

CHAPTER VI

THE FRENCH PANAMA CANAL COMPANY

Whilst the American Interoceanic Canal Commission was investigating the comparative merits of the various isthmian routes, a project for a waterway through the Isthmus of Panama was set on foot in France at the suggestion of Count Ferdinand de Lesseps.

In 1875 the subject was discussed at length by the Congrès des Sciences Géographiques at Paris, which strongly recommended the immediate prosecution of surveys with a view to decisive action. Following the session of the Congress a provisional company was formed by General Türr and other individuals for the purpose of securing a concession from the Republic of Colombia. This syndicate was composed of speculators whose sole motives were of a commercial nature. They despatched to the Isthmus Lieutenant L. N. B. Wyse, an officer of the French Navy and a brother-in-law of General Türr, with instructions to select a route and negotiate with the Colombian Government for a concession. In making his selection the Lieutenant was to be guided by a consideration for the prime object of the syndicate, which was to make as large a profit as possible from the sale of whatever interests it might acquire. Wyse and his employers were not actuated by any utilitarian sentiments, but merely by a desire to make money out of the scheme regardless of ultimate consequences. The spirit that moved them in the promotion was exhibited by their successors in the conduct of the enterprise, the management of which was "characterized by a degree of extravagance and corruption that have had few, if any, equals in the history of the world."

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COLOMBIA'S CONCESSION TO THE FRENCH PROMOTERS

Lieutenant Wyse made a perfunctory survey, commencing at Panama and extending only about two-thirds of the way to the Atlantic coast. Nevertheless, he calculated the cost in detail and claimed that his estimate might be depended upon to come within ten per cent of the actual figures. The Colombian Government entered into a contract with the Lieutenant which in its final form was signed two years later. It gave to the promoters the exclusive privilege of constructing and operating a canal through the territory of the Republic without any restrictive conditions, excepting that, if the route adopted traversed any portion of the land embraced in the concession to the Panama Railroad, the promoters should arrive at an amicable arrangement with that corporation before proceeding with their operations. On the part of the concessionaires it was agreed that the course of the canal should be determined by an international congress of engineers.

The concession was transferred to La Compagnie Universelle du Canal Interoceanique de Panama, generally known as the "Panama Canal Company," and on the fifteenth day of May, 1879, the International Conference met to determine the route. It was composed of one hundred and sixty-four members, of whom more than half were French and the remainder of various nationalities. Forty-two of the members only were engineers. The proceedings were pre-arranged and those who knew most about the subject in hand found that their opinions were least in demand. The following conclusion was put to the vote and carried by a small margin, the engineers who voted affirmatively being in a minority:

CONCLUSION OF THE INTERNATIONAL CONFERENCE

"The conference deems that the construction of an interoceanic canal, so desirable in the interests of commerce and navigation, is possible and, in order to have the indis-





CULEBRA. CUT LOOKING NORTH FROM LAS CASCADAS.

All trains are standing on the bottom of cut, elevation +40.

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pensable facilities and ease of access and of use, which a work of this kind should offer above all others, it should be built from the Gulf of Limon (Colon) to the Bay of Panama; and it particularly recommends the construction of a ship canal on a level in that direction."

It was at this meeting that Ferdinand de Lesseps made his first public appearance in connection with the enterprise. He took the chair and dominated the sessions of the Conference, and there is no doubt that his will was the most potent influence in bringing about its decision. Several members, who were radically opposed to the conclusions, rather than declare their difference from the opinions of a man of the great distinction and high reputation that de Lesseps enjoyed at the time, absented themselves when the final vote was taken.

FERDINAND DE LESSEPS, DIPLOMATIST AND PROMOTER

Ferdinand de Lesseps was born in France in 1805. At an early age he entered the consular service of his country and on more than one occasion distinguished himself in critical emergencies. In 1854, he visited Egypt and conceived the idea of the Suez Canal. For several years the opposition of the British Government obstructed his efforts to carry out the great undertaking which was eventually brought to a successful conclusion by him. He also promoted the construction of the Corinth Canal.

De Lesseps was at the height of his reputation when he assumed the direction of the ill-fated Panama venture. His great intellect may have been on the wane, but it is certain that his self-confidence and boundless belief in his own abilities were never greater than when he made the declaration, that "the Panama Canal will be more easily begun, finished and maintained than the Suez Canal." The disgraceful failure that resulted must be attributed largely to de Lesseps himself. He publicly assumed the responsibility for the enterprise and its management from

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the outset. Although he was not an engineer and had but a very limited knowledge of the science of engineering, he considered himself better informed than men who had the advantage of technical training and experience. He laid out the work, acting upon data which a professional engineer would have deemed insufficient or unreliable. With fatuous disregard for the opinions of experts, he altered plans and estimates to conform with his own unsupported ideas and, in short, exercised an arbitrary and unwise control over every feature of the undertaking. Almost to the last he cherished the belief that he enjoyed the unbounded confidence of the French people and that their purses would never be closed to his demands. Although his plans were fatally faulty and largely impracticable, there is no reason to doubt de Lesseps's good faith in the earlier stages of the enterprise. As it advanced and the errors of his basic calculations were forced upon him, he resorted to deception and, with the constantly increasing difficulties of the situation, his words and actions took an ever increasing divergence from the direction of truth and honesty.

Notwithstanding that the project was essentially a French one, and the money absorbed in it was subscribed in France, the interest in it was universal, and the collapse of the Company caused widespread excitement. Not the least serious of the results was the discredit cast upon the whole question of interoceanic communication and especially upon the Panaman phase of it. Exaggerated pessimism succeeded to the optimistic hopes which attended the launching of the venture, and even after this lapse of time doubts of its practicability are extensively entertained. Such doubts, however, can not find a logical basis in the fiasco produced by the Panama Canal Company. Its entire enterprise was built upon an unstable foundation. The plans were conceived in error and in ignorance of some of the most potent factors in the problem to be solved. Important circumstances were overlooked or inadequately pro-

vided for. Available knowledge was neglected and past experience disregarded. One man's preconceived ideas were applied to the situation in substitution of a scientific study of the conditions. The original miscalculations were followed by a series of avoidable mistakes, the inevitable consequence of which was the final disaster.

The mismanagement of the undertaking amply sufficed to insure its failure, but the catastrophe that ensued was rendered greater by the insane extravagance and the unbounded corruption which characterized the conduct of the Company. Froude, in his book on the West Indies, says:

FROUDE'S CHARACTERIZATION OF THE FRENCH
MISMANAGEMENT

"In all the world there is not, perhaps, now concentrated in any single spot so much swindling and villainy, so much foul disease, such a hideous dung heap of moral and physical abomination, as in the scene of this far-famed undertaking of nineteenth century engineering. By the scheme, as it was first propounded,* six and twenty millions of English money were to unite the Atlantic and Pacific oceans, to form a highway for the commerce of the globe and enrich, with untold wealth, the happy owners of original shares. The thrifty French peasantry were tempted by the golden bait and poured their savings into M. de Lesseps's money box."

Commenting upon the causes that contributed to the failure, a writer in the *Forum* stated that "following his acknowledged principles of being sole arbiter of the companies which he founded, M. de Lesseps has directed every step without counsel, control or, it may be added, knowledge of what was required. His eye has been bent steadily upon the Bourse. He has never put forward a single estimate that has not been falsified by the event. For the

*The noted author meant to say, the equivalent of "six and twenty millions, etc." Very little English money was invested in the scheme.

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work of a responsible engineer he has substituted the action of what he called consultative committees, superior councils, and the like, which have been, for the most part, little more than picnic parties at public cost, and with the recommendations of which he has dealt as he thought fit."

RUINOUS FINANCING FROM THE OUTSET

The first and a continuous drain upon the financial resources of the Company was in the form of "founders' profits." At the initial meeting of the shareholders, when they all fondly imagined that the venture was a bonanza, they were informed that they had to pay the following claims, and accepted the statement without a murmur:

ESTABLISHMENT EXPENSES OF THE PANAMA CANAL COMPANY

For the Concession.....	\$2,000,000
Preliminary Expenses.....	2,160,000
Profit on Preliminary Expenses.....	2,360,000
American Financial Group.....	2,400,000
Total.....	<u>\$8,920,000</u>

The greater part of this sum was taken by the founders out of the first \$20,000,000 paid in. It is doubtful if any of the outside shareholders knew precisely, or even approximately, what these figures represented. They were too absorbed in visions of vast prospective profits to concern themselves overmuch with present expenditures.

In addition to the immediate cash benefits the founders were to receive fifteen per cent of the net profits of the Company. These prospective payments were capitalized under the name of *parts de fondateur* in "parts" of \$1000 each. There were originally five hundred and later nine hundred of these "parts," which attained a price of \$16,000 each. De Lesseps is authority for the statement that in November, 1880, they sold at \$76,000 each.

In 1883 the promoters netted \$716,900 and the directors

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and staff, \$186,900, out of the "profits" of the undertaking. The directors were allowed a further three per cent of the profits, which contingent benefit they commuted into a present payment of \$48,000.

RECKLESS EXTRAVAGANCE ON THE ISTHMUS

Dr. Nelson, who was upon the ground whilst the Panama Company's operations were in progress, makes the following statement: "The famous Bureau System is what has obtained in the Isthmus up to the present time, with changes and amplifications without number. There is enough bureaucratic work, and there are enough officers on the Isthmus to furnish at least one dozen first-class republics with officials for all their departments. The expenditure has been something simply colossal. One Director General lived in a mansion that cost over \$100,000; his pay was \$50,000 a year; and every time he went out on the line he had his *deplacement*, which gave him the liberal sum of fifty dollars a day additional. He traveled in a handsome Pullman car, especially constructed, which was reported to have cost some \$42,000. Later, wishing a summer residence, a most expensive building was put up near La Boca. The preparation of the grounds, the building, and the roads thereto, cost upwards of \$150,000. . . . Another man had built a large bath-house on the most approved principles. This cost \$40,000. Thousands and tens of thousands have been frittered away in ornamental grounds, for all had to be *beau*, utility being a secondary consideration."

THE ORGANIZATION OF THE PANAMA CANAL COMPANY

We will now resume the history of the Panama Canal Company. It was capitalized at \$80,000,000, in shares of \$100 each, which were opened to public subscription in Europe and America in August, 1879. Less than one-tenth of the amount was taken up and the organization of the

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corporation was indefinitely postponed. In the criminal trial that followed the failure of the Company, Charles de Lesseps stated that after the abortive effort to float the Company his father placed the financial arrangements connected with the disposal of the shares in the hands of an influential group of financiers and journalists, who undertook to mould public opinion to a favorable form. Here we find the explanation of three of the enormous items of preliminary expense which are given above. Early in 1880 M. de Lesseps arrived at Colon, accompanied by an international technical commission which was charged with the work of making the final surveys and marking the precise line to be followed by the Canal. This highly important task, like all the other preliminary steps of the undertaking, was performed in haste and the party left the Isthmus before the close of February.

RECKLESS ESTIMATES OF THE COST OF CONSTRUCTION

The Paris Congress had estimated the cost of constructing the Canal at \$214,000,000, and the time necessary for its completion at twelve years. The technical commission expressed the opinion that the entire operation might be finished in eight years at a cost of \$168,600,000. In view of the fact that several of the engineer-members of the congress considered the former estimate too low, it is difficult to understand how the commission arrived at its figures. The reduction was not, however, sufficiently great to satisfy the purpose of de Lesseps, which was to present to the public a proposition so attractive as to be irresistible. In order to promote this object, he took upon himself to alter the sum fixed by the commission to \$131,600,000, which he declared would be sufficient to provide for the entire expenses of the operation. The first year's traffic was estimated at 6,000,000 tons, assuring a revenue of \$18,000,000, and this was claimed to be a very conservative assumption, whereas, it was in reality almost beyond the possibility of

realization. The limit of fanciful prediction had not, however, been reached. In May, 1880, Mr. A. Couvreur, Jr., a member of a large contracting firm, publicly stated that his house was prepared to undertake the entire work at a cost of only \$102,400,000. In the light of our present knowledge the absurdity of these statements is patent, but we must remember that at the time the whole proposition rested upon a basis of theory. The fact should have been an incentive to conservatism, and, although there may not be sufficient ground at this stage of the enterprise to impugn the honesty of the promoters, the recklessness with which M. de Lesseps submitted his inexpert calculations to the public was little short of criminal.

THE STOCK IS OVERSUBSCRIBED BY THE PUBLIC

Having prepared his new financial prospectus on the alluring lines indicated, M. de Lesseps made a tour of the United States, England, Belgium, Holland, and France, delivering speeches in which the enormous profits to accrue to the fortunate investors in the Panama Canal project were depicted in the seductive rhetoric that was always at his command. Following this campaign of words, \$60,000,000 in shares of \$100 denomination were offered to the public and doubly subscribed for.

