THE TRANSFORMABLE CANAL.

THE FORMER CHIEF ENGINEER OF THE FRENCH COMPANY ADDRESSES THE PRESIDENT.

General Advantages of Wet Over Dry Excavation and Special Applicability of This Method to Work on the Isthmus—Consulting Board Described as Belonging to "Retrograde" Party of Engineering Profession, and Its Report Biassed and Partisan in Spirit—Its Estimates, Based on Exaggerated Unit of Cost, Calculated to Disprove Feasibility of "Transformation"—Best Practical Engineers Favor Dredging Rather Than Dry Digging—Value of Gamboa Lake as Dump and as Power Generator Ignored—Transformation to Lockless Waterway, "Strait of Panama," Compared to Lowering and Widening Street Without Interrupting Traffic—Responsibility for the Huge Gatun Dam—Methods and Machinery.

MR. PRESIDENT: I submitted to you in March of last year a project of construction of the Panama Canal, and you have referred it to the International Consulting Board, which rejected it.

It was based on the principle of reducing to the minimum the excavation in the dry, which offers untold difficulties on the Isthmus, and of employing to its maximum the excavation by floating dredges which disposes of all the Isthmian difficulties, does away with the labor question and preserves there the wonderful qualities of power and cheapness it has everywhere, if the unloading of the scows can be made in a deep body of water close to the point of extraction.

I indicated as the dump in deep water the enormous Gamboa Lake, created by the Gamboa dam in the high Chagres valley, in the very centre of the Isthmus, in close contact with the level where dredges will float and load the scows and easy to connect with this level by flights of small barge locks as are required by the scows.

I wrote to you that if the sea level canal were contemplated at once it should be built by this method, even if an earlier exploitation was out of the question.

I showed how the conditions to be created in order to allow the use of the dredging system could satisfy also within four years the needs of the world's commerce by allowing the opening to traffic at the beginning of the dredging, if the successive levels, to be created for the works of the dredges, were connected with adequate locks for international transit.

This is known as the principle of transformation, which I first presented in 1887.

I gave to you in March last, and with more complete details to the board in September, the technical solutions which allow the inexpensive and gradual elimination of the locks during the process of deepening, which allow the complete independence and reciprocal freedom of the works and of the transit, if the standard channel of 150 feet adopted for the first lock canal is brought to 300 feet or more for the sea level passage. (Page 226, report of the consulting board.)

I showed to the board that, thanks to the extraordinary progress made recently in dredging rock and earth, it could be reasonably contemplated to give not only 300 feet to the sea level passage, but 500, which would create the perfect waterway free from any tide lock, free from any danger of obstruction through slides in the deep cuts, free from any danger to arise from an eventual destruction of the Gamboa dam, thanks to its elimination as a dam, that will result from the system of construction which will raise the bottom of the whole valley of the Chagres above the dam and to the level of its crest on several miles by the dumping of four to six hundred million cubic yards brought by the scows. (Page 234 and following, report of consulting board.)

I termed the invulnerable waterway to be thus created the "Strait of Panama," because, if it is still about three times less wide at the water level than the Bosporus, the strait between Europe and Asia Minor, at Hussein Pacha and at Kawak, it is also about three times larger than the standard Panama Canal hitherto contemplated. It is a free interoceanic waterway of a size intermediate between a canal and a natural strait, and deserves legitimately either denomination.

I profess for several members of the International Consulting Board personal sentiments of friendship, but this cannot prevent me from demonstrating that the scientific spirit has not inspired its studies, so far as the report shows, and that the conclusions they brought forward are in vital places erroneous and misleading.

Before leaving for France next week I am compelled by the sentiment of an inexorable duty to appeal from President Roosevelt badly informed to President Roosevelt better informed, and this high duty I am discharging publicly now.

There are parties in science as there are in politics, and partisan spirit excludes the scientific spirit of experimental induction.

The progressists among engineers are those who want to develop as far as possible the employment of the dredging excavation, transportation and dumping on water, on account of the scientific and experimental fact that this system possesses exclusively marvellous qualities of simplicity, power and cheapness as soon as the proper conditions are created for the works of the dredges and their annexes, as they are provided for in the plans I proposed. Their opponents, the retrogrades, inspired by the prejudices of prolonged habits of mind, are those who want to sustain the excavation by steam shovels and rail transportation, in spite of their marked inferiority in every respect, an inferiority enormously increased by the labor and climatic conditions of the Isthmus.

It is the spirit of the last which has prevailed in the consulting board; it is not the experimental scientific spirit of the first.

It has transformed into mountains the gravel in the path of the hydraulic system; it has transformed into gravel the mountains in the path of the dry system.

EXPERIMENTAL UNIT PRICES OF DREDGING EXAGGERATED BY 300 PER CENT.—INVERSE TREATMENT FOR THE PRICES OF DRY EXCAVATION.

An obvious example of that tendency to ostracize unduly the dredging and to favor the dry digging can be readily gathered from the examination of the unit prices admitted by the consulting board for the only two kinds of works the United States has yet undertaken on the Isthmus, if put next to the cost which results from actual experience.

On pages 395 and 396 of the report is to be found the average cost per cubic yard of removal of the ground in the dry at Culebra. This cost is figured from actual expenses during fifteen months.

Actually the most perfect steam shovels, according to the American ideas, are working at Culebra; no improvement in the price therefore can be hoped from an amelioration of the plant, but a large increase in cost must necessarily happen as the cut will be deepened; the haul to the dumps will be longer and the ceaseless troubles to result from continuous invasions of water will be increased alarmingly.

On page 299 of the report is to be found, on the other hand, the average cost per cubic yard of the removal of the ground in the wet system. The cost of actual dredging in the Colon harbor is seven cents and in the Panama harbor eight cents. This results from data bearing on an excavation in the wet of an importance of the same order as that made by dry process.

Contrary to what happened at Culebra, the plant with which the work is done is antiquated; it is twenty years old and has been idle for sixteen years. Machines of the same type are in current use now which excavate, transport and dump twice as much earth with the same expense.

If the United States had renewed the dredging plant in Panama and in Colon the average actual cost of the excavation by dredging there would have been 3.75 cents instead of 7.5 cents per cubic yard.

