A TRIP TO THE PANAMA CANAL.

By Colonel J. A. HARTIGAN, C.M.G., D.S.O.
Royal Army Medical Corps.

Within reach of many of our foreign stations is a country or place of particular interest, which most officers develop a desire to visit during their tour in the vicinity. As far as Jamaica is concerned, such a place is unquestionably the Panama Canal. I therefore considered myself very fortunate in having recently had an opportunity of visiting it under very favourable conditions. The whole trip took twelve days.

Armed with many letters of introduction kindly furnished by Dr. McLean, Medical Superintendent of the United Fruit Company in Jamaica, we sailed from Kingston to Port Limon in Costa Rica, a journey of forty hours. It was a calm voyage, the north-east trade winds being—very unexpectedly—conspicuous by their absence. Most of the passengers, who had come direct from England, complained bitterly of the heat but after residence in Jamaica, a journey across the Caribbean in “mid-winter” felt almost bracing. We were fortunate to find on board a copy of “The Cradle of the Deep” by the late Sir Frederick Treves, surely one of the most delightful of the many books written on the West Indies.

Costa Rica (Rich Coast), said to be the most flourishing and most peaceful of the Central American Republics, was discovered by Columbus on his fourth trip across the Atlantic in 1502. It remained under the power of Spain till 1829 when it became independent. This little Spanish American entity is very mountainous, her mountains forming part of that mighty range extending from Alaska in the north to Magellan in the south.

The coast line is hot and fever stricken and most of the inhabitants are negroes. The principal towns are found inland at various altitudes. Tropical forests extend from the coast up to the mountain slopes yielding mahogany; cedar and other tropical timber. The soil is very fertile and the area under cultivation is rapidly increasing. Along the coast the coconut palm abounds, further inland are found bananas, cocoa and pineapple, and still higher are large tracts of the famous Costa Rican coffee which is said to command very high prices in the European and American markets. Turtles are captured in large numbers more especially on the Pacific side and a large trade is conducted in tortoise shell ornaments, a fact which the lady members of the party discovered in an incredibly short time!

Limon, the Atlantic port of Costa Rica, is still in a very primitive state. Except for a few large buildings wherein are housed the offices of the leading trading firms, the houses are poor and unattractive and the roads
are positively appalling. It is little wonder that the town can boast of only two motor cars and still less wonder that they are both of the "Ford" variety. A drive in one of them was strangely reminiscent of a similar means of progression on the Menin Road in 1915! About a mile from the harbour and built on a promontory jutting out to sea, is the United Fruit Company Settlement which forms a marked contrast to the rest of the town. Here are housed the employees of that huge trading corporation. It contains married quarters, single members' quarters, mess and recreation rooms (all mosquito proof), swimming pool, tennis courts and a small golf course.

The gardens are artistically laid out and the lawns and hedges are kept in apple-pie order. There is also a hospital, built on the most up-to-date lines, over which I was kindly shown by Dr. Facio the medical superintendent. Here are treated not only the employees of the company but, as far as the accommodation will allow, the poor inhabitants of the district. The wards were very crowded on the day of my visit. There were many negro patients showing signs of marked malarial cachexia with enormous spleens. I was also shown a case of advanced pellagra.

On the following day a party of about twenty of us from the ship made the trip to the capital—San José. One hundred and eight miles from Limon, the journey took six hours by the narrow gauge railway but the time passed quickly in admiring the beautiful mountain, forest and river scenery en route. For the first four hours the journey was made through thick tropical jungle but after that time, when we were about 3,000 feet above sea level, the country became more open and flat, cottages were dotted all over the landscape and here and there the larger houses of the coffee planters with the inevitable "barbacues" on which the coffee bean is passed through the many processes required before it is ready for exportation.

