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主編：季嘯風、沈友益

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DIFFICULTIES IN THE HAIHO.

VESSELS REPORTED AGROUND.

CHINESE LAUNCH KEELS OVER.

Since last week's report the condition of the Haiho has become steadily worse and owing to the present silted condition of the Upper Reaches of the River and the impracticability of maintaining the swinging berths, all vessels destined for Tientsin are advised to remain at Tangku. A notice to this effect has been published by the harbourmaster, Capt. E. B. Green.

Yesterday it was reported that there was barely nine feet of water in the harbour at high tide.

As the steamers discharge their cargo at Tangku there is a heavy demand for registered lighters, of which there are insufficient to meet all requests. Various shipping firms are endeavouring to get permission from the Customs authorities to discharge their cargo into Chinese lighters and bring them up to Tientsin by tug-boat.

On Sunday, the Japanese steamer *Nichi Fuku Maru* went aground, while trying to come up the river, near the Pukow Wharf, about four miles from Tientsin. She is discharging part of her cargo at the spot by permission of the Customs and when refloated will return to Tangku to discharge the remainder. The *Shengloc*, a Chinese steamer, which was reported to be coming up the river on Sunday, had not arrived at Tientsin yesterday evening and it was thought this vessel had also gone aground.

A Nasty Accident.

Several other incidents of a

slight nature are reported, and yesterday afternoon came news that a small launch, named the *Hoyu*, running between Tientsin and Tangku, had gone aground opposite Chen Tang-chwang, about a quarter of a mile above the Pukow Wharf, and owing to the strong ebb-tide had heeled over.

At the time this occurred, the *Hoyu* was drawing a lighter crowded with Chinese passengers and there was a rumour that a number of Chinese had been drowned.

Later in the afternoon, however, an official report was received by the harbour authorities which stated that no lives had been lost.

Arrangements are being made to lift the *Hoyu*.

Tientsin, Thursday, Aug. 9 1928

P.T.T.

CHIH LI RIVER COMMISSION.

THERE are very few official organs in China to-day embarrassed with riches, and such as there are very soon invite the sinister attentions and excite the covetousness of the higher Authorities. When the intention was announced to dissolve the Chihli River Commission last winter it was obvious that the handsome little nest-egg of one million dollars which it happened to have laid by was the main motive for the dissolution. It is true that the survey for the "Grand Scheme" had been completed. But there was other work to be done which it was in the interests of this province to complete. Nevertheless, with the condition of the river system, and of the Haiho especially, worse than it had been for a long time, it was decided to abolish the Commission. Public indignation, political changes, and other circumstances, apparently, enabled the Commission to carry on for a few months longer, and to preserve its funds from diversion to other purposes.

It might have been supposed that the Nationalists, in view of

their vaunted schemes of reconstruction and their high professions regarding the welfare of the people, would have been more ready to recognise the great usefulness of this body, resist the temptation afforded by its possession of considerable funds, and authorise the very talented and experienced personnel to carry on their uncompleted tasks, pending the moment when an All-China Government could tackle the immense problems before this country, of which navigation and drainage schemes are not the least important. But it was not long before the Nationalists fell before temptation. Two young men, one of whom had served as a clerk in

the Peking Ministry of Finance, while the other was formerly a draftsman in the employ of the Commission, took over the affairs of this highly-important technical body, dismissed half the technical staff, and added their own particular cronies to the staff. It is asserted that the major portion of the Customs monthly grant of Tls. 30,000, specially authorised for the specific purposes of this Commission and for no other object, will be remitted to Nanking, to assist in financing the so-called Construction Commission, whose immediate usefulness and activity are not very apparent. No doubt the large balance in hand of some \$600,000 would be similarly diverted.

We are opposed to the abolition of the Commission, and the decision of the Nationalists to maintain at least a skeleton organisation is therefore approved on the point of principle involved. But it is essential that it shall be an efficient Commission, competently staffed. If it is to be merely a name, a bureau for the provision of jobs, and to be maintained on a basis too far below the high standards previously established, then it were better that the Commission disappeared altogether and the grant be given to some other body more competent to fulfil the important tasks that are at hand.

It is an open secret that new schemes have been drafted by the Engineer-in-Chief of the Haiho Conservancy which will doubtless be published in the Press in a day or two. We are not at liberty at the moment to disclose the nature of these schemes, but it is perfectly obvious that if they are approved and the necessary financial provision is authorised, a trustworthy organisation will have to be created to co-ordinate and carry out the measures.

The technical establishment of the Chihli River Commission hitherto has been entitled to the highest professional and public repute. The personnel of the Commission have done admirable work under conditions of almost unprecedented difficulty. They have been attacked by superstitious peasantry who regarded their instruments and their activities with extraordinary suspicion. They have been molested by bandits and members of the peasant Secret Societies. They have very often had to carry out their onerous duties with war raging all round them. Yet their loyalty has never faltered and they have done their job faithfully and well under all circumstances. The handsome tribute paid to the technical staff by the Chief of the Department does Mr. Yang Pao-ling credit and the staff simple justice.

No doubt an appreciable reduction of staff became justified after the completion of the Commission's work in connection with the "Grand Scheme," and we do not cavil at this, though there is so much work still to be done, and the technical staff represent such an intimate body of experience and knowledge, that the fullest and most cautious consideration in reducing the staff was obviously necessary. Not all the technical members have been dismissed, but those who remain are probably not altogether happy in their present circumstances. The placing of two minor officials in charge of the Commission and the dismissal of many men who have given years of study to the problems of the

River System or have long been active on the administrative side, has shaken the confidence of all. If Party men of little experience are always to be chosen for important offices in preference to men of long training and ripe knowledge of particular problems, then the outlook for China is exceedingly bad. In an organ of this description the ordinary Party placemen are not only out of their element; they are a positive menace to the smooth and efficient running of the administration.

This is not the only unfavourable experience Tientsin has suffered since the change of regime. A new Court official was recently appointed by Nanking—a man with little qualification for his important post. There was a considerable amount of ready cash available, intended for the payment of the salaries of the Court personnel. The money disappeared and the Judge decamped. The consequence was that the staff of the Court went on strike. This incidentally explains

the matter mentioned in our correspondence columns the other day, regarding the non-burial of the body of a Russian who was drowned in a pond in the country off Racecourse Road. The body was left there for days in a state of advanced decomposition as the result of the strike and the refusal of the Coroner to conduct the inquest.

No doubt the uncertainty of tenure, the frequent changes and controversies in the higher political circles, and the lack of a permanent civil service will reveal the same phenomena, in possibly an aggravated form, under the Nationalist regime, as we witnessed our disgust under the Tachuns. Indeed, we should not be at all surprised if greater demoralisation does not ensue than we have ever known, before discipline is restored all round. Meanwhile the two instances we have cited should assist in dissipating any illusions among Chinese who hoped too much of the new regime.

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HAI-HO CONSERVANCY COMMISSION.

REPORT ON THE GENERAL CONDITIONS AFFECTING THE HAI-HO.

