is in direct touch with the four chief trading points of the country.

Before leaving the subject, it will be interesting to note the relative importance of Hunan, which province will be absolutely controlled by your line in point of foreign trade. Hunan is the only province in China where foreigners are not resident, and one of the four, out of the eighteen provinces comprising the Empire, heretofore without a treaty port. Whatever foreign goods are therefore shipped into Hunan are for consumption by the Chinese themselves. There being no treaty port in Hunan, there is no direct importation of foreign goods, so that they are shipped to Hankow and reshipped from there on transit pass, or through the native custom houses or likin stations.

During the year 1898, Hankow—which, as has been pointed out above, is the distributing centre for the interior of the Empire—reported foreign goods sent forward on transit passes to the value of 9,100,606 taels [1 tael equals 70 U. S. (gold) cents]. These goods were distributed through nine provinces, including Hupeh in which Hankow itself is located. Of this total amount 4,537,736 taels worth of goods were sent to Hunan alone, or more than one-half of the total goods forwarded. The province of Hupeh itself, outside of the limits of Hankow, where there is a large number of foreign residents, took but 1,888,805 taels; while the province of Honan, through which the Belgian line is to run, and which like Hunan is without a treaty port, but unlike Hunan has foreign residents, consumed foreign goods, under transit passes, to the value of but 615,961 taels. During the year the Maritime Customs reported that the total value of goods forwarded under transit passes from all ports to the interior amounted to 36,404,858 taels, an amount distributed through the eighteen provinces. It will, therefore, be seen that Hunan took just one-eighth of this total.

I am not arguing that the consumption of foreign goods to the value of $3,000,000 constitutes a large traffic, but it is important, however, to note the ratio and see to what extent it is able to consume foreign goods. It is indicative of the comparative resources of this section of the Empire, and it is interesting to point out that, although the total value of foreign goods sent forward under transit passes from Hankow was slightly less in 1898 than in 1897, Hunan increased its amount and was the only one of the provinces supplied from Hankow that did so. For the past three years the growth of the transit-pass business to Hunan has been as follows: 1896, 3,006,129 taels; 1897, 4,446,174 taels; 1898, 4,537,736 taels.

The importance of Canton, Shanghai, Tien-tsin and Hankow is fixed by geographical conditions. Canton is at the head of the Canton River, which is really the estuary for the combined flow of the West, the North and the Pearl Rivers, the three principal streams and consequent trade routes of Southern China. With its fine harbor and juxtaposition to Hongkong, it is, of necessity, and must always continue to be the gateway to the southern part of the Empire. In like manner, Shanghai, at the mouth of the Yangtze, is the controlling point for the whole of the central zone; while Tien-tsin, the port of Peking, is the entrance to the north, the northwest and Mongolia. Hankow is at the head of steamship navigation on the Yangtze, and at the junction of that stream and its principal tributary, the Han, and if the extreme western part of the country be neglected, which part is mountainous and very thinly populated, Hankow is approximately the geographical centre of the Empire.

The future railway system of China will, therefore, have

for its basis the mutual connection of these points. It happens that they are about equidistant, being approximately 700 miles from each other. Hankow and Shanghai being connected by a navigable river, it is probable that a railway connecting these two places will be postponed for some years, and therefore the principal line, or the real backbone of the future system of Chinese railways, will be the line from Canton to and through Hankow to Peking, which, as the map will show, divides the country north and south into halves. The Yangtze River crosses this line at its midway point, Hankow, and again divides the country into two parts north and south, so that the Peking-Canton line in connection with the Yangtze River quarters the Empire. This line is established by the Belgian line from Hankow to Peking and by your concession from Hankow to Canton, the more valuable of the two.

A line from Tien-tsin to Ching-kiang has already been conceded to an Anglo-German syndicate. At Ching-kiang it will connect with a line, the concession for which has been arranged – although at this date not signed—with an English syndicate, headed by Messrs. Jardine, Matheson & Company, for a line from Shanghai to Ching-kiang, to Nanking, and thence across the river to Sin-yang. The Jardine-Matheson Syndicate has also arranged for a concession for a line from Shanghai, via Hang-chow, to Ning po.

The only other concession or projected line which has reached a serious point of contemplation is the lines of what is known as the Peking Syndicate, an Anglo-Italian combination for the constructing of railways in the provinces of Shansi, Shensi and Honan for the development of the syndicate's coal concessions. Then, there is in the north

the existing line, to which reference has been made, under the control of the Government itself.

Of contemplated concessions there is a possible line for the Jardine-Matheson Syndicate from Hang-chow westward into the Province of Kiang-si, which can be continued to join the Ping-hsiang Branch of your own concession, and so make an east and west line between Shanghai and the province of Hunan, or be continued south through the province of Kiang-si across the Nan-ling range and join your line at Shao-chou. This would give probably the best Shanghai-Canton line that can be constructed.

Of other lines, less seriously considered than this, are lines running westward from Canton, up the West River through the province of Kwang-si, Kwei-chau and Yun-nan, or a possible line connecting the Yangtze Valley with the Indian system of railways in Burma. If either of these lines should be built, the first would connect with your concession at Sam-shui, and the other would connect with your railway at Yo-chou, and running either up the Yangtze to Chung-king, or else up the Yuen Kiang across the province of Kwei-chau and Yun-nan into Burma, but in either event adding to the traffic of your line.

Of the four great points in China, the Tientsin-Peking situation is divided between the Chinese Government, the Anglo-German, the Anglo-Italian and the Belgian syndicates; Shanghai is controlled by the English concession; Hankow is divided between yours and the Belgian concession, while Canton is absolutely controlled by your concession.

CHAPTER V.

OBLIGATIONS AND RESOURCES OF THE CHINESE GOVERNMENT.

The bonds that are to be issued in payment for this work are the direct obligations of the Chinese Government, with a first lien upon the property created by them. In order to get an idea of the value of this Government obligation, it is necessary to consider, briefly, the debt and resources of the Empire.

Previous to the war with Japan, the funded debt consisted of two issues of bonds, bearing date 1886 and 1887 respectively; the former for 1,855,108.82, Shanghai taels, and the other for 50,000,000 German marks, subject to reduction by sinking fund provision. Since the war the Government has been obliged to contract further loans. The existing indebtedness is given in detail in the following table. (See page 52.)

The total amount of China's debt outstanding is, therefore, £52,979,665, exclusive of the railway debt, for which there is actual property of at least equal value in existence as an asset, on which the total annual payments for both interest and sinking funds are £3,199,177, or exclusive of the interest on the railroad loan, which is self supporting, £3,082,117. The debt of India, whose population is about the same as China, is about £135,000,000, or deducting the value of the government railways, £56,000,000, and the debt of Japan about £50,000,000. It can be seen, therefore, that in spite of the disastrous result of the Japanese war, the debt of China is not a large or burdensome affair.

CHINESE GOVERNMENT LOANS.

Name of Loan.	Original Amt.	Annual Redemption in Sterling.	Outstanding in Sterling.	Annual Interest.	Date of Final Payment.
7 Per Cent. Silver Loan of 1886 E.....	£250,000	£8,163	£140,963	£9,867	1917
5½ Per Cent. Gold Loan of 1887.....	245,000	24,510	73,529	4,044	1902
7 Per Cent. Silver Loan of 1894.....	1,453,333	10 equal drawings, commencing 1905.	1,453,333	101,733	1914
6 Per Cent. Gold Loan of 1895..... H. & S. B. C.	3,000,000	15 equal drawings, commencing 1900.	3,000,000	180,000	1914
6 Per Cent. Gold Loan of 1895..... Chartd. Bk. "Cassel Loan."	1,000,000	15 equal drawings, commencing 1901.	1,000,000	60,000	1915
6 Per Cent. Gold Loan of 1895..... Natl. Bk. of Germany, &c.	1,000,000	15 equal drawings, commencing 1901.	1,000,000	60,000	1915
4 Per Cent. Gold Loan of 1895..... French Syndicate guaranteed by Russia.	15,820,000	200,000*	14,953,390	632,800	1931
5 Per Cent. Gold Loan of 1896..... H. & S. B. C. and D. A. Bk.	16,000,000	166,000*	15,473,675	800,000	1932
4½ Per Cent. Gold Loan of 1898..... H. & S. B. C. and D. A. Bk.	16,000,000	115,000*	15,884,775	720,000	1943
5 Per Cent. Ch. Impl. Ry. Gold Loan.....	2,300,000	40 equal drawings, commencing 1905.	2,300,000	115,000	1945
Totals.....	£57,068,333	£513,673	£55,279,665	£2,683,444	

* These issues retired through a Sinking Fund. In addition to the proportion stated being drawn, the interest on the whole loan is paid, and the surplus interest over that due on outstanding bonds is used as a further redemption fund.

The several sinking fund and interest payments on every one of the above issues have been promptly met when due. To furnish the sums required for these payments and the other sums requisite to meet the expenses for maintaining the various branches of the Government, the Imperial Treasury has at its hand, first, the net returns of the Imperial Maritime Customs, which are, however, pledged as collateral for some of the above loans specifically; secondly, the net receipts of the Imperial Chinese Railway; thirdly, various sources of taxation.

On account of there being no system of accounts kept, or detailed reports made, it is impossible to give even a close approximation of either revenue or disbursements, except in the case of the Imperial Maritime Customs. From such information, however, as is obtainable, the resources of the Government under the above three heads will be briefly stated.

Although the receipts of the Customs from import and export duties have been gradually increasing, in proportion as the import and export trade was shown to be increasing in a previous chapter, on the other hand there has been a falling off in the receipts from opium likin, to about the same extent as the increases in the former case, so that the revenue of this department has varied but little for the past ten years. The report for the year 1898 gave the gross receipts as follows;

Import duties	7,223,642	Hk. Tls.
Export duties	8,468,892	"
Opium likin	3,983,182	"
Coast trade duties	1,497,082	"
Transit dues	717,738	"
Tonnage dues	612,861	"
TOTAL	22,503,397	"

or equivalent to about $16,000,000 gold.

The expense of maintaining this department is not published, but from reliable information I ascertained that it amounts to about 3,000,000 taels per annum, leaving 18,500,000 taels as net profit. This last sum, amounting to about £2,750,000, is in itself almost enough to pay the annual sums required for the services of the Government loans. An increase of only ten per cent. in the duties would make it ample.

The net earnings over expenses of the present Imperial Chinese railway amount to about 1,000,000 Mexican dollars, or, say £100,000, as an offset against the interest of £115,000 on the railway loan. This railway loan, however, was contracted to extend the railway system to the treaty port of New-chwang and thence to a connection with the Russian Trans-Siberian Road in Manchuria. When this is done—and the work is now in progress—the earnings of the road will be very much increased, and the Government can look forward to a profit, resulting from the operation of the railway, over and above the interest charges.

The third source of income, namely, the various forms of taxation, is, of course, the most important, but, on the other hand, the most difficult to obtain reliable or even satisfactory information relative thereto. The methods of internal taxation are complex and wasteful. The Imperial Board of Revenue at Peking each year makes out a budget for the expenses of the coming year, and proportions the total thus ascertained among the various provinces in accordance with what is considered their ability to pay, and the Governors of the various provinces are then informed of the amount which they will be required to turn into the Imperial Treasury. The most fruitful source of revenue is a land tax, payable partly in cash and partly

in grain. As illustrating the wasteful methods in vogue by the Government, frequently the actual money in silver bullion is forwarded to Peking, and even when the tax is remitted by draft, the latter is taken to Peking by a Chinese official, involving, of course, according to Chinese etiquette, the necessity of being accompanied by a large and expensive retinue. There being no detailed accounts kept of the amount raised by land, or, for that matter, by other taxation, the possibilities for stealing on the part of sub or even high officials are practically unlimited, and there is no question but that the people of China actually contribute a very much larger sum than the Imperial Government reports as receiving. A part of this amount is actually stolen, and a part of it is wasted by the cumbersome and expensive Chinese methods.

The portion of the tax payable is grain is settled by actually sending the grain to Peking. Of course, the loss and waste in so doing is necessarily enormous. Were this grain sold in the open market, and the cash remitted, the net result would be much more beneficial.

Next to the land tax, however, the greatest source of Government revenue is the tax on salt. The sale of salt in China is absolutely a Government monopoly, controlled by specially designated officials called "Salt Commissioners." Merchants in any given district are allowed to buy their salt from the Government at certain depots at a fixed price, and can sell it at retail only at a price established by the Salt Commissioner.

Next to the salt tax in importance is the likin tax, levied, as was explained previously, on the inland transportation of goods. None of these likin stations keeps a record, so once more the opportunity for stealing and waste is great.

In addition to the above, there is the revenue received from the native customs houses, from special taxes on opium and miscellaneous sources. The actual receipts of the Government from these various headings can be taken, approximately, as follows:

Land Tax, in money	25,000,000	Tls.
" " " grain	7,000,000	"
Salt Tax	14,000,000	"
Likin Tax	13,000,000	"
Native Customs	1,000,000	"
Opium Tax	2,500,000	"
Miscellaneous sources	6,000,000	"
	68,500,000	"

which, with the net return of the Maritime Customs, give a revenue of 87,000,000 taels, or about $61,000,000 gold per annum.

The principal thing for which the Government of China is likely to incur further obligations will be in the matter of railways or other internal improvements. The railways created by these obligations should be self-sustaining. and, therefore, practically not add to the Government's burdens.

Should, however, it become necessary to do so, there are many ways in which the Government can, under proper financial administration, increase its receipts. The following are some of the opportunities:

1. Maritime Custom charges, which, as pointed out above, amount to an average of something less than 4 per cent., can be materially raised without interfering with Chinese trade.

2. The Native Customs can and should be consolidated with the Maritime Customs Bureau. Any department,

such as Native Customs, entirely in the hands of Chinese officials, does not return the full receipts.

3. The introduction of railways will increase both the internal and external trade, therefore, adding to the Government revenue, both from Likin and Maritime Customs.

4. The whole method of tax gathering can be reorganized, so as to save an enormous amount of waste and stealing. There is probably little doubt that the people of China now pay at least twice, probably more, what the Imperial Government actually receives. In this connection it is interesting to compare the land and salt taxes of China and India, where the conditions, in regard to population and comparative wealth, are quite similar:

Land tax—India	100,000,000	Tls.
China	25,000,000	"
Salt tax—India	33,000,000	"
China	14,000,000	"

In like manner, the tax on opium, which now amounts to about 2,500,000 taels, should, by those who have studied the problem, amount to from 15,000,000 to 18,000,000 taels. As the latter sum is the one which the people probably pay, the difference between the payments and the reported receipts is lost by stealing or waste.

5. Post Office Receipts. A little over a year ago, the Post Office Department was organized as a subdepartment in the Maritime Customs. Previous to that time, each separate commercial district of China maintained its own local post office. It is too early yet to note the beneficial result of this action. There is no doubt, however, that after the new system has become thoroughly well estab-

lished and further extended it will work a profit to the Government.

Japan has already carried out a system of reforms such as is outlined above, showing that it is possible for an Oriental nation to have its financial methods put on a solid basis.

At present China meets its obligations. All of its loans, however, are held by foreigners. Should the income from present sources and by present methods fail at any time to meet the interest and sinking fund debts, foreign governments will unquestionably at once step in and take charge of China's finances, and by reorganizing them, as was done by the English in the Customs, will enormously increase the net returns to the Government, without increasing the burdens of the people.

China, therefore, has the ability, or at least the potentiality, to successfully meet any obligations that the Government is likely to incur, including the interest and principal payments on the bonds issued for your line.

CHAPTER VI.

REVENUE TO BE DERIVED.

The question as to whether this railway will pay, and, if so, to what extent, is a question much more difficult of accurate solution than even the probable cost.

The line traverses a section of the country with a dense population, a fertile soil, and vast mineral resources, but with, at present, a traffic, of course, insufficient to support such a railway as this. The question therefore arises, will the Chinese avail themselves of the facilities offered, and to an extent sufficient to produce a revenue which will necessarily be paid in at low rates in silver and yet be of sufficient volume to meet the interest charges in gold on an investment of, say, $40,000,000?

To the first part of the above question the answer is unquestionably, yes. When one sees the amount of manual labor expended in the transportation of the articles that are produced and consumed in Hunan, there can be no doubt but that, when improved facilities are offered to the people, these facilities will be availed of to a very large extent, especially as the net cost of transportation by rail will be much reduced below the present junk tariff in spite of low price of labor.

The Chinese are essentially a trading nation, and, where given the opportunity, do not hesitate to spend money with a view to getting a profit back. Along the West River, in the neighborhood of Sam-shui and Fat-shan and especially near Canton, there is a continual procession

of boats, large and small, carrying both passengers and freight. Then there are regular lines of large junks propelled by stern wheels worked by gangs of coolies ranging from twelve to twenty-four and even thirty-six in number, giving these boats a speed of six or seven miles an hour. These boats run at intervals during the day time between Fat-shan and Canton of about thirty minutes, and between Hsi-nam or Sam-shui and Canton at intervals of about one hour. The fare on these boats, Canton to Fat-shan, ten miles, is, 1st class, $7\frac{1}{2}$ cents; 2d class, 5 cents; 3d class, $2\frac{1}{2}$ cents, and some of the photographs which accompany this report give views of these boats showing to what extent they are loaded.

In addition to these boats, however, there is an express service consisting of small rowboats, decked over in front and called, from their appearance, "slipper" boats, which are propelled by three or four oarsmen standing up at the stern. These boats carry from two to four passengers, who are obliged to lie down beneath the cover, and attain a speed of 7 or 8 miles an hour and make no stops, charging 25 to 50 cents for the trip.

In the north, where there is a railway, the passenger trains are densely packed, and the Chinese quickly learned that goods could be more economically handled by the railway than by junks on the river or in packages on coolies' backs.

In order to get some idea of the possible volume of traffic, I collected the statistics in regard to Indian railways; the existing Chinese railways from Tien-tsin to Peking, and from Tien-tsin to Shan-hai-kwan, and also for the railway system in Japan, where the conditions of life, so far as density of population, the productiveness of the soil and

the poverty of the people, are comparable with the conditions existing along the line of your railway.

As for a direct comparison, probably the Chinese railway is the most valuable. This line consists of 294 miles, connecting Tien-tsin, with Peking 80 miles, and a line extending northeasterly along the shores of the gulf of Pe-che-li, 174 miles to the Great Wall at Shan-hai-kwan, and thence 40 miles beyond. At Tung-shan are located the mines of the Kai-ping coal fields. The rest of the country is an agricultural one, and tributary to the railway on one side only, the other side being the gulf of Pe-che-li. Except the business to and from the capitol of the empire, this line is fairly identical, in respect of traffic conditions, with the line between Hankow and Canton; and it is probable that the local business, from Canton north or from Hankow south, will be as great as the local business between Tien-tsin and Peking. Although this railway is under the direction of an English manager, the accounts are in the hands of the Chinese and it is very difficult to obtain accurate information in regard to either the gross returns or the operating expenses. The figures, as furnished me by the Traffic Manager, and which he said were correct within a small fraction, such as two or three per cent., were for the year 1898 as follows, reduced to United States gold.

Division.	Miles of Road.	Gross Earnings.	Gross Earnings per Mile.
Tien-tsin—Peking.....	79.68	$411,292	$5,162
Tien-tsin—Ku-yeh.....	94.29	496,943	5,270
Ku-yeh—Chun-hou-so.....	119.50	190,765	1,596

From the observations of your Engineer while inspecting this road, and from statements made by the managers, he is of the opinion that a larger gross business is done than what appears on the accounts. Owing to the

Chinese methods of "squeeze" in such matters, there is no doubt that the conductors in charge of the trains, both passenger and freight, do a considerable business on their own account for which the company never receives any credit. In like manner, the expenses are unquestionably inflated. Sinecure positions are found for the dependents of persons of influence.

A line from Shanghai to Wu-sung, which has been is operation but a few months only, is too small in length, being but 8.1 miles in length, to be of any value for comparative purposes.