Eventually we reached the capital and here we found hidden among the mountains of Central America a modern city with a climate, similar to that of the high veldt in South Africa. San José is a city of some 50,000 inhabitants built on a large plateau, 3,890 feet above sea level. Besides the President's residence and the National Palace in which are installed the various ministries and the chamber of deputies, there are many buildings such as churches, colleges, schools, hotels, shops, etc., which would do justice to any European city. The streets are well laid out, noticeably clean, and lighted by electricity. One could not help being struck also by the number of public parks, all well looked after and all provided with a band stand as the Costa Ricans are very fond of music. There is an efficient tram service and taxi cabs are available in abundance. The National Theatre is a beautiful little building like a miniature of the Paris Opera House. It contains many handsome paintings. There are two railway stations to choose from and your choice would depend on whether you wished to go to the Pacific or the Atlantic!
The hospital is in every way up to date. One of the consulting surgeons is (like the writer) a graduate of Durham. He is very proud of his native city and he informed me with evident satisfaction that the Government is employing more school teachers than soldiers at the present time, a condition of affairs which does not obtain in some of the sister republics. The inhabitants are for the most part of pure Spanish descent, those of mixed blood being noticeably few. Spanish is of course, the National language—and only a small proportion of the educated classes can speak English. San José and the surrounding district is rapidly becoming a favourite summer resort for Americans residing in the Canal Zone. Well pleased with our visit to the Capital, we returned to the ship next day and shortly afterwards sailed for Christobal, a twelve hours' journey.

Panama.—The Isthmus of Panama was Spanish territory till 1819, when it became independent. It then passed through many changes and vicissitudes, ultimately becoming one of the United States of Colombia. In 1903 it asserted its independence from the Colombian Government and became a separate republic. The population is about 350,000, consisting largely of a mixed race. The metropolis is Panama City near the Pacific entrance to the Canal.

The "Canal Zone" is a strip of territory extending four miles at each side of the Canal, which is administered by the United States of America. The two cities—Colon on the Atlantic and Panama on the Pacific side—are, however, excluded from the latter administration except as regards sanitation—a detail which will be alluded to again later. Adjoining Colon and Panama respectively are the two American towns Christobal and Ancon. In each case the American and Panamanian towns are only separated by a roadway, a point of no little importance, in view of the fact that the Republic of Panama has not yet deemed it necessary to adopt prohibition!

The administration of the Zone, which is under the War Department at Washington, is presided over by a Governor who is invariably an officer of the Engineer Corps of the United States Army, and similarly the Chief Health Officer is a regular officer of the United States Medical Corps. Otherwise the officials are mainly civilians, and the administration of the Zone is quite distinct from that of the Army stationed therein.

The Panama Canal.—As this canal is not so well known to the members of the Corps as her elder sister of Suez, a few details may be of interest. It was first begun by a French Company in 1882 and continued till 1889, when the attempt failed mainly owing to the appalling mortality from yellow fever and malaria. During that period 5,000 deaths occurred at the Ancon Hospital alone, of which 1,200 were from yellow fever. Many of the cases were admitted to the hospital with injuries or minor ailments, but developed yellow fever after admission. There was during that period a devoted Sister Superior in the hospital who spent her spare

4 Since our visit San José has suffered from a severe earthquake.
time in gardening. In order to prevent the destruction of her plants by the voracious "Umbrella" Ant, she had a low concrete wall built round her garden with a narrow shallow gutter filled with water over which the ants could not navigate. In these pools the yellow fever mosquito bred, and so the unfortunate patients became infected. It is not often that a praiseworthy act is followed by such calamitous results.

A new French Company was formed in 1894, but eventually the work was taken over by the United States in 1904 and completed in 1914. It was on August 15 of the latter year that the canal was first opened to world traffic—a time when the minds of Europe were centred in another place.

The canal, which is fifty miles in length, does not, as is generally supposed, run from east to west, but from the north-west to south-east, the Pacific entrance being actually twenty-two miles east of the Atlantic.
entrance. The dominating feature of the canal is the Gatun Lake which forms nearly three-quarters of its whole length.