OUTLINE OF IMPROVEMENT SCHEMES.

PROPOSED TEMPORARY AND RADICAL MEASURES.

AUG 10 1928 P.T.T.

The following report was submitted to the Board of the Hai-Ho Conservancy Commission at their 349th meeting held on Friday, 2nd August, 1928, by the new Engineer-in-Chief:—

Tientsin, 1st August.
Gentlemen:—

Immediately upon my arrival at Tientsin I devoted myself to, in a most to the study of the present difficult conditions of the Hai-Ho on the basis of information which has been collected.

I would add that, being placed in possession of the Commission's Reports, as well as of the Final Report of the Chihli River Commission, before my departure from France; and, having been in touch with Mr. Louis Perrier in France, I gained, before my arrival in China, a cursory idea of the conditions with which I should be confronted.

I believe myself now to be in a position to submit some general conclusions, which are largely confirmed by trustworthy documents and by information, the correctness of which appears very plausible.

I will not revert to the question of the diversion, in 1912, of the Chao P'ai Ho. As has already been stated, this accident, which might, and should, have been avoided, has, without doubt, highly increased the difficulty of maintaining a sufficient depth in the Hai-Ho and on its Bar. However, between 1920 and 1922, this difficulty was,

to a large extent, overcome.

The condition of the Hai-Ho was, indeed, very satisfactory. Although deprived of an important part of the regular water supply, it should have received from upstream, the Hai-Ho Conservancy Commission obtained truly splendid results. They had, in the space of a very few years, succeeded in increasing the depth of a somewhat small stream, which flows into a sea of mean tidal amplitude, in such a way as to allow big steamers to pass over the Bar and anchor in a harbour 35 miles distant from the sea. The exceptional value of these results is well shown by the fact that it was necessary, owing to the narrow width of the river, to excavate Swing Berths at Tientsin.

Well deserved homage is due to the Engineers who were the main artisans of this work.

REASONS FOR RECENT DETERIORATION.

Seeing that there has been no change in policy or system; that, in fact, further improvements (albeit still inadequate) have been carried out on the Pei Ho. WHAT ARE THE REASONS FOR THE AGGRAVATED CONDITIONS DURING THE LAST FEW YEARS?

The reasons appear to me, at first sight, to be the following:—

1.—The Silt, which shoals the Harbour and the Bar, comes, mainly, as is well known, from the Yung Ting Ho in times of freshets. In a technical note, attached hereto, I give a detailed explanation on the variation of the effects of these freshets in accordance with their importance.

The small freshets, provided important simultaneous flows do not take place in the other tributaries, result in silt lodging mainly in the Harbour and on the Bar. When the freshets become heavier, the silting is less in the Harbour, mainly felt further down stream and, invariably, on the Bar.

A very heavy freshet will cause a general scouring of the river and a heavy shoaling of the Bar.

In cases when the freshet from the Yung Ting Ho is small and those from the other tributaries are large, the shoaling will usually be negligible.

During the past two years, and since the commencement of the present rainy season, neither the Yung Ting Ho nor the other tributaries have

had important flows. This is the first reason for the serious shoaling of the Harbour and Bar.

2.—Drought is, most probably, also responsible for the abnormally heavy percentage of silt, which is quite extraordinary, found this year in the water from the Hsi Ho, which is usually very clear. It is likely that the silt carried in suspension by this river at the end of last year

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was deposited in the bed and is now being brought on again by the freshets of this season.

3.—In 1925 the dykes of the Yung-Fing Ho were carefully strengthened. In former years, even in cases of small freshets, breaches occurred in the dykes of this river. A part of the water, carrying its spoil in suspension, was wont to escape onto the plains, where the silt was deposited. The water, thus clarified, slowly reached the Hai-Ho by a new course and contributed towards its cleansing.

During the last two years this has ceased to be the case. The breaches, troublesome for the villagers—but most beneficial to the Hai-Ho—no longer occur, and total flow of water passing below the lateral weir of Chin-men-cha (the last weir downstream) comes with its silt to the delta.

It should be added that a considerable strengthening of dykes has recently and prematurely been carried out all over the country, producing similar results in each tributary and creating, as is instanced in the Hsi Ho, the present high percentage of silt.

4.—The function of the delta is at present much less favourable than it was before. According to information I have received, the water no longer spreads all over the delta in the many small beds subject to heavy silting. It now gathers, at least over a large part of the delta, into one well-defined bed through which it flows without depositing its silt, the slope being somewhat steep and, in all probability, erosion is

even taking place in this bed which has been formed in very loose substance. Spoil, deposited years ago, is thus being carried on in suspension to the Hai-Ho.

The smallness of the freshet may be one reason for this change in conditions. A restricted flow will the more readily gather together in a single channel. But this is probably not the sole reason. The trouble may, to some extent, be due to villagers who, by small works, try to fend off water encroaching upon their properties; works, which succeed because the streams are small and which result in collecting all the water into a main channel too big for the people living on its banks to obstruct.

The present shoaling of the Hai-Ho would thus result.

a.—from a temporary cause, viz. the exceptional dryness of the last two years.

b.—from many so-called improvements applied in the interior to the previous conditions governing the river system of the Province.

PIECEMEAL IMPROVEMENTS BY

IRRESPONSIBLE PERSONS DEPRECATED

A good deal of improvement work has been carried out in a

decidedly short-sighted way to the advantage of some villages. Under political influences it has been considered advisable, or unavoidable, to start immediate activity in some places without regard for the fact that a river system is by no means a solid entity, but a very pliable and sensitive thing, ever subject to its own modifications and upon which any local action may cause repercussions, usually of a very unfavourable nature, at great dis-

stances. Thus, by strengthening the dykes of a certain reach, the country in its vicinity is protected, but the flood is rendered much more severe both downstream and, if the slope is small, upstream. It is also common knowledge to any Engineer that if, in a stream of more regular regimen, dykes or groynes are built in the minor bed with a view to reduce the width and increase the depth, the slope will, at the same time, be reduced above and below it where the depth will immediately become more shallow.

IMPROVEMENTS SHOULD ONLY BE CARRIED OUT ON GENERAL TECHNICAL LINES.

Thus, the improvement of a river or of a river system must not be undertaken except in accordance with a general plan, which has been carefully studied by technical men able to foresee and to provide for any repercussions and consequences.

This is especially true in regard to the river system of this Province. Nature has accumulated difficulties here and the system is, in all probability, in a condition more unstable than any other in the world. There can be few instances elsewhere in the world of an estuary of so large a river as the Huang Ho migrating over no less than 200 Kilometres in 40 centuries. This particular instability is the consequence of geological and climatic factors.

GEOLOGICAL AND CLIMATIC FACTORS CAUSING INSTABILITY.

a.—Silt is mainly a compound of loess from the plateaux upstream, in which particles of silica prevail and so cause deposits far less consistent than would be usually found in those containing a large percentage of fine clay particles. Owing to this, the rivers of this Province continue their way with migra-

tions over districts nearly flat in the same way as the beds of torrents migrate on steep slopes of unconsolidated cones of dejection.

b.—The rain regimen is extremely irregular, consisting of alternate periods of short but diluvial rains and of long and excessive drought.

