

Main Dam, downstream view, showing overflow and siphon tunnel outlets, stone toll and rockfill pitching.

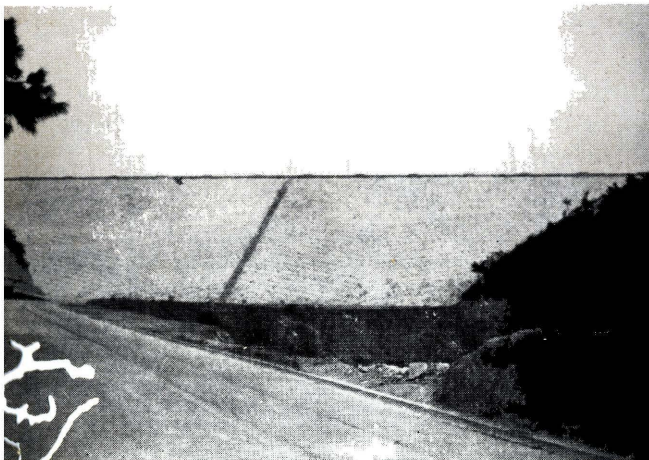
The Jubilee Reservoir, named to commemorate the Jubilee of his late Majesty King George V, is situated about twelve miles from Kowloon, in the Shing Mun Valley in the New Territories. The object of this construction was to afford an additional supply of water to the people of Hong Kong and Kowloon. To accomplish this end a pipe line was laid on the bed of the channel that separates the two cities.

The reservoir is formed by two dams, the Shing Mun Dam and the Pineapple Pass Dam, and has a total capacity of 3,000,000,000 gallons.

The Shing Mun Dam, which is of unusual design, consists of four different parts, namely:

(1) *The Watertight Diaphragm*, containing 9,000 cubic yards of reinforced concrete, forming the face of the dam, built in 20 feet and 25 feet panels separated by copper strips to allow for expansion and contraction.

Pineapple Pass Dam, downstream view showing rockfill pitching.



THE JUBILEE

An Outstanding Engi

The Jubilee Reservoir, near Hong Kong. The project represents an outstanding engineering achievement. One of the dams which form the Reservoir is the Shing Mun Dam, the highest in the British Empire, being 285 feet from the river bed to crest. Mr. G. B. Gifford Hull, managing engineer of the project, was in direct charge of the inception. Readers of the Marsman Magazine will find a brief description of the project which will show the position of Mr. Hull as one of the outstanding engineers of the world.

(2) *The Thrust Block* which consists of about 140,000 cubic yards of plain concrete with buttresses on its upstream side which carry the water-tight "face" of the dam and permit of its inspection from behind. The thrust block is not of itself stable against the water pressure and stability is given by—

(3) *The Rock Fill*, which is a mass of closely set stones, set by hand, amounting to about 700,000 tons in weight. The rock fill is not built on a rock foundation and is therefore susceptible to settlement, and to ensure that the water thrust is transmitted to it during such settlement, and to avoid "point" contact with the thrust block, a wedge-shaped mass of sand has been introduced between the rock fill and the thrust block. This is called—

(4) *The Sand Wedge*, and apart from fulfilling the above functions it gives a certain amount of elasticity to the whole structure, and renders it better able to withstand earthquake shocks.

To form a cut-off throughout the length of the dam, a tongue trench, varying from 6 to 20 feet deep, was cut to watertight rock and filled with about 20,000 cubic yards of concrete.

This Shing Mun Dam is 285 feet from river bed to crest and it is believed to be the highest in the British Empire.

The Pineapple Pass Dam is 82 feet high, consisting of a concrete core wall carried to rock 72 feet below ground surface, with earth filling pitched with

RESERVOIR

neering Achievement

ng, was opened on January 30, 1937. achievement in engineering construction. voir is believed to be the highest in the river bed to the crest.

director of Marsman Hongkong-China, tire Jubilee Reservoir project from its agazine will be interested in the follow- ch has added considerably to the reputa- ing men in his profession.

granite on the upstream or water side, and with rock fill on the downstream side.

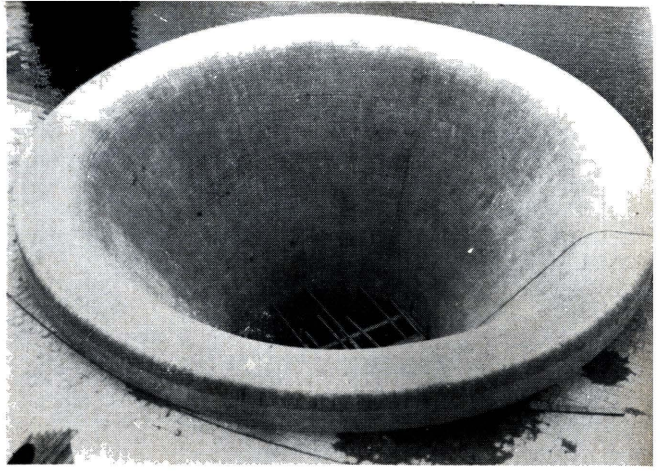
Construction was begun early in 1933. At first malaria was the worst enemy to be overcome, but when the site was reached by the road anti-malaria works were carried out. Ultimately, 986 acres were drained by permanent concrete drains totalling 22 miles in length, and the disease was conquered.

