Sukkur Barrage Successfully Completed.

The Straits Times, 5 April 1932, Page 3

Sukkur Barrage Successfully Completed.

LARGEST PROJECT OF ITS KIND IN THE WORLD?

Perennial Irrigation Of 6½ Million Acres.

The Sukkur Barrage, recently completed, is the largest individual irrigation project in India or possibly in the world. It will bring perennial irrigation to an area of 6½ million acres, about half of which is at present uncultivated desert land; it should bring wealth and prosperity to a large area of Sind, a province remarkable for its deserts and the poverty of its inhabitants.

The successful completion of this undertaking has depended to a considerable extent on the use of excavators, of which there were no fewer than 46 employed, all of which were supplied by Ruston and Hornsby, or Bucyrus-Erie, now joined in the British company of Ruston-Bucyrus Ltd., represented in Malaya by the United Engineers Ltd.

WITHIN recent years many great irrigation projects have added to the prosperity of India, the two greatest being the Sukkur Barrage, and the Sutlej Valley Punjab project. The sum total of the irrigation projects in the Punjab are of much greater extent than the Sukkur Project, and they have already brought incalculable benefits to the people of that district where formerly famine was an annual spectre in the land.

To understand the Sukkur and the Punjab projects it is necessary to visualise the great plain that stretches from the foot-hills to the Himalayas, covering almost the whole of the Punjab, Bikaner State,

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ROHRI'S COMPLAINT.

15 April 1932 - Water Supply Affected By Sukkur

Bahawalpur State, Sind, down to the Arabian Sea, an area of about 200,000 square miles, 700 to 800 miles long and of irregular width.

It is a flat alluvial plain, with scarcely an appreciable rise or hill on its surface. It has a very gentle slope to the sea. The annual rainfall varies from two to twenty inches over the area and, in general, is quite insufficient for the needs of agriculture. But for the great rivers, this plain would be, as a large portion of it still is, an arid desert.

The Punjab Projects.

The Punjab projects get their name, of course, from the State in which they are located. The word Punjab is a corruption of Panjnad, meaning "the five rivers." They

with the cessation of the monsoon and the coming frosts.

Inundation Canals.

Now the country is so flat that water, led by canals cut from the banks, can be taken almost anywhere over the area during flood time, when the river rises to flow into the canals. Known as inundation canals, from time immemorial, systems using this type of irrigation have existed on the land adjacent to the great rivers.

Before the Roman era, and during the epochs of the vigorous conquerors from the north, such as the Moguls, these inundation canals were made vast and intricate systems, covering large areas of the land. The remains of large derelict cities in the deserts in the Punjab, Bikaner, Bahawalpur and Sind bear witness to the canal systems they must have depended on, and their decay and extinction to the failure of government and canal administration.

The drawback of the inundation canals is that they only run during about three months of the year, from the end of June to the middle of September, and thus can only serve to irrigate, and then in an uncertain manner, a hot weather crop, such as rice.

Since practically all the rainfall of the area also falls during this period, there are nine months of drought to be faced annually, and the cotton, wheat, barley, oats and rye crops, which, where water is available, are wonderful winter and spring crops throughout the area, are either unobtainable or have to depend on well irrigation.

Irrigation Works.

The object of all the great irrigation projects of the Punjab and of the Sukkur Project in Sind is to supply water in the canals, throughout the year, and this is done by build-

Barrage. Hyderabad (Sind), Mar. 21. The effect of the Sukkur Barrage on the water supply of Rohri, a 'own on the left bank of the Indus and the site of the Barrage, has caused a great deal of concern there. The water supply...

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MESOPOTAMIA.

22 October 1912 - Progress of the Great Irrigation Scheme. The following account of the progress made in the first portion of the works under Sir William Willcocks's scheme for the irrigation of Mesopotamia has been received by Heater's agency. Tho works are being carried out by Sir John Jacks <n (Limited), for...

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Engineering, building skill has come with long war to keep out the sea

3 December 1961 - Engineering, building skill has come with long war to keep out the sea THE tourist who visits the extreme north of the Netherlands sees that most villages are built on mounds which protrude far above the flat country mounds obviously raised by the hand of man. They are the hydraulic...

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ing dams or "barrages" with regulating sluice gates, across the rivers, to raise the water level to

Bungsar Road Power Station, Kuala Lumpur.

are the Jhelum, Chenab, Ravi, Beas and Sutlej.

These rivers all join together before leaving the south-west toe of the Punjab to join the Indus, one of the mightiest and longest rivers in the world, which has its source at a height of over 20,000 feet in the remote Tibetan plateau, not far from that of the Sutlej, though four great rivers come between, before the two finally join.

The Indus forms the western boundary of the Punjab, and after its confluence with the five rivers, flows down as a great stream through Sind to the sea, near Karachi.

All these rivers draw their water from the rainfall and snows of the Himalayas and are subject to seasonal rise, their flow during February, when they are at their lowest level, being only a small fraction of the volume passing in August, when the melting snows and monsoon rains are at their maximum intensity.