EFFECT OF THE GRAND CANAL ON THE RIVER SYSTEM.

The unfavourable influence of such indigenous conditions has been completed by the incongruous activity of an ignorant population of villagers, who submit to the authority of unqualified men. For instance, there is no doubt that in ancient times the rivers of the system now converging on Tientsin from the southern districts of the province have had separate outlets to the sea—most of them through the old courses of the Huang Ho—and did not flow, as they do to-day, more or less parallel to the sea shore. All these outlets have, in comparatively recent times, been closed in consequence of the construction of the Grand Canal. The result is that an immense area has been practically deprived of escapes for its water is, in consequence, subject to periodical floods.

LOCAL INTERESTS DESTRUCTIVE TO THE GENERAL WEAL.

The fight between the water and the people originated in this way. Everybody, in his attempt to repulse floods, drove back the water onto the property of his neighbour so that the fight developed into an affray between the villagers themselves. Some built dykes for their safety, while others, located further downstream, or between dykes, immediately attempted to breach them when the freshets failed to accomplish this. The question of dykes has developed into one of internecine strife throughout a large

area of the Province and one may even now see sentinels guarding these dykes on a summer's night. In other places, canals have been excavated to relieve flooded areas and these have occasioned floods to

other districts further downstream.

It is indeed time to put an end to these thoughtless and chaotic practices, which are invariably of purely local interest and consistently detrimental to other people. It is a matter which might well engage the attention of the Government.

CHIHLI RIVER COMMISSION ORGANISED TO STUDY GENERAL PLAN OF IMPROVEMENT.

The necessity to deal with questions of this nature has been recognised and, in 1918, a Commission for the Improvement of the River System of Chihli was organised to study a general plan of work.

This Commission has carried out an important preliminary work, urgently needed and of great value, in collecting, by means of a General Survey and by Hydrometric and Meteorological observations, all necessary data for the discussion of a solution of the problem put before it. Furthermore, their Engineer-in-Chief (Mr. F. G. Rose) published, in 1925, his Final Report and Grand Scheme recommending several measures for the North-Eastern part of the system.

The above remarks deal with a somewhat broader question than that of the amelioration of the Hai-Ho. They form, however, a necessary preliminary statement since the fight against floods cannot be carried on without, as indicated in these remarks, severe repercussions on the condition of the Hai-Ho, the main and almost the only outlet for all the water falling in the Province.

account of conditions of flood and of a nature detrimental to the Hai-Ho (as may well happen) must be regarded as a measure detrimental to the whole Province. For the sake of benefiting a few villages, injudicious action is capable of reverting the Province to conditions prevailing centuries ago, when China was without any connection with the outside world.

CONSERVANCY OF THE HAIHO OF FIRST CONSIDERATION. TRIBUTARIES THE MAIN SPHERE FOR ACTIVITY.

The conservancy of the Hai-Ho must thus be one of the primary considerations in any scheme for Flood improvement, which fact appears to have been too little considered in recent years. On the other hand, the possibilities of further improvements on the Hai-Ho and Bar being now limited, the main sphere of activity lies upstream and consists, moreover, only of conservancy measures. This sphere lies within the jurisdiction of the Commission.

PRELIMINARY REMARKS ON SCHEME FOR IMPROVING THE PROVINCIAL RIVER SYSTEM.

In conformity with your instructions, I now have the honour to submit the following preliminary remarks on a Scheme of Improvement of the River System of the Province as a basis for discussion.

ANY MEASURE DETRIMENTAL TO THE HAIHO IS DETRIMENTAL TO THE WHOLE PROVINCE.

One must not forget that the conservancy of the Hai-Ho does not only spell the prosperity of Tientsin, but also the prosperity of the entire hinterland connected with the outside world by means of this one Harbour and its river system. Hence, any local improvement, however important, carried out on

As I have only been in the country a very few weeks, I am naturally not in a position to proffer a complete solution, accompanied by all technical and financial details. When first I read the Commission's Reports, I was struck by the following facts, which are not very technical, but of pure common sense:—

HAIHO THE ONLY OUTLET FOR WHOLE FLOW OF WESTERN PART OF PROVINCE.

"A.—The rivers comprising the Provincial River System have no outlet to the sea other than the Hai-Ho and the Pei Tang Ho. The latter

takes only the water from the drainage area located in the North-East of the Province and also the rather insignificant flow coming from a few canals opened in the left bank of the Pei Yun Ho, viz.—Ching Ling W. Ho, Kwan Erh Chiang and Hsin Kai Ho. The flow capacity of the Pei Tang Ho is, furthermore, somewhat small. It may thus be stated that the Hai-Ho must carry practically the whole flow of the Western part of the Province. This is to say that the Hai-Ho is the only outlet of a watershed comprising a total area of 84,000 sq. km. in the mountains plus 75,000 sq. km. in the plains.

According to its width, which the importance and value of large concerns along the Bunds at Tientsin prevent from being increased, the total flow of the Hai-Ho cannot exceed some 1200 m³ per second, or 100 millions of cubic metres per day.

Many measurements ad-

ready made show, however, that the total flow of the Tributaries upstream may attain, and even exceed, 30,000 m³ per second. In fact, at a short distance upstream from Tientsin, Mr. Pincione, in 1924, found the total flow of the tributaries to be 19,900 m³.

ARTIFICIAL ESCAPE CANALS OUT OF THE QUESTION.

It is quite absurd to consider the possibility of such a flow escaping through artificial canals, since it may be seen by anybody that the total output of the Hai-Ho—a large stream for a canal and one expensive to excavate—has only 1/20th or 1/30th of the total capacity required.

(Continued on page 6.)

THE HAIHO REPORT.

(Continued from page 7.)

safe both for the considerable present and the tremendous future. There was no small amount of very natural irritation on the financial side of the question the last time it was brought prominently before the public, by Mr. Van der Veen. But we cannot afford to cut off our nose to spite our face. And even in this case, financial considerations would have weighed less, if anything at all, had there not been a doubt about the unanimity of the technical experts.

Like most other schemes, the proposals formulated by M. Hardel fall into two distinct phases, namely, palliative measures, and radical measures. Consideration will naturally first be given to measures designed to produce early relief. On this point the Report of M. Hardel supports as "very

satisfactory" the proposal in the Report and Grand Scheme of the Chihli River Commission and the statement made at the Ministry of Interior on November 10, 1927. In brief it provides for the restoration of the function of the Yungtingho Delta by strengthening and raising the dykes of the Delta. The origin and function of the Delta was lucidly explained in non-technical language by Mr. Van der Veen in his address to the Rotary Club last autumn. Chinese engineers preserved the Haiho from complete extinction some 200 years ago by building the dykes of the Yungtingho wide apart at a point some 50 kilometres before the waters of this silt-laden torrent reach the Peiho, thus forming a large storage basin 600 square kilometres in extent upon which much of the silt was deposited. This huge reservoir, as we know, has been gradually filled up. The slope of the basin is considerable, the height at the upper end being 20 metres above Taku Datum and the lower end only six metres. It is therefore proposed immediately to raise the dykes around the lower half of the basin and along the Peiyunho, so as to make the delta once more a true storage reservoir, where the silt will readily settle instead of being poured into the Haiho. It is affirmed that the total area of the delta is largely sufficient to hold the silt for many years. It is recommended that in the present state of affairs the Peiyunho dyke should be provided with gates and sluices, in order to retain within the dykes surrounding the delta no more than a small layer of wafer for the purpose of settling the silt.