The railway system of India is divided into government and private railways, some of the gauge of five feet six inches and others of the gauge of one metre. These railways aggregate a total of 20,841 miles, and are steadily increasing in length. For the fiscal year of 1897, these railways reported:

Miles.	Gross Earnings.	Earnings per Mile.
20,006.....	$78,339,400	$3,916

The Japanese railway system forms, however, the most interesting basis for comparison.

The Japanese railway system was inaugurated in 1871 by the construction of a line between Tokyo and Yokohama, and the growth of the railways, especially during the past two years has been phenomenal.

The Japanese railways are like the Indian railways, partly Government and partly private lines, and all have the same gauge, 3 feet 6 inches.

Of the government system the principal portion, and which, at the same time, is the chief railway of Japan, is the line from Tokyo to Yokohama, and thence parallel with

the coast through Kyoto to Kobe, thus joining the two chief ports of Japan, Kobe and Yokohama, with the capital, but in so doing it subjects itself to the competition of water-borne freight.

The private railways of Japan ramify all over the Island; the principal one being the Nippon Railway, which extends from Tokyo northeast.

The results of operation of the Government railways, taking them in 5-year periods, have been as follows:

Year.	Mileage.	Gross Earnings.	Operating Expenses.	Net Earnings.
1872.....	18	$ 87,465	$ 56,732	$ 30,732
1878.....	65	455,168	263,124	192,044
1883.....	115	920,147	463,124	456,923
1888.....	244	849,437	338,562	510,875
1893.....	551	2,290,316	1,083,099	1,207,216
1898.....	662	4,863,745	2,393,024	2,470,720

The private railways for the years 1893 to 1897, inclusive (it was not conveniently possible to obtain their figures previous to 1893, nor for the fiscal year of 1898), make the following returns:

Year.	Mileage.	Gross Earnings.	Operating Expenses.	Net Earnings.
1893.....	1,320	$2,552,176	$1,227,981	$1,324,195
1894.....	1,368	2,928,779	1,221,605	1,707,174
1895.....	1,537	3,839,801	1,562,711	2,277,090
1896.....	1,680	4,840,533	1,829,039	3,511,493
1897.....	1,642	5,484,329	2,357,072	3,127,257

On all the railways in the Orient the passenger business contrary to European and American experience, exceeds the freight.

On the Imperial Chinese Railway, the freight and passenger receipts were in 1898:

Passenger..... $822,644 (Silver)
Freight..... 629,594 "

There is, however, a special coal traffic between the collieries at Tung-shan and Tong-ku for export, amounting to $377,914 (silver).

On the Japanese railways the difference is still greater. For the year 1898 the receipts of the government and private railways amounted to:

	Passenger.	Freight.	Total.
Government Lines..... ..	$7,472,342	$2,540,054	$10,012,396
Private "	2,144,342	1,918,464	4,062,806

These figures indicate that the oriental native will travel if he is given the opportunity, in spite of the general impressions to the contrary, and in spite of the small wages that he receives. During the year 1898 on the Peking-Tien tsin Division, 80 miles long, there were no fewer than 9,423 first-class and 344,009 native passengers traveling second class, or an average of 1,000 passengers per diem. In like manner, the Customs returns from Canton show that the travel by steamer between Canton and Hongkong, exclusive entirely of any local travel and exclusive of the large travel by junk, amounted in 1898 to 5,762 foreigners and 922,277 Chinese, a grand total of no less than 928,039 passengers, or an average of over 2,500 per diem. It is interesting to compare these figures with the annual travel between New York and Boston, which, both by boat and rail, all lines, is in the neighborhood of only 600,000.

The rates at which this business is done are far from being so low as is frequently supposed or as might be expected from the smallness of the daily wage. The Imperial Chinese Railway in the North has but two classes of passengers, first and second; on the little line between Shanghai and Wu-sung, and in Japan, there are three classes; in India there are four, and on the railway in the island of

Formosa two. On the Imperial Chinese Railway the rate of fare is not uniform, being lower on the line from Tien-tsin along the coast towards Manchuria than from Tien-tsin to Peking. The rates, per mile, charged on the various systems, expressed in United States gold cents, are as follows:

	1st Class.	2d Class.	3d Class.	4th Class.
Tien-tsin–Peking.....	1.50	0.75	....	....
Tien-tsin–Chung-hou-so.....	1.00	0.50	....	....
Shanghai–Wu-sung.....	5.00	3.00	1.00	....
Japan	2.10	1.40	0.70	....
India.....	2.36	1.13	0.56	0.30
Formosa.....	3.00	1.50	....	....

In like manner the freight rates, per ton per mile, are:

	1st Class.	2d Class.	3d Class.	4th Class.	5th Class
Imp. Chinese Ry....	2.25	2.00	1.60	1.20	....
Japan.	2.00	1.50	1.25	1.00	....
India.....	5.55	4.12	3.60	2.34	1.59

Coal is carried on the Imperial Chinese Railway from the mines at Tong-shan to the port of Tong-ku at the rate of .7 cent per ton per mile. On this basis from 2,000 to 2,500 tons a day are handled.

The Japanese railways have during the present year increased their present rates to the figures given above. During the year 1898, for which the earnings have already been stated, the tariff was somewhat lower than the above rates, showing that the tariff is not oppressive.

When it is considered that the average native passenger receives the poorest accommodations—the Chinese second-class passengers, for instance, riding usually in open gondola cars—it will be seen that the above figures, both as to passenger and freight, are high, and are enough to excite the envy of the average American railroad traffic manager.

From the figures already given, it will be seen that the earnings per mile on the whole Indian system average about $4,000 gold; although the government lines, which form the better part financially of the system, average $5,500, with the chief lines running as high as $6,500 to $11,000. In like manner, the Japanese system average on the government lines $7,350, and on the private lines $3,400, the former, as in the case of India, occupying the best location. The Chinese railway system, as a whole, averages $3,400; although, if the portion from Tong-shan northward towards Manchuria be omitted, which is a poor section, as has already been explained, the balance of the system shows an average of about $5,000.

On account of the cheapness with which labor can be procured, and of the comparatively high rates, and in spite of the heavy general expenses and the greater number of laborers that have to be hired, it is possible to keep the ratio of operating expenses consideraby below what is customary to be found in this country. In India the ratio of operating expenses ranges from 48 per cent. to 51 per cent. in Japan, from 43 per cent. to 50 per cent., and in China, from 50 per cent. to 60 per cent.

The heavy operating ratio in China is due to the fact that in 1898 the receipts were handled by Chinese officials and accounts were not satisfactorily kept. There is little doubt that the railroad actually earned a larger amount of money than has been returned, and that the operating expenses should have been very much less if the pay-rolls could have been purged of a lot of unnecessary office-holders.

On the Siang River the charges for junk transportation for a haul of about 300 miles is about $\frac{8}{10}$ths of a cent

per ton per mile. The voyage, however, is quite indefinite in point of duration, and the cargo is subject to deterioration by being wet, or by pilfering in the case of coal. The up-stream charge for manufactured goods from Hankow is about 50 per cent. greater than the price named. Your railway, by cutting off the river bends, will shorten the distance by about 50 miles in 300. Coal from the Ping-hsiang mines destined for Hankow costs to transport:

	Cost.	Distance.	Rate per Mile.
From mines to Ping-hsiang by coolie.....	$0.70 to $1.40	14 miles	5 to 10 cents
" Ping-hsiang to Siang-tan by sanpan....	1.00 " 2.00	80 "	1¼ to 2 "
" Siang-tan to Hankow by junk.....	0.84	300 "	0.3 "

or a total charge ranging from $2.54 as a minimum to $4.24 as a maximum, according to the stage of water in the river.

By rail this distance would be about 320 miles; so that the present minimum charge gives an average rate of .8 cent per ton per mile, and the maximum through charge (winter rate) one of 1.3 cents, with certain portions of the route paying 5 to 10 cents. It will, therefore, be seen that a railway will offer not only a quick and certain delivery, and a saving of stealing while in transit, but also a reduction in actual expenditure against which the existing means, even by cheap junks, will not be able to compete.

The greatest single item of traffic that this property will have will be coal. China's supply of coal now comes principally from the Kai-ping mines at Tong-shan in the north, and by importation from Japan. A smaller amount is received from the French possessions in Tong-king; from some mines recently opened on the West River, from 200 to 500

miles from Canton; from Cardiff in Wales, and from certain points in Australia.

The greatest point of coal consumption is Hongkong, where all the steamers take on board their supplies. The receipts of coal at Hongkong during the year 1898, amounted to no less than 871,276 tons, made up as follows:

From Tong-king	115,200	tons.
" England—Cardiff, etc	119,282	"
" Australia	26,075	"
" Japan	605,219	"
" Kai-ping—North China	4,000	"
" Kuang-si—South China	1,500	"

NOTE.—About one-half quantity of Tong-king reexported to Canton, chiefly dust coal.

The coal imported to Canton direct by steamer, and therefore exclusive of any coal that might be reshipped from Hongkong, and, included in the Hongkong statement above amounted to 45,799 tons, divided as follows:

From Japan	7,705	tons.
" Kai-ping	4,400	"
" Tong-king	33,694	"

In addition to this, however, there is a large amount of coal that comes down the West River from the Province of Kuang-si.

At Hongkong the cheapest coal sold is the Tong-king coal which, for lump, at wholesale in large lots, sells at from $3 to $4 gold, and the dust from $1.50 to $2.25. Kai-ping coal is worth $4; Japan coal $4 to $5.50; Australian $5 to $6 and Cardiff $9 to $13. In Canton the prices are a trifle higher, and the Kuang-si coal, which comes down in native junks, sells for $4.

The Shanghai Customs returns show that, at the port of Shanghai during the year 1898, coal was received to the extent of 667,986 tons, of which about 450,000 tons came from Japan; 47,000 tons from Kai-ping, and the balance from other points. In addition to these receipts a good deal of coal—principally, however, Hunan anthracite—was received in native junks. Japan coal ranges in price from $4 to $5, and Kai-ping coal about $5.

The Customs returns at Hankow show that 35,150 tons of foreign coal were received. At this point the great bulk of the coal that is burnt comes down in native junks, and no return is therefore made by the Maritime Customs. The coal that is thus received is either bituminous coal or coke for the Han-yang Iron Works or anthracite for the other local industries and domestic consumption. The iron works take all the bituminous coal that can be received, and therefore that does not appear in the open market. The anthracite ranges in price from $5 gold and upwards. When I was in Hankow, on account of the low stage of the river, a very poor grade of anthracite coal was selling as high as $9, gold.

The market for coal in China is, therefore, a very large one. From the figures quoted above, it will be seen to what an extent China has to depend on Japan for her supply of fuel. The Japanese mines are not extensive; the supply is getting visibly less, and the price continually rising. The Kai-ping mines are producing about 2,500 tons per diem, and this output is not susceptible of much increase. China, therefore, will be compelled to look in the future for the development of new fields.

The three chances for supplying coal on a large scale and cheaply are (1), the concessions covered by what is

known as the Anglo-Italian Syndicate, in the provinces of Shan-si and Shen-si, which coal will find its way north to Peking and thence to the sea, or southeast, either to the river Han and thence to the Yangtze by junk or to a connection with the Belgian Road; (2) by the territory tributary to your line in Southern Hunan or Northern Kwangtung; (3) by the field lying up the West River, which is now finding its way to market by junk.

The haul on either the first or the third of the above-mentioned fields is as long or longer than the haul by your line, and even if they should both be developed, the possible market for coal in a country as large and populous as China is continually expanding. With the introduction of railways and new civilization, manufacturing industries and an increased demand for coal will immediately follow, and probably in a greater ratio than the mines can be opened up. I personally sampled coal at a number of mines now opened along the route, and submit the results of analyses that I have had made. (See page 69.)

An examination of these figures, taking ash as the governing factor, shows a great variety. There are certain coals like the Ping-hsiang, certain of the Hunan, and both the Kwangtung coals which are low in ash, and will compare favorably in this respect with coals in this country. It will be noticed that these coals vary from soft bituminous to a very hard anthracite, in which the quantity of volatile matter is very small. There are others of the coals which run high in ash, with proportion ranging from 15 to 37 per cent.

The Ping-hsiang coals are good, and other analyses that I have seen made at the Han-yang Iron Works and by the English chemist of the Government Mint at Wuchang, show

KIANG-SI COALS.

Mine.	Locality.	Moisture.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.	Variety.
Ping-hsiang	Kiang-si	1.05	29.84	55.76	13.34	0.63	Bituminous.
" "	" "	0.98	26.45	66.42	6.16	0.70	"

HUNAN COALS.

Ping Tze-pu	Siang-tan	5.77	26.99	52.90	14.34	2.66	Bituminous.
	An-yuen	5.25	1.58	86.24	6.93	0.22	Anthracite.
Ping-chow	Fei Kiang	5.41	2.92	85.78	5-89	0.20	"
Chang-shu-sha	" "	4 38	7.15	79.26	9.20	1.67	Semi-anthracite.
" " "	" "	4.40	7.49	68.63	19.48	1.42	" "
Chin Nin-char	" "	3.82	5.78	65.98	24.42	2.54	" "
" " "	" "	3.03	6.69	52.99	37.28	0.74	" "
	Yung-hsing	2.83	9.08	70.10	17.99	0.94	Semi-bituminous.
	" "	1.57	7.05	81.96	9.42	1.90	Semi-anthracite.
Nin Shing	Shing-ning	1.26	14.82	65.84	18.08	1.87	Bituminous.
Shih Hing	" "	0.65	14.25	57.73	27.22	2.53	"
Shin Chiang	" "	0.96	15.76	68.08	15.20	2.29	"
Mai Char	" "	0.81	19.09	61.07	19.03	2.09	"
Tsai Char	" "	0.89	15.81	73.56	9.74	1.82	"
Toh Kou-lin	Chên-chou	2.63	12.09	77.13	8.15	1.68	Semi-bituminous.
Ma Ling	" "	3.85	8.73	77.91	9.50	1.69	Semi-anthracite.

KWANG-TUNG COALS.

Yen-ling	Lo-chang	2.85	5.54	82.85	8.76	2.84	Anthracite.
Hsi Shui	Shao-chou	1.47	11.50	80.61	6.42	1.63	Semi-bituminous.

even better results than my own figures. Of the other coals there are enough, both coking and non-coking and anthracite, to reach a marketable standard.

For local consumption the Chinese break up their coal into dust and mix it with clay into balls. They therefore endeavor to find a coal that is soft and easily worked, and where a high proportion of ash is not necessarily an objection. This demand will consume coals of inferior quality or those not suited for steamer use.

The Ping-chow coal is an anthracite, very hard and resembling in its general appearance Pennsylvania coal, as will be seen from the figures. This coal contains 86 per cent. of fixed carbon, less than 6 per cent. of ash, and but $\frac{2}{10}$ of 1 per cent. of sulphur, and is a coal, both by analysis and physical structure, capable of being used in blast furnaces.

Attention is also invited to the Yen-ling coal, near Lo-chang in Kwang tung, an anthracite fairly low in ash, but yet containing enough volatile matter to make it ignite at least as easily as American anthracite. This is a coal that should establish itself well for household consumption in Canton.

In like manner attention is invited to the Hsi-shui coal, near Shao-chou in Kwang-tung, still lower in ash, and with enough volatile matter to constitute it a semi-bituminous. This coal, although high in sulphur, would make a good steam coal, and will secure for itself a proper share in in the Canton and Hongkong markets.

The Ping-hsiang mines are now owned by H. E. Shêng. The coal in the western territory, south from Ping-hsiang, and as far as the southern limits of the field at Shao-chou, is owned by individual Chinese.

In order to compare these coals, however, with other

OTHER CHINESE COALS.

Mine.	Locality.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	
West River	Kuang-si	1.29	26.27	53.74	18.20	2.35	Bituminous.
French mine	Tong-king	1.84	12.70	76.48	8.98	0.74	Compressed briquette.
Hongay	" "	1.65	9.90	80.77	7.68	0.10	Semi-anthracite.
Kaiping No. 5	Tung-shan	0.72	27.52	66.50	5.26	0.68	Bituminous.
" " 9	" "	0.66	26.56	59.77	13.01	1.61	"
Linse No. 5	" "	0.69	29.21	61.52	8.58		"
" " 9	" "	0.83	24.07	54.83	20.27	1.83	"

JAPANESE COALS.

Ohnoura	Japan	1.36	36.22	52.01	10.41	1.12	Bituminous.
Ichimura	"	1.81	34.66	45.90	17.63	2.57	"
Daigo	"	3.78	37.32	48.89	10.01	0.50	"
Miiki	"	0.51	37.10	53.62	8.77	3.80	"

coals with which they would have to come in competition, I give a table (see page 71) showing the make-up of the other important Chinese coals and certain typical Japanese coals.

The best coal on the Chinese market is Kaiping No. 5, a bituminous coal of high grade. This seam, however, is nearly exhausted, and what is known as the Kaiping coal is generally taken from seam No. 9 of the Kaiping mines, or from the Linse mine, where it will be seen that the proportion of ash is high.

At Canton the Chinese coals are from the West River, where the ash is very high, or a semi-anthracite from the French possessions at Tong-king. The anthracite or the semi-bituminous coals from Kwangtung are both of them better coals than either the West River or the Tong-king output.

As was previously shown by the shipping statistics, the great bulk of the coal sold in the Chinese markets comes from Japan, in which the product of ash varies from 9 to over 17 per cent. Taking, therefore, the coals as so far developed—and the field has not, by any means, been explored—there exists along the line of your concession coals, both bituminous and anthracite, which are bound to command a large market.

For the development of the mineral properties the Government has a system of granting a concession covering a large territory, and then issues an order forbidding the owners of coal to sell to any one but the holders of the mining concession. This is, of course, tantamount to condemnation, as it obliges the owners of the mineral properties either to sell the properties to the concession-holder at practically his price or to sell him the output at his terms. The practical result is that the mineral rights are acquired by the holder of this concession on terms agreed upon.

Should this project be undertaken it ought to be accompanied by a concession on the part of the Chinese Government covering all mineral rights—metals as well as coal—for the territory passed through, and which would become tributary to the line. If that were done, then the property should be properly and carefully examined geologically—which, of course, has never been done. Coal can be put on cars at mine mouth at not exceeding 60 cents per ton and laid down in Hankow at from $1.80 to $2, or at Canton at from $1.25 to $2 as against existing prices, as was shown above in this report, ranging from $4 to $9. The difference, or so much of it as can be maintained, will accrue as profit to the syndicate. The extent of the field thus tributary to the main line has a length of 250 miles and a breadth of at least 75 miles—containing a quantity of coal practically unlimited.

CHAPTER VII.

SUGGESTIONS.

It is obviously quite impossible to present an estimate in detail of what the earnings on the proposed line are likely to be. With the completion of a railway, a wholly new traffic will be built up, different both in quantity and kind from that now existing. Statistics of the present condition of affairs, even if obtainable, would therefore be of little account. The best guide that can be had is to take the earnings per mile of the present Chinese system, and to a less extent the earnings of the Japanese and Indian systems; for, after all, in both of the latter countries the general conditions of life and trade are similar to those existing in China, or that would exist after the building of railways.

In figures previously given, it will be seen that the Imperial railways in the north average $3,400 gold per mile, while the portions between the Tong-shan mines and Peking average $5,000 per mile. The northern extension in this system is not as good as the greater part of the country tributary to your line. While certain portions of your line are certainly as good as, if not actually better than, the best portion of the northern system. Taking your line as a whole from Hankow to Canton, I believe that the earnings, within a reasonable time after the road is built, will amount to $4,000 to $4,500 per mile.