It was agreed that the first two years should be a period of organization to be devoted largely to surveying and ascertaining from actual experience something of the cost of excavation and other features of the operation. In other words, the public having invested its money upon the strength of certain wild guesses advanced with all the assurance of conviction, it was now proposed to investigate the facts. Later developments proved that even the surveys of the line were unreliable. Three years after the engineering force had been at work upon the ground it was discovered that what they supposed to be an almost fathomless swamp was composed of solid rock a few feet below the surface, and

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this was only one of a number of similar misapprehensions. The second period, of six years, was to be occupied with the actual work of construction under contract.

THE COMPANY COMMENCES THE WORK OF CONSTRUCTION

In February, 1883, the latter stage was entered upon with Mr. Dingler as engineer in chief. His plan for a sea level canal made the following provisions: The canal, which had its origin at Colon, in Limon Bay, was to follow the bottom of the Chagres Valley for a distance of about 28 miles, to Obispo; it was then to cross the Cordilleras, the passage accounting for about 7 further miles of its length; continuing thence, the line traversed the Valley of the Rio Grande and terminated in deep water near the Island of Naos, in the Bay of Panama. The full length of the proposed cut was 46 miles. The depth of the canal was to be 30 feet and its width at bottom 72 feet.

For the regulation of the waters of the Chagres, which vary from 26 cubic yards at low water to 2,620 cubic yards in flood, it was proposed to construct a large storage reservoir at Gamboa by damming the river and deflecting its affluents to the sea on either side of the Isthmus.

The cube of the excavations provided for by this plan was a minimum of 157,200,000 yards, being 59,000 more than had been estimated by the commission and 98,250,000 more than the congress had indicated.

This plan was accepted and, despite the enormous increase of work entailed by it, de Lesseps adhered for a year longer to his original estimate of cost and time of construction. It was not until a meeting of the shareholders in 1885, that he increased the former to \$120,000,000, and extended the latter to July, 1889.

A SIMPLE UNDERTAKING ACCORDING TO DE LESSEPS

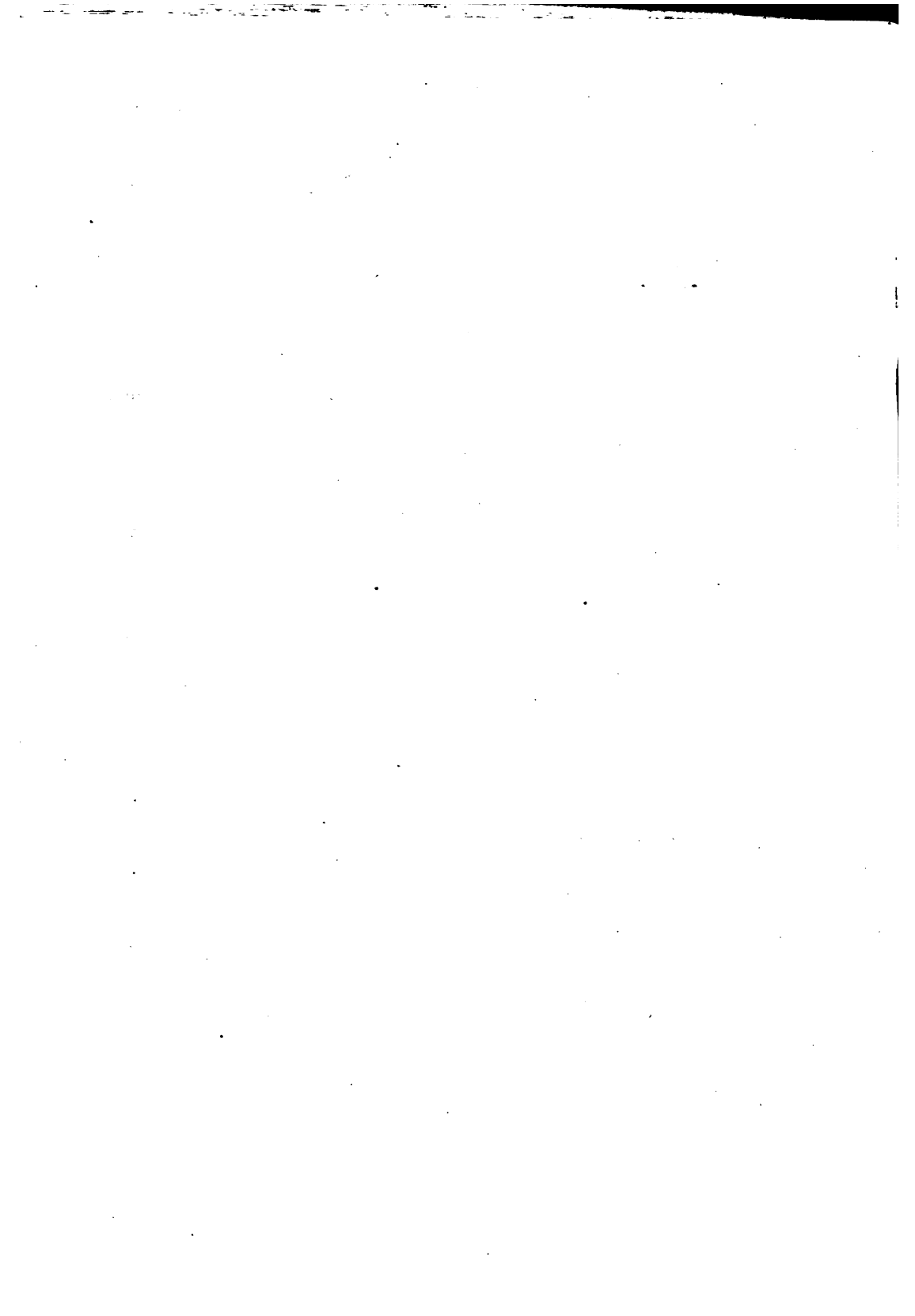
At the inception of the enterprise M. de Lesseps established a Bulletin which became the medium for the dissemination among the shareholders and the general public of



BACHELOR QUARTERS

CLUBHOUSE

VIEW IN THE TOWN OF CULEBRA, CANAL ZONE.
This shows the type of buildings used for bachelor quarters and employees' clubhouses. The high hill back of the clubhouse is "Gold Hill." The Canal runs between the clubhouse and Gold Hill.



the most exaggerated reports and the most reckless mis-statements. In March, 1881, de Lesseps stated in this publication: "But two things need be done: to remove a mass of earth and stones, and to control the river Chagres. . . . The canal is, therefore, an exact mathematical operation." This statement alone betrays the promoter's ignorance of the great engineering problems inseparably connected with the undertaking; for the control of the Chagres involves the most intricate and difficult calculations and engineering works imaginable. In addition were the thousand and one obstacles: disease, labor problems, inadequate machinery, public distrust of the project and financial difficulties to be encountered and which de Lesseps entirely ignored or made light of.

By the middle of 1885, hardly one-tenth of the estimated minimum excavation had been done, and it became evident, even to the non-professional observer, that the program could not be carried out in accordance with the assurances repeatedly given by de Lesseps. The enterprise began to be severely criticised and passionately discussed in the press of France. The credit of the Company was seriously affected by these assaults and it became necessary to adopt drastic measures for the restoration of public confidence in order to secure the additional funds that were already needed. At this critical juncture, the promoter, for M. de Lesseps had long since taken the whole affair into his own hands, sought the aid of the Government, which had been extended to him during the Suez Canal operation. He applied for permission to issue lottery bonds, but the desired authority was not granted at that time.

By this time it was widely recognized that, de Lesseps's declaration to the contrary notwithstanding, the Panama project involved immeasurably greater difficulties than those encountered in the Suez undertaking. In fact, the two operations were so dissimilar in every essential respect that the latter afforded no criteria by which to judge the former. At Suez, the entire line lay along low ground and most of

pendently of the others, but all arrived at one conclusion, which is the more remarkable since two of them were in the employ of the Company. In the forepart of 1886 the reports were submitted to the respective principals.

Armand Rousseau, the Government commissioner, found that the completion of the Canal with the resources available and in prospect was practically impossible unless the plan was changed to one involving the use of locks.

M. Jacquet declared that, after a thorough investigation of the work in all its details, he was convinced of the necessity of abandoning the original design, and he recommended the construction of a lock canal along the precise line adopted for the sea level project. Leon Boyer, who held the position of Director of Works upon the Isthmus, stated that the completion of a canal on a level was impossible with the money at command and in the time stipulated. He suggested a *temporary* waterway, to be operated by locks and to be replaced by a sea level canal as soon as possible.

This weight of expert opinion, which it must be remembered was in corroboration of similar expressions voiced by eminent engineers on previous occasions, de Lesseps discarded in his usual high-handed manner. He would not listen to a word against the sea level project, but declared in the most emphatic terms his intention to pursue it to the end. He had "promised the world a canal at the level of the oceans," and he proposed to keep his word despite all opposition. At this stage of the proceedings the "Great Undertaker," as he began to be dubbed, assumed the role of the persecuted philanthropist.

The shareholders of the Company were frequently informed henceforth that all kinds of powerful interests were in league against their enterprise, but at the same time they were assured that he, de Lesseps, might be depended upon to circumvent the machinations of these wicked plotters.

Lest the reader should fall into misapprehension as to

the true significance of the recommendations of the engineers which have been cited, it may be well to remind him that the undertaking of the Panama Canal Company was a purely commercial enterprise, and that the reports and suggestions of the experts in question were made with that fact constantly in mind. None of them expresses the opinion that a sea level canal is impracticable, nor is the question taken into consideration by either of them directly. The point of their decision was whether a sea level canal could be constructed at a cost and in such time as to make its after operation a profitable business for the shareholders. Time, of course, is a great factor in the cost of an operation involving hundreds of millions. Interest increases at an enormous rate during the later years. Therefore, considerations which would preclude the pursuit of a project solely contemplating commercial results might not be of sufficient weight to deter a government from following the same lines. The United States, observing business principles to the utmost reasonable extent, might justifiably construct a sea level canal at an expense that would entail the ruin of a private corporation. Even though the operation of the canal should fail to return any interest upon the money invested, the Government might well consider itself fully compensated for the outlay by the political advantages secured, the great savings in the movements of warships, and other desiderata which will be noticed in detail in later chapters.

FURTHER EFFORTS TO RESTORE THE WANTING CONFIDENCE OF THE PUBLIC

Whilst the engineer reports to which reference has been made above were in course of preparation, de Lesseps visited the Isthmus with a large party of individuals, many of whom were influential in the commercial and financial circles of France. Few of them had any technical knowledge, but the majority seem to have been susceptible to the

persuasive eloquence of the great promoter, for upon their return the enterprise received the endorsements of various chambers of commerce and general boards. In July, 1886, the Government declared its intention of postponing for several months the decision in the matter of the lottery bonds. De Lesseps took umbrage at this action and, relying upon the effect of the moral support of the powerful commercial bodies, withdrew his request. He received from the stockholders permission to issue a new series of bonds, and did so with success, but the enterprise had passed beyond the stage of possible salvation.

AN AMERICAN OFFICER INSPECTS THE OPERATION

In March, 1887, Lieutenant C. C. Rogers, U. S. N., was ordered by the Navy Department to inspect the canal work. He took three weeks to the task and went thoroughly over the line. He found the hospitals and quarters for officers and laborers clean, well-ventilated frame buildings, admirably suited to the climate. The canteens were kept by Chinamen, who boarded laborers at reasonable rates. There were upwards of 10,000 workmen, employed by contractors, who, with the number of the Company's employees, made up a total of 11,566. The laborers were chiefly importations from the West Indies, with a few negroes from the Southern States of America. The standard wage was \$1.50 in silver a day. The laborers were paid every Saturday. Sunday was spent in drinking; Monday in recuperation; and on Tuesday they returned to work; "hence," says the lieutenant, "the number of working days in a month seldom exceed twenty or twenty-two." The Company endeavored to put 20,000 laborers upon the ground and, as they could not be had from the West Indies, tried to get them from Western Africa and Southern China, but without success.

The hospital records of the Company showed a death rate of seven per cent of those employed on the work from its inception to July, 1887, but this did not include the

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that upon his own showing the project under the most favorable circumstances would be a financial failure.

A RECEIVER TAKES OVER THE PANAMA CANAL COMPANY

On the fourth day of February, 1889, the civil court of the Seine appointed Joseph Brunet judicial receiver of *La Universelle Compagnie du Canal Interoceanique de Panama*.