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HAI-HO CONSERVANCY COMMISSION.

REPORT ON THE GENERAL CONDITIONS AFFECTING THE HAI-HO.

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PROPOSED TEMPORARY AND RADICAL MEASURES.

AUG 11 1928

P.T.T. (Continued from yesterday.)

MEASURES TO BE TAKEN PENDING COMPLETION OF RADICAL IMPROVEMENT PLAN.

Taking, for instance, the basis of total period of 80 years for the completion of everything, it is evident that something will have to be done in the meantime. A provisional plan will, however, be much easier to study since it will be understood to be only provisional.

It may be remembered that the main basis of the problem is the fact that the total outflow in the West of the Province may, within the space of a few days, exceed by anything between ten and thirty times the amount the outlets are able to carry to the sea, which fact makes it an absolute necessity to store the surplus water somewhere, either over a flooded area, as is now the case, or in large storage reservoirs.

As a permanent solution, the principle of building such reservoirs would offer a decided objection in that the water, being heavily silt-laden, will fill any reservoir in the course of years. Reservoirs of high cost would afford the requisite relief during a limited time, following which new reservoirs would have to be made elsewhere

and so bring the average annual expenditure to a figure which would render it impossible to support such a plan. In fact the case would be hopeless.

But, as a provisional solution, the case assumes a totally different aspect and has to be examined.

THE NECESSITY FOR STORAGE RESERVOIRS.

It must be recalled that the Chihli River Commission has proposed building at Kuang Ting, upstream on the Yung Ting Ho, a so-called detention reservoir, which is not liable to silt up. The total storage capacity of this reservoir would be some 250 million cubic metres and, at this very exceptional site (perhaps unequalled elsewhere in the world) the work might be completed at the very low cost of some \$2,000,000. The plan according to which the reservoir should be operated would be to allow it to be filled only in the event of a high peak in the freshets and to empty it again as soon as possible after the peak has subsided. This would be done so rapidly that no important silting could take place in the reservoir. Under these conditions, the maximum flow of the Yung Ting Ho, now estimated possible to attain

5000 m³ per sec. for a few hours, could be reduced to 1500 m³ for a few days.

The value of such a reservoir for the protection of the Yung Ting Ho dykes is evident and, from this point of view, the plan cannot be too strongly supported. But this is by no means a general solution. During the (say) six days that the Kuang Ting reservoir delivers the 1500 m³ per sec. (which would already be somewhat too much for the Hai-Ho), the other tributaries will deliver perhaps ten times this amount.

The reservoirs required are, accordingly, STORAGE RESERVOIRS, liable to silt up progressively.

LOCATION AND CAPACITY OF REQUISITE RESERVOIRS.

Where should such reservoirs be located? It looks very probable that, within reasonable limits of expense, these should be flat and located in the area of the Western plains. The procedure would be to surround by dykes parts of the present flooded area. The flood extension might in this way be reduced owing to the depth of the water being increased.

There is a place which looks especially attractive. I refer to the Hsi Tien, an extensive basin which is permanently flooded and where, consequently, no expropriation of cultivated land would be endangered. As stated above, the total amount of water spread

over the plain (including the Hsi Tien) in 1924 reached, on the 28th August, the maximum amount of 8238 millions. Of this amount the high proportion of 3043 millions were within the area of the Hsi Tien and 5195 outside on the plains. Furthermore, 2366 millions out of the 8238 came through the Tzu Ya Ho, which is not connected with the Hsi Tien.

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Under these conditions, if
 a.—the 2366 million cubic metres had been stored in other reservoirs,
 b.—the storage capacity of the Hsi Tien would have been increased to ~~8238~~ 2366 = 5872 million m³,
 positively no trouble would have resulted from the 1924 flood, one of the biggest that has ever been experienced.

These figures, based upon the 1924 freshet observations, are assumed to be the maxima. A further important margin of safety would promptly result from the improvement of the rivers, due to the cessation of shoaling.

The level of the water in the Hsi Tien during the dry season is 6.70 metres. The maximum water level reached in 1924 was 10.54 m., but was only 10.31 m. on the 28th August of that year, and the total area is 828 sq. km. On the other hand 92 million m³ are permanently stored in the Hsi Tien below the level of 6.70 m., so that the total storage capacity above this level should be reduced to 5780 million m³ and could be obtained by raising the level to 13.67 m. by surrounding the reservoir with dykes of some 7 metres in height and 100 km. in length.

The total cube of earthworks, including the raising and strengthening of dykes along several tributaries above the Hsi Tien, would approximate 20 million m³, which, on the basis of \$0.25 per cubic metre, would entail an expenditure of some \$5,000,000. To this figure should be added the cost of the Sluice regulating the outflow.

The height of the dykes and their section might be reduced by allowing a small increase in their length and by somewhat enlarging the area of the reservoir. The total cost of the works would thus be reduced, but some land would have

to be purchased. This question should be thoroughly examined later.

Funds should also be provided for other reservoirs on the Tzu Ya Ho of smaller capacity (2366 million m³ in 1924). One of these could probably be located, as is the case with the Hsi Tien reservoir, in a natural depression close to Ngai Hsin Chuang at the confluence of all the tributaries forming the Fu Yang Ho.

A further site should be sought in the Hu Tuo Ho watershed.

OPERATION OF RESERVOIRS.

The minimum time necessary to allow the contents of such reservoirs to flow through the Hai Ho is about three months, on the basis of 100 million cubic metres per diem. In fact, owing to a certain flow continuing in all the rivers after the freshets, the time should be a little longer. On the other hand, evaporation should reduce the water in storage to a certain extent and might account for from 6% to 10%. Thus it can be said that, following a heavy freshet, the reservoirs might be emptied by the end of December. Such a duration of storage in the reservoirs would be ample to allow the silt to settle. Under these conditions, there would be no advantage in hurrying the evacuation and, in view of the conservancy of the Hai-Ho, it would be better to delay evacuation as long as possible. In the event of a heavy freshet a steady flow of 400-500 m³ per sec. of clean water might, in this way, be passed through the Hai-Ho

over many months to its great advantage.

The losses from evaporation of the waterflooding far greater areas, at present, much larger than would be the case if the water were stored in reservoirs. The amount of water penetrating into the ground is also important. These are the reasons why the larger part of the flooded areas dry before November now-a-days.