The road ought to be operated, and, under foreign management, would, I believe, be operated for not exceeding 50

per cent. of its gross receipts. This would leave $2,000 to $2,250 per mile net returns, or 5 per cent. on $40,000 to $45,000. The estimated cost of the road per mile was shown in Chapter III to be $42,500; that is to say, the road would about meet its fixed charges without calling upon the Government for aid, and without returning any profit upon the stock. As the country becomes more opened up, as branch lines are constructed into Western Hunan, or the more important lines to Burma and Sz-chuen are undertaken, and principally when the line from Hankow to Pekin is completed giving with your road a through line from north to south, these earnings will be correspondingly increased and will come up to the earnings of the more important Japanese or Indian lines, which amount to $7,500 to $11,000 per mile. It is the general opinion of residents in China that Hunan is the most promising field for railway development in the whole country.

It is not, however, necessary to build at once the whole of the line, and certain portions on which the earnings would be less than the average could be omitted. Thus, instead of completing the line to Wuchang, it could for the time being be terminated at Yo-chou, and save in construction 139 miles at an estimated cost of $5,500,000.

Between Yo-chou and Hankow there is the Yangtze River, with a depth at the lowest stage of water of at least 6 feet. Outgoing freight, of which the chief item will be coal, can be transferred at Yo-chou to barges and be towed down the river to Hankow, or farther to Shanghai if necessary, in very much the same manner as coal is now sent from the Pittsburg district down the Ohio and the Mississippi as far as New Orleans.

When the railway system of China is built up and there

arises a demand for a through train service, the link between Yo-chou and Hankow can be completed. In order to construct the line there will have to be built in the first instance barges of the general character such as would be needed for the transfer of freight in order to deliver rails and other construction materials at various points along the line. Tugs will also have to be built to tow these barges during construction. The cost of the barges and the tugs has been included in the estimated cost of the line; but if a fast running boat were required bonds for the purchase of such boat or boats to run between Hankow and Yo-chou can be taken from the bonds estimated for the construction of the Yo-chou-Hankow Division, but which would be held awaiting the completion of this portion of the line.

This idea of temporarily stopping the line at Yo-chou and saving additional expense I submitted to H. E. Shêng and secured his approval. This omission would increase the average earnings per mile, as you would practically get the same gross earnings, for the whole of the line to Hankow, but on 139 miles less distance, because the portion of the line between Yo-chou and Hankow would originate but little traffic as previously stated. But if the Syndicate desires to proceed with the work even more slowly, and would prefer to enter into the project gradually, without facing the large expenditure of $30,250,000 required even for the line from Yo-chou to Canton, it is quite possible to do so, to preempt the territory, and to hold secure all your rights, by constructing a small length of railway on which the net earnings would be, beyond any question, so far as human foresight can see, in excess of the fixed charges, and leave enough for a profit on the

stock. The portions of the system that would meet this suggestion are the Ping-hsiang branch, from Ping-hsiang to the Siang River at Lu-kou, 65 miles; from Canton to Sam-shui, 28 miles, and from Canton, northward, a distance of, say, 50 miles. The estimated cost of construction of these three lines is $5,000,000, including Canton terminals, an average of $35,000 per mile. It will be noted that the cost per mile of these preliminary lines is less than the average cost of the whole. This is due to the fact that they traverse open, level sections of country, where the cost of construction would be less than elsewhere.

As I have already explained, at Ping-hsiang there are large mines belonging to H. E. Shêng, now opened up ready for heavy business. This coal is insured a market of about 250 to 300 tons per diem at the Han-yang Iron Works, and would also be used in the mints, cotton mills, tea presses and other industries at Hankow and Wu-chang, and by all the steamers navigating the Upper Yangtze; it would also find its way, to some extent, to Nanking, Ching-kiang and Shanghai. These mines alone would, within twelve months after the railway is built, secure a market of 1,000 to 1,500 tons per diem.

I have already shown you that the expense of taking this coal from the mines to Siang-tan, 30 miles down the Siang River, below Lu-kou, is at the rates of 2 to 4 cents per mile. A railway tariff of, at least, 1 gold cent per mile would be cheerfully paid. Taking the local business on the Northern Railway system, exclusive of coal at $2,500 per mile, and adding to this 600 tons of coal per diem at one cent per ton per mile, we would get gross earnings on this Ping-hsiang Branch of about $4,700 gold per mile. This gross estimate I believe to be a very conservative one.

The output of coal would unquestionably exceed the figure of 600 tons, while the local business would also be greater than the sum mentioned, because this section of the country was the best bit of agricultural territory that I saw and much superior to the land tributary to the northern railway. It was one of the few sections which was able, in view of the difficulties of transportation, to be able to raise enough rice for home consumption and to export it in large quantities. It contains three large cities, besides a number of prosperous small ones.

This sum, however, would pay the interest on the bonds and would leave a surplus for the stock. In addition to this, there would be the profit of hauling the freight and passengers on the barges and steamers between Lu-kou and Hankow and intermediate points, because these barges would obtain the trade between places like Siang-tan and Chang-sha with Hankow.

The profits on this barge traffic could be arranged to be independent of the railway, and could be made to accrue to a subsidiary company on which all the earnings could be secured by your Syndicate, except such an amount as it would be deemed advisable to turn over to Chinese officials in order to secure their co-operation.

The net profits of the railway above bond interest are under the terms of the concession to be divided between the Syndicate and the Chinese in the ratio of one-fifth and four-fifths. The great gains must be obtained, therefore, in ways where this division does not apply, such as steamboat lines, terminals, warehouses, mines or other similar openings. This special barge and steamboat suggestion is not only such an opportunity, but it will gradually educate the people to the new order of things, and so make

a railway profitable from the start whenever the construction of a through line is undertaken.

The two lines from Canton would be equally profitable. The road from Canton, through Fat-shan to Sam-shui traverses a section of the country which, for commercial activity, is not equaled in the whole empire. This line, 28 miles long, would serve a population aggregating at least 2,500,000, and would pass a succession of manufacturing points. I believe that the earnings per mile on this part of the road would be 50 per cent. greater than the earnings on the line between Tien-tsin and Peking, beginning at once with the completion of the road.

There is to-day between Canton and Fat-shan a continuous succession of junks carrying the passengers to and fro. The customs statistics, where a part of the records of this junk travel are kept, indicate that the travel between these two points alone amounts to two thousand people a day. These junks now have to follow the windings of what is known as Fat-shan Creek, and require from two to three hours to make the trip. A railway train would make the same run in from thirty to forty minutes, and would practically control the whole of the traffic, besides developing additional business. With the gross earnings at $7,500 gold per mile, the net earnings should be certainly $3,500 per mile, out of which interest of less than $2,000 would be required, leaving the balance for profit. In addition to the local value, this line possesses a great strategic one, as it is a controlling factor in a West River line which will be built at no distant day.

The line from Canton north, for a distance of 50 miles, would traverse a rich agricultural country thickly peopled. The gross earnings on this line should amount to from $5,000 to $6,000 per mile. If the coal in the neighborhood

of Shao-chou is found on examination to be of the quality that the outcrop promises, this road could be extended to the coal fields, and so bring down to Canton and Hongkong its share of the coal traffic, which now amounts at these places to 3,000 tons a day, and steadily increasing. By thus building up the line step by step, the system could be completed as occasion demanded, and without incurring risk of capital invested; for the lines that I have just mentioned are in each case abundantly ample to earn their fixed charges and return a surplus profit.

The earnings that I have mentioned are local only; that is, they are receipts from business originating on your line. Your concession has another value in addition to what it will produce directly. In the first place it is one-half of the great through line which must be the main stem or back-bone of China's railway system, and, secondly, it controls the outlet of any important line that can be built in the southwestern quarter of the empire, as the attached railway map shows. The four great valleys from south and western China, and which are the only possibly railway routes, intersect your line; the Yangtze and Yuen Rivers at Yo-chou, the Siang from southwestern Hunan at the mouth of the Lei, and the Si Kiang or West River at Sam-shui. In like manner a road south through Kiang-si will tap your line at Shao-chou. The eventual through business will be very heavy.

The general impression among foreign residents and those who have made a study of internal affairs in China, is that the country tributary to your line, especially that portion which is in Hunan, is as good as any other section that is to be found in China. This opinion is well represented by the following quotation taken from the Commission sent out to China three years ago by the Blackburn Cham-

ber of Commerce to report at length upon the possibilities of trade with the Chinese Empire. This report stated as follows:

"A larger foreign trade still is that with Hunan, one of the greatest markets in China for Lancashire goods. The transit pass system appears here to run smoothly. The main artery of trade in Hunan is the Siang River, on which are the important cities of Siang-yin, Chang-sha, Siang tan and Hung-chou.

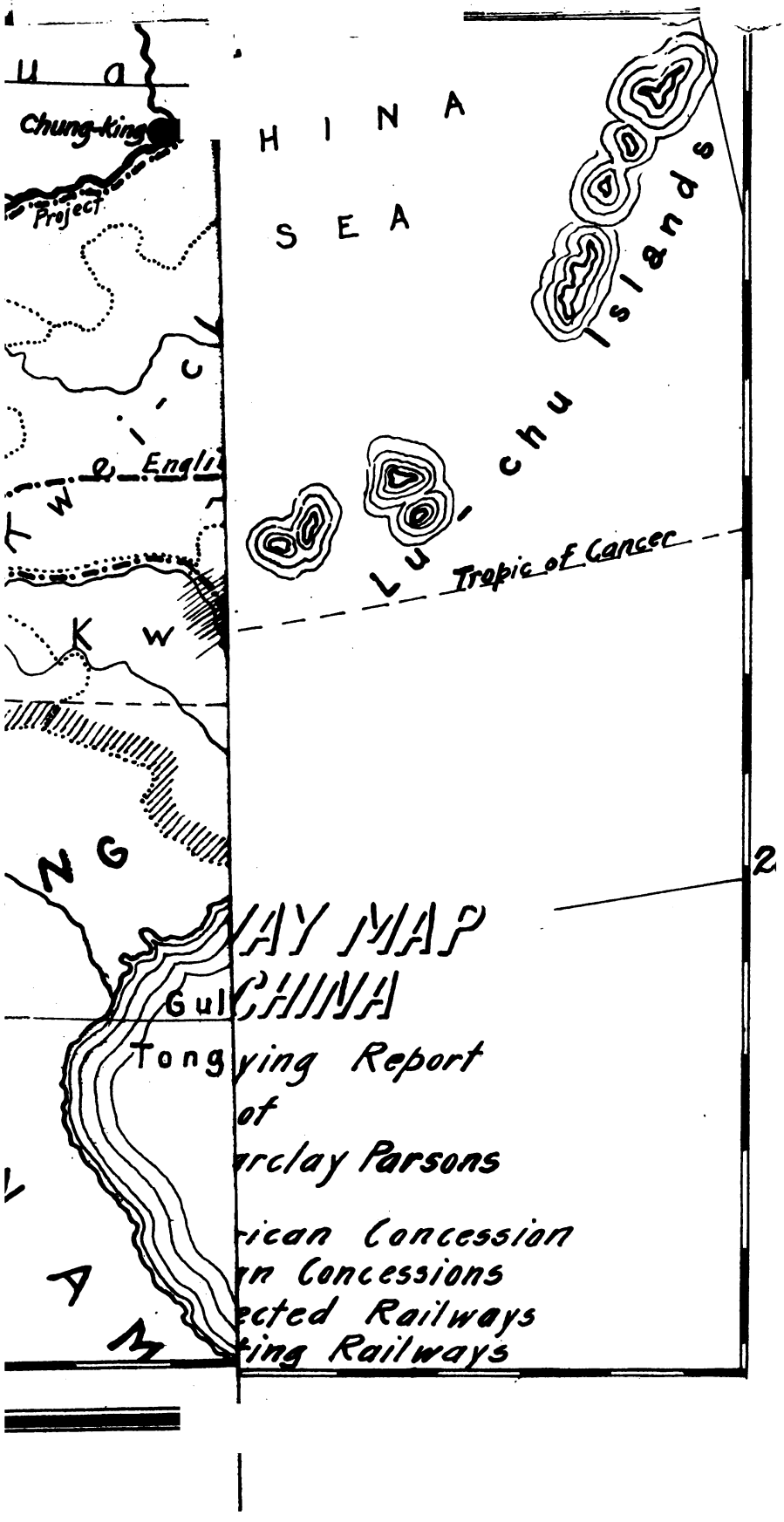
"I consider this one of the most promising fields for the development of the Lancashire trade, because Hunan is rich in minerals—coal and iron being widely spread in the Siang basin—in agriculture, and, above both, in the hardiness, enterprise and industry of her sons. When the minerals are worked by modern methods, this may well be the richest region in China."

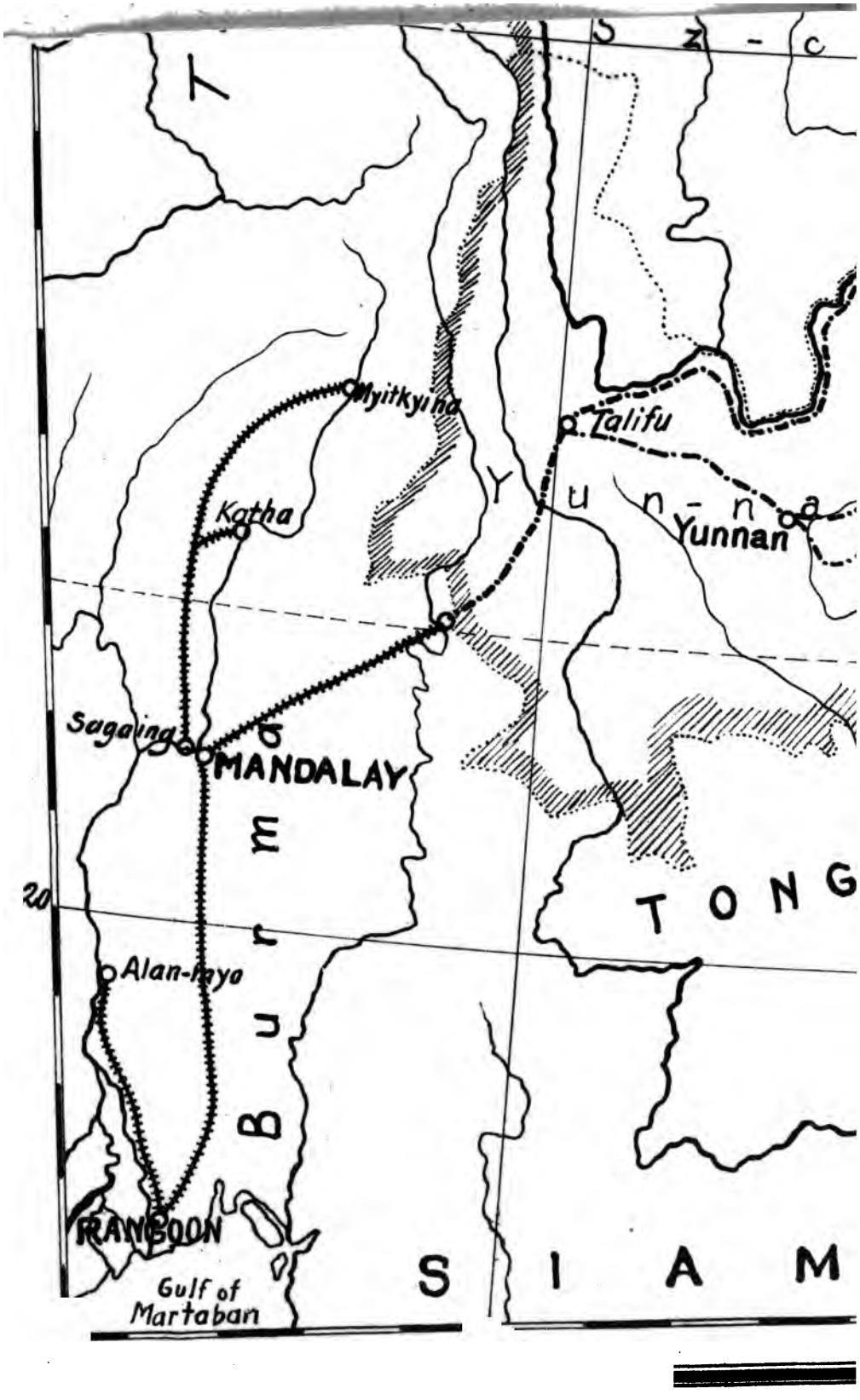
This report is accompanied by a general map of China, showing the location of your concession and of the other conceded and projected lines, and by a profile of the line as surveyed between Hankow and Canton, showing a singularly favorable profile for operation. The map showing the location of the line was duly approved by the Director-General in accordance with the provisions of the concession.

In conclusion, I wish to express my appreciation of the many courtesies extended by T. E. Chang Chih-tung and Shêng, especially by the latter, in sending with me his engineer and two of his secretaries, and also my appreciation of the faithful, cheerful and excellent service rendered by Messrs. Hunt and Denby and by every member of the staff.

Respectfully yours,

WM. BARCLAY PARSONS,
Chief Engineer.





PROFILE

of Railway Survey from

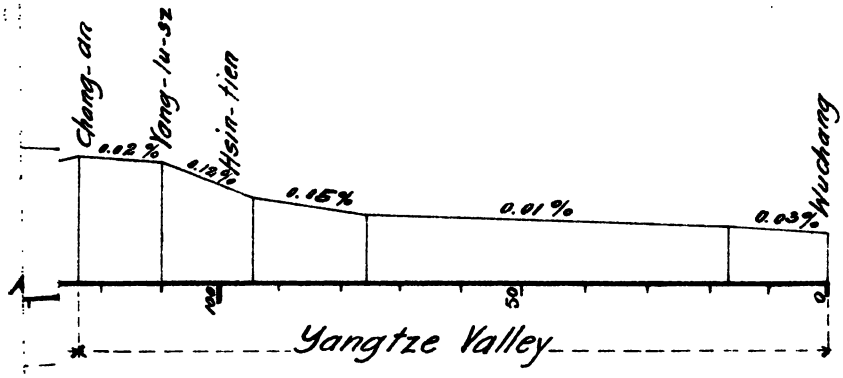
WUCHANG TO CANTON

ican China Development Co. Concession

Accompanying Report

of

Wm Barclay Parsons



REPORT

ON THE

SURVEY AND PROSPECTS OF A RAILWAY

BETWEEN

HANKOW AND CANTON,

UNDER THE CONCESSION

BY THE

CHINESE GOVERNMENT

TO THE

American China Development Company.

BY

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NOVEMBER, 1899.

22 WILLIAM STREET,
NEW YORK, 28th November, 1899.

To the Executive Committee,

CHINESE RAILWAY SYNDICATE:

GENTLEMEN,—In September, 1898, you appointed the undersigned Chief Engineer of the American Chinese Development Company, with instructions to proceed at once to China with such staff as might be necessary to make a survey for the line of railway from Hankow, in the province of Hupeh, to Canton, in the province of Kwang-tung, and thence to the sea, with such branches as might be authorized by the Director-General of Railways and for which that Company held a concession, dated April 14, 1898.

CHAPTER I.

GENERAL ACCOUNT OF THE EXPEDITION.

Acting under the above instructions your Engineer left New York on the 14th of October, 1898.

On arrival in Shanghai, November 14th, I was confronted with a totally unexpected condition of affairs on account of the *coup d'état* executed by the Empress Dowager, and as a result of which there was a decided disinclination on the part of officials to allow the party to pass through the province of Hunan, which—although not specially designated in the concession, nevertheless in all the preliminary negotiations and in all previous discussions of a Hankow-Canton railway—had always been considered as the most valuable route.

Hunan is the province where the strongest anti-foreign feeling has always existed. Except in the northwest corner where such sentiment has always been less, not exceeding six foreigners have been within its borders, and then only along the main line of travel, the Siang River. Of foreign missionary stations there are but two, one at Yo-chou, and one at Hêng-chou, the latter having been continually maintained, curiously enough, during two hundred years.