We will give a brief statement of the receipts and expenditures of the Panama Canal Company from the date of its organization until the end of the year 1889.*

RECEIPTS.

Proceeds from the Capital Stock, various loans and bond issues.....	†\$254,336,547
Other receipts from sundry sources	7,933,317
Expenses incurred but not paid.....	3,668,770
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Total amount collected and due by the Company.....	\$265,938,634

EXPENDITURES.

(*Outlay on the Isthmus.*)

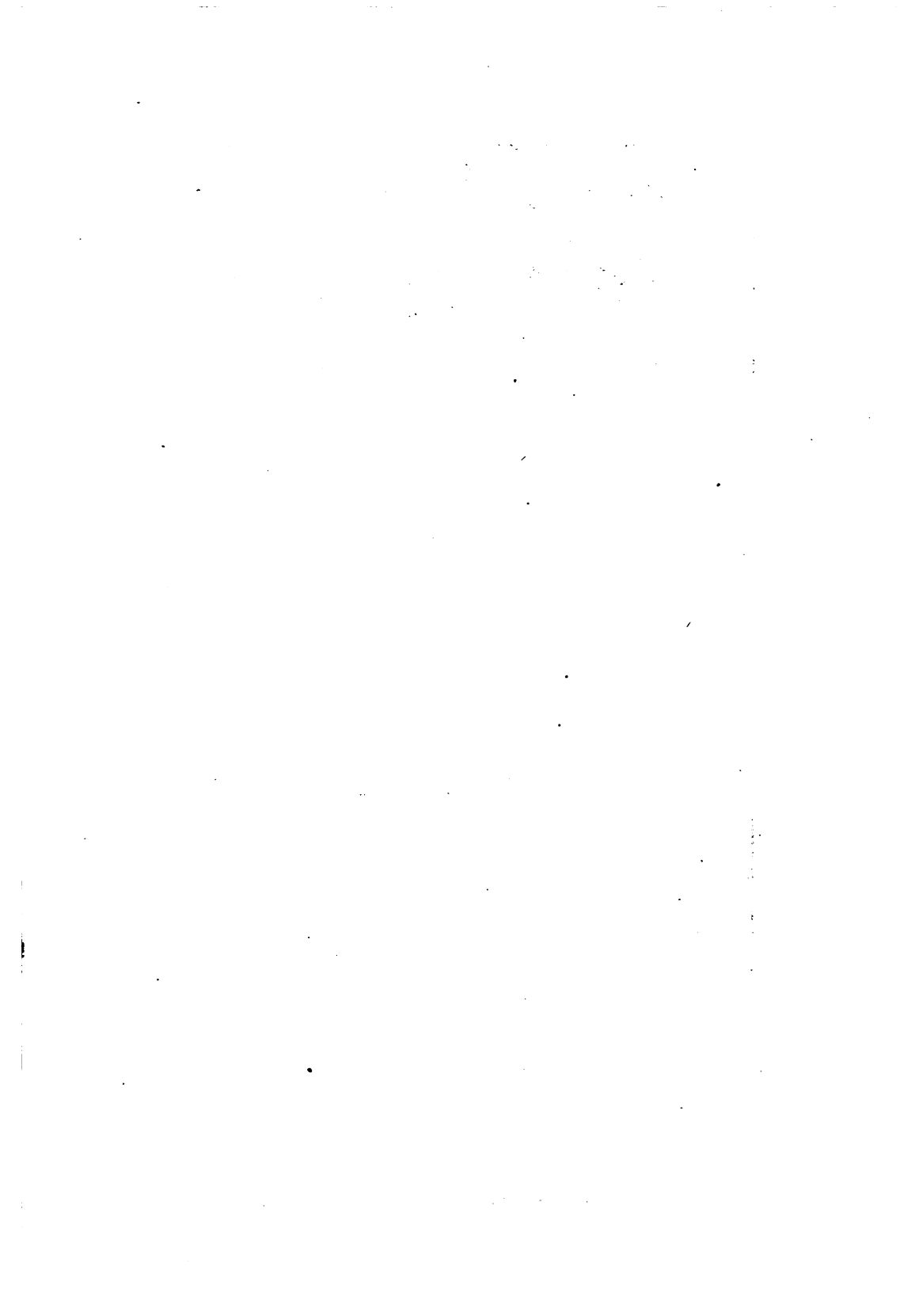
Salaries and expenses of management.....	\$16,540,883
Rents and maintenance of leased property.....	3,301,070
Purchase of articles and material for consumption.....	5,847,920
Purchase and transportation of machinery, etc.....	23,874,935
Surveys and preparatory work.....	270,946
Central workshops and management.....	5,989,577
Various constructions, buildings, and general installation.....	9,407,705
Work of excavation and works of construction.....	89,434,224
Purchase of lands.....	950,655
Sanitary and religious service.....	1,836,768
	<hr/>
Total expenditures on the Isthmus.....	\$156,654,687

(*Outlay at Paris.*)

Paid for the Concession.....	\$2,000,000
Paid to the Colombian Government.....	150,000
Various expenses incurred before organization.....	4,612,244

* A few comparatively small sums should strictly come within the account of 1890, but, for the present purpose, may without impropriety be included in the above statement.

† Fractions have been discarded throughout.





DINING ROOM IN THE MARRIED QUARTERS AT CULEBRA.

The Isthmian Canal Commission has provided comfortable quarters for its employees, carefully designed to meet the requirements of life in the tropics. All buildings are carefully screened to keep out the deadly mosquito.

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Paid to American Financial Group.....	\$2,400,000
Interest on various obligations.....	43,124,272
Amortization transactions.....	4,505,617
Expenses of floating bonds, loans, etc., commission, advertising, printing, etc.....	16,616,840
Paid to agents of the Colombian Government.....	42,760
Boards of management and direction.....	1,242,458
Salaries of employees.....	1,023,444
Sundries.....	742,238
Home Office and furniture.....	417,479
Compensation to contractors on cancellation of contracts.....	240,000
	\$78,140,329

SUMMARY.

Receipts from all sources.....	\$265,938,600
Expenditures—	
At Panama.....	\$156,654,687
At Paris.....	78,140,329
Paid for Railroad shares.....	18,653,637
In connection with Lottery bonds.....	6,452,936
Advance to the Colombian Government.	491,015
Various debtor accounts.....	2,291,160
Cash and negotiable paper in hand.....	3,254,847
	\$78,140,329
Total equal to receipts.....	\$265,938,600

CHAPTER VII

THE NEW PANAMA CANAL COMPANY

The task entrusted to the receiver of the Panama Canal Company was an extremely difficult one. If the affairs of the Company should be wound up it would be impossible to save the shareholders from total, or almost total, loss of their investments, for the property and work which was estimated as worth \$90,000,000 depended for its value upon a continuation of the operation.

The gravity of the situation, in which two hundred thousand persons, the majority of them in moderate circumstances, were involved, was fully appreciated by the Government, and special legislation was effected for the purpose of affording the Company temporary relief from the pressure of its liabilities.

Several circumstances militated against the endeavors of the receiver to reorganize the enterprise. The most serious of these was the public scepticism which had followed the failure of de Lesseps to make even a respectable approach towards the achievement of his undertaking. The shareholders had learned at last that systematic deception had been practised upon them for years, and they felt that they had no reliable knowledge as to the state of affairs at the Isthmus.

AN EFFORT TO RESTORE PUBLIC CONFIDENCE

The first step in the process of restoring public confidence was the investigation of the commission to which reference was made in the preceding chapter. In addition to the statement of the amount of work done and the value

of the plant, the commission gave an opinion that a lock canal might be completed in eight years at a further cost of \$100,000,000.

Any hope that might have been derived from this report was, however, dependent upon the success of the receiver in negotiating new concessions with the Colombian Government, for the time limit, under the contract, for the completion of the canal, neared its termination. Lieutenant Wyse, who had secured the original grant, was sent to Bogota immediately following the submission of the commission's report. After *pourparlers* that extended over four months, a new agreement was signed December the tenth, 1890, providing for an extension of ten years.

In the meanwhile Joseph Brunet had died and was succeeded by Achille Monchicourt. The new receiver applied himself with remarkable energy and acumen to the organization of an active company. He had contrived to keep the work going upon the Isthmus, although the scale of operations was greatly reduced. During the years 1891-93, he settled, by a series of compromises, most of the lawsuits existing with the old company and successfully resisted certain creditors and bondholders who would otherwise have ruined the interests of all concerned.

STEPS TOWARDS THE REORGANIZATION OF THE COMPANY

In April, 1893, Colombia made a further concession to the receiver, by granting an extension until October 31, 1894, for the organization of a new company and ten years from that date for the completion of a canal. A few months later "a special law for the liquidation of the Interoceanic Canal Company" was passed and had the effect of suspending the most obstructive actions before the courts. Early in the following year, death relieved Achille Monchicourt and his place was filled by M. Gautron. There remained but a few months in which to effect the organization of the new company and, with the co-operation of the attorney

for the bondholders, the receiver bent his energies to the task. They secured the co-operation of the managers of the old company, the contractors, and certain other interested persons, in the new enterprise, in the form of abatements of their claims, and subscriptions to the capital of the reorganization. The amount necessary to complete the full sum was to be asked of the old bondholders and shareholders.

The by-laws of the New Panama Canal Company were filed towards the close of June, 1894. The capital of the company consisted of 650,000 shares of \$20 each, 600,000 of which were to be subscribed for, whilst 50,000, absolutely unencumbered, were to be given to the Colombian Government in consideration of the contracts granting extensions. Thus, five years after the appointment of a receiver for the Interoceanic Canal Company, what was generally known as the "New Panama Canal Company" was definitely established.

The new company, like its predecessor, was a commercial concern, pure and simple. Although the French Government, by the exercise of extraordinary legislation, had been largely instrumental in the creation of the company, neither governmental patronage nor responsibility was extended to it.

The directors of the new company appointed a *Comité Technique* to thoroughly examine the whole problem of the canal. This was a wise determination, for the surveys made under the direction of the old company had been of such a cursory character that little reliance could be placed upon them.

WELL-CALCULATED ACTION BY THE NEW COMPANY

The *Comité Technique* was composed of seven French engineers and an equal number of foreign experts, including several who had the special advantage of experience in canal work. Whilst making careful surveys and maturing plans

for the ultimate operations, the committee directed the continuance of excavations in places where they were certain to come within the specifications of any plan that might eventually be adopted. In addition to its original investigations, the *Comité Technique* verified and rectified the surveys and measurements of the old company. In short the technical committee performed the most valuable scientific work that had yet been done in connection with the Isthmus and handed over to the Isthmian Canal Commission maps and documents which Admiral Walker declared to be worth at least a million dollars.

REPORT OF THE COMMITTEE OF INTERNATIONAL ENGINEERS

The final report of the *Comité Technique* was submitted at the close of the year 1898. It estimated the cost of a canal, which could be completed in ten years, and would be equal to all the demands of commerce, at one hundred million dollars. Aside from the question of health, the *Comité* recognized two principal difficulties to be overcome—the cut through the divide and the control of the Chagres. The former, whilst a stupendous task, was merely a matter of excavation and involved no serious engineering problem; the latter, on the contrary, presented features sufficiently intricate and perplexing to tax to the utmost the available technical ingenuity of the world. The solution appeared to be susceptible of achievement by several different methods, and numerous plans emanated from sources that commanded respectful attention.

“The studies of the New Company were based on three fundamental principles: (1) To reject any plan that did not, independently of considerations of time and expense, offer every guarantee of a serviceable canal. (2) To reject any fanciful scheme depending on the application of new and untried devices not justified by experience; and (3) to give due weight to the peculiar tropical conditions under which the work must be executed. These must compel

falling occasionally to 2,500 metres (8,202 feet), the minimum being 1,700 metres (5,577 feet), and this latter only for about half a mile in approaching Obispo, where the width is sufficiently increased to justify the reduction."

The scientific information accumulated by the *Comité Technique* is amongst the most valuable data relating to the Panama Canal extant and is valued at \$1,000,000.

CRYSTALLIZATION OF AMERICAN INTERESTS

By the time the *Comité Technique* had made its report, public sentiment in this country had become strongly impressed with the desirability of a trans-isthmian canal under American control, and a majority in Congress favored immediate action to that end. The Nicaragua route appeared to be the best available at the time and general opinion favored it. The situation thus created caused extreme anxiety to those interested in the welfare of the New Panama Canal Company. It had reached precisely the stage where the directors proposed to appeal to the financiers of the world, when its prospects were thus suddenly overshadowed. Although firmly convinced that the Nicaragua route was greatly inferior to their own, the company realized that should the United States construct a waterway there, or elsewhere, commercial competition would be impossible. This and other considerations would surely deter investors from backing the private enterprise. Furthermore, with the American Government in the field, the completion of the Panama Canal would be retarded, if not prevented, by the difficulty in securing labor under competitive conditions.