These experimental data being known, as well as their rational consequences about the future prices to be admitted as units, let us see what interpretation the consulting board has given to them.

On page 419 of the report is the schedule of unit prices adopted by the consulting board.

It shows that the excavation in the dry at Culebra down to high tide level is estimated at 80 cents a cubic yard, and that the dredging in Colon and Panama harbors is estimated at 15 cents (mud and sand).

It results from these figures that an increase of 12 per cent. over the cost resulting from actual experience of digging in the dry at Culebra is deemed by the consulting board sufficient to cover the certain and important increase of expenses to result from the deepening, and that an increase of 100 per cent. over the cost resulting from actual experience of dredging at Colon and Panama is loaded upon the wet system without any possible rational justification, when, on the contrary, the probable cost ought to have been placed at one-half of the one actually obtained with antiquated dredges.

In fact, the price of dredging is 300 per cent. above what it will certainly be at Colon and Panama.

The characteristic spirit which inspired such a treatment of the experimental data cannot find an excuse in the ignorance of the real condition of the actual dredging. There are two most important statements on this point.

On page 299 of the report Mr. Maltby, the engineer in charge of the division of dredging, after giving the actual price of seven cents in Colon, is quoted as saying: "We can do it for much less with a modern dredge."

It will be seen on page 304 of the report that Mr. Welcher, delegate of the Dutch Government, declared that he had dredged this year in Holland with a transportation of four or four and one-half miles for 3.66 cents a cubic yard.

I give this example of the unequal treatment of the excavation in the dry and in the wet to show how easy it is to turn the back to the true direction, if the austerity of the scientific spirit does not maintain rigidly the alignment shown by experimental facts and if partisan spirit of preconceived ideas is allowed to exert its misleading influence.

EXPERIMENTAL UNIT PRICES OF SUBAQUEOUS ROCK EXCAVATION EXAGGERATED BY 400 PER CENT.

I did not exhibit the above example on account of its importance for the selection of the proper solution. Let us now take a case entirely similar but of vital bearing on the adoption of the logical and scientific solution of the Panama problem, the under water rock extraction.

In the list of the standard prices of the first Isthmian Canal Commission, to be found in the report of 1901, the extraction of submerged rock is fixed at $4.75 a cubic yard.

Such a price would make the cost of the proposition of dredging the greater part of the Panama Canal entirely prohibitive. I explained (pages 232 and 239 of the report) that this difficulty had been wholly wiped out by the new methods actually in use in many great public works.

The best of these methods, the Lobnitz system, invented eighteen years ago and developed for the needs of the Suez Canal, enables this company to remove the rock at 73 cents per cubic yard, that is to say, at 15 per cent. of the price admitted by the Isthmian Canal Commission of 1901. It is known that this price itself is much higher than it should be owing to the very long distance of transportation of the spoil and to the time lost in dredging due to the passage of ships. The records of the Suez Canal show that the rock is made dredgable for 32 cents, and this would be brought down to 25 cents (p. 239 of the report) by suppressing the interruptions due to transit. (Report of the Commission Consultative Internationale de Travaux du Canal de Suez—Reunion du 8 Nov., 1904—Rapport de l'Ingénieur en Chef de la Compagnie.)

But the Suez Canal is not the only witness the board could consult on the cheapness of the new method of subaqueous rock extraction.

On page 255 of the report of the consulting board Mr. Hunter, chief engineer of the Manchester Ship Canal, is quoted as having spoken of several millions of cubic yards to be removed in the Manchester Ship Canal, at an ultimate depth of 29 feet, and as having said that "the cost, figured according to a certain method which has been adopted, would be just under 50 cents a yard (Lobnitz method)." The Manchester canal rock is hard, much more so than that of the Culebra cut in average. With the Lobnitz method it does not cost any more to break the rock at a depth of 50 feet than at a depth of 29. About half of its cost is the generation of power by steam, which will disappear with the gratuitous electrical energy generated by the falls of the Gamboa Lake, according to my plan.

This was the most vital question submitted to the board, one of commanding importance. It must have been discussed very much in the board, and it is a most singular fact that the quotation above is the only one in the report of the board which refers to the price of subaqueous rock extraction by the new method. Nothing can be discovered either in the proceedings or in the appendices of what Mr. Quellennec, consulting engineer of the Suez Canal, member of the board, must have said and written on this point, or of what Mr. Hunter, chief engineer of the Manchester Ship Canal, member of the board, must have said and written on the same point.

On page 380 of the report there is a most explicit statement which certifies that these capital discussions, of which no trace remains in the report, have really taken place, as it is natural to suppose. During Mr. Wallace's testimony the former chief engineer of the Panama Canal said:

> So far as the excavating of rock under water I concerned, there is one process that has not been touched upon in any of these reports, but I think Mr. Bunau-Varilla referred to it, and that was the breaking of the rock by what is called "chisel work."
>
> Mr. Hunter—You mean the Lobnitz system?
>
> Mr. Wallace—I do not know what you call it.
>
> Mr. Hunter—You perhaps need not enlarge upon that. We have discussed that at great length here. It is a process with which Mr. Quellennec and I both happen to be extremely familiar.

What can explain the most extraordinary fact that no traces of the discussions on this vital subject, thus alluded to, can be found in the proceedings or in the appendices of the report? It is not certainly the sincerity of the scientific spirit, nor the desire to furnish the broadest justification to the conclusions reached, that could explain the elimination from the records of the arguments brought in these extensive discussions.

Nothing has remained of the light cast by the experience of the chief engineers of the two greatest canals in the world to enlighten those who had charge of selecting the best solution of the momentous problem confronting the United States. Nothing remains but the simple fact that the consulting board has adopted $2.50 as the price of subaqueous rock extraction by dredge, and $1.50 of it is mined in the dry and subsequently excavated by dredge. (Page 419 of the report.)

A figure of $2.50 for such a work is still more erroneous and still more misleading than the figure inscribed in the schedule of prices for dredging mud and sand at Colon and Panama.

In the former case the exaggeration was 300 per cent. above experimental reality; in this it is 400 per cent. above it at least, and probably 500 to 600 per cent.