Under the liberal policy of the Governor, Chên Pao Cheng, appointed a few years ago by the Emperor, electric lighting had been introduced in Chang-sha, the capital; a school where science and other modern subjects were taught had been established, and the people were being

rapidly prepared to accept the development of western civilization. On the return of the Empress Dowager to power, however, the governor was removed and one representing the extreme conservative element appointed in his stead. This official immediately set about to undo what his predecessor had so well begun. The school was closed; officials friendly to foreign ideas were removed, and an attempt was made to have Hunan and the Huna nese return to their previous anti-foreign attitude.

It was this circumstance that complicated the situation. H. E. Shêng Tajen, the Director-General of Railways, while admitting the superiority of the Hunan route, urged your Engineer to make a survey through the province of Kiang-si, lying to the eastward of Hunan, and while that survey was in progress he would endeavor to influence the Hunan officials to permit a survey to be carried through the latter province. This request was refused, your Engineer maintaining that, as the Hunan route was by everyone recognized as being the best, and had been the only one under consideration in the preliminary discussion, no make-shift or temporary expedient would or could be considered; that as your syndicate had fully complied with its part of the contract by the sending of engineers and the making of the required deposit, the Chinese government, therefore, must fulfill its pledges and see to it that no provincial official be allowed to thwart an imperial undertaking.

As no alternative or compromise would be considered, H. E. Shêng started for Hankow to confer with the Viceroy, Chang Chih-tung, where I joined him at the end of November. At this place the situation seemed even more difficult, the Viceroy and Shêng representing that probably an imperial edict would be necessary to provide a safe pas-

sage, to secure which telegrams were sent by both officials to the Tsung-li-yamen, and by your Engineer to the United States Minister. After some delay an order was received from the Tsung-li-yamen addressed to the Governor of Hunan directing him to permit the party to enter his province to make the survey, and to furnish all the necessary protection. While these negotiations were in progress, your Engineer learned from the residents of Hankow that their opinions coincided with those of the residents of Shanghai, namely, that the journey was one of great difficulty in execution on account of the hostile feeling against all foreigners, and even against other Chinese not belonging to Hunan.

The first 100 miles of the route, however, was in the province of Hupeh, where no trouble was to be anticipated, and so your Engineer immediately applied for permission to allow the party to undertake the survey of this portion while he remained in Hankow to conclude the Hunan negotiations. This permission was secured, and the party left Hankow on December 10th. The very evident anxiety of the Viceroy and Director-General, coupled with the statements and fears of the foreign residents, impressed your Engineer with the seriousness and responsibilities of the situation, as not, on the one hand, to risk your financial interests by showing a lack of firmness, nor, on the other, the personal safety of the party by being unnecessarily rash. Just before leaving Hankow he doubled the supply of ammunition in order to be prepared for any contingency that might arise. It is amusing to record this, as subsequently the trip proved to be practically without incident, except for one case of mobbing when the chief engineer was alone, and undoubtedly with less personal inconvenience than would

be experienced by a party of Chinese engineers making a survey of equal length in the United States, and yet the journey was through the most anti-foreign section of the whole empire, where for fully 500 miles of the territory covered no white man had ever been seen before. The officials were found courteous, polite, and with an evident desire to do all in their power to facilitate the work, while the people themselves—although, of course, intensely curious—as a general thing were very friendly, and when the nature of a railroad was explained to them were anxious that it should be built, and be built once.

On December 17th your Engineer left Hankow, accompanied by W.W. Rich, Consulting Engineer to H. E. Shêng, and on the evening of the following day overtook the survey party on the banks of the Yangtze 35 miles from Hankow. The expedition as then constituted and which went through to Canton consisted of Wm. Barclay Parsons, Chief Engineer; Rufus C. Hunt, Engineer in charge of survey party; A. E. Coulter, Topographer; H. B. Magor, Instrument Man; W. Kirkpatrick Brice, Front Flag; W. S. K. Wetmore, Rear Flag; Charles Denby, Jr., Interpreter and Manager; E. R. Jellison, M. D., Doctor, and, on behalf of the Imperial authorities, W. W. Rich, Consulting Engineer, Woo Yung Fo and Lo Kwok Shui, American educated Chinese Secretaries in the Department of Railway Administration.

Topographically, China is divided into two great interior basins, those of the Yellow and Yangtze rivers, whose major axes run east and west from the mountains of Tibet to the Yellow Sea, with two smaller water-sheds on the north and south. The greatest of these drainage areas, both in size and importance, is that of the Yangtze,

which covers more than one-half of the whole Empire, extending north and south between the 25th and 35th parallels of latitude, and reaching westerly from the ocean, not only the whole width of the Chinese Empire to Tibet, but including that latter country and even some of central Asia beyond. On the south this valley is sharply cut off from the drainage of the China Sea by the Nan-ling range of mountains, which run east and west and contain peaks with an elevation ranging from 5,000 to 7,000 feet. This valley includes the bulk of Chinese mineral wealth, has a fertile soil, good climate and will be the theatre of great material development. Your concession, running westerly from Hankow, in the first instance along the Yangtze, practically controls the railway development of the western half of the valley, including the rich province of Sz-chuen, and the semi-political routes to Burma, in which the English are interested, for any railway built to the western half of the Yangtze Valley will tap your line 125 miles from Hankow.

The route followed by the survey commences at Hankow, in the Province of Hupeh, or rather at Wu-chang immediately opposite Hankow on the south bank of the river, and runs thence practically southwest along the Yangtze for about 100 miles to the borders of Hunan, whence it deflects inland and reaches the Siang River at Siang-yin, a point about 40 miles south of where the Siang flows into the Yangtze. From there the course was substantially due south, following the Siang for 180 miles to the mouth of the Lei Ho, and then the Lei Ho up to the Nan-ling Mountains, where a hitherto unknown pass was discovered permitting the range to be crossed with moderate gradients. On getting over the mountains the

survey followed the Wei Ho and then the Pei Ho across Kwangtung to within 50 miles of Canton, where a direct line was made for the latter point across the open country. The provinces served, Hupeh and Hunan, are in the Yangtze Valley, while the third, Kwangtung, is in the water-shed of the China Sea. The total distance surveyed was 742 miles from Wu chang to Canton, but in addition the Chief Engineer made reconnaissances for a branch line from Lu-kou, on the Siang River, to Ping-hsiang, 66 miles, the coal mines belonging to H. E. Shêng in Kiang-si, and thence along the eastern part of the Province of Hunan, to determine the feasibility of a route there, strongly urged by certain Hunan officials; and from Tsing-yuan, the point on the Pei Ho, where the survey left the river to go direct to Canton, following the river to Sam-shui and thence *via* Fat-shan to Canton.

As the route, for the most part, lay along water courses navigable for junks or small boats, it was possible as a general thing to maintain headquarters afloat, the boats moving on each day according to the progress of the survey. It was only where the route according to local conditions lay some distance from the stream, or where there was no navigable water, or when crossing the mountains, that recourse had to be had to sleeping on shore.

On reaching the borders of Hunan the officials endeavored to restrict the party to the highway, a line for the most part impracticable for railways, and much patience with firmness was necessary to convince them that the direction of affairs and the location of the route were not in their hands. On reaching Chang-sha, the capital, a city with a population claimed by Chinese statistics to amount to 1,000,000, and which boasts of not permitting

foreigners to enter its walls, your Engineer sent his card to the Governor announcing his arrival and requesting an appointment the next morning, when he, accompanied by the whole party, would call to pay his respects. The Governor, partly on the general principle of keeping foreigners out of the city, and partly from fear of consequence if they entered, sent word that it would be impossible to receive the party. As the Chinese set great store on matters of etiquette and outward appearance, it was deemed very essential that the party should enter the city and be formally and publicly received and recognized with full Chinese honors by the Governor, especially as he was the representative of the conservative or anti-foreign party. Not only would the strongest tradition of the province be thus broken, so simplifying all future trips, but the knowledge that the Governor had officially entertained the party would have its direct and immediate effect on all other officials and secure better present treatment. The Governor's offer to call was therefore politely declined, and likewise all sorts of evasions and tempting concessions, such as that the Chief Engineer might call alone, or call accompanied by any three members of the staff to be selected by him. By rejecting all such propositions, and after twelve hours of sending and receiving messages, the Governor yielded and appointed eleven o'clock the next morning as the time of meeting, when he sent official chairs and bearers and a large escort to convey the party from the junks through the city to the official yamên, where he received them in full state surrounded by all the provincial officials and by every formality in accordance with Chinese etiquette. There is no doubt that this reception secured for the party much better consideration from all the other officials that were afterwards met.

On reaching Lu-kou, 47 miles south of Chang-sha, and 280 miles from Hankow the expedition was divided. The survey party in charge of Mr. Hunt continued along the Siang River to the junction with the Lei River, and thence along the latter stream to its head waters, while the Chief Engineer, with Mr. Rich, took an easterly course along the Lu River through Li-ling and into the province of Kiang-si to examine the coal mines at Ping-hsiang and the possibility of building a branch from the mines to the main line. After inspecting the coal mines, the Chief Engineer returned to Li-ling and struck south from there on a route substantially parallel with and distant by about 60 miles from the Siang River. The Governor of Hunan and certain other officials had forced the consideration of this line upon the Director-General with such insistence as to its advantages over the river line, that it was deemed advisable to examine it. The country, a description of which is given below, was such as to condemn it for railway construction. This line joined the Lei Ho at Yung-hsing, where the Chief Engineer arrived four or five days in advance of the survey party. From Yung-hsing he made an investigation of the large coal field, both anthracite and bituminous, of which Yung-hsing is the centre, and then, keeping in advance of the party, pushed on to the Che-ling Pass, the summit of the range, in order to locate the route over the divide. In this work he was attended with great good fortune, in that he discovered a hitherto unknown pass nearly 150 feet lower than the one used by the highway for many centuries, and over which was carried, until the opening of the Yangtze, all the traffic between south and central China. This highway, one of the monuments of China's greatness in the past, is a paved road about 15 feet wide and 30 miles in

length, connecting the head of small-boat navigation on the Wei Ho with the head of small-boat navigation on the Lei Ho, so that goods or passengers from Canton could reach any point in the Yangtze Valley with but 30 miles of land journey. The survey party joined the Chief Engineer at Che-ling, where the survey across the range was made under his direction down to the Pei Ho.

On reaching Canton very careful and elaborate investigation was made of terminal sites; the feasibility and desirability of constructing a line between Canton and Hongkong, or rather to Kow-loon, the point on the mainland immediately opposite Hongkong; the feasibility of reaching the sea at Macao, the Portuguese port on the western end of the Canton River, corresponding to Hongkong on the eastern side, and the nature and extent of the present business of both Canton and Hongkong. The whole party then proceeded to Shanghai, where headquarters were established and the survey notes and estimates of cost worked out, after which the estimates, together with a map of the survey in compliance with the terms of the concession, were submitted to and received the approval of the Director-General, as expressed by him in writing on the face of the map, a copy of which is attached to this report.

CHAPTER II.

DETAILED DESCRIPTION OF THE COUNTRY, PEOPLE AND RESOURCES.

The principal, in fact almost the only, means of internal communication in China are the water ways, which are utilized to an enormous extent. Even small streams which in other countries would be considered as worthless, are here made use of by small boats which are hauled up against the current and, at times, literally over rocks by men with ropes. Such transportation is necessarily expensive, tedious and attended with frequent loss both of boat and cargo, but there being roads it is the only means at hand.

The chief artery of traffic is the Yangtze with its tributaries. Between Hankow and its mouth, a distance of about 700 miles, the Yangtze has a width varying from one mile to five miles, and a minimum depth, at extreme low water, of 12 to 13 feet. The river has a normal annual rise of at least 45 feet, and in some years of over 50 feet, which high water occurs during the summer when tea is being shipped. Large ocean-going steamers can ascend as far as Hankow during the busy season, and vessels of fair draught can go up there at all stages of the river. Daily service by good steamboats is maintained between Hankow and Shanghai throughout the whole of the year, and a tri-weekly service in smaller vessels is maintained from Hankow up the river to I-chang, the present head of steam navigation, a distance of 1,050 miles from the sea, although

from I-chang, large junks are able to ascend to Chung-king, a distance of 350 miles more, and practically the outpost of civilization, but where foreign nations, including the United States, maintain consulates. Small boats go still farther into the interior.

Hankow, substantially the geographical centre of the Empire, is the great tea market of China and the metropolis and distributing point of the central part of the country. At Hankow the Yangtze, about one mile broad, is joined by the river Han from the north, the latter stream having a width of about one half mile. On the north bank of the Yangtze and on the east bank of the Han is Hankow. This city has been opened to foreign trade since 1861. It has a large and well-laid-out foreign concession, with an extensive foreign population. It contains several brick tea pressing plants in the hands of the Russians, a match factory and other industries. The population of Hankow is estimated, according to the Chinese authorities, at about 1,000,000; its actual population is probably about 600,000. Immediately across the Han, and in the acute angle formed by that river with the Yangtze, is Han-yang, with a population of about 150,000. It is a much less important point than Hankow, although it contains the Han-yang Iron Works, consisting of two blast furnaces and complete rolling mill plant with a daily capacity of about 100 tons of rails or other rolled shapes. Directly opposite Hankow and Han yang is Wu-chang, the capital of the province of Hupeh, and the official residence of the Viceroy of the "two Hu's" (Hupeh and Hunan). Wu-chang contains probably 500,000 people, with two government mints, a large cotton mill, silk filature works, and other industries. The population of the three cities—which are, however, practically one, occupying the relative posi-

tion towards each other of New York, Jersey City and Brooklyn—is something over 1,000,000 people (although the Chinese make claims of 2,000,000 or more), and therefore Hankow divides honors with Canton and Peking in claiming to be the most populous city in China. The relative commercial importance of Hankow will be referred to later.

From Hankow, and running northward, the Belgian concession for the Peking-Hankow line commences. Although our concession covers a line of railway from Hankow, the survey was commenced at Wu-chang, where construction would undoubtedly begin, the river to be crossed by a boat ferry if transfer connections are necessary with the Belgian line. Such a ferry could do all the business that will be required for many years.

The general characteristics of the Yangtze River resemble those of the Mississippi. It is an alluvium-bearing stream, subject to erosion, and on account of its great rise its banks are at nearly all points liable to be overflowed, to protect their lands from which the Chinese have erected an incomplete system of dikes. The land next to the river is very flat. Back from the river, a distance of 10 to 20 miles on the south side, is a range of hills, between which and the river there is a chain of small lakes. The railway line must either follow the edge of the river where, as in the case of the Mississippi, the land is higher than farther back, or it must lie to the south of the chain of lakes along the foothills. Our survey was made following the dikes on the river's edge; but reconnaissance work was done along the foothills to determine the feasibility of construction there. As the result of the investigation, I am inclined to favor the route along the foothills and so avoid the expense of constructing a high embankment, because the dikes, on ac-

count of their irregularity, can be utilized but to a small extent. The foothills are generally unproductive, although coal has been found in them, notably at one place about 35 miles from Wu-chang. This coal, however, is very high in sulphur and could be used only as a low-price domestic fuel.

The land between the foothills and the river, on account of the frequent deposits of alluvial material by the river, is, like the Mississippi Valley land, exceedingly fertile, and, by a proper system of dikes, could be developed to a much greater extent than it is at present. The belt of country, however, is narrow, and owing to the presence of the lakes and the portions not protected against inundation probably not over 35 per cent. of the surface is under cultivation. The total amount of produce that could be raised from it to be shipped to market is small, and this can find a fairly satisfactory method of reaching Hankow by the river boats. This produce consists chiefly of rice, but in addition cotton, beans, and bean oil. In the first 100 miles there are no places of any importance, although numerous small villages.

On reaching Hunan the route unquestionably should lie well back from the river, in order to get any tributary country at all, for next to the river and between it and some large lakes, there is but a narrow tongue of land. This country is a very much richer and more productive section than that passed through Hupeh, being a great tea district.

The route that was surveyed, and which would substantially be the best route to follow, would pass out of the valley of the Yangtze into that of the Siang and reach the Siang River at Siang-yin. This line would miss the city of Yo-chou situated substantially at the junction of the

Siang and the Yangtze by about 25 miles. It appears to be more economical to run the main line to the eastward of Yo-chou and to reach it by a branch. Yo-chou has a population of probably 40,000, and is an important place, not only on account of being at the junction of the Siang and the Yangtze, but also at the junction of the Siang and the Yuen, which drains the western part of the province of Hunan, and so serves as a distributing point for a large area. By an imperial decree it has been declared a treaty port, and a custom house is about to be established and the place thrown open for foreign settlement and trade.* Between Yo-chou and Hankow there is at all seasons of the year a depth of water of at least 6 feet.

The Siang River in its general characteristics is similar to the Yangtze, except that the level ground adjoining the river is narrower than that along the larger stream, the hills in many cases running directly to the river's edge. Wherever there is any level ground it is highly developed by cultivation, and this is true of all the smaller valleys running into that of the Siang. The chief products of cultivation are rice, tea, cotton, tobacco, millet, bean and tea oil, vegetables and timber, pine and bamboo.

The hillsides sustain tea-oil plants, a shrub growing to a height of 6 to 10 feet, and producing a nut from which the Chinese extract an oil used both for cooking and lighting purposes. It is interesting and somewhat surprising to notice that in many cases the Chinese have taken up arbor culture on a large scale, and were setting out groves of pine trees. This is a work well adapted to the Chinaman with his patience in waiting for a result. Through it the hill sides can be made productive and a supply of timber for

* A recent news cable reports this as having been done.

mine props secured. The river has a rise of about 30 feet, which in some cases is sufficient to overflow the banks, except where they are protected by dikes.

The possible route along the Siang is subject to but small modifications, the general location being of necessity near the river's edge. This would involve heavy embankments across the valleys and lowlands to keep the rails above the flood line, and with side cuttings on the hills, but with the exception of the heavy earthwork, construction would be comparatively simple, there being no important features. During the winter months the river, although with a width of 2,000 feet, is very shallow. Above Yo-chou a depth not exceeding 2½ feet can be secured. Above Chang-sha this available depth would be decreased to 2 feet, with numerous shoals, and above Lo-kou to not over 1 foot to 1½ feet. At present there is a large volume of trade by junks on the Siang. Small boats called sanpans bring coal, rice, tea and other products down the little tributary streams, which are then loaded into larger junks and shipped to Hankow, while they bring back a return cargo of petroleum, cotton goods and other foreign-made articles. On account of the shallow water these boats frequently go aground, and navigation at all times is slow, tedious and attended with much risk.

On leaving the Siang for the valley of the Lei, the topography becomes much more broken and rugged. The valley of the Lei is narrow, with but a small amount of bottom land, and construction would be almost entirely side-hill work; but as far as a revenue-producing country is concerned, this territory would probably be the best encountered, as this is the coal district. Along the main line the northern limit of the coal field is at about Hêng-

shan, but there is not much serious work in the development of the coal measures until the Lei River is reached, the greater part of such development lying between Lei-yang and Chêng-chou. I made an investigation of certain portions of the field as would become at once directly tributary to the railroad. To make a full investigation of this field would require many months' work and a diamond drill. Chinese mining methods are most crude, consisting merely of a single drift driven down the vein until water is encountered, or until the depth becomes too great for men to carry up the coal on their backs. The mine, so called, is then considered as worked out and is abandoned, and a new opening is made for the process to begin over again. There seem to be three and possibly more workable veins, varying in width from 2 to 10 feet. These veins are not horizontal, but have a dip of from 30 to 35 degrees. The quality of the coal is somewhat peculiar, most of it being exceedingly soft and easily crushed between the fingers. For local Chinese purposes this is not objectionable, as the Chinese prefer to have their coal crushed into dust and then mixed with clay into balls.

There were found, however, several deposits of a harder coal sufficiently so to bear transportation. In fact, there was found one mine producing coal exceedingly hard in character, low in both phosphorus and volatile matter and sufficiently good to be used in blast furnaces for the production of pig iron, the same as anthracite is used in some of the Pennsylvania works. This coal is marked "Ping-chow" in the analysis of coals which will be found below under the general discussion of coal traffic.