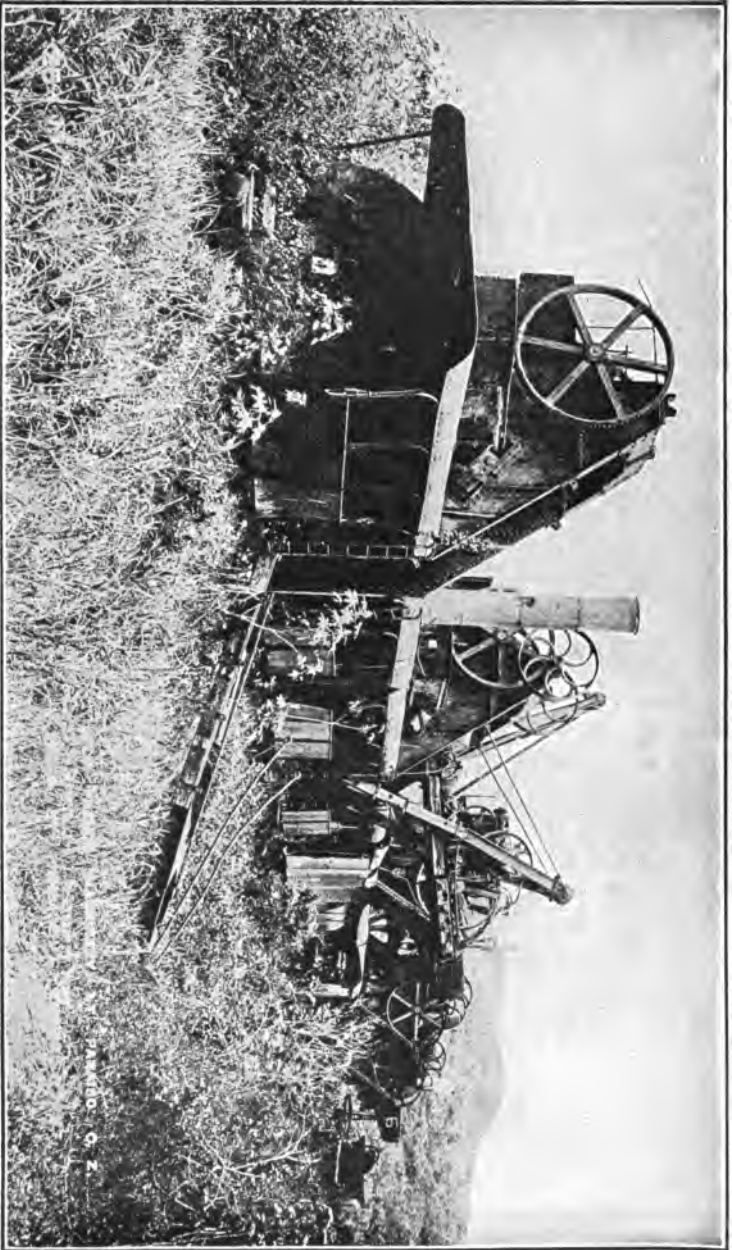
In this dilemma the directors decided upon a course calculated to bring the comparative merits of the Nicaragua and Panama routes squarely before the American Government. Since the report of the *Comité* had not been made public, the directors were satisfied that the United States authorities could not possibly have anything like adequate

knowledge or appreciation of the superior advantages of their proposition.

The full report of the *Comité Technique*, including details of the *projet* recommended by it, was accordingly placed in the hands of President McKinley during the first week of December, 1898. On the twenty-first day of that month the Senate, by a large majority, passed a bill providing for government support of the Maritime Canal Company in its Nicaraguan enterprise, but the House adjourned without taking action upon the measure. On the reassembling of Congress the French Company secured a hearing before the Rivers and Harbors Committee of the lower house, to whom the Senate bill had been referred on an amendment. The Company's representatives frankly explained their project and expressed the willingness of the Company to re-incorporate under American laws in case the Panama route should be decided upon. The Senate amendment was defeated and, in March, 1899, Congress authorized the President to make an exhaustive investigation as to the most practicable and feasible Isthmian route for a canal that should be under the complete control of the United States and the absolute property of the nation.

APPOINTMENT OF THE FIRST ISTHMIAN CANAL COMMISSION

In accordance with these instructions President McKinley placed the work of investigation in the hands of a body which was officially styled "The Isthmian Canal Commission," and which was composed of the following members: Rear-Admiral John C. Walker, U. S. N. (retired); Hon. Samuel Pasco; George S. Morison; Lieutenant-Colonel Oswald H. Ernst, Corps of Engineers, U. S. A.; Lewis M. Haupt, C. E.; Alfred Noble, C. E.; Colonel P. C. Hains, Corps of Engineers, U. S. A.; Wm. H. Burr, C. E.; Prof. Emory R. Johnson. The Commission made an examination of the New Panama Canal Company's project, both in Paris and on the Isthmus, and then proceeded to ascertain



OLD FRENCH MACHINERY RUSTING IN THE JUNGLE.

A pathetic reminder of the gigantic failure of De Lesseps.



upon what terms and conditions the property and rights of the Company might be transferred to the United States, for the law under which the Commission was acting forbade the consideration of government support to a private enterprise. The Republic of Colombia having signified its willingness to consent to the alienation of the concession, it only remained for the Commission to learn the purchase price in order to make its report to the President. There was considerable delay and some misunderstanding about this last detail. The Company was naturally reluctant to submit a definite figure to a body which "had no authority to accept or reject any terms," but proposed instead to make a tentative offer subject to an itemized valuation and arbitration where necessary. To this the Commission would not listen, but insisted upon a statement of the Company's price in a lump sum without reservation.

THE REPORT OF THE COMMISSION FAVORS THE
NICARAGUA ROUTE

The report of the Isthmian Canal Commission was presented to the President in November, 1901. It discarded altogether the detailed memorandum of valuations submitted by the Company and briefly declared that the "total amount for which the Company offers to sell and transfer its canal property to the United States" is \$109,141,500. The value set upon it by the Commission was \$40,000,000. It needs no extensive calculation to determine that this was an underestimate, even when due allowance is made for the usual depreciation of second-hand property. It will be remembered that the receiver of the old company valued the assets that passed into his hands at about \$90,000,000, and several millions had been expended in a judicious manner by the new company.

The report closed with the following recommendation: "After considering all the facts developed by the investigations made by the Commission and the actual situation as

118 THE NEW PANAMA CANAL COMPANY

it now stands, and having in view the terms offered by the New Panama Canal Company, this Commission is of the opinion that 'the most practicable and feasible route' for an Isthmian canal, to be 'under the control, management, and ownership of the United States' is that known as the Nicaragua route."

THE FRENCH COMPANY MEETS OUR BID

When this finding became known at Paris the directors of the New Panama Canal Company immediately resigned, and at a general meeting of stockholders held in the last days of the year it was decided to meet the terms of the Commission's estimate. Accordingly an offer to sell out all assets, rights, and interests for the sum of \$40,000,000 was telegraphed, the owners realizing that with only one possible purchaser and the certainty of the property becoming practically valueless unless taken by that purchaser, no alternative existed. The Company's change of base impelled the Commission to make a supplementary report, in which it stated that "the unreasonable sum asked for the property and rights of the New Panama Canal Company when the Commission reached its former conclusion overbalanced that route, and now that the estimates by the two routes had been nearly equalized, the Commission can form its judgment by weighing the advantages of each and determining which is the more practicable and feasible. . . . After considering the changed conditions that now exist, the Commission is of the opinion that 'the most practicable and feasible route' for an Isthmian canal to be 'under the control, management, and ownership of the United States' is that known as the Panama route."

THE SENATE INVESTIGATES THE QUESTION OF ROUTE

In the meanwhile, and before the Isthmian Canal Commission had filed its report, an ill-considered bill had been passed by the House, authorizing the President to secure

a concession from Nicaragua and to proceed at once to the construction of a waterway by that route. Fortunately the Hepburn Bill was not hastily disposed of in the Senate. The matter was thoroughly investigated in committee and extensively debated in the chamber. The weight of engineering opinion was overwhelmingly in favor of the Panama route, but, perhaps, the most effective statement in its favor was delivered by Senator Hanna, who had made a close personal investigation of the question. A series of practical inquiries submitted by him to eighty shipowners, shipmasters, officers and pilots engaged in operating the most important intercontinental steamship lines and sailing vessels elicited replies which were without exception strongly in favor of the Panama route. More than ten per cent of these emanated from persons interested in sailing ships and familiar with the navigation of them, a result especially significant in view of the fact that one of the very strongest objections advanced against the more southerly location is its assumed disadvantage to sailing craft.* The debate in the Senate was followed by the passage in both branches of Congress of the Spooner Bill. This measure authorized the President to acquire the rights and property of the New Panama Canal Company for a sum not to exceed \$40,000,000 and to secure by treaty with the Republic of Colombia the perpetual control of the territory needful for operating the canal; it also provided for the prosecution of the work by an Isthmian Canal Commission consisting of seven members to be appointed by the President.

We have already recited briefly the incidents of the imbroglio that followed the failure of the Colombian Legislature to ratify the Hay-Herran Treaty and culminated in the independence of Panama. Sufficient has been said to show how nearly the American people came to being committed to the Nicaragua route. What, in such an event, would have been the actual outcome it is impossible

* Full details of this interesting information will be found in the Congressional Record, June 9, 1902.

to conjecture, but there is ample ground for the belief that the undertaking would have proved more hazardous, more difficult, and less satisfactory when completed, than the Panama project.

It will be convenient at this point to consider briefly the most important features of difference between the two routes. In the first place, the verified data upon which to work was very much greater in the case of Panama, not to mention the fact that a considerable proportion of the task had already been accomplished at that point. In fact the Nicaragua project is still a mass of theory which application might prove to be infinitely erroneous, whilst at Panama the stage of uncertainty had been virtually passed and the operation presented definite and calculable tasks.

THE NICARAGUAN ROUTE COMPARED WITH THAT OF PANAMA

The American Isthmus does not contain a single natural harbor on the Nicaraguan coast. A satisfactory approach to a canal might be excavated upon the Pacific side, but the Atlantic littoral offers no such facility. The harbor of Greytown, which was once a good one, has long since been closed by the formation of banks whose material is constantly carried down by the San Carlos and Serapiqui Rivers. These obstructions could be cleared, but only at great expense and the maintenance of the necessary channel would involve incessant dredging. At Panama, an excellent entrance was available at either end of the Canal.

Whilst both routes lie within the zone of seismic disturbances, there was no recorded convulsion, nor any physical evidence of one, in the Isthmus of sufficient force to have seriously damaged a lock level canal, much less one upon the sea level. Nicaragua, on the other hand, presents volcanic features, including Lake Nicaragua itself, which betoken tremendous upheavals in the past. The earth-

quake that occurred in that region in 1844 must have caused great destruction to a canal had one been in existence at the time, as well as to the shipping on it. The proposed line passes close to the active volcano Ometepe, which was in violent eruption as late as 1883. The great volcano, Momotombo, on the edge of Lake Managua, after fifty years of inactivity, burst out with great violence in the month of February, 1905. This eruption was preceded by earthquakes.

NICARAGUAN ROUTE PRESENTS MANY EXTRAORDINARY
DIFFICULTIES

The region traversed by the Nicaraguan route is subject to strong winds and heavy rainfall, which would militate against the safe navigation of a canal. The latter preventing clear observation would tend to delay or prevent passage at night. It is true that Panama is also subject to heavy rainfall, but it is neither so continuous nor so great as upon the Atlantic coast of Nicaragua, which has no definite dry season. Moreover, any delays occasioned from this cause would be of shorter duration and of less consequence in Panama owing to the difference in length of passage.