This fresh water lake, entirely artificial, is the result of impounding the waters of the river Chagres by means of the enormous Gatun Dam. The latter, a huge structure of earth and rock, is nearly half a mile wide at its base and 1\(\frac{1}{2}\) miles in length. Viewed in its present state it is difficult to imagine the dam being artificial as it looks part of the landscape. Its surface now functions as part of a golf course. By means of this dam the water in Gatun Lake is maintained at eighty-five feet above sea level, and thus an enormous amount of excavation was obviated. The escape of water from the lake is controlled by a "spillway," a semi-circular construction of concrete with steel gates. By means of a hydro-electric plant the escaping water generates sufficient power to operate all the machinery in the locks and to light the Canal Zone. The Culebra Cut—that part of the canal which is most heard of owing to occasional slides—is really an arm of the lake. It is nine miles long and cuts through the continental "divide." Enormous dredgers were at work in the Cut when we went through.

The Locks.—While there is a tide of only twenty-six inches in the

Fig. 2.—A railway bridge over one of the many rivers in Costa Rica.
Atlantic, that on the Pacific is ten feet—hence the necessity for locks. Of these there are three sets, all constructed in pairs so that two vessels can pass in opposite directions at the same time. Each lock chamber is 1,000 feet long and 110 feet wide. The locks are magnificent structures, built of concrete and steel, and are worked entirely by electricity. At each lock there is a high building from which the working of the lock is controlled. No ship is allowed to pass through the locks under her own power, but is towed through by electric locomotives which run on tracks along the lock walls.

A journey through the canal is most interesting; it takes eight hours. Starting from the Atlantic end there is a stretch of about seven miles before one reaches the Gatun locks. During this stage one crosses at an acute angle the old French canal now much frequented by pleasure boats from Colon. As one approaches the locks the sight of several steamers on the Gatun Lake, eighty-five feet above, is a very striking one. The ship then enters the flight of three locks and rapidly emerges on the lake. One could not help being struck by the clock-work precision with which the passage through the locks was carried out. Scarcely a word was spoken, and everything was directed from the control house by electrical appliances. The ship then proceeds at a good speed through the lake, thence through the Culebra Cut, at the end of which she enters the Pedro Miguel Lock, and is lowered thirty feet to a small lake (Miraflores). After traversing this lake she arrives at the locks of the same name where, by means of a flight of two locks, she is lowered fifty-five feet to sea level. A channel about 8½ miles in length completes the journey to the Pacific Ocean. We
passed through the Miraflores Locks after dark. The locks were brilliantly illuminated and the scene was extremely picturesque.

The construction of the Panama Canal has been described as the world's greatest engineering feat. What is no less wonderful is the magnificent medical and sanitary work which made its construction possible. President Roosevelt appreciated that fact, and it is recorded that he informed a Committee of the American Medical Association that he wanted the best man in the world for the task, and having found him, that he would give him full power. His choice fell on the late General (then Colonel) W. C. Gorgas who was at that time employed on similar work in Cuba. That his choice was a happy one everyone now knows, as his work in the Panama has become a byword among sanitarians all over the civilized globe and no name is held in such high esteem by all classes in Panama to-day as that of Gorgas. Colonel Gorgas was Chief Health Officer of the Canal Zone, a position now held by Colonel Henry Clay Fisher, U.S.M.C. To the latter officer I owe a deep debt of gratitude for his great kindness to me during my visit and the facilities he gave me of seeing the work which is now being done under his direction. He also furnished me with much of the data which is used in these notes. In addition to his sanitary duties Colonel Fisher has administrative control over all medical personnel, hospitals, etc., in the Canal Zone (excluding the Army and Navy).

At the Pacific end of the Canal is the City of Panama, the oldest city on the American continent and the Capital and seat of Government of the
A Trip to the Panama Canal

Republic. It is a typical old Spanish city of some 50,000 inhabitants with a fine old Cathedral and many churches. The streets are narrow and tortuous and many of the shops are laden with Panama hats which are obtainable for sums varying from 10s. to £50. Curiously enough, all these hats are imported from Ecuador. Separated by a road from Panama City is the American town of Ancon, the most conspicuous buildings in which are the famous Ancon Hospital and the Tivoli Hotel. The latter, which is very comfortable, is under the direction of the Zone Administration. Adjoining Ancon is Balbao (named after the discoverer of the Pacific), a feature of which is the Headquarters Offices of the Canal Administration—a very handsome building. At Ancon and Balbao reside the Americans and Europeans employed in connexion with the Panama Canal and the Offices of the Headquarter Staff of the Army stationed in the Zone. Although one had previously heard of the beauties of these two settlements, one could not help being agreeably surprised at their most attractive appearance. The very pretty flower-clad houses, the well-kept lawns and hedges, and the beautifully laid out roads make a very pleasing picture. Along each side of the main avenues is a row of stately royal palms, and as all the roads are either of concrete or asphalt, there is a complete absence of dust. Many other smaller settlements are established at various points along the Canal as well as separate settlements for native employees.