The anthracite field as developed extends practically continuously from Hêng-shan southerly to Yung-hsing

and from the Lei eastward certainly to the borders of Hunan and probably beyond, a distance of at least 75 miles.

West of the Lei River coal is said to exist, but the limited mining work has not been sufficient to develop its extent.

South of Yung-hsing there is a change in the geological structure of the country, and there is found a large deposit of coking bituminous coal. This coal has been known and worked for over one hundred years, and is now being mined and shipped to the Han-yang Iron Works for the production of steel. There are five mines, or rather five groups of Chinese mines, on this deposit, demonstrating that this bituminous basin has a length of at least 13 miles, and probably considerably in excess of that, but exactly how much can be foretold only by a very careful geological survey. There appear to be five or six workable seams with a thickness varying from three to ten feet. The coal is coking, but apparently does not clinker. It is somewhat tender, but will stand transportation, and as it coalesces quickly under heat, it can be used in grates, even in the fine state.

South of this bituminous basin—which is really but a small deposit in the larger anthracite field—anthracite or semi-anthracite is again discovered, and continues in workable quantities, but in poorer quality, as far south as Chêng-chou. The total length of the southeastern Hunan coal field, as actually developed along the line of the railway, is about 125 miles.

More important than this deposit in Southern Hunan is the Ping-hsiang basin, lying just out of Hunan in the Province of Kiang-si, which basin, as said above, is now owned by H. E. Shêng. To reach this field a branch would have to be run from Lu-kou, following the valley of the Lu River,

one of the most, if not actually the most, highly cultivated sections that was visited. This branch would have a length of about 65 miles, with an exceedingly good tributary country, the chief product of which would be rice. The Ping-hsiang coal is bituminous, consisting of five veins, with a thickness of from four to six feet. This coal has been tapped in a number of places by Chinese mines; but H. E. Shêng is now spending considerable money, under the advice of a German engineer, for the development of his property according to European methods, and is putting in a very elaborate plant which has a capacity of 1,000 tons per diem, and which could be readily increased to about 2,000 tons per diem at any time within three months. The Ping-hsiang coal is a high grade bituminous coking coal, its only fault being tenderness, making it easily broken in transportation. Certain parts of the field, however, showed coal considerably harder than that being actually sent to market. In ash it is low, very low in fact for a Chinese coal, while the sulphur is so low as to permit its generous use in steel manufacture. For consumption at the Han-yang Iron Works, the various manufacturing industries at Hankow and Wu chang, for steamer use on the Yangtze and at other points, Ping-hsiang can be depended on for a steady business of 1,000 tons of coal per diem. In addition, there will be a good local agricultural business and a general merchandise traffic with the cities of Li-ling, Hsiang-tung and Ping-hsiang. At the time this section was visited in the month of January, the streams were at the lowest stage and almost dry, so that this coal had to be carried in baskets by coolies to the city of Ping-hsiang, a distance of about twelve miles, and there stored until there should be enough water in the river to float small boats down to Lu-

kou; the small boats would then continue their journey to Siang-tan, where transference would be made to larger junks, and thus to Hankow.

As an evidence of the defective methods of Chinese inland transportation, and of the attendant expense, the manager of the mine, himself a Chinese, stated that it was a known fact that, at certain places where the coolies stopped to rest on the road, coal would be abstracted from the basket by them and its place taken by the addition of dirt. Again, when the coal was put on the small boats, the boatmen would sell the coal while in transit, again substituting black dirt to make up the weight, and likewise the boatmen in charge of the junks between Siang-tan and Hankow would do the same. Coal which was known to have ash running from 5 to 8 per cent., by the time it reached the works would contain 30 to 40 per cent In confirmation of this the chemist at the Han-yang Iron Works submitted a statement showing that the coke that was received from these mines contained about 20 per cent. of ash, whereas the coal contained from 30 to 40 per cent. According to the wasteful Chinese methods of burning, two tons of coal are required to produce one ton of coke, and therefore the coal should contain not exceeding one-half of the ash found in the coke; whereas, as a matter of fact, the ash in the coal was nearly twice that of the coke. This is explained by the circumstance that the coal can be easily adulterated, but not the coke.

Shipments of coal from the mines to Han-yang, a distance of nearly 400 miles by water, consume from two weeks to two months, according to the stage of water in the river or the prevailing winds. It will thus be seen that a railway would offer great inducements to trade in

the matter of safety and quickness of dispatch, irrespective of nominal transportation charges, although on account of the difficulties of river navigation the railway charges, as will be shown further on, need not exceed the present junk tariff.

As has been stated above, a reconnoissance was made for a line from Li-ling south. The eastern part of the country over which this reconnaissance was made in order to determine its feasibility for a railway is not worthy of serious consideration. The surface is much broken, and, as the drainage lines run westerly to the Siang River, the railway would be an undulating one, with gradients exceeding one per cent. Except the bottom lands along those streams large large enough for small-boat navigation, and thus affording an opportunity to trade, the back country is not developed, and the population is correspondingly thin. Coal of good quality was found along the road, indicating the continuance to the eastward of the field above described as now developed along the Lei Ho.

Of other minerals in Hunan, there are known to exist iron, copper, lead, antimony, mica and probably silver. These minerals are found chiefly in the southwest corner of the province, but have never been developed owing to the lack of transportation facilities; and the extent and values of such deposits can be determined only after a careful geological survey. That they exist there is no doubt and probably in paying quantity.

Of the cities along the route between Hankow and the southern borders of Hunan, Hankow, Wu-chang and Hanyang, have already been mentioned, and there are no others of importance in the province of Hupeh. In Hunan, especially worthy of mention, are Yo-chou, at the junction of the Siang and Yangtze rivers, with a population of prob-

ably 40,000; Siang-yin, with 20,000, at the south end of the Tung-ing Lake; Chang-sha, the capital of the province, 500,000; Siang-tan, the commercial metropolis of the province, with 600,000 population; Li-ling and Ping-hsiang, on the Ping-hsiang Branch, with 20,000 people each; Lei-yang, the distributing point for the coal trade on the Lei River, 4,000 population, and Chêng-chou, at the head of small-boat navigation and the distributing point for the southern portion of the province, with 10,000. These places are all on the line of the railway; Yo-chou and Siang-tan being reached by separate branches of 25 and 8 miles in length respectively. They are all walled cities, with narrow paved streets, and with every evidence of a good and satisfactory mercantile trade. The shops are large, containing a great variety of goods, luxuries as well as necessaries, many of which were bearing European and American marks.

There are in Hunan, in addition to the above-mentioned places, and which would become tributary to the railway, Chang te in the northwest corner of the province, with probably 400,000 reported population whose trade comes down the Yuen River to Yo-chou; and Hêng-chou, on the Siang River, being only 10 miles southwest of the railway near the mouth of the Lei River, with 200,000 population· this place is at the head of medium-size junk navigation, and thus has become a distributing point for the south-western part of the province. The area of Hunan is about 75,000 square miles, or, say, one and one-half times that of the State of New York, which latter has a population of 6,000,000, as against 22,000,000 claimed by Chinese authorities for Hunan. The latter figure, as with all other Chinese figures regarding population, I believe to be

exaggerated. I prefer to deduct from one-third to one-half in all cases.

From the section that has just been described, the principal agricultural products would be rice, tea, tea-oil, cotton, tobacco, oranges from Southern Hunan, and timber. The mineral shipment is, of course, coal, the amount of which that now goes to market cannot be ascertained, but probably amounts to 300 tons daily. Of manufacturing industries there are several of minor importance, such as bricks, paper, and one which has reached considerable proportions, namely, the making of earthenware jars, pots and other similar articles. Clay for the production of these articles is found in several places along the Siang River, where large pottery works are found in operation, the products of which are loaded on junks and sent up and down the river to various points. These kilns now burn wood or brush for fuel, but with the advent of the railway would undoubtedly use coal refuse, and would ship their products much more extensively than they do now, as these jars are used for the storage of water by the Chinese, but, on account of their weight, are difficult to transport, except immediately along the rivers. There was also found one large granite quarry employing many hundred men, the production of which was said to go as far as Shanghai.

From Chêng-chou, in southern Hunan, to Lo-chang, in Kwangtung, a distance of 77 miles, would be the most expensive and the least productive part of the route. From Chêng-chou begins the ascent of the dividing range. This part of country is very mountainous, with a very small population, and capable of producing nothing unless it be that coal should be discovered. The distance from Chên-chou to the Wei Ho, at the southern foot of the

divide, is 39 miles, and from this point to Lo-chang, a distance of 38 miles, the line will lie along the river in a continuous canyon.

Lo-chang is a prosperous-looking place of 6,000 population, and is the head of small junk-navigation, although very small boats are able to go up the river 45 miles more. From Lo-chang to Tsing-yuan the country is fairly open, broken, however, with small hills. The population is very thin, there being only one place of importance, namely, Shao-chou, at the junction of the Pei and Wei rivers. It has a population of about 15,000 and owes its importance to the dividing of the waterway and so enabling it to be a distributing point for the northern part of Kwangtung province. This country produces enough crops to supply the people with food, and, in addition, mulberry trees and leaves for the silk industry. Coal, however, of a very fair quality has been discovered near Lo-chang of anthracite, and near Shao-chou of bituminous variety. Owing to the lack of proper development, it is again impossible to discover the geological structure of either of these fields. The veins, however, appear to have a thickness of about five feet. The coal was sampled, and the results of the analysis will be found below. This would seem to indicate a continuous coal area from Hêng-shan, in Hunan, to Shao-chou, in Kwangtung. The Shao-chou and Lo-chang coal has not been taken to market, owing to the absence of transportation facilities. Analysis indicates that they should both find a good sale at Canton, the former for steam and the latter for domestic purposes. They are harder than the Hunan coals, and so will stand transportation.

At Tsing-yuan the expedition was again divided, as has been previously explained, the survey line being run

directly to Canton in order to save distance, and to keep the railway out of the district which is liable to overflow. This country proved to be an exceedingly good section, fertile, well developed, with a constant succession of prosperous-looking villages, and every appearance of being able to furnish a local traffic that would pay well. While the survey was in progress by that route, the Chief Engineer, accompanied by Mr. Rich, made an inspection of a line along the river by the way of Sam-shui. Between Tsing-yuan and Sam-shui there was little that he saw to warrant the construction of a railway, but after reaching the latter conditions change radically.

Sam shui is now a treaty port, with a custom house, but a place in itself of no importance, except that it marks the junction of the West and the North rivers, and a line from there to Canton would control the continuation of a line up the West River, which will undoubtedly be built at no very distant day, and when built will be an exceedingly good line, as it develops the Southwestern quarter of the empire. The Director-General has decreed, over his signature on our official map, that the line of the railway shall run from Canton to Sam-shui. This is an important thing for the Syndicate, as it will control the future of the West River business between Canton and Sam-shui, and, therefore, of the West River line. The line would have to be built and operated as a separate branch, as it is cut off by the Canton River from making a direct physical connection with the line running direct from Tsing-yuan to Canton. The terminals, however, that have been tentatively selected are conveniently located, so that a car ferry can be run connecting the two roads. The bulk of the business of the two lines, however, would be traffic

into and from Canton itself, and not so much with each other.

Between Sam-shui and Canton, however, there is a country that railway operation would pay handsomely from the start. This country is fertile and the most thickly populated that was seen upon the trip. The distance was 28 miles, but in that distance there were found several places of importance, the chief of which were Hsi-nam, a good trade point, with a population of about 8,000, and and Fat-shan, a manufacturing centre, where articles of all kinds, and which are known throughout China as Canton-made articles, are turned out. Fat-shan is well built, has an air of prosperity second to no other place visited, including even Canton, and has a population that can safely be estimated at 750,000 This country is perfectly level, and railroad construction would be cheap, except as to a number of small bridges crossing the canals and other waterways.

Canton, the southern terminus of the concession, is a place so well known by frequent description as not to require much said about it here. It has a population, as claimed by the Chinese, of 1,500,000, but probably 1,000,000 would be nearer the mark. It was the first place in China opened to foreign commerce, and foreigners have been received there and active trade carried on for over three hundred years. An extensive examination was made there by your Engineer, accompanied by Mr. Rich, into the possibility of obtaining good terminals. A satisfactory site was found on the water front, where a depth of 22 feet can be obtained, which is the limit of vessels coming up the Canton River.

At Canton there is a choice of two things, either to make

the terminus of the road at Canton, or to actually reach the sea. Although your concession did not so actually state, the general plan was to extend the line from Canton to Hongkong, or rather to Kow-loon. The only two ports on the sea within reach of Canton are the British possession of Hongkong and the Portuguese possession of Macao.

I made an examination of Macao and its harbor. Although this place is of ancient date, having been in the hands of the Portuguese for nearly 350 years, and was the original base for foreign trade with China, it nevertheless is quite inadequate to meet the demands of modern commerce. The harbor is small, with but seven feet of water at low tide on the bar, nor is it possible to improve the same so as to make it available for deep draught vessels. Macao can therefore be dropped entirely out of consideration as a railroad terminus.

Since our concession was granted, the English have obtained from the Chinese Government a large increase to their territory at Kow-loon, so that it is impossible to get a line within 15 miles to the harbor of Hongkong.

From an investigation of the territory, however, your Engineer is in great doubt whether, after all, a line to Kowloon is very desirable. In the neighborhood of Canton the country is flat, and is intersected by many small streams. On approaching the coast the surface of the ground becomes much broken, and on reaching the coast mountains, with the exception of one or two places, the line would have to follow the indentations of the shore, and would be longer than the river line (100 miles) by probably 20 miles. Through the mountainous country, practically half of the route, there would be no local or tributary business whatever as against the competition of the river boats, which would have the

great advantage of delivering passengers and freight directly into Hongkong itself, whereas the railroad would simply deliver them at Kow-loon with the necessity of a long ferry transfer. It is a matter of great doubt whether this road would, from its own business, pay the interest on the cost of construction and it certainly is not essential to the success of your line.

Hongkong has no value except as a port of entry, but such business is enormous and second to no other place in the whole Orient. The city, with a population of 250,000, of which about ten thousand are white, is built on a mountainous island, between which and the mainland is a magnificent roadstead. It is the terminus of some of the steamship lines and a port of call for all of them. The Harbor Master's report for 1898 gives:

HONGKONG SHIPPING STATISTICS.

	1896.	1897.	1898.
Foreign Ships.....	9,352	9,944	11,058
Junks—Foreign Trade.....	39,576	57,803	58,936
" Local "	11,535	9,546	9,635
Foreign Tonnage.....	12.333,396	12,124,599	13,252,733
Junk Foreign Tonnage.....	3,767,403	3,441,295	3,626,754
" Local "	415,154	372,280	386,293
Total Tonnage.....	16,515,953	15,938,174	17,265,780

From the above it will be seen that the average daily entries or clearances are over 30 foreign vessels and 180 Chinese junks.

The traffic which Hongkong has consists in foreign goods arriving from America and Europe for distribution to the southern part of China, and the shipment from Hong-

kong of various products of the latter territory. With the construction of your line, making a vastly increased area tributary to Canton, and therefore to Hongkong, the shipping business would be correspondingly increased. Vessels arriving at Hongkong discharge and receive their cargoes in two ways; firstly, by going to the warehouses of the Kow-loon Wharf and Dock Company, and there placing their cargoes in the go-downs of that corporation, where they are held until sold or delivered to the consignee, or, secondly, by lying out in the stream and lightering their cargoes to and from the shore. The former is the usual course followed by vessels whose terminus is Hongkong. Vessels, however, that make Hongkong a port of call, such as the lines plying between Japan and Shanghai and Europe, and the American lines, such as the Canadian Pacific, Pacific Mail, and the Oriental and Occidental companies' ships, whose terminus is Hongkong, follow the second. Vessels that thus operate constitute the largest cargo carriers that go to Hongkong. Access to these vessels would have to be had by lighter, no matter whether the railroad stopped at Canton or at Hongkong. It is perfectly possible to procure at Canton a good terminal site, where, as said above, a depth of 22 feet can be obtained—the limiting depth in the Canton River between Hongkong and Canton—where foreign ships, drawing not exceeding that amount, can come directly alongside and save the terminal charges at Hongkong. For the deeper draught vessels and the regular liners, which, as has been pointed out, lie out in the harbor at Hongkong, connection can be made by lighters and tug boats from Canton almost as conveniently as from Kow loon. The bulk of the passenger business would terminate at Canton anyway.

Passengers between Hongkong and Central China can be taken to the train at Canton from Hongkong by the present fast-running steamboats, and at a cost in time of probably not more than an hour or an hour and a half. This view of the matter is that taken by many of the business men in both Canton and Hongkong, who do not hesitate to express their opinion that a line, while a great convenience to the foreign residents in Hongkong, would probably not of itself pay.

If, after the development of the enterprise, it is found that the through business is increasing, and that a sufficient volume of such traffic could be turned over to the Hongkong extension to make it a profitable venture, your option with the English syndicate, as to taking one-half, could then be exercised and a road constructed.

Geographically, it is possible to run a line from Canton across country and strike the sea at the northern end of the Kow-loon border and still remain wholly in Chinese territory, and not interfere with the claims of Messrs. Jardine, Matheson & Company. Such a line would have no value; it would reach the sea, where there is at present no town and no regularly constituted harbor, and foreign traffic would have to be developed in the face of Hongkong competition. Such a course should not be considered seriously for a moment.

The results shown by the survey in brief are:

First.—That a line can be secured between Hankow and Canton with a length of about 710 miles, which, for about 700 miles, will follow rivers, where the maximum gradient will not exceed one-half of one per cent., or 26.4 feet per mile, and that the dividing range can be crossed with five miles of continuous ascent on both sides, where the maxi-

mum gradient will be one per cent., or 52.8 feet mile, being an extraordinarily feasible line to operate. A profile of the line is attached to this report.

Second.—The topography of the country at both the termini is open, but gradually getting more broken as the Nan-ling Range is approached. In no case does the topography present difficulties that can not be overcome within a reasonable cost, and, as the line does not cross a single stream of importance, the bridging will be exceedingly light.

Third.—The rivers are practically the sole existing means of inland communication. They, therefore, are the established trade routes, and traverse the best developed sections. On account of variations in water and frequent shoals, they cannot be considered as competitors to railway traffic, whenever the latter is established.

Fourth.—The line traverses a country which, for the greater part of its length, is fertile and well populated, and for 150 to 200 miles runs through a continuous coal-bearing formation, both anthracite and bituminous.

CHAPTER III.

COST.

To ascertain in advance the cost of such a railway as has been here outlined is a matter of considerable difficulty. In order to guide him as to conclusions, your Engineer procured all possible information from the cost of such lines as have been constructed in China and Japan, and took into consideration the cost of earthwork and masonry in the way of dikes and bridges that he discovered in his journey across the country.

The cost of day labor in China, as compared with our own, is very low, but such figures must not be accepted at their face value. The wages of a farm hand in the interior are, with keep, about one gold dollar per month. The wages of day laborers on contract work in the country vary from 7 to 10 cents gold. In the treaty port cities where the price of labor has risen, the cost of a day laborer is about 12 to 15 cents. Such men, however, have been taught to work with the crudest of implements, refuse to adopt modern methods as fearing to decrease the demand for labor if such methods are once inaugurated, and therefore accomplish but a portion of the result that a day laborer would accomplish in our own country. In Shanghai, where the most intelligence in the way of handling men was found, it is estimated that it requires four coolies to do as much as one foreign laborer; and certainly at least the same ratio can be figured on for work in the interior. In the North, in the early days of railroad construction, a day laboror

could be obtained for the minimum figure that has been mentioned above. At present his rate of wages is probably twice that.