Serious difficulties in the case of the Nicaragua construction would be created by the San Juan River, which may be considered as at least equal to those involved in the regulation of the Chagres. The course of the former stream is extremely tortuous, and expert opinion holds that it would be impossible to reduce it to a safe curvature. General Abbott says: "This long river route, exceeding in length the entire distance from ocean to ocean by the Panama line, must remain subject to the combined effects of strong winds, sharp curvature, and longitudinal and cross currents, to say nothing of the obscuration due to heavy rainfall. It may well be doubted whether any system of artificial lighting could render night transit safe for large ships, and without it delays and possible congestion could

hardly be avoided." A popular idea prevails that the Nicaragua route offers a great advantage in the seventy miles of lake section, but this is fallacy. Something like one half of the distance is over bottom that presents a similar problem to that encountered at Lake Menzeleh in the construction of the Suez Canal, to wit, the opening and maintenance of a channel through soft mud. The Isthmian Canal Commission estimated the cost of this portion of the operation at \$8,000,000. Even when made, this expensive and difficult channel would be a source of frequent danger, for Lake Nicaragua is subject to violent storms, during which there would be serious liability of vessels grounding. To quote General Abbott: "It remains to refer to what from an engineering point of view would be perhaps the most serious objection to the Nicaragua route if completed and opened to traffic. This would be the risk of longer or shorter interruptions liable to result from the complicated systems of water supply in seasons of drought of long duration; and the lake lies in a district where they are far from uncommon. It has been claimed that a vast lake about 3,000 square miles in extent must furnish an ideal source of supply, but the matter will bear a little examination.

CONTROL OF LAKE NICARAGUA A SERIOUS PROBLEM

"By the dam on the lower San Juan river the channel of the present stream would be transformed into an arm of the lake, maintained sensibly at the same level, and through this arm all shipping must pass, the depth of water depending wholly on the stand of the lake. This stand is now subject to a natural oscillation of about 13 feet. Under the projected conditions the entire outflow must pass over the dam at a distance of 50 miles from the main lake, and if the level is allowed to rise above the present high water stand, valuable lands under cultivation on the west shore of the lake would be flooded and claims for

damages would result. On the other hand, the bed of the river is crossed by many ledges of rock, and the cost of excavation fixes a limit to the depth economically practicable. . . . The level of the lake must be held approximately between 111 feet and 104 feet above tide and the bed of the present river must be excavated sufficiently to afford a sailing depth of 35 feet at all times. But the records establish that years of high lake and years of low lake follow in no regular succession. As it is impossible to provide a reserve sufficient to control the level of an immense body of water 3,000 square miles in extent, the regulation of this vital element must be left to the foresight and good judgment of the operator controlling the outflow of the dam. . . . Carelessness or bad judgment on the part of the operator at the dam, or an abnormal season, might therefore involve the stoppage of traffic for an indefinite period. A really desirable canal should be subject to no such contingency."

The Nicaragua route shows some savings in distances between important shipping points as measured upon the map, but these would almost certainly be made up for by the much shorter time of passage through the Panama Canal.

It must be borne in mind that the decision of the Isthmian Canal Commission in favor of Nicaragua was prompted by the price asked by the Company for its interests in the Panama enterprise and that decision was promptly reversed as soon as the Commission's estimate was accepted. As the cost of constructing and maintaining the respective waterways was practically equal in the Commission's opinion, it is evident that the alacrity with which they turned to the Panama proposition when the terms were favorable was due to a conviction of the superior merits of that project.

CHAPTER VIII

THE AMERICAN ENTERPRISE

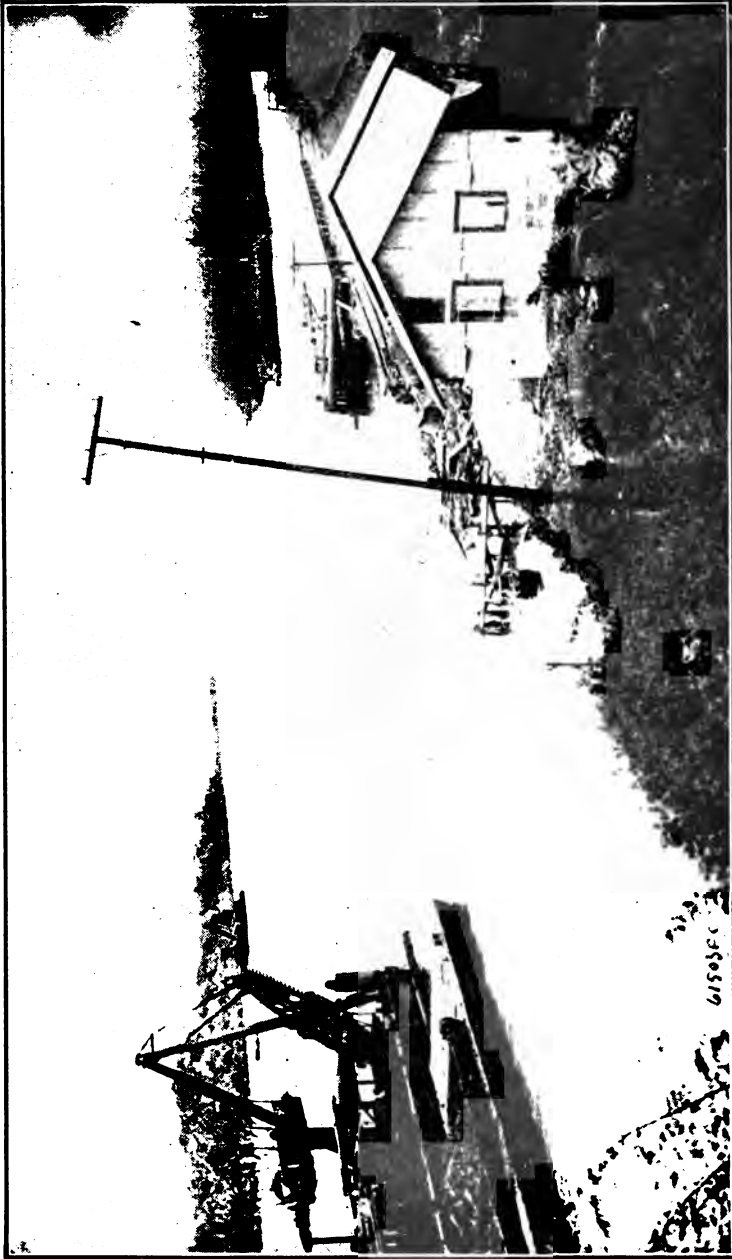
The Hay—Bunau-Varilla Treaty was negotiated between the respective representatives of the United States and Panama in the autumn of 1903 and fully ratified February, 1904. The most important features of this convention are as follows:

Article 1. [“The United States guarantees and will maintain the independence of the Republic of Panama.”]

Article 2. [“The Republic of Panama grants to the United States in perpetuity the use, occupation and control of a zone of land, and land under water for the construction, maintenance, operation, sanitation and protection of said Canal, of the width of ten miles, extending to the distance of five miles on each side of the center line of the Canal to be constructed;] the said zone beginning in the Caribbean Sea three marine miles from mean low-water mark and extending to and across the Isthmus of Panama into the Pacific Ocean to a distance of three marine miles from mean low-water mark, with the proviso that the cities of Panama and Colon and the harbors adjacent to said cities, which are included within the boundaries of the zone above described, shall not be included within this grant. . . . The Republic of Panama further grants in like manner to the United States in perpetuity all islands within the limits of the Zone above described and, in addition thereto, the group of small islands in the Bay of Panama, named Perico, Naos, Culebra and Flamenco.”]

Article 3. [“The Republic of Panama grants to the United States all the rights, power, and authority within the Zone mentioned and described in Article 2 of this agree-





Photograph, Underwood & Underwood, N. Y.

THE INTERSECTION OF THE AMERICAN CANAL WITH THE OLD FRENCH CANAL AT MINDI.

This picture also shows the dredges operating in the Atlantic Entrance to the Canal.

ment . . . which the United States would possess and exercise if it were the sovereign of the territory within which said lands and waters are located, to the entire exclusion of the exercise by the Republic of Panama of any such sovereign rights, power or authority.”

Article 6 provides for compensation to private property owners, by the United States, for any damage to private property occasioned by the canal operations and for the assessment of such compensation by arbitration.

UNITED STATES AUTHORITY IN COLON AND PANAMA

Article 7. “. . . The Republic of Panama agrees that the cities of Panama and Colon shall comply in perpetuity with the sanitary ordinances, whether of a preventive or curative character, prescribed by the United States and, in case the Government of Panama is unable, or fails in its duty, to enforce this compliance by the cities of Panama and Colon with the sanitary ordinances of the United States, the Republic of Panama grants to the United States the right and authority to enforce the same.

“The same right and authority are granted to the United States for the maintenance of public order in the cities of Panama and Colon and the territories and harbors adjacent thereto in case the Republic of Panama should not be, in the judgment of the United States, able to maintain such order.”

Provision is made in this article for the reimbursement of the United States for any outlay it may make, under the discretionary authority referred to above, in “works of sanitation, collection and disposition of sewage, and distribution of water, in the cities of Panama and Colon.”

Article 9. “The United States agrees that the ports at either entrance of the canal and the waters thereof, and the Republic of Panama agrees that the towns of Panama and Colon shall be free for all time, so that there shall not be imposed, or collected, custom-house tolls, tonnage, anchor-

peace and other officers discharging duties usually devolving upon these officers of the law, will be continued in office if they are suitable persons. . . . The laws of the land, with which the inhabitants are familiar, and which were in force on February 26, 1904, will continue in force in the Canal Zone and in other places on the Isthmus over which the United States has jurisdiction until altered or annulled by the said Commission," but the principles of government set forth in the Constitution of the United States are to be observed in the administration of the Zone.

In a later letter to the Secretary, the President makes an important declaration of the broader policy of the United States towards the Republic of Panama as follows:

ATTITUDE OF THE UNITED STATES TOWARDS PANAMA

"The United States is about to confer on the people of the State of Panama a great benefit by the expenditure of millions of dollars in the construction of the canal: but this fact must not blind us to the importance of so exercising the authority given us under the treaty with Panama as to avoid creating any suspicion, however unfounded, of our intentions as to the future. We have not the slightest intention of establishing an independent colony in the middle of the State of Panama, or of exercising any greater governmental functions than are necessary to enable us conveniently and safely to construct, maintain, and operate the canal under the rights given us by the treaty. Least of all do we wish to interfere with the business and prosperity of the people of Panama. However far a just construction of the treaty might enable us to go, did the exigencies of the case require it, in asserting the equivalent of sovereignty over the Canal Strip,* it is our full intention that the rights which we exercise shall be exercised with all proper care for the honor and interests of the people of Panama. The exercise of such powers as are given us by the treaty within

* See Article 3, of the treaty quoted above.

the geographical boundaries of the Republic of Panama may easily, if a real sympathy for both the present and future welfare of the people of Panama, is not shown, create distrust of the American government."

It is not our purpose to enter into a discussion of the political aspects of the treaty, but a careful reading of the portions which have been reproduced will give an idea of the great scope of this convention. To draw attention to but one direction in which its potency extends, the provision for the maintenance of order by the United States in the cities of Colon and Panama is a practical preventive of future revolution in the Republic.

At the close of the year Secretary Taft visited the Isthmus and entered into an agreement with President Amador, covering several supplementary matters of importance. A tariff adjustment, satisfactory to the Panamans, was effected. It was arranged that only supplies for the canal, and goods in transit, were in future to be entered at the Zone ports, thus assuring the Government of Panama of all customs receipts and port dues. The Republic agreed to reduce its tariff from fifteen to ten per cent, except upon wines and alcohol, and to place its postal rates upon the two-cent basis. Panama also agreed to adopt the gold standard, a very necessary measure for the welfare of that republic, as well as for the facility of transactions between the two nations. At the time this understanding was arrived at, the Colombian currency had become so debased that a five-dollar bill was exchangeable for an American nickel, and there was one cent change due at that.

A FUTILE REVOLUTIONARY MOVEMENT

Just before the arrival of Secretary Taft, General Huertas had planned one of the puny revolutions which have furnished librettists with inexhaustible material. He had mobilized the army of 182 half-clad men and boys, with the design of subverting the Amador government. The

threat of calling upon half a dozen American marines who happened to be in the city with their side-arms on, induced him to give up the idea. He was placed upon the retired list and the army of the Republic was disbanded.

At a banquet given in his honor by the Panaman President the Secretary delivered a timely homily on the subject of revolutions and urged upon his auditors the necessity of the government preserving the rights of the minority. The speech, which was in the nature of a friendly warning and an intimation that the United States expected the Republic to refrain from any revolutionary disturbances in the future, was well received by the representatives of both political parties, and doubtless had a salutary effect.