It is not the price corresponding to the antiquated and obsolete system, $4.75. It is not this price, which certainly was adopted by the first commission only because it played an insignificant part in their project. It is not, on the other hand, the price of the new system, 50 cents; it is a hybrid, illogical, irrational, misleading price, the result of a contest between progress and regress; a compromise between two things that do not admit compromise, but a compromise which presents the grave inconvenience of basing misleading, erroneous estimates which have been invoked as incontestable truth to eliminate the transformation system.

It was a compromise probably generated by a desire for harmony, but which has been used as a deadly weapon to fight the principle of transformation by dredge of the high level canal to the sea level water way and to conceal its superior, its inestimable qualities.

The estimate of the cost of transformation based on this erroneous and misleading unit price is to be found in Appendix P (pages 411 to 413 of the report). If the transformation is made in order to get the narrow sea level canal 150 feet wide (except at Culebra, 200 feet) this estimate reaches, according to the consulting board, $208,985,000.

If the transformation is made in order to get a 300 foot wide channel at sea level the cost is estimated at $316,620,000, according to the consulting board.

The substitution of the price of 50 cents per cubic yard for the exorbitant and unjustified price of under water rock extraction of $2.50 and $1.50 would reduce the cost in the first case to $105,885,000, in and the second to $158,120,000.

No estimates are made for the 500 foot channel for the "Strait of Panama," but it may be fairly calculated, as resulting from the figures above, that every increase of 100 feet will cost $50,000,000, and that the transformation to the strait would reach $250,000,000; that is to say, with the usual addition of 20 per cent. covering the unforeseen, a total of $300,000,000.

This is precisely the figure I arrived at by another method of calculation (page 236 of the report). It represents a maximum of the cost of transformation of the high level canal to the Strait of Panama, and certainly is more than twice higher than will be the practical cost, thanks to the marvellous conditions afforded by the use of the Gamboa Lake as a dump and of its falls for generating the power, and to the average softness of the Culebra central mass. (See the opinion of Mr. Stevens, page 289 of the report.)

CONSEQUENCES OF THE MISLEADING ESTIMATES OF THE COST OF TRANSFORMATION.

The same spirit of unbalanced justice has led to neglect of the experimental data of the dry excavation at Culebra and of the wet excavation at Colon and Panama. It has added 300 per cent., as one unjustified surplus, to the real cost of excavation in the wet, against 12 per cent. to the cost in the dry, when this would justify much more; now it adds 400 per cent. surplus to the actual cost of subaqueous rock dredging, as it is shown in the Suez and Manchester Ship canals, as well as in many other great harbor works in the world, including those of Japan, which has purchased successively seven Lobnitz plants in five years.

Thus, thanks to this simple and apparently insignificant error in a unit price estimated, is shelved the powerful and economic method of building the Panama Canal, the precious method which allows the nearly immediate obtention of the passage (within four years), and later on, in a maximum of twenty years, and most probably within twelve years, the obtention of the invulnerable, broad, deep and lockless "Strait of Panama," which no earthquake, no act of war, no crime of evildoers, no accident can cripple for any length of time or can render unserviceable, as would be the tide locked, narrow, shallow sea level canal, or the perpetual high level lock canal, perhaps at the moment when its strategic character will make it indispensable.

EFFORTS TO CLOUD THE TRANSFORMATION PROJECT WITH IMAGINARY DIFFICULTIES.

But the partisan spirit has not limited itself to recommend the adoption of unit prices so absolutely in conflict with actual experience. It has tried to cloud the transformation with imaginary and not existing difficulties.

It is obvious that if a street has to be doubled in width and lowered at the same time the circulation will not be trouble one instant during the transformation. The excavating and paving will be done on the additional half without interrupting the circulation where it passes actually. When the new way is made circulation is deviated into it, and the previous way is then excavated and paved at the new level in its turn.

This is the simple system dictated by common sense, which insures the constant independence of the transit and of the works in the successive depressions of the summit channel. It has been minutely described, page 226 and following of the report, and demonstrated unobjectionable, if the standard width of 150 feet necessary for navigation is at least doubled and brought to 300 feet or more for the sea level passage. It has been shown also that the navigation channel would be contracted if such increase was not admitted.

This is true whatever may be the lateral slopes of the cut, steep or not steep.

The discussion made on this point by the consulting board, and to be found at the bottom of page 32, is, I regret to say, a biassed one. It does not state clearly on what hypothesis of final width it is based, but the fact that the steepness of the side slopes is taken into account shows that the board had committed itself to the hypothesis of no increase of width; that is to say, to a hypothesis which I had declared to be defective, that I had recommended not to adopt.

What can be said of a discussion which for the confident reader appears to bear on the proposition itself, but which does not, which bears on features that the proposition excludes? What can be said of a discussion so presented as to suggest that the objections applying to the feature excluded by the proposition applied to the proposition itself? The least that can be said is that such an oblique manœuvre is entirely incompatible with the clear sincerity of a scientific discussion.

UNEXPLAINABLE SILENCE OF THE REPORT OF THE CONSULTING BOARD ON THE PROPOSAL LAID BEFORE THEM TO BUILD A LOCKLESS WATERWAY: "THE STRAIT OF PANAMA."

It is surprising that the consulting board in its discussion of the system I proposed has remained silent on the important chapter of the "Strait of Panama," which was submitted to them and had provoked so much public attention and discussion.

The reason for this silence seems to be clear in view of what has just been stated. As the objections formulated by the board against the transformation are based on the unexpressed admission that the same standard width would be kept for the high level lock canal and for the sea level passage, contrary to my proposition, it would not have been possible to keep these objections on their feet with such an obvious increase of width as that of 150 feet to 500 feet.

It would have been necessary to concede that the difficulties pointed out for the transit, and which for a confident reader are supposed to apply to any conditions of transformation, are really vanishing with such an increase of width. It would have been necessary to state frankly that the fixation of the sea level channel at 300 feet or more liberated entirely the transit from any interference by the works and reciprocally.

The maintenance of the cloud of difficulties on the transformation was the obvious aim of a biassed discussion, and the most important part of the project submitted to the board was left out of consideration for the purpose of keeping the cloud in its place, in order to lead everybody to think of the transformation as of something loaded with dangers for the transit.