The rivers commence to rise in May, with the melting of the snows, and fall quickly again in October

that of flood level so that water can flow at all times into the canals which start from the barrage points.

So completely has this principle been worked out in the Punjab, that during the winter scarcely any water flows in the actual river-beds, below the lowest barrages ; it is all diverted into the irrigation canals, and the Punjab has become one of the world's large producers of wheat and cereal crops and probably the richest province in India.

There are no fewer than ten such barrages at different points on the five rivers and others under construction or projected. The canals supply water to three-quarters of the whole of the Punjab, and, including the final feeders, have a total length running into hundreds of thousands of miles, and the total excavation involves a stupendous figure. The little known or talked-of irrigation system of the Punjab is the largest and most intricate in the world.

The above brief survey will serve to introduce and explain the Sukkur barrage project which consists of putting a barrage (or dam) across the Great Indus itself, shortly after

it enters Sind. From the head-

works radiate seven main canals which will give continuous irrigation over the large area mentioned.

The site chosen is at Sukkur, where the Indus has broken through a low barrier of sedimentary limestone, and where its width is accordingly considerably less than its average flood-level bed-width. The actual width across the main river spans, between the left and right bank canal regulators, is 4,600 feet. The height above low-water level to which the barrage will raise the water level, so that it flows into the canals, is about 12 feet.

It is not the object of this article to deal with the actual construction of the barrage, but rather with the excavation of the canals. It would not be fair to pass, however, without remarking on the difficult engineering problem presented by the construction of the barrage on account of the peculiarities of the Indus.

When in full flood the flow past Sukkur has exceeded one million cubic feet per second, and the flow velocity reaches ten feet per second —almost seven miles an hour. The scour or erosion is tremendous and uncertain in its action and direction in flood time.

An Anxious Time.

The closing of the coffer-dams each winter, preparatory to the three or four months' feverish work on the barrage foundations before the river rises again, has been a very anxious time, since a slight flood might undo the labour of months and imperil the work of a whole season.

The foundation consists of a concrete raft 190 feet wide, with auxiliary and stone pitching to a total width of 430 feet, with lines of sheet piling at the upstream and downstream edges extending across the river. There are two auxiliary lines of piles under the raft, spaced towards the centre.

The river bed silt is so deep that it is not possible to reach solid foundations, hence the raft form of construction, which has proved very successful on other barrage schemes. The stone used is quarried from the neighbouring sedimentary rock bar. It is a soft but serviceable stone, and the masonry subject to stream action is being faced with specially selected hard limestone blocks.

The foundation and piers have been completed in three winter

seasons, working from each bank simultaneously.

Use of Draglines.

To turn to the canal excavation, the Sukkur barrage is the first large project in India to entrust more than half of its canal excavation to dragline excavators. The decision in this direction was made on account of scarcity of hand labour in Sind, and the necessity for completing the canals to a time schedule.

It was not at that time considered that economies in cost could be obtained by their use, since the cost of earthwork by hand labour in India is extraordinarily low—a small canal of say twenty-foot bed width can be constructed by hand at from 2½d. to 4d. per cubic yard excavated according to the district of India concerned.

In practice, however, both on the Sutlej Valley project in the Punjab, and the Sukkur barrage, the draglines have worked, in the majority of cases, at considerably lower rates than the hand-labour estimates, and effected great savings in the earthwork costs.

The total length of the main line canals and branches is about 1,600 miles, of the distributaries, 4,622 miles. The final feeders to the fields may amount to 50,000 miles. Leaving out the latter, which will, in general, be constructed by the farmers themselves on their own land, the excavation involved amounts in round figures to about 210,000,000 cubic yards, or about twice the total excavation of the Panama Canal.

Almost all the main line and branch canals are being constructed with draglines, as are also quite a number of the distributaries in areas where it is difficult to obtain hand labour.

Colossal Excavations.

The total excavation allotted to the machines is about 120 million cubic yards, and, since 1924, when the first large steam machine, a class-320 christened "Wilson Bahadur," after Sir Leslie Wilson, Governor of Bombay Province, who attended the digging of the first bucketful, commenced work, an imposing total of 46 machines has been put to work.

All these machines were manufactured by the two companies, Ruston and Hornsby and Bucyrus-Erie, now joined together in the Ruston-Bucyrus Co., and were so satisfactory from the start that, after the initial purchase of eleven

large steam machines, the purchases were eventually increased, a few machines at a time, to the total mentioned of 46, and incidentally, no other manufacturers of excavating machinery were considered for the supply of subsequent machines on account of the complete success that has attended every one of the machines supplied by the joint companies.

The main line canals are from 180 to 380 feet in bed width where they leave the headworks at Sukkur ; they narrow as they grow in length and branches and distributaries are taken from them. They vary in depth from four feet to 20 feet according to the contours crossed. In low places, borrow pits have to be dug to form canal banks.