The Ancon Hospital is claimed to be the most beautiful tropical hospital in the world, and after being taken over by it by the superintendent (Lieutenant-Colonel Piles, U.S.M.C.) one had little doubt that the claim was well justified. When the Americans took over the Canal in 1904 they also took over the old French Hospital at Ancon. In this many improvements were at once carried out, buildings were enlarged and screened, modern sanitary appliances installed and new equipment procured.

The present magnificent structure was begun in 1915 and completed in 1919. It is said to have cost two million dollars to build, and its equipment is valued at another million. It is beautifully situated at the base of Ancon Hill and the avenue of approach is called Gorgas Road. Built of reinforced concrete, the roof is covered with vitrified Spanish red tile. The central building contains the administrative offices, record room, four operating theatres, out-patient clinics and X-ray department. Radiating from the central block are five "ward groups" each consisting of four wards (two on each floor) with a dining-room, kitchen, dressing-room, laboratory, medical officer's room, nurses' room, etc. There is also an isolation section with accommodation for over 100 cases, and in addition a section containing forty rooms for the use of private patients. The total capacity of the hospital is 880 beds which could be increased to 1,200 in emergency.

Although the Superintendent is an officer of the Medical Corps of the United States Army, it is not a military hospital. It is primarily for the
use of employees of the Canal Administration, but naval and military patients are also sent there. In addition private patients from all parts of the world (especially South America) are admitted, the rates being 5 dollars per day for ward treatment and 7.50 dollars for a private room. Extra charges are made for surgical operations, X-rays and special nurses.

A point which quickly attracts the notice of the visitor is that many of the doors are marked "Gold patients only," "Silver patients only." This is but another way of saying "White patients only," "Coloured patients only," and it is based on the fact that while all white employees are paid on the gold basis or United States currency, coloured employees are paid in local currency.

The staff of the hospital consists of 33 medical officers, 90 nursing sisters and about 150 female attendants. The medical officers are appointed from civil life and are given Civil Service status. They do not engage in private practice.

Water supply.—Filtered and disinfected water is supplied not only to the occupants of the Canal Zone and to the cities of Panama and Colon but also to ships passing through the canal that may require it. The price charged to a ship depends on whether she is at anchor or alongside a dock. During the year ended June 30, 1922, 121 million gallons of water were disposed of in this way.

Three purification plants are in use. Colonel Fisher very kindly took me to see that at Miraflores. The water is pumped from the Chagres River through eleven miles of three foot cast iron pipes. Mr. George C. Bunker in his article on the water supplies of the Panama Canal describes this plant as follows:—

"The plant consists of the following units: An aeration basin, 86 by 130 feet in plan, equipped with 105 spraying nozzles; a head house containing three baffled mixing chambers of the under and over-flow type, alum storage space, solution tanks, and bacteriological laboratories; three cross-connected, parallel, concrete sedimentation basins with a total capacity of 4,500,000 gallons, measuring 300 feet by 125 feet in plan by 17 feet deep, each of which contains two solid baffle walls in which there are five rectangular openings near the top; a filter box into which the settled water flows; a filter building containing 14 rapid sand filters of the gravity type, with a combined filtering area of 5,950 square feet, an office and laboratories; an 820,000 gallon clear water well under this building; two concrete tanks, combined capacity 1,000,000 gallons; from which wash water is furnished to the plant and a general supply for the Pedro Miguel district and Fort Clayton; a small concrete building for housing duplicate chlorinators; and a pump station in which there are pumps for filling the wash water tank and an air compressor for air-washing the filters."

The capacity of the plant is seventeen million gallons per diem and the average daily output in 1922 was 7,860,000 gallons.
Here are also maintained physical and chemical laboratories for testing fuel oil, petrol, kerosene, asphalt, paints, etc., and for carrying out researches of various kinds.