Outside of the imaginary interference with traffic the other objections are without foundation.

I do not want to extend this already too cong letter. However, I wish to state that I challenge any one to prove, with the appendices of the report in hand, before unprejudiced and competent engineers:

1. That the transformation requires greater lockages than would be needed with locks made without the idea of transformation in view.

2. That the upstream gates of the upper locks will present special difficulties of operation. This is dismissed by the very simple reason that they will be identical with the downstream gates of the same locks as will be projected without any idea of transformation.

3. That there will be any suspension of passage by either one of the twin locks, whether isolated or in flight, during all the transformation if it is so desired. This one fact would require an explanation which I did not give because I thought the most ordinary engineers would see at once how to do it.

4. That the work of constructing the locks with the same dimensions as those of the minority report will take more than four years. This can be established by the figures of the minority report, if the difference in the amount of excavation between the sites I indicated and that of the Gatun site is considered. (Pages 245 and 84 of the report.)

OPINION OF THE CONSULTING ENGINEER OF THE SUEZ CANAL ABOUT THE SUPPOSED DIFFICULTIES AND COST OF THE TRANSFORMATION.

The objections raised against the principle of transformation on the grounds of a supposed cost which is erroneous and of supposed difficulties which do not exist have been judged in the following way by Mr. Quellennec, consulting engineer of the Suez Canal. (Page 139 of the report):

> I think also that the transformation of a high level lock canal into a sea level canal is a feasible operation and not presenting great difficulties if certain measures are taken at the time of construction, especially with reference to the disposition of the upstream gates. I think also that such a transformation can be made at less cost than is shown by the estimates presented by the Lock Canal Committee for such transformation.
>
> To conclude, I prefer a sea level canal and I think a lock canal should be considered only as a temporary one, and so constructed that it may be easily turned into a sea level canal.

This expression of scientific views covers and ratifies the whole principle which I have submitted.

It is in strict conformity with the modern principles of enlightened engineering which a biassed and unfair trial can defeat but momentarily.

THESE ERRONEOUS AND MISLEADING ESTIMATES OF THE TRANSFORMATION CANNOT BE SHELTERED AGAINST THE JUDGMENT OF A NEAR FUTURE.

The obviously wilful neglect of the knowledge acquired now of the real cost of subaqueous rock extraction, the production, without stating their limits, of objections which would apply only to this kind of transformation, which would aim at a narrow sea level channel less than 300 feet in width, has been probably deemed a dangerous fact for a near future by those who use such arguments in this great debate.

In order to avoid the severity of the judgment of the scientific world in a short space of time, the recommendation not to adopt the principle of transformation is followed by these lines (page 413 of the report):

> It is believed that in the future methods and appliances for the work required for depressing the canal will be improved to such an extent as to greatly diminish the cost and time of the transformation.

The positiveness of this assertion establishes that these methods and appliances have not to be discovered. They exist now, but the consulting board has decided, with the exception of Mr. Quellennec, to disregard them. It is a poor shelter that such a reserve affords in view of the minuteness of the description of the methods made (pages 224 and following of the report).

THE INSTABILITY OF THE HUGE GATUN DAM.

If I have a right of appeal in what concerns the unjustifiable trial to which my proposition has been submitted, it might seem improper to throw any criticism on another proposition.

However, I am bound to decline any responsibility for the employment that has been made in the erection of the huge Gatun dam of the method I invented and described for the small Bohio dam (page 213 of the report), and consisting in elevating and depositing with centrifugal pumps on the dam site enormous quantities of dredged material.

By a strange forgetfulness of the rules protecting the intellectual property this method has been adopted without any mention of its origin. (See pages 213 for the Bohio dam and pages 69 and 304 for the Gatun dam.)

However, if this method applies admirably as I projected it to the conditions of a dam at Bohio, 1,500 feet long at the crest, resting on a ground 30 feet above the sea (except in the bed of the river proper, where it reaches sea level) and holding the water at a normal level of 50 feet, with a possible rise to 60, I do not think it applies to a dam at Gatun, 7,700 feet long at the crest, resting on a ground nearly at sea level (20 feet in the river bed) and holding back the water at 85 feet altitude.

I consider such a structure as a highly dangerous one in view of the softness of its mass, if one takes into account the light earthquakes which are frequent and must be constantly expected on the Isthmus. They often cause the fall of glasses on the tables, and such inclinations of the ground will determine successive compressions and depressions in the soft and extremely long mass of the dam, which will cause ruptures of continuity and immediate washout.

As, in case of such a terrible accident, the name of the originator of the method of construction, though not mentioned now, would not fail to appear conspicuously, I beg to state emphatically that I expressly disapprove from a scientific standpoint the use of my method—very good for a small, low and temporary earth dam, highly dangerous for a huge dam of more than twenty million cubic yards in volume, in a country frequently shaken by earthquakes.

CONCLUSION.

I consider that the correct and unprejudiced interpretation of the material facts registered in the appendices of the report of the consulting board irresistibly demonstrate the veracity of the principles and the conservatism of the figures I stated.

In six months, April to September, 1905 (page 296 of the report), Mr. Maltby, with old obsolete dredges working with one single crew, removed 600,000 cubic yards at an average price of 7.5 cents and almost without labor.

At Culebra, in the dry (pages 395 and 396 of the report), during the same period, with an extensive force of laborers, with the best steam shovels known, the excavation reached 450,000 cubic yards.

If the dredges had been modern and not obsolete, if they had been worked with two crews, the excavation with an insignificant number of men would have been 2,400,000 cubic yards, at an expense of 3.75 cents a cubic yard, against 450,000 at Culebra, with an enormous force of laborers, at an expense of 71 cents, and which would have been still 60 cents if we deduct the cost of mining to obtain conditions of ground entirely similar.

These figures ought to open the eyes that are not wilfully and purposely closed; they show how moderate was my contention that dredging is three times more powerful and three times more economical than dry excavation (page 239 of the report), when we find dredging to be actually eight times more economical, and bound to be sixteen times so soon as modern ladder dredges will work.