THE COMMISSION VISITS THE ISTHMUS

The Canal Commission arrived at the Isthmus in April, 1904. The only work in progress at the time was the excavation of the Culebra Cut, where a few French machines were employed with a force of about seven hundred men. Owing to the long lapse of time since the New Panama Canal Company ceased operations, a chaotic condition prevailed along the entire line of the canal and the plant and equipment transferred by that Company was in such a deteriorated and scattered state as to require months for its collection and repair. Whilst the task of straightening up was being carried out Engineer Wallace tested some American steam excavators and established important data as to units of cost and expenditure of time. Meanwhile the Commission proceeded, by means of new surveys and examinations, to gain such information as might afford a satisfactory basis for the ultimate plans. As has been stated, the French companies performed a great deal of accurate scientific work along the same lines, but much of the data secured from them needed to be modified in order to bring it into harmony with the more extensive scheme of the American project. The Commission was not restricted

by the limitations which governed the plans of the purely commercial enterprises, and whilst its work was entirely of a tentative nature, a waterway much larger than any contemplated by the French companies was a foregone conclusion.

THE PLAN OF THE WALKER COMMISSION

The Commission formulated a plan for a lock canal at an 85-foot level with a dam at Bohio and a lake 38.5 square miles extending from that point to Obispo. The Commission rejected the sea-level plan, prefacing its conclusion with the following statement: "If a sea-level canal be constructed, either the canal itself must be made of such dimensions that maximum floods, modified to some extent by a reservoir in the Upper Chagres, could pass down its channel without injury, or independent channels must be provided to carry off these floods. As the canal lies in the lowest part of the valley, the construction of such channels would be a matter of serious difficulty, and the simplest solution would be to make the canal prism large enough to take the full discharge. This would have the advantage, also, of furnishing a very large canal, in which navigation under ordinary circumstances would be exceptionally easy. It would involve a cross section from Obispo to the Atlantic, having an area of a least 15,000 square feet below the water line, which would give a bottom width of at least 400 feet. The quantity of excavation required for such a canal has been roughly computed, and is found to be about 266,228-000 cubic yards. The cost of such a canal, including a dam at Alhajuela and a tide lock at Miraflores, near the Pacific end, is estimated at not less than \$240,000,000. Its construction would probably take at least twenty years."

The investigations of the Commission were necessarily directed chiefly to the various suggestions for the control of the Chagres. The question had to be considered from

the point of view of a sea level canal as well as that of a waterway with locks. In the former case the flood waters of the river, if admitted into the canal, would create dangerous currents and carry in heavy deposits, necessitating extensive dredging. The various dam projects were examined by the Commission as well as the plans of the French companies for diverting the river through a tunnel to the Pacific Ocean.

Before the Commission closed the first year of its existence the question of its efficiency and adaptability to the work in hand was widely raised. Secretary Taft, upon his return from the Isthmus in December, 1904, had expressed to the President an opinion that the Commission, whilst it had "made as much progress in the necessary preparations for the buildings of the canal as could be expected in the short time since its appointment," was unwieldy and so constituted as to render difficult the apportionment of specific work and responsibility among its members. Chief Engineer Wallace complained that his plans were repeatedly changed and that he was hampered in the effort to carry them out.

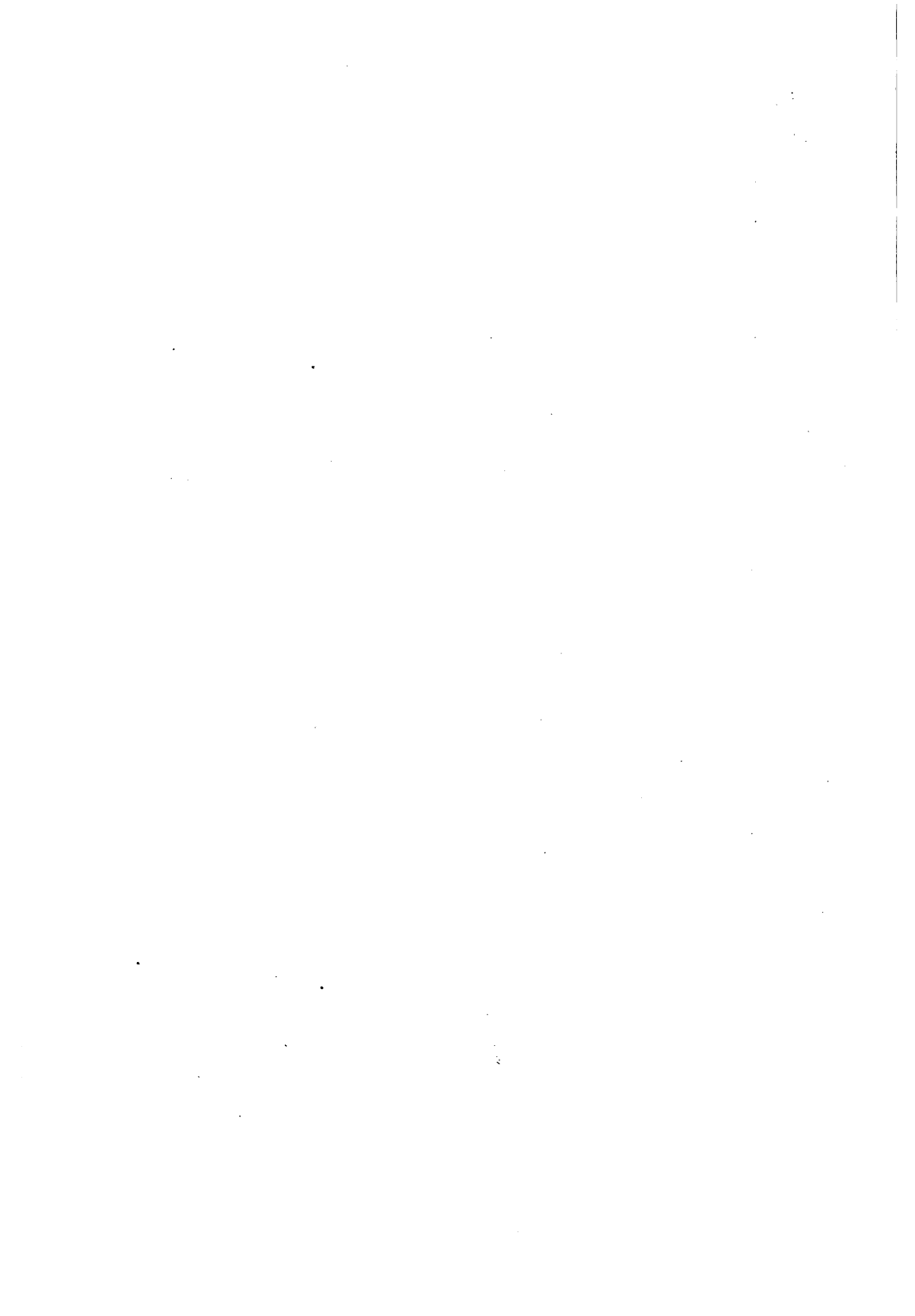
THE OBJECTIONS TO THE COMMISSION

In a message sent to Congress on the 13th of January, 1905, President Roosevelt plainly expressed his objections to the existing arrangement. He asked for "greater discretion in the organization of the personnel" to be employed in the management of the enterprise.

"Actual experience has convinced me," he said "that it will be impossible to obtain the best and most effective service under the limitations prescribed by law. The general plans for the work must be agreed upon with the aid of the best engineers of the country, who should act as an advisory or consulting body. The consulting engineers should not be put upon the Commission, which should be used only as an executive instrument for the executive and adminis-



MANDINGO STOCKADE FOR ZONE CONVICTS ENGAGED IN ROAD BUILDING.
A tropical prison. Zone convicts are profitably employed in building government roads.



trative work. The actual work of executing the general plans agreed upon by the Commission, after receiving the conclusions of the advising engineers, must be done by an engineer in charge; and we now have an excellent engineer." The President went on to state that the Commission should consist at most of five members and preferably of three.

In response to this message, the House passed a bill to abolish the Commission and place the government of the Zone and the construction of the Canal entirely in the hands of the President, but the measure was defeated in the Senate. Failing Congressional relief the President determined, in his characteristic way, to deal with the situation himself. He secured the resignation of the entire Isthmian Canal Commission and reformed that body, placing the control of affairs definitely in the hands of an Executive Committee composed of three of the seven members required by law to constitute the whole. Each of the executive members had distinct duties assigned to him. Chairman Shonts was placed in charge of the entire enterprise, with powers resembling those of a railroad president. Engineer Wallace was made field manager, with full control of the construction. Judge Magoon was created Governor of the Canal Zone and United States Minister to Panama. The other four members of the Commission were: Mordecai T. Endicott, Peter C. Hains, Oswald H. Ernst and Benjamin M. Harrod.

WALLACE RESIGNS AND STEVENS STEPS IN

The new arrangement had been in force less than sixty days when the Chief Engineer, for some cause which has never been fully explained, resigned his position. The resignation, coming as it did without warning or adequate explanation, naturally aroused resentment on the part of Secretary Taft, and Mr. Wallace retired from the service under a cloud. The place thus made vacant was promptly and satisfactorily filled by the selection of John F. Stevens,

who had been engaged by the War Department to supervise the construction of the new railroads in the Philippines. Mr. Stevens assumed charge of the canal operations in August, 1905.

On the first day of the following month the International Board of Consulting Engineers met in Washington. This body had been formed with the co-operation of several foreign governments for the purpose mainly of examining the principal problems involved in the construction of the Canal.

THE PRESIDENT'S ADDRESS TO THE CONSULTING ENGINEERS

The President addressed the assembled Board at length, explaining that his remarks were to be taken as suggestions rather than as instructions. "I hope," he said, "that ultimately it will prove possible to build a sea-level canal. Such a canal would undoubtedly be best in the end, if feasible, and I feel that one of the chief advantages of the Panama Route is that ultimately a sea-level canal will be a possibility. But, while paying due heed to the ideal perfectibility of the scheme from an engineer's standpoint, remember the need of having a plan which shall provide for the immediate building of the canal on the safest terms and in the shortest possible time.

"If to build a sea-level canal will but slightly increase the risk, then, of course, it is preferable. But if to adopt a plan of a sea-level canal means to incur hazard, and to insure indefinite delay, then it is not preferable. If the advantages and disadvantages are closely balanced I expect you to say so.

"I desire also to know whether, if you recommend a high-level multi-lock canal, it will be possible after it is completed to turn it into, or substitute for it, in time, a sea-level canal, without interrupting the traffic upon it. Two of the prime considerations to be kept steadily in mind are: 1. The utmost practicable speed of construction.

2. Practical certainty that the plan proposed will be feasible; that it can be carried out with the minimum risk."

After a thorough study of the maps and documents in the possession of the Isthmian Canal Commission, the Board of Consulting Engineers spent three weeks on the Isthmus, and on February 19, 1906, presented their report to Congress through the President, advocating a sea-level canal. A dissentient minority of five members, all Americans, made however a detailed report advocating a lock canal eighty-five feet above mean sea-level.

THE MILITARY BOARD

In April, 1907, Mr. John F. Stevens resigned from the position of Chief Engineer. President Roosevelt, with the hearty approval of Mr. Taft, who was then Secretary of War, immediately installed a military organization, in accordance with an idea that had been entertained for some time previous. A new Commission was created, with Colonel George W. Goethals, Corps of Engineers, U. S. A., as Chairman and Chief Engineer. The other members were Lieutenant-Colonel H. F. Hodges, U. S. A.; Lieutenant-Colonel William L. Sibert, U. S. A.; Lieutenant-Colonel D. D. Gaillard, U. S. A.; Civil Engineer H. H. Rousseau, U. S. N.; Colonel W. C. Gorgas, U. S. A.; and Honorable J. C. S. Blackburn. Mr. J. B. Bishop was retained in the position of Secretary to the Commission and Editor of the weekly "Canal Record." The only change in the composition of the membership was occasioned by the retirement of Senator Blackburn at the close of his third year's service. The vacancy was filled by the appointment of Mr. M. H. Thatcher, on April 12, 1910, to the head of the Department of Administration.

When Colonel Goethals and his aides came into control of the Canal, the lock plan, as advocated by the minority of the Board of Consulting Engineers, had been authorized by Congress and accepted by the people of the United States

as representing the form which the waterway would ultimately take.

The opportunity of still further strengthening the position of the Chairman of the Commission was not neglected by the President. Colonel Goethals was also made the chief executive of the Canal Zone, exercising the power formerly vested in the Governor, and President of the Panama Railroad Company, thus centering in him the absolute authority upon the work and making him superior to all save the President and the Secretary of War.

THE INVESTIGATING BOARD

In February, 1909, the President ordered Secretary Taft and a board of experts, especially appointed for the purpose, to make an inspection of the work upon the Canal, with particular reference to the Gatun Dam. In the resultant report the Commissioners expressed the opinion that the site of the structure met all the requirements of safety and that excess of precaution characterized the design and measures for its execution. They recommended a reduction in the height of the dam and also suggested some modifications of other parts of the Canal plan.

The changes which were adopted in 1909, and a few that had been previously determined upon, were the last of any consequence to be effected.