In the event of the development of a large irrigation system, the loss from evaporation and storage in the ground would become even larger than they are now. The irrigation basins might thus be somewhat rapidly drained to the great advantage of agriculture. However, the flow in the Hai-Ho would, for many months, be maintained by the steady influx of water draining through the ground in the irrigated area and finding its way back to the rivers. This would be a very favourable condition.

SILT DEPOSIT IN THE RESERVOIRS.

Taking 5% by weight (2.8% by volume after deposition) as an average percentage of spoil carried in suspension by the rivers, the capacity of each reservoir would be reduced yearly in the ratio of 2.8% of the total volume of water flowing through the reservoirs during the year. It appears highly probable that, during the first weeks of the freshet season, a certain percentage of silt will remain in suspension in the water flowing out of the reservoirs. In order to arrive at a safer estimate, we will maintain the ratio of 2.8%.

In 1924, the total amount of water flooding the plain on the 4th September was

2974 million m³ in the Hsi Tien
 5165 elsewhere

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Total \$139

The total cube of water which could, in 1924, have passed through the reservoirs would thus have been 12,430 million m³. A part of this flow, coming from the cleaner rivers, might have been run directly to the sea without depositing its silt in reservoirs. This will not be taken into account because it would be wrong to apply the mean figure of 2.8% only to water, rather heavily loaded. Furthermore, it is desirable always to keep our estimate on the safe side.

On the other hand, the freshets are generally much lighter than those of 1924. We might take the flow of seven years on much the same basis as that given in the report of the Chihli River Commission.

1 year	12,500 million m ³	12,500
2 years	5,000 million m ³	10,000
3 years	3,000 million m ³	9,000
1 year	2,000 million m ³	2,000

Total flow in seven years 33,500 million m³ coming to an average total flow of 4,775 millions per year and to a total average maximum silt deposit of 137 million m³ per year during these seven years.

IRRIGATION AREA TO BE PREPARED ANNUALLY.

It would thus be necessary to carry out the irrigation programme at such a speed as to be able to admit to into the irrigated area a total water supply of 137 million cubic metres during the second year, 270 millions during the third, and so forth. This result can be obtained by preparing annually 137 sq. km. for irrigation.

After the first seven years, 959 million m³ would thus be stored annually in the irrigation basins, and the annual amount of water passing through the reservoirs in a year of heavy freshets would fall to 11,540 million m³. The average silt deposit in the reservoirs

would thus be reduced to 137 m³ a year and it would be sufficient to prepare annually for irrigation 137 sq. km. After another period of seven years this figure would, in the same way, be further reduced to 117 sq. km. and so forth.

Considering, however, the important economic advantages to be derived from this irrigation, it would be well to maintain at least a figure of 100 sq. km. as the minimum average area to be prepared yearly for irrigation.

CANAL TO RELIEVE HAIHO NOT RECOMMENDED.

Is there any advantage to complete this provisional solution of

At the same time 4291 million m³ had been flowing through the Hai Ho to the sea.

several big reservoirs by any scheme of digging a canal to relieve the Hai-Ho? It does not appear so. In two months, 8238 million m³ are received in storage by the reservoirs. A very expensive canal of the same size as the Hai-Ho, costing, on the basis of Cuttings made in the Hai-Ho, some \$17,000,000, might, during these two months, theoretically drain some 6,000 million m³, thus largely reducing the capacity of the reservoirs. But it would also be necessary considerably to increase the sections of the main rivers—the Ta Ching Ho and Tzu Ya Ho—leading up to the head of the canal and this would entail a cost of twice as much again.

THE YUNG TING HO PROBLEM SOLVED.

In the total capacity of 8238 million m³, taken above as the flow of the Yung Ting Ho is included to an extent of 1294 millions. It will be remembered that the Yung Ting Ho, due to breaches in its dykes in 1924, flowed entirely through the Western plain and the report of the Chihli River

The same thing should occur a little further downstream at Chin Men Cha, where there is another weir to relieve the Yung Ting Ho of a further 10%. The Chihli River Commission has proposed the strengthening of these two weirs and to provide them with sluices and gates. This proposal is one of the best points in the Grand Scheme of that Commission. It may be criticized only on the score of being insufficiently radical. The Yung Ting Ho must be allowed to follow its present natural tendency, which is to become a tributary of the Ta Ching Ho and NOTHING SHOULD BE DONE TO PREVENT THIS. The best improvement to be effected to the Lu Kou Ch'iao and Chin Men Cha weirs is by no means so costly as the construction of sluices and gates: it would be merely to explode a few charges of dynamite in the sills of these ancient and obsolete works.

Commission states (p 31) that during this year of abnormally heavy freshets, the river left

“its original bed, downstream of the breach sites, absolutely dry.”

Thus, the execution of the above plan includes the convenient diversion of the Yung Ting Ho, together with its silt, to the Hsi Tien reservoir, which will act as its storage basin until the irrigation system has been prepared in the Yung Ting Ho valley. The requisite storage capacity is provided for in the Hsi Tien reservoir. It is necessary to emphasize the advantage of this point for the conservancy of the Hai-Ho.

On the other hand, the Hsiao Ching Ho, a defluent of the Yung Ting Ho at Lu Kou Ch'iao, should in times of freshet, already be bringing 20% of the Yung Ting Ho flow to the Ta Ching Ho through the Lu Kou Ch'iao weir

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Of course, in view of the particularly heavy percentage of silt in the Yung Ting Ho water, the irrigation programme must be commenced as soon as possible in its valley.

IMMEDIATE PALLIATIVE PLAN.

These solutions of the Flood and Silt problems require time to accomplish. A few years are necessary merely to divert the Yung Ting Ho to the Ta Ching Ho through the Hsiao Ching Ho, and to prepare the Hsi Tien reservoir.

Something must, accordingly, be done in the next few months to relieve the Hai Ho of the present shoaling.

As to this, I find a very satisfactory proposal in the Report and Grand Scheme of the Chihli River Commission and in the Statement made at the Ministry of Interior on the 10th November, 1927.

RESTORING THE FUNCTION OF THE YUNG TING HO DELTA.

These documents provide for the strengthening of the dykes of the Yung Ting Ho delta. This solution will, in itself, be self-support-

ing and entirely satisfactory and complete if it is understood that the dyke along the Pei Yun Ho will also be strengthened and raised. In this way the delta, within its dykes, will become a true storage reservoir where the silt in the water will readily settle. The total area of the delta is largely sufficient to hold the silt of the Hai-Ho for many years. If the population in the delta were insignificant, it might even be made a storage reservoir for, at least, the waters of the Yung Ting Ho and thus permit a reduction in the size of the Hsi Tien reservoir. This, unfortunately, is not the case. In the present state of affairs, the Pei Yun Ho dyke should be provided with gates and sluices, in order to retain within the dykes surrounding the

delta no more than a small layer of water for the purpose of settling the silt.

This solution, very simple and inexpensive, will provide the necessary time to carry out the radical schemes outlined above.