These capital facts cannot be dismissed by the objection that the ground is mud and sand in Panama and cannot compare with the Culebra ground. The powerful dredges of nowadays do not necessitate distinction between different kinds of dredgable ground, only rock has to be made dredgable by a previous operation; their work is equally cheap (if properly constructed) at 20, 40 or 50 feet depth.

I consider that the operation of excavating rock under water is demonstrated in the appendices to be a cheap and easy operation by the Lobnitz system.

I consider that no sincere and scientific objection has been, or can be, raised against the solution insuring the complete independence of the work and of the transit, and insuring the easy, cheap elimination of the locks, whether single or in flight, without interrupting passage on either of the twin locks during the process.

I consider that the figures of time I advanced for cutting through Culebra (the 20,000,000 cubic yards passage for a 130-foot summit channel), for erecting the locks, building the Bohio and Gamboa dams and opening to navigation within four years, are based on more conservative elements than those admitted by the minority for the construction of its 85-foot level summit in seven and a half years, with a 53,800,000 cubic yard cut through Culebra and a huge dam at Gatun of more than 20,000,000 cubic yards volume. (Pages 84 and 85 of the report for the minority report, and 245 for my proposition.)

I consider, however, that whatever summit level may be adopted, the transformation will be insured, with all its qualities, if the dam for storing water is erected at Gamboa and if the precautions in the designs of the locks I have described (page 222 and following) are respected.

By such a precaution, entailing no important expense, after the opening of the high level lock canal, when the exact cost of removal by dredge of earth and rock has enlightened everybody, the transformation will be decided probably with a still larger sea level width than the one I propose now of 500 feet for the "Strait of Panama."

I do not hesitate to state that the digging in the dry down to 85 feet, through the central mass, will retard the opening of the waterway much more than is expected; that this question is the only one that presents a real gravity, and that, therefore, a higher passage at 130 is recommendable by all considerations of logic and experience.

In addressing to you, Mr. President, this respectful and public appeal, I serve, I think, for the last time, the great cause for which my country has made so many sacrifices, in blood and in gold, and for which its genius actually deserves the credit of having generously and brilliantly contributed to the progress of science and mankind.

In defending the solution which results from the experience I acquired at the head of the works of the old Panama company, the solution of what has been called for centuries the "mystery of the Isthmus", in promoting the realization for the benefit of the United States and of the world of an artificial Bosporus between North and South America (yesterday a dream; to-day a reality), I serve also a great moral interest now common to America and France, as my countrymen have already served similar ones, at the two other great landmarks of the history of the United States—the war of independence and the purchase of Louisiana. I remain thus faithful to the political and scientific traditions of the two great republics of the Old and of the New World.

I am, Mr. President, with great respect, your very obedient servant,

PHILIPPE BUNAU-VARILLA.

NEW YORK, March 5.

BOYCOTT

There is a line of boycott on The **Square Deal** magazine because it publishes facts about Labor Union and other trusts.

If your news-stand does not supply The **Square Deal** you may know how they are trying to suppress it. Transfer your business to the newsdealer American enough to furnish what the people demand without regard to the orders of the labor trust not to sell it.

PASSED THE MONEY ALONG.

Hot Mixup Between Women in Store Ends in Pocket Picking Arrest.

A floorwalker in a Fourteenth street department store ran into the street yesterday afternoon, yelling for the police. He found a pair of cops and hustled them into the store. Two women, in front of a ribbon counter, were clutching at each other's hair and mixing it up faster and faster.

The policemen untangled them and gave heed to the complaint of Mrs. Libby Kreitz of 317 Madison street. She said she was looking at ribbon samples when she felt a tug at her handbag. She glanced up quickly and saw a woman slip some paper money to a girl. Mrs. Kreitz looked in her handbag, saw her money was gone, and promptly grabbed the woman beside her.

The police arrested the accused woman and locked her up in the Mercer street station house. She said she was Mrs. Fanny McMahon of 140 Waverley place. The girl who received the money, Mrs. Kreitz declared, got away.

The Seagoers.

On the passenger list of the North German Lloyd Line steamer Kaiser Wilhelm der Grosse, which sails to-day for Bremen, are:

Miss Edna May, Miss Jane May, General Director S. Bergmann of Berlin, Mr. and Mrs. Elisha Dyer, Mrs. F. S. Leclerq, Mrs. George H. Macy, Miss C. Lucile Potter and W. E. Wightman.

Aboard the Cunarder Carpathia, which sails to-day for Mediterranean ports, are:

Mrs. F. C. Andrews, Mrs. J. P. Gordy, Mr. and Mrs. John Gilfoyle, Mrs. Harold Nathan, Mrs. A. Ogden, James Slater, Brig.-Gen. James N. Wheelan, Nelson B. Williams, Otis N. Williams and W. Hugh Walker.

Among the passengers who arrived on the White Star Line steamer Republic, from Alexandria and Naples, yesterday were:

W. F. Alloway, Vernon Andrews, D. M. Chrisholm, D. W. Corbett, Charles H. Hammond, Campbell Reaves, William G. Cheney, W. H. Derbyshire and R. Gordon Macdonald.

On the French Line steamer La Gascogne, from Havre, arrived yesterday:

George Bakmeteff, Russian Ambassador to Tokio; A. Gonband, D. Thomas Leon Doit, J. Iola and V. Iola.

Steward Dived Off the Republic.

William Taylor, a steward on the White Star line steamer Republic, which arrived yesterday from Naples and Alexandria, jumped overboard on February 2 when the boat was 500 miles west of Gibraltar. He had been acting oddly and had been locked in a stateroom, but broke out, ran to the port side of the second deck forward and jumped over the rail. His dive was seen by many of the passengers. The ship was swung about almost within her own length. A boat was lowered and picked him up. He was brought in and is stil under confinement.

NASSAU TO HAVE A GRAFT HUNT

SUPERVISORS WILL LOOK INTO CHARGES OF CORRUPTION.

Investigating Committee Appointed—Will Ask Why It Cost the County $46,000 to Publish Tax Sale List—Wallace Says List Was Padded Ten Times Over.