The large machines work in pairs, each machine digging one half of the canal and dumping the earth to form one canal bank.

The 300-foot widths require the largest machines with 145-foot booms, in order to obtain the necessary digging and dumping reach. The 380-foot canal, the East Nara, is too wide even for these machines, and a portion of it has to be rehandled. Most of the large machines are arranged so that when the canal narrows, they can be equipped with a larger bucket and a section taken out of the boom.

The smallest distributaries go down to about six feet bed width, and even these are being successfully and economically worked by means of the small Diesel machines. Between the main line canal and the small distributaries there are canal sections to be dug of intermediate widths, and the various machine sizes and boom lengths have been chosen to work them.

Battle Against Sandstorms.

Over the huge area covered by the barrage canals, the working conditions and the ground vary a great deal. Certain areas are very sandy, and in these both working and living conditions are very unpleasant.

Sind is subject to strong winds, with frequent sandstorms, and machines whose task requires them to dump their buckets in the teeth of the prevalent wind, work in a continual cloud of dust and sand. This causes excessive wear on all exposed working parts, and is such a serious matter that on later machines, wholesale enclosing of the working parts has been resort-

ed to, including completely enclosed dust-proof Diesel engines.

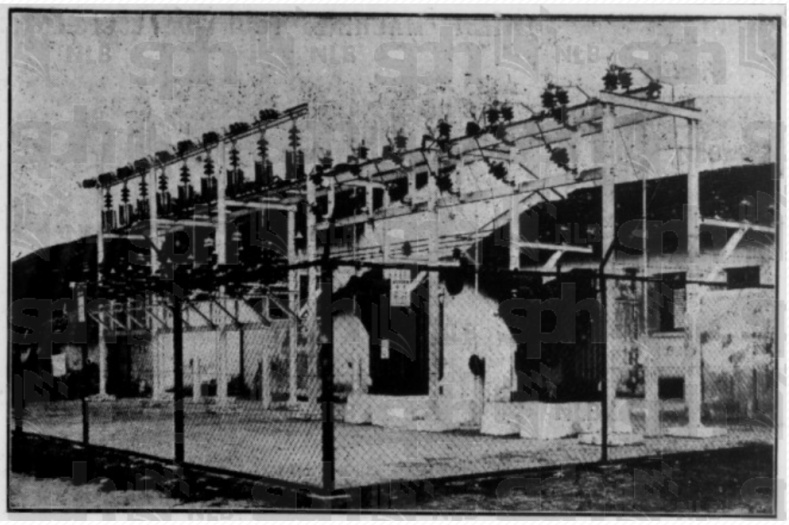
In other places, there is ground so hard that blasting has had to be resorted to in the centre line of the canal to assist the dragline buckets.

There are practically no roads in Sind, and tramway tracks from the nearest railway station have had to be used for supplying the large steam machines. Many of the small Diesel machines are miles out in the desert, away from railways or roads.

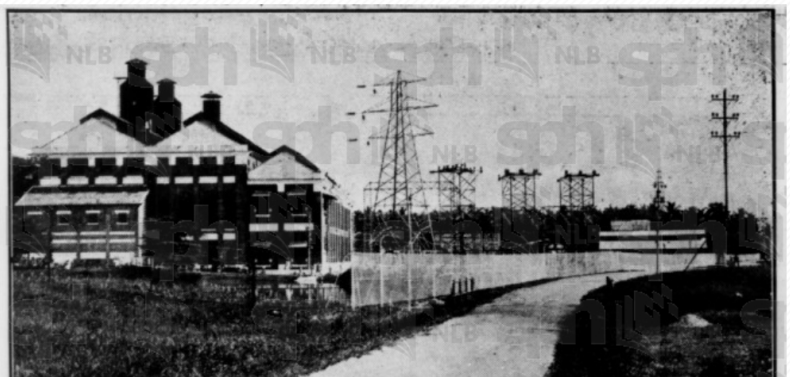
It is usual to make a beaten track to such machines alongside the canal they are digging, over which all supplies are taken, fuel oil, water, food, etc., by motor lorry, bullock cart or camel.

Some of the more isolated machines had to rely entirely on camel transport. The operators of such machines have very unpleasant living conditions, as they must live in tents, close to the machines, and repitch their camp every week or so as the machines move on. Their drinking water is not improved by a long journey in petrol tins on the back of camels, and it is very difficult to get fresh meat or vegetables to the camps.

All machines work on a three-shift basis, night and day, summer and winter. During the summer, especially in May and June, the temperature at noon is seldom far from 115 degrees in the shade and often runs over 120, with dust storms on many of the days.



The electrical sub-station at Kajang which supplies the town of Kajang and the rubber factories on the west country estates with power. (Photo: O. Y. Kok.)



A modern power station in the Malay States. This is the Bungsar Road station, Kuala Lumpur. (Photo : O. Y. Kok.)