There were found in several places in Hunan very extensive earth works in progress in the building of dikes, work that, in its general character and expense, compares relatively with that of a railway embankment. The wages that were paid to the laborers on this work were about 8 to 9 gold cents per day, and the cost per cubic yard of work done was in several pieces of work, which were of sufficiently large magnitude to be taken as examples, 5 cents silver or 2½ cents gold. The cost in silver of earth work per cubic yard on the railway near Peking has varied lately from 4 to 8 cents, or 2 to 4 cents gold, according to special difficulties, and whether in embankment or cutting.

The Chinese, even in the interior, understand the principle of sub-contracts, and therefore the above statistics were obtained without much difficulty, and can be taken as fair examples, especially as there was a close agreement in cost stated, although the places where these figures were obtained were many miles apart, and there was no possible connection in management between them. Such figures, however, represent the cost of embankments where the material is taken from a borrow-pit immediately alongside. In the work of constructing the railway under consideration the earth work would be at all points heavy. In the low and flat lands high embankments would be necessary in order to keep the rails above the regular summer overflow. In the undulating country a succession of deep cuts and fills would be required. On account of the comparatively low cost of earth work, it would be economical to build wider embankments and cuts than is the usual practice in the United

States, in order to provide a surplus of material against slides, to keep the ballast from rolling down the bank, and to provide ample drainage space in the cuts to take care of the heavy torrential rains. All these facts will tend to make the "quantities" greater than on a line of similar character in the United States.

The cost of the dike work as given above can be taken as a fair price for sub-contract work on the railway embankments. In the country under consideration, however, there are no horses, and, when it comes to handling the earth in long cuts the same conditions for low-price work will not obtain. If the cuts are very large so as to warrant the initial expense, material can be handled by cars pushed by men on light portable railways. In the smaller cuts all of the earth would have to be carried in baskets on men's backs.

The price, therefore, that has been estimated for earth work is very largely in excess of the prices that were in vogue, and which appear to be fair. This is done to compensate for the cost of removal of the earth from cuts, and also to provide a contingency fund for slips and wash-outs during construction and leave a surplus for contingencies.

Loose rock and solid rock, of which there will be a large quantity in the mountain sections, will be most economically removed by hand. Labor that is accustomed and trained to do rock work by hand can be obtained in sufficient quantity. It would probably not pay to introduce mechanical appliances.

The prices that have been named in the estimate below are, for loose and solid rock, 25 and 65 cents gold respectively. The cost of similar work on the railways in the North are 18 and 62 cents, but the amount of solid rock

encountered was small. The increased rates have been named to provide a margin of safety, but the actual cost should not exceed the northern experience, in fact owing to the greater quantity of rock to be handled the cost per cubic yard should be decidedly less.

The other work that would be done by local labor would be masonry, and the work in connection with the stations and track-laying. All other disbursements would be for imported material.

After a very careful consideration of the problem, your Engineer has become convinced that it is absolutely impossible to undertake what is known as the American style of railway construction—that is, to build a railway with a small initial expense, with temporary work, and to improve and develop the same as traffic may warrant; nor, if it were possible, is the same desirable. This railway is to be paid for by Government bonds, and it will not be possible to issue a junior mortgage for improvements and betterments in the future.

Therefore it is necessary to estimate on the fullest possible construction at the outset. It is not possible to introduce temporary work economically; because timber and such materials as would be needed for such work would have to be imported from Oregon or other countries, and the cost of the same when laid down in the interior of China would be almost as much as the cost of a permanent structure in steel or stone. Ties would also have to be imported from Australia, Java, or our own Pacific Coast, and will range in cost from 75 cents to $1.50 gold when laid down. This would render it economical to use a heavy rail and to reduce the number of ties.

There is, however, another reason for constructing a

well-built road. This railway will have to be operated by Chinese train men and maintained by Chinese track men. Such men are, of course, not of the intelligence that corresponding men are on American railways, and with them it is impossible to take any risks whatever. The railway over which a Chinese engine man runs a train must be perfectly and solidly constructed, with no weak spots which would require exercise of judgment on his part.

Rails, ties, bridges, rolling stock and other equipment will all have to be purchased abroad, shipped to Shanghai, or, if the state of the river permit, to Hankow, and there put on barges and shipped up the Yangtze and the Siang to points where the same are to be used. In the matter of rails such freight and handling charges would cost $15 a ton. A locomotive that would cost $10,000 here would cost $15,000 by the time it was placed upon the rails in China, and, in like manner other portions of the rolling stock and equipment will have their cost increased.

The bridge work will, fortunately, be light, there being no bridge of any serious consequence, in that there will be no single span exceeding two hundred feet, and most of the bridges will be short-span plate girders. Good building stone will be found all along the line, with which stone or concrete arches and bridge piers can be very cheaply constructed.

The general expense in relation to construction will be exceedingly heavy. It will be necessary to maintain in Shanghai a large and expensive general office; and to support the engineer corps in the field will cost twice as much as for similar work in the United States. Cabling, banking and other charges will assume large proportions.

Then, finally, there will be disbursements in connection with the Chinese officials.

It must be remembered that China is a land whose laws, although codified on a complex and elaborate scale, are over four hundred years old, and which, naturally, do not contemplate the existence of railway and other corporations. To facilitate construction, to get the enforcing of contracts, and to secure one's rights, recourse cannot be had, as in lands enjoying occidental civilization, to courts of law, but appeal will have to be taken to the local officials who, according to Chinese law, decide cases according to their own personal views. Furthermore, it must be recognized that a Chinese official does not, and is not expected to, live by his salary. Public office in China is avowedly a means of securing a livelihood by indirect methods. To make a present, therefore, to a magistrate in China is not the same as bribing an official here; it is more to be compared to a fee paid to a lawyer, or to court expenses. In the pushing through of a work of this magnitude, and in a country where such work is wholly unknown, it will be absolutely necessary to secure the good-will and co-operation of all the officials, to do which will cost money. This item has been included under the head of contingencies.

Right-of-way expense has been omitted, as this is one of the details being arranged with H. E. Shêng. In any event it will not be large. The Chinese officials can arrange that. The graves of ancestors will not constitute such an obstacle as is popularly supposed. The number of graves is much less than I anticipated, and in the north a payment of about $5 per grave removes all objections.

On this basis the following estimate has been prepared,

which was submitted to H. E. Shêng. At first he was disappointed at the total, as he understood that railways in the United States cost less than they do in other countries, and had hoped that a similar result could be produced in China. He submitted the estimate, however, to his consulting engineer, Mr. Rich, who returned the same, suggesting a slight modification in the way of reduction of the figures in earth work, which in the original estimate were slightly larger than in that given herewith. Your Engineer, feeling that the figures of cost of earth work were perhaps unnecessarily large even to provide reserve funds, as explained above, accepted the suggestion of the Consulting Engineer of the Chinese Government, and made a small reduction, and re-submitted an estimate to H. E. Shêng, the same as is given herewith, and which met with his approval. Some of these items, as, for instance, the item of equipment, it would not be necessary to meet at once. The bonds for such expenditure could be kept in the Treasury for future demands.

This estimate covers the cost of the line from Hankow to Sam-shui, together with the Yo-Chou, Ping-hsiang and Siang-tan branches, but since its presentation to Shêng the present and wholly unexpected rise in the prices of iron products has taken place. I consider, however, that sufficient margin has been introduced to cover this rise, especially as it is believed that the present prices cannot be maintained, especially on exported articles. If the prices do continue the development of the iron and coal fields of China will receive a great impetus, increasing the traffic of the line to more than offset the cost of construction.

ESTIMATE OF QUANTITIES AND COST.

DISTANCE—Main Line *via* Sam-shui.....740 miles.
Ping-hsiang Branch..... 66 "
Yo-chou " ..... 25 "
Siang-tan " ..... 9 "
Sidings..... 78 "
TOTAL TRACK.....918 "

Items.	Quantities.	Price U. S. Gold.	Amount U. S. Gold.	Total Amount.
Earth excavation. Cu. Yds.	22,200,000	$ 0.10	$2,220,000	
Loose rock excavation, "	4,930,000	0.25	1,232,500	
Solid " "	6,432.000	0.65	4,180,800	
Tunnels.....Lin. ft.	5,000	75.00	375,000	
Culvert masonry..Cu. Yds.	125,000	4.00	500,000	
Bridge " . "	106,400	10.00	1,064,000	
Arch sheeting.... "	2,800	15.00	42,000	
Rip-rap..... "	420,000	1.00	420,000	
Bridge steel .....Tons	13,600	80.00	1,088,000	
Oregon pine....M.ft. B.M.	3,600	33.00	118,800	
Station buildings.....No.	160	1,000.00 10,000.00	630,000	
Engine houses ..... "	13	8,000.00	104,000	
Turn-tables..... "	16	3,000.00	48,000	
Water stations ..... "	46	3,000.00	138,000	
Car ferry ..... "	1	.....	250,000	
Canton and Wu-chang terminals.....	.....	.....	500,000	
Shops	.....	.....	500,000	
Track complete.....Miles.	918	9,500.00	8,721.000	
Telegraph line ..... "	840	150.00	126,000	
Total construction proper.	.....	.....	.....	$22,058,100
Equipment, 840 miles at $5,000	.....	.....	.....	4,200,000
Engineering.....	.....	.....	.....	1,300,000
General, legal, syndicate .	.....	.....	.....	1,300,000
Contingencies	.....	.....	.....	3,000,000
Int. during construct'n and exchange, 12%.....	.....	.....	.....	3,900,000
TOTAL.....	.....	.....	.....	$35,758,100

Before leaving the subject, it will be interesting to note the relative importance of Hunan, which province will be absolutely controlled by your line in point of foreign trade. Hunan is the only province in China where foreigners are not resident, and one of the four, out of the eighteen provinces comprising the Empire, heretofore without a treaty port. Whatever foreign goods are therefore shipped into Hunan are for consumption by the Chinese themselves. There being no treaty port in Hunan, there is no direct importation of foreign goods, so that they are shipped to Hankow and reshipped from there on transit pass, or through the native custom houses or likin stations.

During the year 1898, Hankow—which, as has been pointed out above, is the distributing centre for the interior of the Empire—reported foreign goods sent forward on transit passes to the value of 9,100,606 taels [1 tael equals 70 U. S. (gold) cents]. These goods were distributed through nine provinces, including Hupeh in which Hankow itself is located. Of this total amount 4,537,736 taels worth of goods were sent to Hunan alone, or more than one-half of the total goods forwarded. The province of Hupeh itself, outside of the limits of Hankow, where there is a large number of foreign residents, took but 1,888,805 taels; while the province of Honan, through which the Belgian line is to run, and which like Hunan is without a treaty port, but unlike Hunan has foreign residents, consumed foreign goods, under transit passes, to the value of but 615,961 taels. During the year the Maritime Customs reported that the total value of goods forwarded under transit passes from all ports to the interior amounted to 36,404,858 taels, an amount distributed through the eighteen provinces. It will, therefore, be seen that Hunan took just one-eighth of this total.

I am not arguing that the consumption of foreign goods to the value of $3,000,000 constitutes a large traffic, but it is important, however, to note the ratio and see to what extent it is able to consume foreign goods. It is indicative of the comparative resources of this section of the Empire, and it is interesting to point out that, although the total value of foreign goods sent forward under transit passes from Hankow was slightly less in 1898 than in 1897, Hunan increased its amount and was the only one of the provinces supplied from Hankow that did so. For the past three years the growth of the transit-pass business to Hunan has been as follows: 1896, 3,006,129 taels; 1897, 4,446,174 taels; 1898, 4,537,736 taels.

The importance of Canton, Shanghai, Tien-tsin and Hankow is fixed by geographical conditions. Canton is at the head of the Canton River, which is really the estuary for the combined flow of the West, the North and the Pearl Rivers, the three principal streams and consequent trade routes of Southern China. With its fine harbor and juxtaposition to Hongkong, it is, of necessity, and must always continue to be the gateway to the southern part of the Empire. In like manner, Shanghai, at the mouth of the Yangtze, is the controlling point for the whole of the central zone; while Tien-tsin, the port of Peking, is the entrance to the north, the northwest and Mongolia. Hankow is at the head of steamship navigation on the Yangtze, and at the junction of that stream and its principal tributary, the Han, and if the extreme western part of the country be neglected, which part is mountainous and very thinly populated, Hankow is approximately the geographical centre of the Empire.

The future railway system of China will, therefore, have

for its basis the mutual connection of these points. It happens that they are about equidistant, being approximately 700 miles from each other. Hankow and Shanghai being connected by a navigable river, it is probable that a railway connecting these two places will be postponed for some years, and therefore the principal line, or the real backbone of the future system of Chinese railways, will be the line from Canton to and through Hankow to Peking, which, as the map will show, divides the country north and south into halves. The Yangtze River crosses this line at its midway point, Hankow, and again divides the country into two parts north and south, so that the Peking-Canton line in connection with the Yangtze River quarters the Empire. This line is established by the Belgian line from Hankow to Peking and by your concession from Hankow to Canton, the more valuable of the two.

A line from Tien-tsin to Ching-kiang has already been conceded to an Anglo-German syndicate. At Ching-kiang it will connect with a line, the concession for which has been arranged – although at this date not signed—with an English syndicate, headed by Messrs. Jardine, Matheson & Company, for a line from Shanghai to Ching-kiang, to Nanking, and thence across the river to Sin-yang. The Jardine-Matheson Syndicate has also arranged for a concession for a line from Shanghai, via Hang-chow, to Ning-po.

The only other concession or projected line which has reached a serious point of contemplation is the lines of what is known as the Peking Syndicate, an Anglo-Italian combination for the constructing of railways in the provinces of Shansi, Shensi and Honan for the development of the syndicate's coal concessions. Then, there is in the north

the existing line, to which reference has been made, under the control of the Government itself.

Of contemplated concessions there is a possible line for the Jardine-Matheson Syndicate from Hang-chow westward into the Province of Kiang-si, which can be continued to join the Ping-hsiang Branch of your own concession, and so make an east and west line between Shanghai and the province of Hunan, or be continued south through the province of Kiang-si across the Nan-ling range and join your line at Shao-chou. This would give probably the best Shanghai-Canton line that can be constructed.

Of other lines, less seriously considered than this, are lines running westward from Canton, up the West River through the province of Kwang-si, Kwei-chau and Yun-nan, or a possible line connecting the Yangtze Valley with the Indian system of railways in Burma. If either of these lines should be built, the first would connect with your concession at Sam-shui, and the other would connect with your railway at Yo-chou, and running either up the Yangtze to Chung-king, or else up the Yuen Kiang across the province of Kwei-chau and Yun-nan into Burma, but in either event adding to the traffic of your line.

Of the four great points in China, the Tientsin-Peking situation is divided between the Chinese Government, the Anglo-German, the Anglo-Italian and the Belgian syndicates; Shanghai is controlled by the English concession; Hankow is divided between yours and the Belgian concession, while Canton is absolutely controlled by your concession.

CHAPTER V.

OBLIGATIONS AND RESOURCES OF THE CHINESE GOVERNMENT.

The bonds that are to be issued in payment for this work are the direct obligations of the Chinese Government, with a first lien upon the property created by them. In order to get an idea of the value of this Government obligation, it is necessary to consider, briefly, the debt and resources of the Empire.

Previous to the war with Japan, the funded debt consisted of two issues of bonds, bearing date 1886 and 1887 respectively; the former for 1,855,108.82, Shanghai taels, and the other for 50,000,000 German marks, subject to reduction by sinking fund provision. Since the war the Government has been obliged to contract further loans. The existing indebtedness is given in detail in the following table. (See page 52.)

The total amount of China's debt outstanding is, therefore, £52,979,665, exclusive of the railway debt, for which there is actual property of at least equal value in existence as an asset, on which the total annual payments for both interest and sinking funds are £3,199,177, or exclusive of the interest on the railroad loan, which is self supporting, £3,082,117. The debt of India, whose population is about the same as China, is about £135,000,000, or deducting the value of the government railways, £56,000,000, and the debt of Japan about £50,000,000. It can be seen, therefore, that in spite of the disastrous result of the Japanese war, the debt of China is not a large or burdensome affair.

CHINESE GOVERNMENT LOANS.

Name of Loan.	Original Amt.	Annual Redemption in Sterling.	Outstanding in Sterling.	Annual Interest.	Date of Final Payment.
7 Per Cent. Silver Loan of 1886 E.....	£250,000	£8,163	£140,963	£9,867	1917
5½ Per Cent. Gold Loan of 1887.....	245,000	24,510	73,529	4,044	1902
7 Per Cent. Silver Loan of 1894.....	1,453,333	10 equal drawings, commencing 1905.	1,453,333	101,733	1914
6 Per Cent. Gold Loan of 1895..... H. & S. B. C.	3,000,000	15 equal drawings, commencing 1900.	3,000,000	180,000	1914
6 Per Cent. Gold Loan of 1895..... Chartd. Bk. "Cassel Loan."	1,000,000	15 equal drawings, commencing 1901.	1,000,000	60,000	1915
6 Per Cent. Gold Loan of 1895..... Natl. Bk. of Germany, &c.	1,000,000	15 equal drawings, commencing 1901.	1,000,000	60,000	1915
4 Per Cent. Gold Loan of 1895..... French Syndicate guaranteed by Russia.	15,820,000	200,000*	14,953,390	632,800	1931
5 Per Cent. Gold Loan of 1896..... H. & S. B. C. and D. A. Bk.	16,000,000	166,000*	15,473,675	800,000	1932
4½ Per Cent. Gold Loan of 1898..... H. & S. B. C. and D. A. Bk.	16,000,000	115,000*	15,884,775	720,000	1943
5 Per Cent. Ch. Impl. Ry. Gold Loan.....	2,300,000	40 equal drawings, commencing 1905.	2,300,000	115,000	1945
Totals.....	£57,068,333	£513,673	£55,279,665	£2,683,444	

* These issues retired through a Sinking Fund. In addition to the proportion stated being drawn, the interest on the whole loan is paid, and the surplus interest over that due on outstanding bonds is used as a further redemption fund.

The several sinking fund and interest payments on every one of the above issues have been promptly met when due. To furnish the sums required for these payments and the other sums requisite to meet the expenses for maintaining the various branches of the Government, the Imperial Treasury has at its hand, first, the net returns of the Imperial Maritime Customs, which are, however, pledged as collateral for some of the above loans specifically; secondly, the net receipts of the Imperial Chinese Railway; thirdly, various sources of taxation.

On account of there being no system of accounts kept, or detailed reports made, it is impossible to give even a close approximation of either revenue or disbursements, except in the case of the Imperial Maritime Customs. From such information, however, as is obtainable, the resources of the Government under the above three heads will be briefly stated.

Although the receipts of the Customs from import and export duties have been gradually increasing, in proportion as the import and export trade was shown to be increasing in a previous chapter, on the other hand there has been a falling off in the receipts from opium likin, to about the same extent as the increases in the former case, so that the revenue of this department has varied but little for the past ten years. The report for the year 1898 gave the gross receipts as follows;

Import duties	7,223,642	Hk. Tls.
Export duties	8,468,892	"
Opium likin	3,983,182	"
Coast trade duties	1,497,082	"
Transit dues	717,738	"
Tonnage dues	612,861	"
TOTAL	22,503,397	"

or equivalent to about $16,000,000 gold.

The expense of maintaining this department is not published, but from reliable information I ascertained that it amounts to about 3,000,000 taels per annum, leaving 18,500,000 taels as net profit. This last sum, amounting to about £2,750,000, is in itself almost enough to pay the annual sums required for the services of the Government loans. An increase of only ten per cent. in the duties would make it ample.

The net earnings over expenses of the present Imperial Chinese railway amount to about 1,000,000 Mexican dollars, or, say £100,000, as an offset against the interest of £115,000 on the railway loan. This railway loan, however, was contracted to extend the railway system to the treaty port of New-chwang and thence to a connection with the Russian Trans Siberian Road in Manchuria. When this is done—and the work is now in progress—the earnings of the road will be very much increased, and the Government can look forward to a profit, resulting from the operation of the railway, over and above the interest charges.