The Board of Supervisors of Nassau county decided yesterday in executive session to investigate the charges of graft and collusion made against certain county officials, and will arrange the details by resolution the first of next week. It is probable that the three supervisors, William H. Jones of Oyster Bay, Edwin C. Willets of North Hempstead and former County Judge Robert Seabury of Hempstead will sit as a committee in the court house in Mineola, where all who have made any public charges of graft, collusion or kindred sins against county officials will be examined. Halstead Scudder will conduct the investigation. A record has been kept of public utterances, whether in court proceedings, open letters or words spoken by those who have charged collusion and graft, and all will be called.

The trouble started in 1902, when John C. Kennahan, owner of the Oyster Bay *Pilot* and Fred Crandall, owner of the Roslyn *News*, got the job of publishing the list of properties for sale for non-payment of taxes. County Treasurer Charles F. Lewis gave out the list, and it was published by the papers named at an expense of about $46,000. Former Assemblyman George Wallace of Freeport, whose own paper, the *South Side Observer*, was a candidate for the tax sale and did not get it, charged that the list was padded at least ten times and that the sale could have been conducted at an expense for advertising of about $5,000. He made sensational charges against County Treasurer Lewis which were the basis of a libel suit, which was dropped before trial.

Former Congressman Townsend Scudder, who resides in the town of Oyster Bay, charged that Kennahan received entirely too much for advertising the tax sale, and has started quite recently a taxpayer's suit to compel restitution, naming in his papers as parties to what he characterizes as collusion against the county, County Treasurer Lewis, Supervisor William H. Jones of Oyster Bay, Supervisor Edwin C. Willets of North Hempstead and former Supervisor Smith Cox of Hempstead. In his suit Mr. Scudder does not mention the money paid to Fred Crandall for the 1902 tax sale, but singles out Kennahan, who received exactly the same amount, and alleges that the taxpayers were charged at least $18,000 too much in that advertising bill, by reason of the list having been padded beyond all reason.

Townsend Scudder said yesterday:

"I am overjoyed and delighted to hear of such an invetstigation, if it is to be taken up and conducted properly, fairly and in good faith. If the investigators carefully compare the tax sale list of Nassau for 1902 with the lists of other counties in New York State, they will surely find that Nassau published thousands and thousands of words not published by other counties in their tax sale lists and which were entirely unnecessary to be published. If the comparison of the list with the lists of a majority of those of other counties of the State is careful, it will be discovered that wonderful improvements may be made in the manner of advertising tax sales in Nassau."

FALL RIVER LINE FAVORED.

Protest to Interstate Commerce Commission of Railroad Favoritism.

Martin H. Knapp and Charles N. Prouty of the Interstate Commerce Commission gave a hearing in the Federal Building yesterday on the charges that the trunk lines running into New York were giving low through rates to the Fall River Line, in discrimination against the other steamship companies.

The Enterprise Transportation Company, which runs what is known as the New Fall River Line, is the complainant. It names the New York Central, Pennsylvania, Delaware, Lackawanna and Western, Erie and Lehigh Valley as the roads which have combined to give the old Fall River Line a monopoly of through traffic from New England to all Western points.

A protest against Commissioner Prouty, on the ground that he had said in a speech that the New York, New Haven and Hartford Railroad acquired an unjust monopoly of the carrying trade in its territory, was overruled by Presiding Commissioner Knapp.

George W. Brady, general manager of the Enterprise Transportation Company, was the first witness. He said that his line ran three boats between Fall River and New York and carried the products of eighty-five out of ninety-two of the big cotton mills in Fall River. Their rate was two cents per 100 pounds lower on local freight to New York than the old line's rate, and they made a good profit at that. But on the through business to Western points the old line was able to underbid it 10 to 15 cents per 100 through its arrangement with the trunk lines.

It was the same way with the passenger traffic, he said. His line made money carrying passengers at $1 a head to New York, where the Fall River Line charged $2 and $3. The older line was again able to scoop the through business.

George D. Dixon, freight traffic manager for the Pennsylvania, was the first railroad man called to testify.

"In the first place," explained Mr. Dixon, "we have been getting freight and passengers for years from the Fall River Line, which was first in the field. We have had the same agreement on through traffic with that company that the other roads have. As for admitting any other steamship company to the same rates, that would mean admitting all, thus giving us a flood of often undesirable freight. From the Fall River Line we are getting all the freight we believe we can ever get from New England."

F. L. Pomeroy of the New York Central and Traffic Manager Janis of the Lehigh gave testimony along the same line.

Commissioner Knapp adjourned the hearing at 3 o'clock. A report will be prepared and forwarded to Washington, embodying the commission's recommendations in the case. Commissioner Knapp said several times at the hearing that he could see no evidence of violation of the law.

H. H. ROGERS TO ANSWER

If the Missouri Court on Rehearing Decides That Answers Can Be Exacted.

Supreme Court Justice Gildersleeve adjourned yesterday to March 26 the hearing on the application for an order compelling Henry H. Rogers to answer certain questions put to him at the recent hearing in connection with the suit brought by the State of Missouri against the Standard Oil Company. The cause of the adjournment was that the company has applied for a reargument of the motion in Missouri, where the Supreme Court has decided in a local case that the same questions asked here of Mr. Rogers are relevant and must be answered.

W. V. Rowe, counsel for Mr. Rogers, said in court that, speaking as the mouthpiece of Mr. Rogers, he was prepared to inform Justice Gildersleeve and Lawyer Wollman, who represents Attorney-General Hadley of Missouri here, that Mr. Rogers would positively answer the questions relating to the transfers of stock of the Standard and its subsidiary companies if the Supreme Court of Missouri finally decided that they must be answered. Mr. Rowe said that Mr. Rogers's refusals to answer had been made on the advice of counsel, in the belief that he was within his rights.

Lawyer Wollman said that if Mr. Rowe would go on record to this effect he would consent to an adjournment. As the decision of the Missouri court is looked for on March 23, Justice Gildersleeve set the hearing for the 26th.

My repeat orders are proof positive that my cigars are what I claim them to be.

Argue as you may as to what I can or cannot do, say what you may as to why men order their first hundred cigars of me, you cannot get around the evidence that the repeat orders offer.

That evidence can be construed only in one way—that every man who reorders has tried my cigars, proved them and found that I do as I say.

I have had over seven hundred of these repeat orders in one week, requiring over one hundred thousand cigars to fill them. Isn't that proof positive that my cigars are better than my advertising?