CANAL TO EVACUATE YUNG TING HO NO LONGER REQUIRED.

This brings to an end all the controversies which have taken place in regard to the best plan for an outlet canal for the Yung Ting Ho. Such a canal being no longer required, the question is closed.

SUMMARY.

I have the honour to suggest the following measures:—

- I. *Immediately.* To strengthen and raise the dykes of the Yung Ting Ho delta (as provided in the Statement of 10th November, 1927), and especially the Pei Yun Ho dyke.
- II. *As soon as possible* (always in the spirit of the Grand Scheme of the Chihli River Commission and in the Statement of the 10th November, 1927) to let the whole flow of the Yung Ting Ho (except for the small amount necessary to the pec-

(Continued on page 6.)

HAI-HO CONSERVANCE COMMISSION.

(Continued from page 5.)

ple now depending upon water from this river) flow into the Ta Ching Ho through the Lu Kcu Ch'iao and Chin Men Cha weirs and the already existing Hsiao Ching Ho.

For this purpose, to immediately study and commence the construction of a big storage reservoir at the Hsi Tien.

Also to build at Kuan Ting the detention reservoir already provided for by the Grand Scheme and Statement, and to strengthen the Upper Ta Ching Ho dykes.

III. *As soon as possible* to commence the construction of the irrigation system in the Yung Ting Ho valley.

IV. *To Study* and start the construction of two or more storage reservoirs in the Western plains and extend to this part of the country the development of the irrigation programme.

V. *To Abandon* all plans for outlet canals, which are far too costly in comparison with their practical efficiency.

VI. *Leave to secondary urgency* any canals or other works connecting adjacent rivers, since such works, which are usually rather costly, are deprived of any general efficiency and may prove useless when the above plan has been carried out.

ADMINISTRATIVE ORGANISATION.

It must be clearly understood that this Scheme can only be successfully carried out under the following conditions:—

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- A.—To establish a single general management provided with laws and regulations and with the necessary authority
1. to prevent the undertaking of other works not authorised by this management
 2. to regulate all sluices and weirs now under the control of the various individual river Commissions and Bureaux.
 3. to provide for absolute immunity from damage to, or interference with, the works.
- B.—The establishment of laws for Expropriation and for Farmers' Associations in connection with the irrigation system. (It will be agreed that, in the absence of such laws, private and very small interests will, in a short time, render it impossible to carry out the program exposed above—or, for that matter, any other program worthy of recommendation)

I have the honour to be,
Gentlemen.

Your obedient Servant,
JEAN A. HARDEL.
Engineer-in-Chief.

TECHNICAL NOTE.

At any time in a tidal river, the place where the more important shoaling occurs, is that where slack water obtains, viz: the place where the flow will just change to ebb or the ebb to flow.

This place is, according to the time, somewhere between the upstream limit reached by the flow. As the flow goes upstream, so does the point of shoaling go with it up to this limit and later returns to the Bar. Thus, the place where the more important shoaling happens, is always moving. It may easily be understood that if its motion is slower in any reach of the river, the shoaling will be of longer dur-

ation in this reach and a larger quantity of silt will deposit there. This is the case at two points, the upstream limit of the flow and the Bar.

This is the reason which, at present, causes the shoaling to be especially heavy in Tientsin Harbour. Should the flow from upstream increase, the upstream limit of the flow tide would recede further downstream to some point where the shoaling would then become particularly heavy. A very severe freshet would bring this point right to the Bar. In such an event, the current will usually scour the upstream reaches.

The largest part of the silt (except the very small particles) will, of course, have to settle somewhere. Any silt not settling in the River will deposit near the Bar. But here the settling area being very large, a far larger volume of silt is required to reduce the depth to the same extent. Such a volume of silt is, unfortunately, often brought down by the river.

Tientsin, Saturday, Aug. 11 1928

THE HAIHO REPORT.

II. P.T.T.

THE main difference between the immediate palliative measures advocated in the Haiho Report and the proposals advanced last Autumn by Mr. Van der Veen lies in M. Hardel's rejection of the escape channel scheme. This, it will be recalled, aroused the fear that the silt thus diverted to Peitang would drift toward the Bar channel. M. Hardel will have nothing to do with new escape channels, either for the particular and restricted purposes for which this was designed, or in connexion with the Grand Scheme. The Yungtingho Delta has done good service in the past. It is now filled up and incapable of discharging its functions of retaining the silt and preventing it from coming into the Haiho. He would simply restore these functions by strengthening and raising the

dykes on the two sides at the Peiyunho end, by completing and strengthening the existing dyke at the end, following the line of the Peiyunho, and by constructing a sluice and gates to regulate the output from the Delta and one or two minor works in the Delta itself. He would contain the surplus water and control its cleaner flow into the Haiho. The escape channel previously proposed would take it away, silt and all.

Since this is the portion of the scheme on which public bodies must necessarily concentrate at once, it merits a little more detailed consideration at the moment than the larger, radical measures, which are of greater importance and magnitude but must be left to the future. It may be argued that the containing of the water would gravely increase the peril to Tientsin in the event of flood or the collapse of the higher dyke immediately above the city, at the lower end of the basin. Secondly, would not the inundation of this part of the Delta arouse the hostility of the families who have settled therein, producing various difficulties and possible complications? In the first place, the answer that occurs to the lay mind is that in the present conditions an excessive volume of water would in any event seriously imperil the city and port, not from the hinterland, as in 1927, but from the silted river itself, as in 1924, when the Haiho was level with its banks and actually did inundate houses on its banks in the city.

Furthermore, it is proposed to flood only a small area and to a very shallow depth. The process will be so slow as to be practically unnoticeable, and the deposit of silt there will in the dry season be very beneficial to cultivation. A certain number of people will doubtless be affected. But in any case they face great risks. The Yungtingho quite frequently changes its course in the delta, and there is moreover the ever-present risk of flood following heavy precipitation in the catchment areas.

The former scheme provides for floods by creating an escape channel. The present proposals aim at stopping the flow of silt straight away, and, by disposing of the silt already deposited in the Haiho, restoring the capacity of this river not merely for navigation purposes but for the larger accommodation and release of flood waters. We realise that the decreased depth of the river greatly retards tidal propagation and ensures virtually a steady flow of the water to the sea, but nevertheless the actual volume of water now discharged into the Gulf is, we take it, immensely below the maximum possible, such as was attained in the case of the 1924 floods, when the greater capacity of the river as an effluent alone saved us all from inundation.

The second stage of the scheme submitted by M. Haridel (to whom the community is indebted not only for the clarity and competence of his Report but for the commendable speed with which he has gone to work on these problems), following the palliative measures, is the development of storage reservoirs. It so happens that a perfectly serviceable storage reservoir exists in the permanently inundated area known as the Hsitién, lying between Tientsin and Paotingfu, more generally known to foreigners, we believe, as the Paotingfu Lake. This is obviously intended to contain water. The proposal is to equip it to contain a much greater amount than it ordinarily holds, by building a dyke around it and leading our great bugbear the Yungtingho into it, through the Hsiaoehingho, which is, in fact, the natural course the former desires to take. The silt will be dropped in this great basin, and the flow of the cleaner water through the sluice gates at the outlet will be regulated according to requirements. It is estimated that this basin will serve the purpose in containing the silt for some 30 or 40 years. Its life, therefore, is not unlimited. It will be possible, of course, to raise the dykes when necessary. But it does not con-

stitute a permanent solution. Something more becomes necessary.