The third source of income, namely, the various forms of taxation, is, of course, the most important, but, on the other hand, the most difficult to obtain reliable or even satisfactory information relative thereto. The methods of internal taxation are complex and wasteful. The Imperial Board of Revenue at Peking each year makes out a budget for the expenses of the coming year, and proportions the total thus ascertained among the various provinces in accordance with what is considered their ability to pay, and the Governors of the various provinces are then informed of the amount which they will be required to turn into the Imperial Treasury. The most fruitful source of revenue is a land tax, payable partly in cash and partly

in grain. As illustrating the wasteful methods in vogue by the Government, frequently the actual money in silver bullion is forwarded to Peking, and even when the tax is remitted by draft, the latter is taken to Peking by a Chinese official, involving, of course, according to Chinese etiquette, the necessity of being accompanied by a large and expensive retinue. There being no detailed accounts kept of the amount raised by land, or, for that matter, by other taxation, the possibilities for stealing on the part of sub or even high officials are practically unlimited, and there is no question but that the people of China actually contribute a very much larger sum than the Imperial Government reports as receiving. A part of this amount is actually stolen, and a part of it is wasted by the cumbersome and expensive Chinese methods.

The portion of the tax payable is grain is settled by actually sending the grain to Peking. Of course, the loss and waste in so doing is necessarily enormous. Were this grain sold in the open market, and the cash remitted, the net result would be much more beneficial.

Next to the land tax, however, the greatest source of Government revenue is the tax on salt. The sale of salt in China is absolutely a Government monopoly, controlled by specially designated officials called "Salt Commissioners." Merchants in any given district are allowed to buy their salt from the Government at certain depots at a fixed price, and can sell it at retail only at a price established by the Salt Commissioner.

Next to the salt tax in importance is the likin tax, levied, as was explained previously, on the inland transportation of goods. None of these likin stations keeps a record, so once more the opportunity for stealing and waste is great.

In addition to the above, there is the revenue received from the native customs houses, from special taxes on opium and miscellaneous sources. The actual receipts of the Government from these various headings can be taken, approximately, as follows:

Land Tax, in money	25,000,000	Tls.
" " " grain	7,000,000	"
Salt Tax	14,000,000	"
Likin Tax	13,000,000	"
Native Customs	1,000,000	"
Opium Tax	2,500,000	"
Miscellaneous sources	6,000,000	"
	68,500,000	"

which, with the net return of the Maritime Customs, give a revenue of 87,000,000 taels, or about $61,000,000 gold per annum.

The principal thing for which the Government of China is likely to incur further obligations will be in the matter of railways or other internal improvements. The railways created by these obligations should be self sustaining. and, therefore, practically not add to the Government's burdens.

Should, however, it become necessary to do so, there are many ways in which the Government can, under proper financial administration, increase its receipts. The following are some of the opportunities;

1. Maritime Custom charges, which, as pointed out above, amount to an average of something less than 4 per cent., can be materially raised without interfering with Chinese trade.

2. The Native Customs can and should be consolidated with the Maritime Customs Bureau. Any department,

such as Native Customs, entirely in the hands of Chinese officials, does not return the full receipts.

3. The introduction of railways will increase both the internal and external trade, therefore, adding to the Government revenue, both from Likin and Maritime Customs.

4. The whole method of tax gathering can be reorganized, so as to save an enormous amount of waste and stealing. There is probably little doubt that the people of China now pay at least twice, probably more, what the Imperial Government actually receives. In this connection it is interesting to compare the land and salt taxes of China and India, where the conditions, in regard to population and comparative wealth, are quite similar:

Land tax—India	100,000,000	Tls.
China	25,000,000	"
Salt tax—India	33,000,000	"
China	14,000,000	"

In like manner, the tax on opium, which now amounts to about 2,500,000 taels, should, by those who have studied the problem, amount to from 15,000,000 to 18,000,000 taels. As the latter sum is the one which the people probably pay, the difference between the payments and the reported receipts is lost by stealing or waste.

5. Post Office Receipts. A little over a year ago, the Post Office Department was organized as a subdepartment in the Maritime Customs. Previous to that time, each separate commercial district of China maintained its own local post office. It is too early yet to note the beneficial result of this action. There is no doubt, however, that after the new system has become thoroughly well estab-

lished and further extended it will work a profit to the Government.

Japan has already carried out a system of reforms such as is outlined above, showing that it is possible for an Oriental nation to have its financial methods put on a solid basis.

At present China meets its obligations. All of its loans, however, are held by foreigners. Should the income from present sources and by present methods fail at any time to meet the interest and sinking fund debts, foreign governments will unquestionably at once step in and take charge of China's finances, and by reorganizing them, as was done by the English in the Customs, will enormously increase the net returns to the Government, without increasing the burdens of the people.

China, therefore, has the ability, or at least the potentiality, to successfully meet any obligations that the Government is likely to incur, including the interest and principal payments on the bonds issued for your line.

CHAPTER VI.

REVENUE TO BE DERIVED.

The question as to whether this railway will pay, and, if so, to what extent, is a question much more difficult of accurate solution than even the probable cost.

The line traverses a section of the country with a dense population, a fertile soil, and vast mineral resources, but with, at present, a traffic, of course, insufficient to support such a railway as this. The question therefore arises, will the Chinese avail themselves of the facilities offered, and to an extent sufficient to produce a revenue which will necessarily be paid in at low rates in silver and yet be of sufficient volume to meet the interest charges in gold on an investment of, say, $40,000,000?

To the first part of the above question the answer is unquestionably, yes. When one sees the amount of manual labor expended in the transportation of the articles that are produced and consumed in Hunan, there can be no doubt but that, when improved facilities are offered to the people, these facilities will be availed of to a very large extent, especially as the net cost of transportation by rail will be much reduced below the present junk tariff in spite of low price of labor.

The Chinese are essentially a trading nation, and, where given the opportunity, do not hesitate to spend money with a view to getting a profit back. Along the West River, in the neighborhood of Sam-shui and Fat-shan and especially near Canton, there is a continual procession

of boats, large and small, carrying both passengers and freight. Then there are regular lines of large junks propelled by stern wheels worked by gangs of coolies ranging from twelve to twenty-four and even thirty-six in number, giving these boats a speed of six or seven miles an hour. These boats run at intervals during the day time between Fat-shan and Canton of about thirty minutes, and between Hsi-nam or Sam-shui and Canton at intervals of about one hour. The fare on these boats, Canton to Fat-shan, ten miles, is, 1st class, $7\frac{1}{2}$ cents; 2d class, 5 cents; 3d class, $2\frac{1}{2}$ cents, and some of the photographs which accompany this report give views of these boats showing to what extent they are loaded.

In addition to these boats, however, there is an express service consisting of small rowboats, decked over in front and called, from their appearance, "slipper" boats, which are propelled by three or four oarsmen standing up at the stern. These boats carry from two to four passengers, who are obliged to lie down beneath the cover, and attain a speed of 7 or 8 miles an hour and make no stops, charging 25 to 50 cents for the trip.

In the north, where there is a railway, the passenger trains are densely packed, and the Chinese quickly learned that goods could be more economically handled by the railway than by junks on the river or in packages on coolies' backs.

In order to get some idea of the possible volume of traffic, I collected the statistics in regard to Indian railways; the existing Chinese railways from Tien-tsin to Peking, and from Tien-tsin to Shan-hai-kwan, and also for the railway system in Japan, where the conditions of life, so far as density of population, the productiveness of the soil and

the poverty of the people, are comparable with the conditions existing along the line of your railway.

As for a direct comparison, probably the Chinese railway is the most valuable. This line consists of 294 miles, connecting Tien-tsin, with Peking 80 miles, and a line extending northeasterly along the shores of the gulf of Pe-che-li, 174 miles to the Great Wall at Shan-hai-kwan, and thence 40 miles beyond. At Tung-shan are located the mines of the Kai-ping coal fields. The rest of the country is an agricultural one, and tributary to the railway on one side only, the other side being the gulf of Pe-che-li. Except the business to and from the capitol of the empire, this line is fairly identical, in respect of traffic conditions, with the line between Hankow and Canton; and it is probable that the local business, from Canton north or from Hankow south, will be as great as the local business between Tien-tsin and Peking. Although this railway is under the direction of an English manager, the accounts are in the hands of the Chinese and it is very difficult to obtain accurate information in regard to either the gross returns or the operating expenses. The figures, as furnished me by the Traffic Manager, and which he said were correct within a small fraction, such as two or three per cent., were for the year 1898 as follows, reduced to United States gold.

Division.	Miles of Road.	Gross Earnings.	Gross Earnings per Mile.
Tien-tsin—Peking.....	79.68	$411,292	$5,162
Tien-tsin—Ku-yeh.....	94.29	496,943	5,270
Ku-yeh—Chun-hou-so.....	119.50	190,765	1,596

From the observations of your Engineer while inspecting this road, and from statements made by the managers, he is of the opinion that a larger gross business is done than what appears on the accounts. Owing to the

Chinese methods of "squeeze" in such matters, there is no doubt that the conductors in charge of the trains, both passenger and freight, do a considerable business on their own account for which the company never receives any credit. In like manner, the expenses are unquestionably inflated. Sinecure positions are found for the dependents of persons of influence.

A line from Shanghai to Wu-sung, which has been is operation but a few months only, is too small in length, being but 8.1 miles in length, to be of any value for comparative purposes.

The railway system of India is divided into government and private railways, some of the gauge of five feet six inches and others of the gauge of one metre. These railways aggregate a total of 20,841 miles, and are steadily increasing in length. For the fiscal year of 1897, these railways reported:

Miles.	Gross Earnings.	Earnings per Mile.
20,006.....	$78,339,400	$3,916

The Japanese railway system forms, however, the most interesting basis for comparison.

The Japanese railway system was inaugurated in 1871 by the construction of a line between Tokyo and Yokohama, and the growth of the railways, especially during the past two years has been phenomenal.

The Japanese railways are like the Indian railways, partly Government and partly private lines, and all have the same gauge, 3 feet 6 inches.

Of the government system the principal portion, and which, at the same time, is the chief railway of Japan, is the line from Tokyo to Yokohama, and thence parallel with

the coast through Kyoto to Kobe, thus joining the two chief ports of Japan, Kobe and Yokohama, with the capital, but in so doing it subjects itself to the competition of water-borne freight.

The private railways of Japan ramify all over the Island; the principal one being the Nippon Railway, which extends from Tokyo northeast.

The results of operation of the Government railways, taking them in 5-year periods, have been as follows:

Year.	Mileage.	Gross Earnings.	Operating Expenses.	Net Earnings.
1872.....	18	$ 87,465	$ 56,732	$ 30,732
1878.....	65	455,168	263,124	192,044
1883.....	115	920,147	463,124	456,923
1888.....	244	849,437	338,562	510,875
1893.....	551	2,290,316	1,083,099	1,207,216
1898.....	662	4,863,745	2,393,024	2,470,720

The private railways for the years 1893 to 1897, inclusive (it was not conveniently possible to obtain their figures previous to 1893, nor for the fiscal year of 1898), make the following returns:

Year.	Mileage.	Gross Earnings.	Operating Expenses.	Net Earnings.
1893.....	1,320	$2,552,176	$1,227,981	$1,324,195
1894.....	1,368	2,928,779	1,221,605	1,707,174
1895.....	1,537	3,839,801	1,562,711	2,277,090
1896.....	1,680	4,840,533	1,829,039	3,511,493
1897.....	1,642	5,484,329	2,357,072	3,127,257

On all the railways in the Orient the passenger business contrary to European and American experience, exceeds the freight.

On the Imperial Chinese Railway, the freight and passenger receipts were in 1898:

Passenger..... $822,644 (Silver)
Freight..... 629,594 "

There is, however, a special coal traffic between the collieries at Tung-shan and Tong-ku for export, amounting to $377,914 (silver).

On the Japanese railways the difference is still greater. For the year 1898 the receipts of the government and private railways amounted to:

	Passenger.	Freight.	Total.
Government Lines..... ..	$7,472,342	$2,540,054	$10,012,396
Private "	2,144,342	1,918,464	4,062,806

These figures indicate that the oriental native will travel if he is given the opportunity, in spite of the general impressions to the contrary, and in spite of the small wages that he receives. During the year 1898 on the Peking-Tien-tsin Division, 80 miles long, there were no fewer than 9,423 first-class and 344,009 native passengers traveling second class, or an average of 1,000 passengers per diem. In like manner, the Customs returns from Canton show that the travel by steamer between Canton and Hongkong, exclusive entirely of any local travel and exclusive of the large travel by junk, amounted in 1898 to 5,762 foreigners and 922,277 Chinese, a grand total of no less than 928,039 passengers, or an average of over 2,500 per diem. It is interesting to compare these figures with the annual travel between New York and Boston, which, both by boat and rail, all lines, is in the neighborhood of only 600,000.

The rates at which this business is done are far from being so low as is frequently supposed or as might be expected from the smallness of the daily wage. The Imperial Chinese Railway in the North has but two classes of passengers, first and second; on the little line between Shanghai and Wu-sung, and in Japan, there are three classes; in India there are four, and on the railway in the island of

Formosa two. On the Imperial Chinese Railway the rate of fare is not uniform, being lower on the line from Tien-tsin along the coast towards Manchuria than from Tien-tsin to Peking. The rates, per mile, charged on the various systems, expressed in United States gold cents, are as follows:

	1st Class.	2d Class.	3d Class.	4th Class.
Tien-tsin–Peking	1.50	0.75	....	....
Tien-tsin–Chung-hou-so	1.00	0.50	....	....
Shanghai–Wu-sung	5.00	3.00	1.00	....
Japan	2.10	1.40	0.70	....
India	2.36	1.13	0.56	0.30
Formosa	3.00	1.50	....	....

In like manner the freight rates, per ton per mile, are:

	1st Class.	2d Class.	3d Class.	4th Class.	5th Class
Imp. Chinese Ry.	2.25	2.00	1.60	1.20	....
Japan.	2.00	1.50	1.25	1.00	....
India	5.55	4.12	3.60	2.34	1.59

Coal is carried on the Imperial Chinese Railway from the mines at Tong-shan to the port of Tong-ku at the rate of .7 cent per ton per mile. On this basis from 2,000 to 2,500 tons a day are handled.

The Japanese railways have during the present year increased their present rates to the figures given above. During the year 1898, for which the earnings have already been stated, the tariff was somewhat lower than the above rates, showing that the tariff is not oppressive.

When it is considered that the average native passenger receives the poorest accommodations—the Chinese second-class passengers, for instance, riding usually in open gondola cars—it will be seen that the above figures, both as to passenger and freight, are high, and are enough to excite the envy of the average American railroad traffic manager.

From the figures already given, it will be seen that the earnings per mile on the whole Indian system average about $4,000 gold; although the government lines, which form the better part financially of the system, average $5,500, with the chief lines running as high as $6,500 to $11,000. In like manner, the Japanese system average on the government lines $7,350, and on the private lines $3,400, the former, as in the case of India, occupying the best location. The Chinese railway system, as a whole, averages $3,400; although, if the portion from Tong-shan northward towards Manchuria be omitted, which is a poor section, as has already been explained, the balance of the system shows an average of about $5,000.

On account of the cheapness with which labor can be procured, and of the comparatively high rates, and in spite of the heavy general expenses and the greater number of laborers that have to be hired, it is possible to keep the ratio of operating expenses consideraby below what is customary to be found in this country. In India the ratio of operating expenses ranges from 48 per cent. to 51 per cent.; in Japan, from 43 per cent. to 50 per cent., and in China, from 50 per cent. to 60 per cent.

The heavy operating ratio in China is due to the fact that in 1898 the receipts were handled by Chinese officials and accounts were not satisfactorily kept. There is little doubt that the railroad actually earned a larger amount of money than has been returned, and that the operating expenses should have been very much less if the pay-rolls could have been purged of a lot of unnecessary office-holders.

On the Siang River the charges for junk transportation for a haul of about 300 miles is about $\frac{8}{10}$ths of a cent

per ton per mile. The voyage, however, is quite indefinite in point of duration, and the cargo is subject to deterioration by being wet, or by pilfering in the case of coal. The up-stream charge for manufactured goods from Hankow is about 50 per cent. greater than the price named. Your railway, by cutting off the river bends, will shorten the distance by about 50 miles in 300. Coal from the Ping-hsiang mines destined for Hankow costs to transport:

	Cost.	Distance.	Rate per Mile.
From mines to Ping-hsiang by coolie.....	$0.70 to $1.40	14 miles	5 to 10 cents
" Ping-hsiang to Siang-tan by sanpan....	1.00 " 2.00	80 "	1¼ to 2 "
" Siang-tan to Hankow by junk.....	0.84	300 "	0.3 "

or a total charge ranging from $2.54 as a minimum to $4.24 as a maximum, according to the stage of water in the river.

By rail this distance would be about 320 miles; so that the present minimum charge gives an average rate of .8 cent per ton per mile, and the maximum through charge (winter rate) one of 1.3 cents, with certain portions of the route paying 5 to 10 cents. It will, therefore, be seen that a railway will offer not only a quick and certain delivery, and a saving of stealing while in transit, but also a reduction in actual expenditure against which the existing means, even by cheap junks, will not be able to compete.

The greatest single item of traffic that this property will have will be coal. China's supply of coal now comes principally from the Kai-ping mines at Tong-shan in the north, and by importation from Japan. A smaller amount is received from the French possessions in Tong-king; from some mines recently opened on the West River, from 200 to 500

miles from Canton; from Cardiff in Wales, and from certain points in Australia.

The greatest point of coal consumption is Hongkong, where all the steamers take on board their supplies. The receipts of coal at Hongkong during the year 1898, amounted to no less than 871,276 tons, made up as follows:

From Tong-king	115,200	tons.
" England—Cardiff, etc	119,282	"
" Australia	26,075	"
" Japan	605,219	"
" Kai ping—North China	4,000	"
" Kuang-si—South China	1,500	"

NOTE.—About one-half quantity of Tong-king reexported to Canton, chiefly dust coal.

The coal imported to Canton direct by steamer, and therefore exclusive of any coal that might be reshipped from Hongkong, and, included in the Hongkong statement above amounted to 45,799 tons, divided as follows:

From Japan	7,705	tons.
" Kai-ping	4,400	"
" Tong-king	33,694	"

In addition to this, however, there is a large amount of coal that comes down the West River from the Province of Kuang-si.

At Hongkong the cheapest coal sold is the Tong-king coal which, for lump, at wholesale in large lots, sells at from $3 to $4 gold, and the dust from $1.50 to $2.25. Kai-ping coal is worth $4; Japan coal $4 to $5.50; Australian $5 to $6 and Cardiff $9 to $13. In Canton the prices are a trifle higher, and the Kuang-si coal, which comes down in native junks, sells for $4.

The Shanghai Customs returns show that, at the port of Shanghai during the year 1898, coal was received to the extent of 667,986 tons, of which about 450,000 tons came from Japan; 47,000 tons from Kai-ping, and the balance from other points. In addition to these receipts a good deal of coal—principally, however, Hunan anthracite—was received in native junks. Japan coal ranges in price from $4 to $5, and Kai-ping coal about $5.

The Customs returns at Hankow show that 35,150 tons of foreign coal were received. At this point the great bulk of the coal that is burnt comes down in native junks, and no return is therefore made by the Maritime Customs. The coal that is thus received is either bituminous coal or coke for the Han-yang Iron Works or anthracite for the other local industries and domestic consumption. The iron works take all the bituminous coal that can be received, and therefore that does not appear in the open market. The anthracite ranges in price from $5 gold and upwards. When I was in Hankow, on account of the low stage of the river, a very poor grade of anthracite coal was selling as high as $9, gold.

The market for coal in China is, therefore, a very large one. From the figures quoted above, it will be seen to what an extent China has to depend on Japan for her supply of fuel. The Japanese mines are not extensive; the supply is getting visibly less, and the price continually rising. The Kai-ping mines are producing about 2,500 tons per diem, and this output is not susceptible of much increase. China, therefore, will be compelled to look in the future for the development of new fields.