When thousands of other men have tried my cigars and liked them sufficiently well to go to the trouble of reordering from me, isn't it possible that you will appreciate both quality of cigar and economy in ordering from me?

That there may be no risk to you in trying the cigars I make YOU the following offer:

MY OFFER IS: I will, upon request, send one hundred Shivers' Panatela Cigars on approval to a reader of THE SUN, express prepaid. He may smoke ten cigars and return the remaining ninety at my expense if he is not pleased with them; if he is pleased, and keeps them, he agrees to remit the price, $5.00, within ten days.

Shivers' Panatela EXACT SIZE AND SHAPE

Simply enclose business card, or give personal references, and state whether mild, medium or strong cigars are wanted.

HERBERT D. SHIVERS,
913 Filbert Street, Philadelphia, Pa.

ALDERMEN GET COUNSEL.

Bainbridge Colby to Help Investigate Street Cleaning Department.

The committee appointed by the Board of Aldermen to investigate the Street Cleaning Department met yesterday at the City Hall and selected for counsel Bainbridge Colby. It is understood that he will accept. Mr. Colby is the Republican leader of the Twenty-ninth Assembly district. The committee will begin its inquiry on March 14, at 10:30 A. M., in the Aldermen's chamber.

SPENT $50 WITH DOCTORS

Got Barber's Itch From Shaving—Worse Under Doctors' Care—Tried Everything and Was Discouraged—Railroad Official Cannot Praise Cuticura Too Much

CURED BY ONE SET OF CUTICURA—COST $1

"I want to send you a word of thanks for what the wonderful Cuticura Remedies have done for me. I got shaved and got barber's itch, and doctored with my own doctor; but it got worse all the time. I spent in all about fifty dollars with doctors, but still it got worse. A friend of mine wanted me to try the Cuticura Remedies. As I had tried everything, I was discouraged. I bought one set of the Cuticura Remedies (Soap, Ointment, and Pills, cost $1.00) and they cured me entirely, so I cannot praise them too much. I would be willing to do most anything for the promotion of a cause like the Cuticura Remedies. They are wonderful, and I have recommended them to every one where occasion demanded it. I think every family should know about the Cuticura Remedies where they have children."

Allen Ridgway,
Station Master, The Central Railroad Company of New Jersey,
Oct. 2, 1905. Barnegat Station, N. J.

"BEST IN MARKET"

Are Cuticura Soap and Ointment

"Herewith I express to you my most sincere thanks for the wonderful cure of the scalp of my child by means of the Cuticura Remedies. They are the best Soap and Ointment ever sold in the market." Mrs. M. Neuner,
1206 E. Eager St.,
June 21, 1905. Baltimore, Md.

Complete External and Internal Treatment for every Humor, from Pimples to Scrofula, from Infancy to Age, consisting of Cuticura Soap, 25c., Ointment, 50c., Resolvent, 50c. (in form of Chocolate Coated Pills, 25c. per vial of 60), may be had of all druggists. A single set often cures the most distressing cases when all else fails. Potter Drug & Chem. Corp., Sole Props., Boston, Mass. Mailed Free, "How to Cure Torturing, Disfiguring Humors," and "The Great Skin Book."

TYPEWRITERS.

RENTS SELLS TYPEWRITERS All Makes. Lowest Prices. ANY Style; Rebuilt; Guaranteed; The Typewriter's Exchange; 1½ Barclay St. Telephone 1131 Cortlandt.

TYPEWRITERS—All standard makes rented and kept in order; ribbons free; machines sold from 20 to 50 per cent. less than manufacturers' prices. F. S. WEBSTER CO., 10 Park Place. Telephone, 8570 Cortlandt.

TYPEWRITERS 6 months' rent applied on purchase. General Type. Ex., 243 B'way.

TYPEWRITERS RENTED—All makes; all prices. A. W. M. CO., 343 Broadway. 'Phone 4860 Franklin.

FOR SALE.

SAFES—New and second hand, of all kinds and makes; safes bought, exchanged and repaired. YORK SAFE & LOCK CO., formerly J. M. Mossman. 72 Maiden Lane. Tel. 1423 John.

SAFES Stiffel & Freeman Standard Safes. Large stock of second hand safes. Safes bought, moved, repaired. REYNOLDS & HEIBERGER, Agents, 78 Duane St.

DESKS—Rolltop, partitions, railings, tables, safes letter presses, counters, shelving; stores, offices fitted; 350 doz. chairs. FINN BROS., 28-32 Centre.

LOST, FOUND AND REWARDS.

LOST—$1000 NORTHERN PACIFIC (C. B. & Q. JOINT) 4% BOND No. 75655; $1000 LONG ISLAND R. R. 4% BOND No. 14563M. A LIBERAL REWARD WILL BE PAID FOR THEIR RETURN TO C. B. RICHARD & CO., 31 Broadway, New York City.

HELP WANTED—FEMALE.

EXPERIENCED GIRLS on pocketbooks and case making; also girl to pack and keep stock book. KIGGINS TOOKER, 125 William st.

UMBRELLAS—Tippers wanted on plain parasols and silk umbrellas. ALLISON & LAMSON, 5 East 17th st.

HELP WANTED—MALE.

COMPOSITORS, stone hands and make-up men, linotype and monotype keyboard operators and machinists wanted for permanent positions in the large book and job offices of New York city; highest wages paid to competent men willing to work in "open shops." Call or address, giving as reference former employer, TYPOTHETÆ OF THE CITY OF NEW YORK, Room 1320, 320 Broadway, New York, N. Y.

AUTOMOBILE SCHOOLS OF AMERICA.
Largest private school system in world. Day or night; road and repair work on four-cylinder cars only. Can place 100 graduates at $30 to $40 weekly.
WRITE FOR PARTICULARS.
742 7TH AV. PHONE, 3531—COL. NEW YORK.

LINEMEN—A few independent, first class, experienced electric light linemen to work on the open-shop plan, and to take the place of linemen who went out five months ago, asking exorbitant wages. We guarantee that linemen coming here will not be interfered with, several linemen having been at work here steadily for over two months. Wages $2.75 per day, nine hours, straight time. Time and one-half for overtime and holidays. Good board here, $5 per week. Fare to Wilkes-barre will be refunded on first pay day. Address or notify WILKES-BARRE GAS & ELECTRIC COMPANY, Wilkes-Barre, Pa.