The third stage consists of the irrigation scheme, which is certainly the most arresting and attractive phase of the whole body of proposals and the distinguishing feature of the Report. The idea is to continue the storage reservoirs in service and to make them permanent by bringing clean water into them and regulating the flow into the Haiho of the clean water, by depositing the silt, not into the reservoirs but into the various irrigation basins. The creation of these basins must necessarily be a slow and gradual process, and a systematic schedule is outlined in the Report covering a period of many years. M. Haridel suggests the adoption of the same plan as utilised in Egypt. Large basins will be built along the foothills,

where the slope would maintain a certain value, but where the country is somewhat flat. Each basin would be furnished with intake and outlet canals of easy slope. The volume of water admitted into each basin would vary according to the importance of the freshet. As the available water supply must be stored in the basin, to the great advantage of agriculture and with a view to avoiding floods downstream. Here we may perhaps quote the Report textually:—

"One may, at first sight, be intimidated by the magnitude of such a plan. Allow me, therefore, to give a few convincing facts. According to the Chihli River Commission, the total amount of water which, in 1924, flooded the South-Western plains was 8,238 millions of Cubic metres (the Hsi Tien included). It must be recalled that the freshets of that year (1924) were exceptionally strong. However, taking this figure as a basis we find that, at a depth of one metre, such a quantity of water would be stored on a surface of 8,200 sq. km. We will take this as the magnitude of the irrigated surface to be arranged. Such a work is, naturally, very considerable, but by no means impossible. Distributed over a total period of sixty to eighty years, this would entail the preparation

of 100—140 sq. km. per year, included in squares of ten to twelve kilometres. This would mean the yearly construction of from 100 to 200 Km. of low dykes and a length of small canals in the same order of magnitude.

There is no doubt that the profits resulting from this organisation would very soon be sufficient to provide all the funds necessary for its development, management and maintenance. For it must be observed that, little by little, the ground will rise in the basins so that it will be necessary simultaneously to raise the dykes and extend the intake canals further upstream.

The outstanding features of the scheme, as we understand it, may be briefly summarised as follows:— It abandons the main principle of previous proposals, namely, the provision of a new outlet for the Yungtingho. The Grand Scheme sought to drain off flood waters as rapidly as possible. It could not safeguard the populace against floods, since the combined capacities of the new and existing outlets would be inadequate. All it could perform would be to minimise the flood area and render inundated land more rapidly habitable after the flood had worked its chief havoc. The new scheme is less concerned with the drainage complex. It would use the waters for irrigation and cultivation purposes, and instead of rushing them out into the sea, conserve them in great irrigation basins and reservoirs. It is, therefore, if it proves as practicable as it seems, both constructive and productive and calculated to be a great boon. For Chihli is subject not merely to floods, but to drought and famine. It possesses curative elements for all these terrible evils. It attempts to reconcile at long last the apparent rival interests of the farmer and the port. The objection may be lodged that there are periods when the rivers are dried up, and that, while rain falls mostly in the summer when irrigation facilities would not

be needed by the farmers, the irrigation basins might be so depleted in the Spring, when the water would be needed, that their irrigation functions would cease. No doubt, however, the basins would first be built on perennial rivers. The new scheme envisages a constant and adequate supply of clear water for the Haiho, and rightly emphasises that the welfare of the Haiho involves the welfare of the whole Province, all the more since under the new scheme it is not to be artificially supplemented in discharging its onerous function as the sole outlet for the flow of the western part of the province. The proposals provide not only a safeguard against flood but a safeguard against cultivation in the large areas to be irrigated.

CHIH LI RIVER COMMISSION.

OPPOSITION TO THE HSI TIEN SCHEME.
PTT AUG 17 1928

IRRIGATION PROPOSAL "IMPRACTICABLE."

(To the Editor of the P. & T.
Times.)

Sir,—As representatives of the Nationalist Government Reconstruction Bureau, in charge of the affairs of the Chihli River Commission, recently taken over by the Reconstruction Bureau, we have read with great interest the report by the Hai Ho Conservancy Board, published in the newspapers, dealing with a proposal for a satisfactory solution of this most difficult river problem in Chihli.

We have discussed the features of the report with our engineer-in-charge and requested him to give us his comments in writing which we have received and which we are enclosing with this letter.

We are ourselves somewhat familiar with the situation and it is our opinion that such radical changes as proposed by the Hai Ho Conservancy especially with reference to the Hsi Tien may endanger the property of a great number of people, seriously disturb the mind of the people in the whole province and create serious trouble, and we therefore wish to ask you to be kind enough to have this letter with its enclosure published in your valuable paper. We believe that the comment of an engineer who has had ten years' experience with the river problems of this province is worth a hearing.

We do not wish to associate ourselves with any of the proposals for an intermediate Hsi Tien scheme. As regards the munda-

tion irrigation proposal, which in fact is only a system of small deltas instead of a large one, we do not think it practicable when considering the established agricultural customs based as these are upon thousands of years of experience fitting the climatic conditions, but we firmly believe that the present system of irrigation should be intensively developed along more modern and much more efficient lines.

Seeing the deplorable condition of the Hai Ho we are on the other hand much interested in the immediate palliative scheme, but recognize that some modification may be required to make the scheme satisfactory to everybody and not only to the Hai Ho Conservancy and we feel confident that such modification can be made.

Thanking you in anticipation.

Yours truly,

K. SHU.

P. T. SHEN.

Tientsin, August 15th.

COMMENT ON THE HAI HO CONSERVANCY REPORT.

In the spring of 1918 the Chinese Government authorized the formation of the Chihli River Commission to draw up a scheme for the betterment of the river system of Chihli chiefly with reference to the flood situation.

For ten years the engineers of the Commission have made surveys, topographic and hydrometric, have studied the river problem and have made plans for improvements



some of which have been carried out. The question of the Hai Ho and how best to safeguard the interests of Tientsin as a port has always received the fullest consideration. It was also necessary, however, to consider the general interests of the people living on the plain and a part of the problem has been to find a solution whereby any conflicting interests could be harmonized.

It has been said that Tientsin as a port exists at the expense of the farmers. It may perhaps be more correct to say that Tientsin has merely made use of an existing condition to develop its port, and that in developing this port the condition inland became for a while slightly improved due to a better draining of the flood waters through the Hai Ho as many bends have been cut and the river section enlarged.

During the last two years, however, the improvements made have been nullified by silt brought in from the upstream rivers and the farmers are no better off now than they were 10 years ago before

the improvements were made. That such a thing could happen was foreseen and it was for this reason that the Chihli River Commission was formed to see what could be done to improve on the condition as a whole.