The three chances for supplying coal on a large scale and cheaply are (1), the concessions covered by what is

known as the Anglo-Italian Syndicate, in the provinces of Shan-si and Shen-si, which coal will find its way north to Peking and thence to the sea, or southeast, either to the river Han and thence to the Yangtze by junk or to a connection with the Belgian Road; (2) by the territory tributary to your line in Southern Hunan or Northern Kwangtung; (3) by the field lying up the West River, which is now finding its way to market by junk.

The haul on either the first or the third of the above-mentioned fields is as long or longer than the haul by your line, and even if they should both be developed, the possible market for coal in a country as large and populous as China is continually expanding. With the introduction of railways and new civilization, manufacturing industries and an increased demand for coal will immediately follow, and probably in a greater ratio than the mines can be opened up. I personally sampled coal at a number of mines now opened along the route, and submit the results of analyses that I have had made. (See page 71.)

An examination of these figures, taking ash as the governing factor, shows a great variety. There are certain coals like the Ping-hsiang, certain of the Hunan, and both the Kwangtung coals which are low in ash, and will compare favorably in this respect with coals in this country. It will be noticed that these coals vary from soft bituminous to a very hard anthracite, in which the quantity of volatile matter is very small. There are others of the coals which run high in ash, with proportion ranging from 15 to 37 per cent.

The Ping-hsiang coals are good, and other analyses that I have seen made at the Han-yang Iron Works and by the English chemist of the Government Mint at Wuchang, show

KIANG-SI COALS.

Mine.	Locality.	Moisture.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.	Variety.
Ping-hsiang	Kiang-si	1.05	29.84	55.76	13.34	0.63	Bituminous.
" "	" "	0.98	26.45	66.42	6.16	0.70	"

HUNAN COALS.

Ping Tze-pu	Siang-tan	5.77	26.99	52.90	14.34	2.66	Bituminous.
	An-yuen	5.25	1.58	86.24	6.93	0.22	Anthracite.
Ping-chow	Fei Kiang	5.41	2.92	85.78	5-89	0.20	"
Chang-shu-sha	" "	4 38	7.15	79.26	9.20	1.67	Semi-anthracite.
" " "	" "	4.40	7.49	68.63	19.48	1.42	" "
Chin Nin-char	" "	3.82	5.78	65.98	24.42	2.54	" "
" " "	" "	3.03	6.69	52.99	37.28	0.74	" "
	Yung-hsing	2.83	9.08	70.10	17.99	0.94	Semi-bituminous.
	" "	1.57	7.05	81.96	9.42	1.90	Semi-anthracite.
Nin Shing	Shing-ning	1.26	14.82	65.84	18.08	1.87	Bituminous.
Shih Hing	" "	0.65	14.25	57.73	27.22	2.53	"
Shin Chiang	" "	0.96	15.76	68.08	15.20	2.29	"
Mai Char	" "	0.81	19.09	61.07	19.03	2.09	"
Tsai Char	" "	0.89	15.81	73.56	9.74	1.82	"
Toh Kou-lin	Chên-chou	2.63	12.09	77.13	8.15	1.68	Semi-bituminous.
Ma Ling	" "	3.85	8.73	77.91	9.50	1.69	Semi-anthracite.

KWANG-TUNG COALS.

Yen-ling	Lo-chang	2.85	5.54	82.85	8.76	2.84	Anthracite.
Hsi Shui	Shao-chou	1.47	11.50	80.61	6.42	1.63	Semi-bituminous.

even better results than my own figures. Of the other coals there are enough, both coking and non-coking and anthracite, to reach a marketable standard.

For local consumption the Chinese break up their coal into dust and mix it with clay into balls. They therefore endeavor to find a coal that is soft and easily worked, and where a high proportion of ash is not necessarily an objection. This demand will consume coals of inferior quality or those not suited for steamer use.

The Ping-chow coal is an anthracite, very hard and resembling in its general appearance Pennsylvania coal, as will be seen from the figures. This coal contains 86 per cent. of fixed carbon, less than 6 per cent. of ash, and but $\frac{8}{10}$ of 1 per cent. of sulphur, and is a coal, both by analysis and physical structure, capable of being used in blast furnaces.

Attention is also invited to the Yen-ling coal, near Lo-chang in Kwang tung, an anthracite fairly low in ash, but yet containing enough volatile matter to make it ignite at least as easily as American anthracite. This is a coal that should establish itself well for household consumption in Canton.

In like manner attention is invited to the Hsi-shui coal, near Shao-chou in Kwang-tung, still lower in ash, and with enough volatile matter to constitute it a semi-bituminous. This coal, although high in sulphur, would make a good steam coal, and will secure for itself a proper share in in the Canton and Hongkong markets.

The Ping-hsiang mines are now owned by H. E. Shêng. The coal in the western territory, south from Ping-hsiang, and as far as the southern limits of the field at Shao-chou, is owned by individual Chinese.

In order to compare these coals, however, with other

OTHER CHINESE COALS.

Mine.	Locality.	Moisture.	Volatile matter.	Fixed carbon.	Ash.	Sulphur.	
West River	Kuang-si	1.29	26.27	53.74	18.20	2.35	Bituminous.
French mine	Tong-king	1.84	12.70	76.48	8.98	0.74	Compressed briquette.
Hongay	" "	1.65	9.90	80.77	7.68	0.10	Semi-anthracite.
Kaiping No. 5	Tung-shan	0.72	27.52	66.50	5.26	0.68	Bituminous.
" " 9	" "	0.66	26.56	59.77	13.01	1.61	"
Linse No. 5	" "	0.69	29.21	61.52	8.58		"
" " 9	" "	0.83	24.07	54.83	20.27	1.83	"

JAPANESE COALS.

Ohnoura	Japan	1.36	36.22	52.01	10.41	1.12	Bituminous.
Ichimura	"	1.81	34.66	45.90	17.63	2.57	"
Daigo	"	3.78	37.32	48.89	10.01	0.50	"
Miiki	"	0.51	37.10	53.62	8.77	3.80	"

coals with which they would have to come in competition, I give a table (see page 73) showing the make-up of the other important Chinese coals and certain typical Japanese coals.

The best coal on the Chinese market is Kaiping No. 5, a bituminous coal of high grade. This seam, however, is nearly exhausted, and what is known as the Kaiping coal is generally taken from seam No. 9 of the Kaiping mines, or from the Linse mine, where it will be seen that the proportion of ash is high.

At Canton the Chinese coals are from the West River, where the ash is very high, or a semi-anthracite from the French possessions at Tong-king. The anthracite or the semi-bituminous coals from Kwangtung are both of them better coals than either the West River or the Tong-king output.

As was previously shown by the shipping statistics, the great bulk of the coal sold in the Chinese markets comes from Japan, in which the product of ash varies from 9 to over 17 per cent. Taking, therefore, the coals as so far developed—and the field has not, by any means, been explored—there exists along the line of your concession coals, both bituminous and anthracite, which are bound to command a large market.

For the development of the mineral properties the Government has a system of granting a concession covering a large territory, and then issues an order forbidding the owners of coal to sell to any one but the holders of the mining concession. This is, of course, tantamount to condemnation, as it obliges the owners of the mineral properties either to sell the properties to the concession-holder at practically his price or to sell him the output at his terms. The practical result is that the mineral rights are acquired by the holder of this concession on terms agreed upon.

Should this project be undertaken it ought to be accompanied by a concession on the part of the Chinese Government covering all mineral rights—metals as well as coal—for the territory passed through, and which would become tributary to the line. If that were done, then the property should be properly and carefully examined geologically—which, of course, has never been done. Coal can be put on cars at mine mouth at not exceeding 60 cents per ton and laid down in Hankow at from $1.80 to $2, or at Canton at from $1.25 to $2 as against existing prices, as was shown above in this report, ranging from $4 to $9. The difference, or so much of it as can be maintained, will accrue as profit to the syndicate The extent of the field thus tributary to the main line has a length of 250 miles and a breadth of at least 75 miles—containing a quantity of coal practically unlimited.

CHAPTER VII.

SUGGESTIONS.

It is obviously quite impossible to present an estimate in detail of what the earnings on the proposed line are likely to be. With the completion of a railway, a wholly new traffic will be built up, different both in quantity and kind from that now existing. Statistics of the present condition of affairs, even if obtainable, would therefore be of little account. The best guide that can be had is to take the earnings per mile of the present Chinese system, and to a less extent the earnings of the Japanese and Indian systems; for, after all, in both of the latter countries the general conditions of life and trade are similar to those existing in China, or that would exist after the building of railways.

In figures previously given, it will be seen that the Imperial railways in the north average $3,400 gold per mile, while the portions between the Tong-shan mines and Peking average $5,000 per mile. The northern extension in this system is not as good as the greater part of the country tributary to your line. While certain portions of your line are certainly as good as, if not actually better than, the best portion of the northern system. Taking your line as a whole from Hankow to Canton, I believe that the earnings, within a reasonable time after the road is built, will amount to $4,000 to $4,500 per mile.

The road ought to be operated, and, under foreign management, would, I believe, be operated for not exceeding 50

per cent. of its gross receipts. This would leave $2,000 to $2,250 per mile net returns, or 5 per cent. on $40,000 to $45,000. The estimated cost of the road per mile was shown in Chapter III to be $42,500; that is to say, the road would about meet its fixed charges without calling upon the Government for aid, and without returning any profit upon the stock. As the country becomes more opened up, as branch lines are constructed into Western Hunan, or the more important lines to Burma and Sz-chuen are undertaken, and principally when the line from Hankow to Pekin is completed giving with your road a through line from north to south, these earnings will be correspondingly increased and will come up to the earnings of the more important Japanese or Indian lines, which amount to $7,500 to $11,000 per mile. It is the general opinion of residents in China that Hunan is the most promising field for railway development in the whole country.

It is not, however, necessary to build at once the whole of the line, and certain portions on which the earnings would be less than the average could be omitted. Thus, instead of completing the line to Wuchang, it could for the time being be terminated at Yo-chou, and save in construction 139 miles at an estimated cost of $5,500,000.

Between Yo-chou and Hankow there is the Yangtze River, with a depth at the lowest stage of water of at least 6 feet. Outgoing freight, of which the chief item will be coal, can be transferred at Yo-chou to barges and be towed down the river to Hankow, or farther to Shanghai if necessary, in very much the same manner as coal is now sent from the Pittsburg district down the Ohio and the Mississippi as far as New Orleans.

When the railway system of China is built up and there

arises a demand for a through train service, the link between Yo-chou and Hankow can be completed. In order to construct the line there will have to be built in the first instance barges of the general character such as would be needed for the transfer of freight in order to deliver rails and other construction materials at various points along the line. Tugs will also have to be built to tow these barges during construction. The cost of the barges and the tugs has been included in the estimated cost of the line; but if a fast running boat were required bonds for the purchase of such boat or boats to run between Hankow and Yo-chou can be taken from the bonds estimated for the construction of the Yo-chou-Hankow Division, but which would be held awaiting the completion of this portion of the line.

This idea of temporarily stopping the line at Yo-chou and saving additional expense I submitted to H. E. Shêng and secured his approval. This omission would increase the average earnings per mile, as you would practically get the same gross earnings, for the whole of the line to Hankow, but on 139 miles less distance, because the portion of the line between Yo-chou and Hankow would originate but little traffic as previously stated. But if the Syndicate desires to proceed with the work even more slowly, and would prefer to enter into the project gradually, without facing the large expenditure of $30,250,000 required even for the line from Yo-chou to Canton, it is quite possible to do so, to preempt the territory, and to hold secure all your rights, by constructing a small length of railway on which the net earnings would be, beyond any question, so far as human foresight can see, in excess of the fixed charges, and leave enough for a profit on the

stock. The portions of the system that would meet this suggestion are the Ping-hsiang branch, from Ping-hsiang to the Siang River at Lu-kou, 65 miles; from Canton to Sam-shui, 28 miles, and from Canton, northward, a distance of, say, 50 miles. The estimated cost of construction of these three lines is $5,000,000, including Canton terminals, an average of $35,000 per mile. It will be noted that the cost per mile of these preliminary lines is less than the average cost of the whole. This is due to the fact that they traverse open, level sections of country, where the cost of construction would be less than elsewhere.

As I have already explained, at Ping-hsiang there are large mines belonging to H. E. Shêng, now opened up ready for heavy business. This coal is insured a market of about 250 to 300 tons per diem at the Han-yang Iron Works, and would also be used in the mints, cotton mills, tea presses and other industries at Hankow and Wu-chang, and by all the steamers navigating the Upper Yangtze; it would also find its way, to some extent, to Nanking, Ching-kiang and Shanghai. These mines alone would, within twelve months after the railway is built, secure a market of 1,000 to 1,500 tons per diem.

I have already shown you that the expense of taking this coal from the mines to Siang-tan, 30 miles down the Siang River, below Lu-kou, is at the rates of 2 to 4 cents per mile. A railway tariff of, at least, 1 gold cent per mile would be cheerfully paid. Taking the local business on the Northern Railway system, exclusive of coal at $2,500 per mile, and adding to this 600 tons of coal per diem at one cent per ton per mile, we would get gross earnings on this Ping-hsiang Branch of about $4,700 gold per mile. This gross estimate I believe to be a very conservative one.

The output of coal would unquestionably exceed the figure of 600 tons, while the local business would also be greater than the sum mentioned, because this section of the country was the best bit of agricultural territory that I saw and much superior to the land tributary to the northern railway. It was one of the few sections which was able, in view of the difficulties of transportation, to be able to raise enough rice for home consumption and to export it in large quantities. It contains three large cities, besides a number of prosperous small ones.

This sum, however, would pay the interest on the bonds and would leave a surplus for the stock. In addition to this, there would be the profit of hauling the freight and passengers on the barges and steamers between Lu-kou and Hankow and intermediate points, because these barges would obtain the trade between places like Siang-tan and Chang-sha with Hankow.

The profits on this barge traffic could be arranged to be independent of the railway, and could be made to accrue to a subsidiary company on which all the earnings could be secured by your Syndicate, except such an amount as it would be deemed advisable to turn over to Chinese officials in order to secure their co-operation.

The net profits of the railway above bond interest are under the terms of the concession to be divided between the Syndicate and the Chinese in the ratio of one-fifth and four-fifths. The great gains must be obtained, therefore, in ways where this division does not apply, such as steamboat lines, terminals, warehouses, mines or other similar openings. This special barge and steamboat suggestion is not only such an opportunity, but it will gradually educate the people to the new order of things, and so make

a railway profitable from the start whenever the construction of a through line is undertaken.

The two lines from Canton would be equally profitable, The road from Canton, through Fat-shan to Sam-shui traverses a section of the country which, for commercial activity, is not equaled in the whole empire. This line, 28 miles long, would serve a population aggregating at least 2,500,000, and would pass a succession of manufacturing points. I believe that the earnings per mile on this part of the road would be 50 per cent. greater than the earnings on the line between Tien-tsin and Peking, beginning at once with the completion of the road.

There is to-day between Canton and Fat-shan a continuous succession of junks carrying the passengers to and fro. The customs statistics, where a part of the records of this junk travel are kept, indicate that the travel between these two points alone amounts to two thousand people a day. These junks now have to follow the windings of what is known as Fat-shan Creek, and require from two to three hours to make the trip. A railway train would make the same run in from thirty to forty minutes, and would practically control the whole of the traffic, besides developing additional business. With the gross earnings at $7,500 gold per mile, the net earnings should be certainly $3,500 per mile, out of which interest of less than $2,000 would be required, leaving the balance for profit. In addition to the local value, this line possesses a great strategic one, as it is a controlling factor in a West River line which will be built at no distant day.

The line from Canton north, for a distance of 50 miles, would traverse a rich agricultural country thickly peopled. The gross earnings on this line should amount to from

$5,000 to $6,000 per mile. If the coal in the neighborhood of Shao-chou is found on examination to be of the quality that the outcrop promises, this road could be extended to the coal fields, and so bring down to Canton and Hongkong its share of the coal traffic, which now amounts at these places to 3,000 tons a day, and steadily increasing. By thus building up the line step by step, the system could be completed as occasion demanded, and without incurring risk of capital invested; for the lines that I have just mentioned are in each case abundantly ample to earn their fixed charges and return a surplus profit.

The earnings that I have mentioned are local only; that is, they are receipts from business originating on your line. Your concession has another value in addition to what it will produce directly. In the first place it is one-half of the great through line which must be the main stem or back-bone of China's railway system, and, secondly, it controls the outlet of any important line that can be built in the southwestern quarter of the empire, as the attached railway map shows. The four great valleys from south and western China, and which are the only possibly railway routes, intersect your line; the Yangtze and Yuen Rivers at Yo-chou, the Siang from southwestern Hunan at the mouth of the Lei, and the Si Kiang or West River at Sam-shui. In like manner a road south through Kiang-si will tap your line at Shao-chou. The eventual through business will be very heavy.

This report is accompanied by a general map of China, showing the location of your concession and of the other conceded and projected lines; by a profile of the line as surveyed between Hankow and Canton, showing a singularly favorable profile for operation; and by a lithograph

copy of the map of the line which was prepared under the terms of the concession, and on which the Director-General has affixed his official approval.

In conclusion, I wish to express my appreciation of the many courtesies extended by T. E. Chang Chih-tung and Shêng, especially by the latter, in sending with me his engineer and two of his secretaries, and also my appreciation of the faithful, cheerful and excellent service rendered by Messrs. Hunt and Denby and by every member of the staff.

Respectfully yours,

WM. BARCLAY PARSONS,

Chief Engineer.

CONTENTS.

CONTENTS.

PROFILE

of Railway Survey from

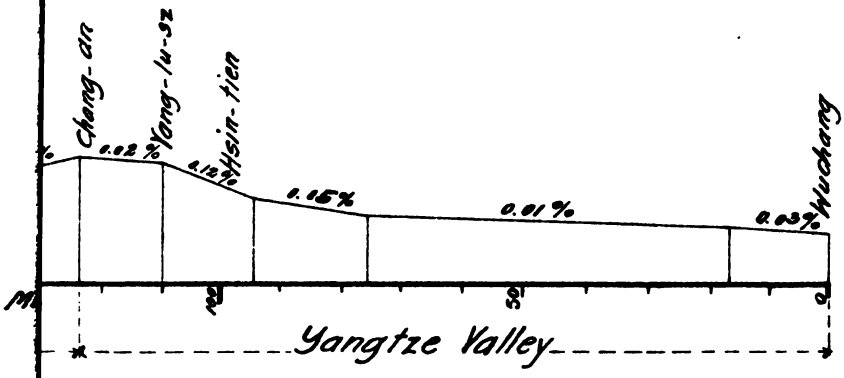
WUCHANG TO CANTON

ican China Development Co. Concession

Accompanying Report

of

Wm Barclay Parsons



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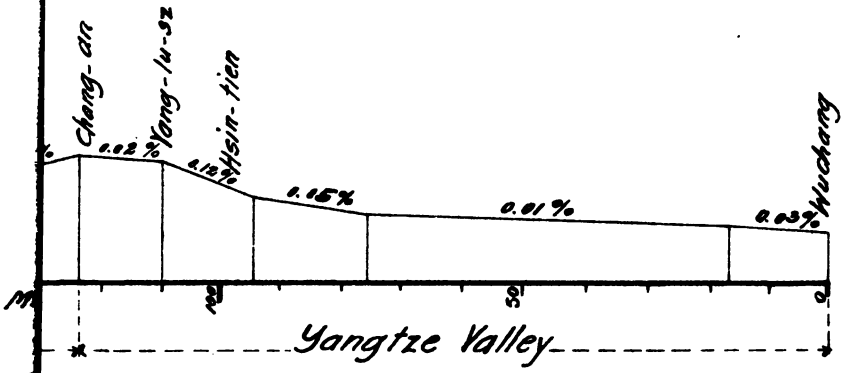

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