WANTED—Two well educated men of business ability to represent us outside of New York city; fine opportunity for industrious men. Call or write, DODD, MEAD & COMPANY, 1 West 35th st., New York city; reference required.

WANTED—Two floor and two planer hands on heavy work; steady work and good wages; no trouble; only first-class men wanted; state wages and experience. FARREL FOUNDRY & MACHINE CO., Ansonia, Conn.

WANTED—Experienced man on gold stamping press; job and edition work. Address S., box 120 Sun office.

SITUATIONS WANTED—FEMALE.

BOOKBINDER—An accomplished bookbinder wants a situation. Address E. W., box 116 Sun office.

OFFICE ASSISTANT—Knowledge of stenography and typewriting; bright beginner, moderate salary. L. O., 438 Hopkinson Ave., Brooklyn.

SITUATIONS WANTED—MALE

BOY wishes position in wholesale or importing house. CHAS. LIPSHITZ, 40 Leonard st., Brooklyn.

PAWNBROKERS' SALES

L. L. FIRUSKI, Auct., 70 Bowery, sells 10 A. M.:
March 6—Order M. M. & E. Bruckneimer; jewelry.
March 7—Order Wm. Simpson & Co., 151 Bowery; all diamonds, watches, jewelry, goods every description pledged prior Dec. 15, 1904, to No. 45153, and all older dates held over.
March 8—Order B. Dreyer, 442 6th av.; all diamonds, watches, jewelry, goods every description pledged prior March 1, 1905, to No. 18414, and all older dates held over.
March 9—Order J. E. Lemon & Co., 476 6th av.; all diamonds, watches, jewelry, goods every description pledged prior Feb. 1, 1905, to No. 47262, and all older dates held over.
March 9—Order S. Stern, 2271 8th av.; all diamonds, watches, jewelry, clothing, goods every description pledged prior Feb. 28, 1905, to No. 15753.
March 12—Order Geo. Weaver, 460 9th av.; clothing, &c., pledged prior March 2, 1905.
March 13—Order M. Manning & Sons, 1670 3d av., 584 8th av.; clothing, &c., pledged prior March 8, 1905.

JULIUS SHONGOOD, Auctioneer, by Joseph Shongood's Sons, Auct's, 94 Bowery.
March 6—Jewelry. A. Friedman, 191 3d av.
March 6—Men's and women's clothing, &c., pledged to Feb. 6, 1905, up to No. 25734. S. Lehman, Brooklyn; E. Glaser, 53 Catharine st.
March 7—Clothing, &c. Magell Bros., 459 Grand st.; Ned Harlam, 490 Hudson st.
March 8—Clothing and all pledges prior to March 1, 1905, with S. Turk, bankrupt, 1464 2d av.
March 8—Jewelry, diamonds, &c. J. Blumenthal, 566 Hudson st.; Ned Harlam, 490 Hudson st.
March 9—Clothing. A. Selinger, 684 2d av.
March 9—Jewelry. Harris & Co., 665 3d av.
March 12—Clothing. L. Schieber, 1629 2d av.
March 12—Diamonds, watches, jewelry, &c., pledged to March 5, 1905. John J. Aaron & Son, 191 Grand st.

CENTRAL AUCTION CO., M. Sheehan, Auct., 152-154 Canal st., will sell at 10 A. M.:
March 12—By H. McAlleenan, 1330 Broadway; all diamonds, jewelry, watches, &c., pledged from No. 30000 in 1904 to No. 2000 in 1905, and all goods held over.
March 12—By H. Breckwedel, 473 Grand st.; clothing pledged to March 5, 1905.
March 13—By R. Simpson & Co., 195 Bowery; watches, diamonds, jewelry, &c., pledged to No. 24000, Jan. 1, 1905, and all goods held over.
March 13—by P. P. Fitzsimmons; clothing.

ELI SOBEL, Auct., 98 Bowery, sells 10:30 A. M. all goods pledged prior Feb. 26, 1905.
March 7—Odds and ends consignment.
March 8—Jewelry. Ivan Prince, 311 7th av.
March 9—Jewelry. Kleinbaum & Isaacs, B'klyn.

BUSINESS CHANCES.

PATENTS TRADEMARKS, DESIGNS AND COPYRIGHTS.
ADVICE FREE, SEND FOR INVENTORS' GUIDE.
EDGAR TATE & CO.,
SOLICITORS OF UNITED STATES AND FOREIGN PATENTS.
245 BROADWAY, NEW YORK.
No charge for selling patents.

A PARTY WANTED WITH $100,000; guarantee 50 per cent. on investment; by thoroughly reliable builder who has under construction a great number of houses at present and desires the above amount for the purpose of completing same; this is an exceptional opportunity. Apply to McDONALD-WIGGINS CO., 257 Broadway.

RESTAURANT—One of the best paying downtown; furnished complete; business about $100 daily; price, $5,000; this is a bargain. McDONALD-WIGGINS CO., 257 Broadway.

ELECTRICAL SUPPLY manufacturing business; party wanted with $10,000; profits 27 per cent.; this is an unusually good opening. McDONALD-WIGGINS CO., 257 Broadway.

LOAN OF $1,000 REQUIRED; capital to be expended in a high class confectionery business on Broadway, this city. Apply to McDONALD-WIGGINS CO., 257 Broadway.

$500 BUYS old established bicycle, phonograph and sporting goods business; good location, New York city. Particulars at McDONALD-WIGGINS CO., 257 Broadway.

LET ME SELL YOUR PATENT—BOOKLET Mailed free; fifteen years' experience; patent sales exclusively. Call, write or telephone. WILLIAM E. HOYT, Patent Sales Specialist, 290 Broadway, N. Y.

SMALL CAPITAL only required to take over an established, going and lucrative paste business. Good reasons for selling. Address B. Box 104 Sun office.

HIGHEST PRICES PAID for pawntickets, diamonds, pearls, watches and jewelry. A. BAUM, 223 Bowery.