The Chihli River Commission began its investigation work in July 1918. As the work progressed it became evident that the flood problem with which it was mainly wrestling could be divided into two distinct phases;

- (1) The general flood problem.
- (2) The silt problem.

Although the two are interdependent, the flood problem was found to be mainly a drainage problem. As regards the silt this was found to center chiefly, at least as regards the Hai Ho, around the Yung Ting Ho. It was no new

discovery, but there have been brought to light many important details, not previously known. As the studies of it have not yet been completed it is too soon to announce a satisfactory solution of this problem.

With regard to irrigation it has always been the opinion of the Commission's engineers that it should be developed along the most efficient lines. Taking everything into consideration it was felt, however, that the basic idea underlying the irrigation method followed by the farmers in this province is not wrong in principle and that the crops grown are fairly well suited to fill the needs of the people. In fact the agricultural system is an outcome of centuries of experience based on climatic and geological conditions. It is readily admitted, however, that an improvement upon the present system which will raise the standard of living amongst the farmers is possible. Given better communications the habits of the people will most likely slowly change and with it will follow changes in the method of farming. An intensive improvement upon the present system of irrigation will not hinder such improvement, in fact, it will promote it. The inundation irrigation plan proposed by the Hai Ho Conservancy Board will impose on the people living on a large area of the plain the cultivation of a certain kind of plant which can stand the harsh treatment of being flushed with the sandy silt in the Chihli rivers, if it is possible at all to find such a plant. This seems to me to be a backward step and at the very best will create a condition which will admit of no improvement once it has been taken up.

The Flood Problems.

The engineers of the Chihli River Commission have been too busy with preliminary investigation work and plans for the very

pressing flood problem to have had, so far, much time to spare for irrigation improvement plans. This remains to be done. A study of the present irrigation districts should be made with a view to finding methods whereby they can be improved. They are local problems and can be arranged for as such.

When it comes to improving the flood condition the aspect is different. Here vast areas are involved, scores of hsiens are affected and conflicting interests have to be settled which are out of the question for any particular locality to deal with, however heavily afflicted it is by the flood disaster.

The floods occur during the middle of the second growing season and are hence disastrous to the crops. And not only that. Due to insufficient drainage the water remains on large areas long into the autumn which makes it impossible to plant the winter wheat, harvested in the beginning of June next year. If this crop is lacking in sufficiency, following a year of floods, famine in many districts will result.

The Commission's plan therefore is to restrict the flooded area as much as practicable by greatly improving the drainage. This will at the same time ensure a large area being dried up sufficiently before the middle of October to plant on it winter wheat. Total immunity from floods is impossible to obtain.

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CHIH LI RIVER COMMISSION.

(Continued from page 9.)

There should be no misunderstanding about this.

Viewing the flood problem from this angle it may be of interest to compare figures with those given in the Hai Ho Conservancy's report. I refer to the intermediate scheme of turning the Hsi Tien into a large storage basin for silt and floods for the whole of the Ta Ching Ho system and also for the Yung Ting Ho. At present the Liu Li Ho and the North and South Chu Ma Ho, most important rivers of the Ta Ching Ho, do not enter the Hsi Tien, but have their combined course to the north-east of it.

In the Hai Ho plan an area of from 1450 to 1500 square kilometres will be flooded within the Hsi Tien and approximately 600 large, prosperous villages are involved (2 hsien towns) of which the great majority would have to be evacuated due to the increase in water level of ten feet. An additional area of about 800 square kilometres must also be flooded unless a highly expensive canal is built from Hsi Tien to Tientsin. With a suggested discharge of 400 to 500 m^3 /sec. from Hsi Tien a broad area along the Ta Ching Ho becomes inundated to a depth of 5 to

6 feet on the average to carry the flow. The gauge height at Ti Liu Tu for a discharge of 400 m^3 /sec. is about 6.5 m T.D. and the plain level here on the average 4.5 m T.D. The total area flooded therefore becomes 2200 to 2300 sq. kms. for the best part of the autumn as the total inflow into Hsi Tien from the west will for a long time balance the outflow from Hsi Tien. The whole of this area therefore will be worthless for crops, even reeds, as the depth of water is too

great.

Under the Commission's drainage plan about 2000 square kilometres are flooded during, say, 10 days of maximum flood stage, but they are drained rapidly and at the latter part of September this area has been reduced by a good deal more than 1000 sq. kms. or 1.6 million *mu* on which it will be possible to harvest next spring a wheat crop worth about 8 mill. to 10 mill. dollars.

It is therefore difficult to see the value of the Hai Ho plan altogether apart from the consideration of drowning out numerous villages in the Hsi Tien area. Based on flood experience the villages in the lower parts of Hsi Tien have been built up on mounds high enough to bring the floor of their houses a little above the maximum flood elevation. Nevertheless, these villages will greatly welcome

improved drainage facilities. As regards the cost of the scheme the sum of five million dollars is mentioned. It seems that this should at least be multiplied by four if all the constructional features are to be taken care of and this does not include compensation to the drowned-out villages which will run into a huge sum of money. The length of dyke from Yung Ting Ho, along the Ta Ching Ho and the eastern edge of Hsi Tien as far south as nearly to the Hu Tuo Ho is about 170 kms. From Yung Ting Ho to Hsi Tien, a stretch practically undyked at present, there must be constructed a very strong dyke in order to prevent the combined flow of Yung Ting Ho, Liu Li Ho, and Chu Ma Ho at times exceeding 10,000 m^3 /sec., from spreading eastward over the plain. The destructive effect of this mighty flow confined to a relatively narrow space where villages are numerous can easily

be imagined. At present it spreads shallowly over the plain and enters the Ta Ching Ho valley east of Hsi Tien. It does little harm to the villages.

Along the Hsi Tien where according to the new plan the depth of water will be about seven metres or 23 feet the dyke must be made exceptionally strong and heavily protected against wave action. The free sweep of the wind here is about 30 kms. and with over seven metres depth of water against the dyke the waves with a strong westerly or north westerly wind will exceed two metres. With the necessary free board the dykes will have to be brought up to an elevation of 17 or 18 m. Taku Datum. The length of this high portion will be at least 20 kms. long and to control and protect this part will in itself be an exceedingly difficult proposition. Should it give way then unspeakable calamity befalls the people living to the east. To be reasonably safe this part alone will cost in the neighbourhood of seven or eight million dollars, and even so no guarantee can be had that it will not collapse under extreme conditions, knowing the material with which we have to deal.

As far as the flow through the Hai Ho for deepening it is concerned there will, even under the Commission's drainage plan be water enough to do the necessary scouring. A flow of 700 to 800 m^3 /sec., through the Hsi Ho for a period of, say, ten days and then gradually diminish during the next two or three weeks when the tidal influence again will begin to be felt at Tientsin it from experience known to be long enough to do the work. It seems also, as far as shipping is concerned, that it would be preferable to have a high velocity lasting a short period than to have 400 to