The chief departures from the plan as previously described were the removal of the terminal locks at the Pacific end from Sosa to Miraflores, and the consequent elimination of the proposed lake between the divide and the Pacific Ocean, certain increases in the dimensions of the channel; enlargement of the lock capacities; decrease in the height of the Gatun Dam, and the construction of breakwaters at Colon and Panama.

CHAPTER IX

THE HEALTH PROBLEM

The question of sanitation, closely allied as it is to that of labor, has always been an important factor in operations conducted upon the Isthmus of Panama, but fortunately, with the advance of time, the difficulties presented by it have become ever more susceptible to scientific treatment. The Panama railroad was built at an appalling sacrifice of life. At that time a blind contest was waged with disease, but no serious effort was made to mitigate the conditions that produced it. The French companies adopted some preventive measures and their provision for the care of the sick was admirable, but it remained for American administration to attack the problem in the determined and radical manner that minimized effects by reducing causes.

It was recognized at the outset that the Panama Canal could not be built by Americans unless the Canal Zone was first made healthy in order that Americans could live here with reasonable safety. So long as health conditions were bad it would be impossible to recruit a stable labor force, not only on account of actual conditions, but also because the Isthmus of Panama had been given a world-wide reputation for unhealthfulness during the construction of the Panama railroad and the work of the French on the Canal.

A knowledge of conditions as they existed on the Isthmus at the time of the American occupation is necessary to a realization of the truly marvelous results which have been accomplished.

The Isthmus itself was truly a valley of death, in which

surgeons, Jesse W. Lazear, Walter Reed, James Carroll and Aristides Agramonte. After various experiments they decided to test the theory of transmission by mosquitoes. To do this it was necessary to secure human subjects for experiment, and they decided to make the first experiments on themselves. The mosquitoes were to be secured, allowed to infect themselves with the disease by biting a yellow fever patient, and then in turn to bite them.

One of these officers, Dr. Agramonte, was immune to the disease through previous attacks; another, Dr. Reed, was recalled from the island before undergoing the experiment. Doctors Carroll and Lazear were bitten by infected mosquitoes, with the result that Dr. Carroll suffered a very severe attack of yellow fever from which he barely escaped with his life. Dr. Lazear was not so fortunate. He contracted the disease in its most severe form and died of it. It must be understood that these surgeons fully realized the great danger which they ran in making these experiments, in order to realize their extreme bravery and high devotion to duty. No appreciation of the marvelous achievement of the Canal itself can be complete without a full measure of praise being given to the high courage of these men who made the discovery through which the execution of the work was made possible.

To further demonstrate the truth of this theory a call for volunteers to undergo mosquito infection was made, and it is a high tribute to the bravery of the American soldier to note that there were instant and abundant responses.

It had been demonstrated by the tests of Doctors Lazear and Carroll that considerable time must elapse between the infection of the mosquito and the time at which it could infect another person. One of the soldiers chosen for the test was submitted to the ordeal of being bitten by infected mosquitoes, and it was discovered that the dangerous period began about twelve days after the infection of the mosquito. Experiments made by soldiers to determine whether or not yellow fever was a contagious disease, by wearing





A ROOM IN BACHELOR QUARTERS AT CULEBRA.

This shows a typical room such as is provided for bachelor Americans. The government has taken great pains to provide good food, clothing and living conditions, including amusements, for its employees.

clothes of a yellow fever patient, and sleeping in a bed previously occupied by a patient who had died of yellow fever, amply proved that it was not possible to transmit the disease in this way. Thus it was fully demonstrated that the *stegomyia* mosquito was the sole means of transmitting this dread disease.

MALARIA TRANSMISSION

The discovery that malaria was transmitted not by poisonous air or water, but by the *anopheles* mosquito solely, was made by a British army surgeon, Major Ronald Ross, who, after studying the problem of transmission of malaria, was successful in infecting birds with this disease by means of mosquito bites. This principle was afterwards applied to human beings successfully, and the theory proven that this was at least one of the methods of transmitting malaria. Later on, by means of further experiments, it was demonstrated that it was not possible to infect beings with malaria by means of either air or water from places in which the disease was epidemic.

Armed with this knowledge the surgeons drew up a new set of regulations for the government of Havana during the American occupation. These regulations were put into effect immediately, and consisted mainly of the segregation of all those attacked by the yellow fever in wire-screened houses so that the mosquitoes could not bite them and make themselves the means of carrying the disease. The infected houses were carefully fumigated, swamps, stagnant water and all likely places for the breeding of mosquitoes drained, with the result that within ninety days the disease was entirely stamped out; and with very few exceptions there has not been a recurrence of it in Havana since 1901.

Similar tactics were carried out in the case of the malaria-carrying mosquito, and with signal success, bringing the death rate from malaria down to about forty-five per year or about one-sixth of the previous rate.

The work in Havana was under the direction of Surgeon Major W. C. Gorgas, and the marvelous success achieved there was largely due to his painstaking work and administrative ability. The work accomplished there, of course, pointed the way directly to the sanitation of the Isthmus. President Roosevelt, realizing the value of the work which had been done, and the necessity for a similar but much greater task on the Isthmus, instructed the first commission to pay particular attention to the problem of sanitation. Colonel Gorgas, as the organizer and director of the campaign in Havana, was unanimously chosen as the best man for the leadership in the work on the Isthmus.

The first Isthmian Canal Commission to take charge of the work of constructing the Canal was appointed by the President on February 29, 1904, and confirmed by the Senate on March 3. The Commission arrived on the Isthmus on April 5 on a visit of inspection, accompanied by Col. W. C. Gorgas, Medical Corps, U. S. A., John W. Ross, Medical Director, U. S. N., Capt. C. E. Gillette, Corps of Engineers, U. S. A., and Maj. Louis A. LaGarde, Medical Corps, U. S. A., as experts on sanitation. After a thorough examination of conditions on the Isthmus these experts returned to Washington and reported a plan for the sanitation of the Canal Zone and the cities of Panama and Colon, and on May 8, 1904, Col. Gorgas, as Chief Sanitary Officer, was authorized to proceed with the work. He returned to the Isthmus, arriving on June 28. Between May 19, 1904, and June 30, 1904, Dr. L. W. Spratling, U. S. N., was acting health officer. As the representative of the Commission on the Isthmus, Gen. George W. Davis, Governor of the Canal Zone, issued an order on June 30, 1904, announcing the organization of the Sanitary Department, with Colonel Gorgas as its head.

IDEAL CONDITIONS FOR SPREADING DISEASE

At the beginning of the American occupation the Isthmus of Panama was afflicted with a plague of mosquitoes. The

high temperature, which varies little during the year, allowed constant breeding and the pools of water left by the almost continuous rains during the rainy season, which lasts for nine months out of the year, open tanks and water barrels, which formed the water supply system, were ideal breeding places. The interior of the Isthmus was a tropical jungle, another condition likewise ideal for mosquito propagation. Practically all of the inhabitants were subject to malaria, and the mosquitoes had a constant source of infection from which to draw. Somewhat similar conditions prevailed with regard to yellow fever.

The methods to be adopted in the war on the disease were clearly defined, and were resolved into a war on mosquitoes, a campaign for cleanliness, and the education of the natives looking to the suppression of the dangerous practices which had before been in operation. The cities of Panama and Colon must have a sewage and water system which would be strictly sanitary. All houses would be carefully screened and their inhabitants protected from mosquito bites in order to limit the spread of the disease. The extermination of the mosquitoes must be accomplished by the draining of all stagnant pools and the elimination of all standing water in every case possible, and where this could not be accomplished spraying with crude oil must be resorted to in order to kill the mosquito larvæ. The brushwood of jungle growth had to be cut and burned, and a general cleaning up process adopted along the whole of the route of the Canal wherever occupied by Canal forces. These portions were cleared of undergrowth of all kinds for a distance of two hundred yards around all habitations.

No deaths from yellow fever had occurred among the employees of the French Company since 1897, although a few cases had been treated on the Isthmus in the year preceding the arrival of the Americans. A large part of the population of Panama was immune, and it was among the new arrivals that the disease first showed itself. In July, 1904, Charles Cunningham, a white employee of the Police Depart-

ment, was taken ill with it and died. No other cases were reported for about a month. On November 21, a case developed in Santo Tomas Hospital in the city of Panama, and in December, 1904, seven cases developed in that city.

In the month of January, 1905, the disease broke out in Colon, and in the two cities 19 cases were recorded that month. In February, 14 cases developed; March, 11; April, 8; May, 33. The maximum was reached in June, when 62 cases were reported, and from that month there was a steady decrease, the number of cases that developed in July being 42; August, 27; September, 7, and October, 3. The last case in the city of Panama developed on November 11, and, the last in Colon, on December 11, 1905. In all there were 246 cases in 1904 and 1905, and 84 deaths. Of this number 134 of the cases and 34 of the deaths were among Commission employees.

The disease had been confined to the cities of Panama and Colon. It was fought by preventing the introduction of more cases from the fever ports of nearby countries, keeping patients in screened rooms where mosquitoes could not gain access to them, and by an energetic campaign for the extermination of mosquitoes. The work was carried on at first without the cooperation of the people, but within a year they had been taught to assist in the destruction of the mosquito.

The first work against malaria was undertaken in Empire, Culebra, and Ancon in July, 1904, and by September it had been extended to Gorgona, Paraiso, and Balboa. The situation with regard to malaria in July, 1904, is accurately illustrated by the conditions at Ancon Hospital, and in the various villages. *Anopheles* and *stegomyia* mosquitoes were found in large numbers in the buildings and wards. Mosquito breeding took place within a few yards of the wards and none of the buildings were screened. The decorative plants and shrubs in the grounds were surrounded with clay vessels containing water and vegetation in which mosquitoes were breeding, and all ditches in the grounds

were producing mosquito life. There is no doubt that many cases of malaria and yellow fever had been contracted in the hospital itself previous to this time. Examinations of blood taken from the inhabitants of one town in the Canal Zone showed that 80 per cent of the people were infected with the malaria organism, and that Ancon was not an isolated instance was proved by the large percentage of cases from all the villages. In Colon one-sixth of the entire population was suffering from malarial attacks during each week, this deduction being based on the number of cases treated in the hospitals.

The permanent work for the prevention of malaria has been practically accomplished, although certain measures such as grass and brush cutting, oiling pools, and similar routine work must necessarily be continued indefinitely.

Only two cases of bubonic plague have developed on the Isthmus since American occupation. On June 15, 1905, a negro longshoreman, at Balboa (formerly La Boca), was taken ill, and a microscopic examination showed that he was suffering with bubonic. He died eight days later. The village was cleaned and disinfected, and a crusade against rats, the common carriers of bubonic, was begun. On July 9, a "rat brigade" was set at work in Panama, and a systematic effort to exterminate the rats around the docks and throughout the city was made. Rat traps were issued free to all persons who wished them. Later a bounty was placed on each rat delivered to the health department, and this bounty is still in effect.

In January, 1904, Dr. C. C. Pierce, of the Public Health and Marine Hospital Service, took up the work on the Isthmus of despatching ships bound to San Francisco and also of making a sanitary survey of the Canal region. In May, by an arrangement between the State Department in Washington and the Government of Panama, he took charge of the quarantine work for the port of Panama, and since that time the quarantine on the Isthmus has been under American control. In spite of the fact that ports

on both the Atlantic and Pacific sides of the Isthmus, north and south, have been infected with bubonic, smallpox, cholera, and yellow fever, the quarantine has been successfully maintained. In both of the stations, Panama and Colon, screened rooms are set aside for yellow fever suspects, and every precaution is taken to guard them from the bite of mosquitoes.

PRESENT HEALTH CONDITIONS

The Canal Zone is at the present day more healthful to the white man than many parts of the United States. There has been an absence of yellow fever during the past nine years and it is safe to say that no epidemic of that disease will ever again occur upon the Isthmus. Malaria is being rapidly reduced and its source eradicated by the persistent labors of the Sanitary Department. The general health of Canal employees, both white and colored, is better than that of the several communities from which they were drawn, but, with regard to the former, it must be considered that they are picked men in the prime of life, and that those among them who succumb to climate or disease are quickly weeded out and sent home.

A total of about \$20,000,000 has been spent upon the Canal Zone for sanitation, but in spite of this fact the Isthmus cannot be regarded as a health resort. It is a reasonably healthy place to live, but it must be remembered that this condition can only be maintained so long as the stringent methods of health precaution are enforced.