Anti-Mosquito Work.—It is of course in this particular branch that the medical profession has won its greatest triumph in Panama. Many excellent books have been written on the subject and it is only necessary to make a passing reference to it here. To fully appreciate the immensity of the task one has to go over the ground oneself and see the natural difficulties that the authorities had, and still have, to contend with.

Enormous tracts of the country form ideal breeding ground for the mosquito but these pests are being slowly but steadily driven further away from the centres of habitation. Roughly speaking, areas are sanitized for a distance of one mile from all settlements, and in addition large breeding places discovered beyond that limit are at once dealt with. Every opportunity is taken to extend the sanitized areas by the installation of permanent drains, filling, etc. The lack of material limits the amount of filling that can now be carried out, and for that reason I am inclined to think that the news of a slide in the Culebra Cut, with the resultant supply of filling material, is not entirely unwelcome to the Sanitary Authorities.

It need hardly be said that such precautions, as prophylactic quinine, screening of houses, oiling, etc., are carried out with great thoroughness, in fact one could not help being struck with the keenness and the close attention to detail with which the whole campaign is being maintained.

As a result of dredging operations, varying climatic conditions, etc., new breeding places are constantly appearing but this is looked upon as part of the day's work and dealt with accordingly. As an example of unexpected difficulties may be mentioned the recent growth of dense aquatic plants which have invaded large surfaces of the lake areas. These were found to teem with Anopheles larvae. They are now being dealt with by oil (previously heated) sprayed from a tank carried in a motor boat. The maximum flight of the female mosquito is of course a question of enormous importance to the Sanitary Authorities in the zone and there seemed to be a tendency among them to the opinion that, when food is not available nearer, she can travel much farther than is generally believed.

Coloured labourers, who used to be employed in digging the canal have recently been allowed to return to the Zone and work on the land. They are not allowed, however, to reside within one mile of important settlements. As these individuals are scattered over wide areas which it is not possible to sanitize, malaria is prevalent among them.

The admission rate per 1,000 employees for Malarial Fever during 1922 was 17 as compared with 514 in the year 1905 and the death rate from all causes during the former year was 6.89 per 1,000. The number of cases of Malaria from all sources that have been reported to the Chief Health Officer has been pretty constant during the last few years and it
J. A. Hartigan

would appear doubtful that any further marked reduction is likely to take place. In fact the present satisfactory condition is only being maintained by unending supervision and watchfulness on the part of a very efficient and experienced staff.

Previous reference has been made to the fact that the United States has sanitary control over Colon and Panama though these cities are not included in the Canal Zone proper. There is a health officer for each city appointed by the Governor of the Zone. Their authority in sanitary matters is final in their respective cities, in addition to which they are empowered to sit as petty magistrates and impose fines on persons not complying with the sanitary regulations. Thanks to the courtesy of Doctor Henry Goldthwaite, the health officer at Panama, I had an opportunity of observing the state of sanitation in that city. It was, by far, the cleanest I have seen in the tropics and would compare very favourably with many cities nearer home.

A tour of service in the Canal Zone is very popular among American officers; a tour lasts three years during which there is a generous allowance of leave and passages to the United States are granted at very reduced prices.

The favourite pastimes of the residents in the Zone are baseball and golf (one American officer referred to the latter as foot-and-mouth disease!). There are many pretty golf courses available including two at the Pacific end. One of the latter is generally referred to as the nineteen hole course and is—needless to say—outside the Canal Zone area.

A very pleasant and instructive month could be spent in Panama but after five days—during which we received great kindness from the American officials—we had to return. We travelled to Christobal by the train which runs for the most part along the side of the Canal and the shores of the Gatun Lake. The hundreds of dead stumps of trees in the latter give a very weird effect of desolation. This railway is said to have cost a human life for every sleeper.

A very rough passage of two days duration from Christobal to Jamaica furnished an unnecessarily unpleasant conclusion to an otherwise most enjoyable holiday.

I am indebted to Qmr.-Serjt. F. W. Bazley, Royal Engineers, for the drawings accompanying these notes.