At the end of 1934, the concreting work was begun. At first there was considerable anxiety felt because of the floods common to the wet season in the district but they were safely controlled. By August of 1935 sufficient work had been done to allow impounding to commence and the inlet to the diversion tunnel was closed by a concrete plug on September the 2nd. By May of 1936 the dam could safely impound 700,000,000 gallons and the permanent supply to Hongkong through the Valve Tower was commenced in that month.

There are certain parts of the works which deserve special mention.

Bellmouth Overflow

When the level of water in the Reservoir reaches a level of 625 feet, surplus water begins to flow over the circular lip of the bellmouth, through the tunnel, and so to waste down the river bed below the dam. The disadvantage of this type however is that a vortex invariably forms in it at certain stages of flow which reduces discharge, causes



Main Dam, overflow Bellmouth.

turbulence, and sets up in addition undesirable vibrations in the structure. After lengthy and elaborate experiments these disadvantages were overcome and on the information gained the Shing Mun bellmouth was designed.

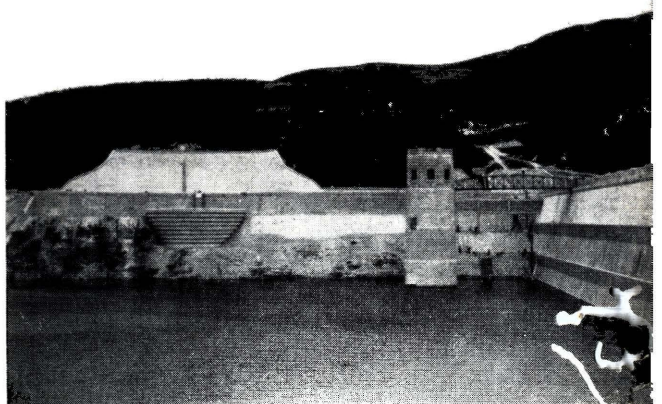
The Siphon Spillway

Incorporated in the dam was a subsidiary spillway, consisting of 6 siphons. This spillway was designed to assist the bellmouth in providing a total discharge of about 90,000 gallons per second, and comes into action when 1 foot 6 inches of water is flowing over the main spillway.

The siphons discharge 3,600 cusecs into a tunnel 11 feet in diameter and through a masonry channel on the quarry bench at level 450. The water from there falls over the rock cliff 100 feet high to the old river bed at a place well clear of the dam.

(Continued on page 17)

Main Dam, South bank, showing overflow Bellmouth valve tower and siphons.



The Jubilee Reservoir

(Continued from page 15)

Pitching

The stone pitching on both of these dams was considered to be unique. As a general rule, stones forming pitching are laid horizontally, but as the rock fill forming the downstream part of the Shing Mun Dam is not founded on rock but on comparatively soft material it was certain that it would settle. It was thought that if the pitching were laid at an angle of 45° in a series of alternating slopes, the settle would not so easily be noticed, especially if joints were broken every few stones. So it was that the design of the pitching was first evolved purely to dissemble the effects of settlement, but on working out details it was noticed that the changing slopes led to the formation of a pointed arch and that the arches gave additional strength to resist any tendency which the pitching may have had to slide downwards. It was decided to "break joint" every third stone by half the height of a course, which involved the insertion of snecking stones, and as blue granite was locally available it

was decided to use it for this purpose. The central part of the rock fill has settled to date about 4 feet, part of the settlement having occurred since the pitching was laid, but there is no apparent evidence of this in its appearance.

Steps on Face of Dam

Although it is unusual to bring up a dam in higher lifts than 5 or 6 feet, it was decided to construct the diaphragm in 20 foot lifts on the Shing Mun Dam. It is customary to bolt "soldiers" to the face of a dam to carry sliding panels between them against which to place the concrete but at Shing Mun, with the special and comparatively thin diaphragm, it seemed better to do away with bolts, and the steps on the dam are the result of a study to that end. They have proved very successful and likewise afforded very convenient walkways from one side of the dam to the other.

The estimate of cost of the works was \$9,200,000, and although nearly \$300,000 worth of extra works have been added, the whole works were completed for approximately \$8,000,000.

Dulong Mining Company

The total advance for the month of February on the Sampaguita, Aurora, and Luna sections was 1,019.5 feet.

A crew of 12 men completed 780 meters of road on the Bimmace-Bolañget project.

The survey to all the portals was completed during February and the map is expected to be completed in about six week's time.

An epidemic of influenza caused some trouble last month but all employees have recovered.