The fact that medical services are entirely free, and that removal to a hospital is compulsory on the part of the attending physician, has much to do with the excellent conditions of health maintained there. It must be confessed, however, that in spite of all these precautions malaria still exists upon the Isthmus and must be regarded as a serious problem, the only solution of which is the entire extermination of the *anopheles* mosquito. The Canal operating forces must

continue to live in screened houses, take quinine in large quantities, remain indoors at night and continue the various precautions which have been adopted.

Considering the nature of the work, the living conditions and the length of time occupied by the enterprise, the death roll has been comparatively small, and to the date of the opening of the Canal there have been in the neighborhood of 6,000 deaths, of which less than 300 were Americans. Of the total number somewhat over 1,000 died from accidents. This really compares very favorably with that of the French, who lost in the nine years of their occupation about 16,000, or nearly three times as many.

CHAPTER X

THE LABOR PROBLEM

Each of the enterprises that preceded the American occupation of the canal territory found the difficulty in securing satisfactory labor one of the greatest deterrents to success.

The health conditions were so forbidding, the problem so apparently hopeless that even the most adventurous spirits of the races of the world looked askance at Panama. When the Americans took charge, however, all this was changed. The Canal Zone was made healthy and the completion of the work assured by the ample credit of the United States. High pay was offered and many other inducements which soon brought the adventurous of all lands flocking to the Isthmus. Hardly a nation is lacking in representatives on the construction force and the census of the Canal Zone taken in 1912 showed forty nationalities from eighty-six different geographical subdivisions, so that the world at large can justly feel proud in the achievement so truly international in its scope.

RECRUITING A FORCE

The number of men upon the rolls of the Commission has varied greatly. When Wallace took charge in 1904 there were 746 men employed upon the Canal. Immediately recruiting stations were opened in the United States, the West Indies and Europe, with the result that about 45,000 men were imported under contract up to 1912. The force has been anything but permanent, especially during the early days of the enterprise, when many of those employed



CULEBRA CUT LOOKING NORTH FROM CUNETTE.

The two steam shovels shown in the foreground are working on the bottom, elevation +40. The water standing in the outer drainage channel is about six feet below the bottom, elevation +34.



departed on the same ship that brought them after one look at the conditions. These were improved, however, and the promise of high pay, free lodging, good and cheap food and all the other inducements offered by the Commission kept a steady stream of labor flowing to the Isthmus.

The high water mark of employees on the Isthmus was reached in 1910 when there were 38,676 men upon the rolls. Of these 5,573 were Americans who usually compose from one-sixth to one-seventh of the total working force. Since 1910 the gradual reduction in the force has been permitted by the completion of various parts of the project and at the time of the opening of the Canal only a small operating and maintenance force will be kept there in addition to the military garrison.

The Americans employed on the Isthmus are in positions of supervision or skilled labor in the various trades, steam engineers, steam shovel men, railroad brakemen, conductors, firemen, policemen and in the higher offices.

Few women came to the Canal Zone in the early days, but according to the census of 1912 there were over four thousand women and children of American employees on the Isthmus. Most of the laborers are colored and come from the islands of the West Indies, Barbadoes, Martinique, Jamaica, Trinidad, etc., to the number of about 30,000. Europe has supplied about half as many. Of the Europeans employed over eight thousand were Spaniards and they proved the most satisfactory of all the common laborers employed by the Canal Commission.

The suggested employment of Chinese coolies to dig the canal met with such opposition in the United States that no move was made to put it into effect. Furthermore, little difficulty was experienced after the work was under way in obtaining all the common labor desired.

THE GOLD AND SILVER ROLLS

Some distinction had to be made between skilled and unskilled labor and this was accomplished by dividing the

employees into "gold" and "silver" men. The gold roll included all the Americans and those drawing over \$75.00 per month who are paid in gold. The silver roll includes all the common and unskilled laborers and these men are paid in the silver money of the Republic of Panama. This distinction is useful in many ways but chiefly in allowing the Commission to draw the color line as it could not do directly, because of the United States Constitution and for other reasons. The distinction, however, is not a hard and fast one, and, consequently, is not open to criticism from that standpoint. In uniformity with this there are separate facilities provided everywhere for the two grades of employees. There are second-class railway cars, special commissary clerks and separate eating-houses.

QUARTERS

The types of quarters furnished for the gold and silver employees of course differ radically, although in both cases living accommodations, together with food, light and water, are supplied by the Government without charge. The gold employees live in two types of quarters, known as *bachelor quarters* and *married quarters*, and assignments to these are made by district quartermasters according to a code of rules, which takes in the date of the applicant's entry into the service, the rate of salary, etc. The quarters for both bachelors and married men are provided with modern plumbing and all necessary furniture. The types of houses differ somewhat according to the salary of the employee, but all are constructed from ingenious designs which adapt them both for convenience and comfort to a tropical climate.

The bachelor employees on the gold roll are housed in quarters like dormitories, and take their meals at hotels established and maintained by the Government.

The silver bachelor employees live in barracks, each of which accommodates seventy-two men. They sleep in a triple tier of bunks, which are fitted with laced canvas

bottoms. These barracks are cleaned daily by janitors and are kept in good order, no baggage or effects of any kind being allowed on the floor.

AMUSEMENTS

One of the most difficult problems about the labor situation on the Isthmus has been the amusement of the employees after working hours. The cities of Panama and Colon do not supply many forms of amusement, besides the fact that they are inaccessible to those employed inland. To meet this difficulty the Commission has gone to great pains and expense to provide club houses, which are operated by the Young Men's Christian Association, and of which there are seven, located at Cristobal, Gatun, Gorgona, Empire, Culebra, Corozal and Porto Bello. These club houses have facilities for billiards, pool, bowling, gymnasium, reading rooms, and also facilities for social, church and lodge functions. Moving pictures are given in the club houses about once a week. There is also the Isthmian Canal Commission band, an excellent organization which gives regular concerts at the towns throughout the Canal Zone.

In spite of the efforts which have been made, however, it is extremely difficult to maintain a steady force on the Isthmus. For instance in 1911, the force of employees on the gold roll changed to the extent of sixty per cent, and statistics show that the average length of stay of mechanics on the Isthmus is one year. There are very few of the original employees who went to the Isthmus in 1904 who remained to the end of the work. Another reason for this constant change of workmen is that the men who compose the force are to a large extent adventurous spirits, who go to the Canal largely to see the big enterprise and be able to say afterward that they had a hand in its completion.

AN AMERICAN MANUFACTURING COMMUNITY

Few people realize how many different classes of work enter into this great enterprise. The great distance between

Panama and this country has necessitated the establishment of an American manufacturing community with all the facilities of an American community of the same sort, including houses, schools, churches, club houses, municipal improvements, such as waterworks, electric light plants, etc. From a labor standpoint the great machine shops at Gorgona and Empire are very interesting. These shops are equipped to build, assemble and repair all of the machinery used in the construction of the Canal. The raw material is purchased in the United States and made into the finished product. Locomotives, trains, dredges, etc., are purchased in the United States, knocked down and shipped to the Isthmus in sections, to be assembled and put into working condition after arrival there. In many cases it is cheaper to manufacture small articles on the Isthmus than to transport them from the United States.

The item of repairs is a serious one, for the reason that the Canal machinery is driven at a very high speed in the effort to obtain phenomenal results. This results in frequent breakage, so that the shops are ever busy with this class of work. One plant alone, that at Gorgona, covers twenty-two acres of ground, and has a railroad trackage of seven miles. These shops have had to be entirely removed before the opening of the Canal, since the rising waters of Gatun Lake will entirely cover their location before the eighty-five foot level is reached.

The old adage that "Necessity is the mother of invention" has been largely demonstrated during the construction of the Canal. Gigantic obstacles have arisen, only to be met and conquered by the ingenuity of the engineers in charge of the work. Many clever devices have been invented and put to practical use. Among these may be mentioned the lock gate operating device, of which a cut and full description will be found in the chapter on "The Plan and Operation of the Canal." Another extremely clever device, which has resulted in a tremendous saving of time, money and labor, is that known as the *track shifter*,

invented by W. G. Bierd. This consists of a huge crane with a long boom, which is run out upon the section of track to be moved. Chains are attached to the rails which are spiked to the ties, and the boom is lifted and drawn to one side, shifting the track some three or four feet. The machine is then moved forward and a new grip is taken on the track farther on and the operation repeated. In this way large sections of track may be shifted to one side in a short space of time. The device has proved of great value, especially on the dumps and fills where the excavated material is deposited.

Another clever device is the unloading plow. A long train of cars filled with earth is run to the proper unloading point, and the plow operated by wire ropes is drawn over the beds of the cars, pushing all the material off to the side desired, and effecting a great saving in time and labor.

Strikes upon the Isthmus have not had great success, for the reason that the Government considered that the main object was to complete the Canal in the least possible time and with the least possible trouble, holding that the good of the nation was above any small private grievance. To this end the Commission was given the authority to expel anyone from the Canal Zone who was not necessary to the work, or who became objectionable for any reason. This was upheld by the Supreme Court, which ruled that the Canal Zone was not a part of the United States, and therefore not subject to the Constitution, but could be treated as a military reservation. Men who stirred up trouble in the work by threatening strikes or making themselves objectionable in any way have been promptly deported and their places filled. The Canal Commission has directed the work with a strong hand, as the only method of pushing it forward to a profitable and successful conclusion.

As a matter of fact, there has been no occasion for a strike on the Isthmus, as the sole grounds have been a desire for more money. When it is considered that these men are working under conditions which have been modified to an

almost unreasonable extent for their ease and well being, it is hard to see any just grounds for a strike. The men work on an eight-hour day schedule, with an intermission of two hours at noon. They get their food cheaper than they could buy it in the United States, free light, water, fuel, quarters, medical services, low railroad rates, and their wages and salaries average from thirty to eighty per cent more than for similar positions in the United States. It would be hard to find a better treated body of men from any standpoint. They are allowed an annual vacation of forty-two days for gold employees, and should they desire they may save up this leave from year to year and take the accumulated vacation in any one year. They are allowed sick leave also on pay.

The net result of all this is that the work has gone forward practically without any serious interruption from labor troubles.

COMMISSARY

The problem of supplying quarters, food, clothing and the necessaries and luxuries of life for the enormous army of workmen at Panama has been a very considerable one. It has, however, been worked out by the Quartermaster's and Subsistence Departments, which respectively have charge of the buildings and physical property of the Commission, together with the recruiting of labor, storage of the material and supplies, and operation of the commissary store system, which sells merchandise to canal employees at prices but little higher than those at which the articles are bought in quantities. In addition the Subsistence Department has charge of operating the hotels, kitchens and messes in which the gold and silver employees are fed. Central stations have been established for this purpose, with huge bakeries, refrigerating plants and storehouses.

The commissary system consists of twenty-two general stores in as many Canal Zone villages and camps along the relocated line of the Panama Railroad. It is estimated

that with employees and their dependents there are about 65,000 people supplied daily with food, clothing and other necessaries. The main supply station of this system is located at Cristobal, from which a supply train of twenty-one cars is dispatched every morning, consisting of refrigerator cars containing ice, meats and other perishable articles, and ten cars containing other supplies. These are delivered at stations along the line, and distributed to the houses of employees by the Quartermaster's Department. Some idea of the volume of this business may be gained from the fact that the purchases of this department in the United States amount to about \$12,000,000 worth of supplies annually, which require a discharge of one steamer each day.

The hotel branch maintains the well known Hotel Tivoli at Ancon, together with eighteen hotels along the line for white and gold employees, at which meals are served at thirty cents each. At these hotels there are served monthly about 200,000 meals. There are seventeen messes for European laborers, who pay forty cents per ration of three meals. There are also operated for the West Indian laborers sixteen kitchens in which they are served by ration of three meals for twenty-seven cents per ration. The supplies for one month for the line hotels, messes and kitchens cost about \$85,000; labor and other expenses, \$16,500. The monthly receipts, exclusive of the revenue of the Hotel Tivoli, amount to about \$105,000.

The commissary stores have on sale a very large variety of articles which are purchased in large quantities under the contract system in the United States, and this business is managed by the Government on a profit just large enough to make both ends meet, including the costs of transportation, handling and delivering.

The commissary stores are run entirely on a charge basis. Employees are issued coupon books of varying face values with which they purchase supplies. At the end of the month the value of the coupons used is deducted from

the employee's salary. The net result of this great system is that the employees and the Canal Commission are not troubled by the prevailing high prices in the United States, and are a well satisfied and contented body of men.





THE GREAT CULEBRA CUT.

At this point the Canal is cut through what is practically a mountain range. The material excavated consisted largely of rock and formed one of the hugest engineering problems in the world's history. The cut is 9 miles long, 300 feet wide 272 feet greatest depth and required the excavation of 100,000,000 cubic yards of material.