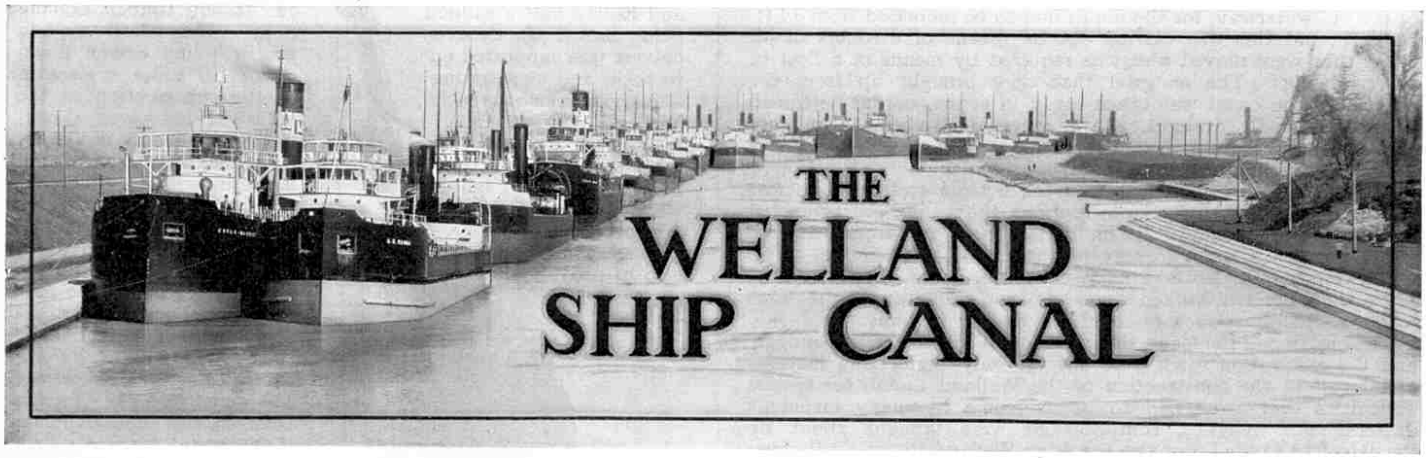

THE WELLAND SHIP CANAL

II.—BURYING A RIVER 75 FT. UNDERGROUND

LAST month we described the general course of the Welland Ship Canal and dealt with the construction of the great locks that carry the waterway up the Niagara escarpment separating Lake Erie from Lake Ontario. We also explained the construction of the immense metal gates that retain the water in the locks. In the present article we shall show how many other interesting engineering problems were solved when making the canal navigable by the giant vessels that ply on the Great Lakes.

A very important part of the work of the canal builder is the construction of reservoirs or ponds in which to store the water required when boats are to be worked through the locks. This is especially important in the case of the Welland Ship Canal, for no less than 19,000,000 gallons of water must be poured into one of the seven great lift locks in order to raise a vessel passing through it to the level of the stretch of the canal beyond it. The quantity is sufficient to supply the daily needs of a city of 250,000 people.

Two of the lift bridges of the Welland Ship Canal open to allow the passage of a large lake steamer entering the Canal from Lake Erie. There are 20 bridges across the Canal, and 10 of them are similar in type to those shown in our photograph. We are indebted to the courtesy of the Department of Railways and Canals, Canada, for the illustrations to this article.

The ponds in which the reserve water for the locks of the Welland Ship Canal is stored are on the east side of the waterway. Those serving the three locks nearest Lake Ontario have areas of 107 acres, 200 acres and 150 acres respectively. The twin flight locks are supplied with water from a reservoir 84 acres in area, and a slightly smaller pond has been formed in order to feed the lift lock that crowns the summit of the Niagara escarpment. In certain places the old canal is used as a channel to connect the ponds, and the weirs that regulate the level of the water in the canal and in the reservoirs discharge surplus water into it. These weirs act automatically, their valves opening when the level of the water in the ponds they protect rises above a certain height.

Providing the necessary reserve for the three twin locks on the face of the Niagara escarpment was a difficult task, for the miniature lake required had to be formed halfway up the hillside. The water in it was to be retained by an earth dam, 3,500 ft. in length, which was to rise in places to a height of 80 ft. 6 in. To add to the difficulties the engineers had to overcome, the line of this dam cut right across the existing canal, several of the locks of which were actually destined to be submerged by the water to be accumulated. How the dam was to be built was therefore a problem Traffic over the old canal could not be stopped until the new one was ready, and this could not be completed until the old waterway had been rendered useless by sinking part of it to the bottom of the pond! The puzzle was eventually solved by constructing a temporary dam across the pond, making part of it available for supply purposes; and the change from the old canal to the new one was made without interruption to traffic. The main dam and its control weir will be completed in the near future.

The construction of the canal involved a stupendous amount of excavation, more than 60 million cu. yds. of earth and rock being dug out along its track. This quantity is sufficient to form a pile six times the size of the Great Pyramid, and in removing it the excavating crews did as much work as if they had dug a hole 7 ft. in diameter through the centre of the earth from Canada to Australia!

The excavating plant employed consisted of steam shovels and draglines, in addition to locomotive cranes and other dragline machines handling clam shell buckets. Most of the dry material was dug out by means of mechanical shovels of all sizes, ranging from small machines equipped with caterpillar tracks to large 90-ton steam shovels capable of holding five cubic yards. Good use also was made of the dragline shovels, and those employed were remarkable for their size. The bucket of one of them had a capacity of five cu. yds. and at the time was the largest in Canada.

The dry material excavated was carried away in dump cars of all kinds, including narrow gauge wagons holding 4 cu. yds. of earth, and others, made of steel and running on track of standard width, that carried 20 cu. yds. A special railway was built and operated by the Government in order to remove the material dug out. This ran from the twin flight locks to the terminus on Lake Ontario and was about 7½ miles in length. It was equipped with a complete block signalling system, and as many as 384 trains were dealt with daily when excavation was in full swing.

Dredging was necessary where the new canal follows the line

MODEL OF THE MONTH

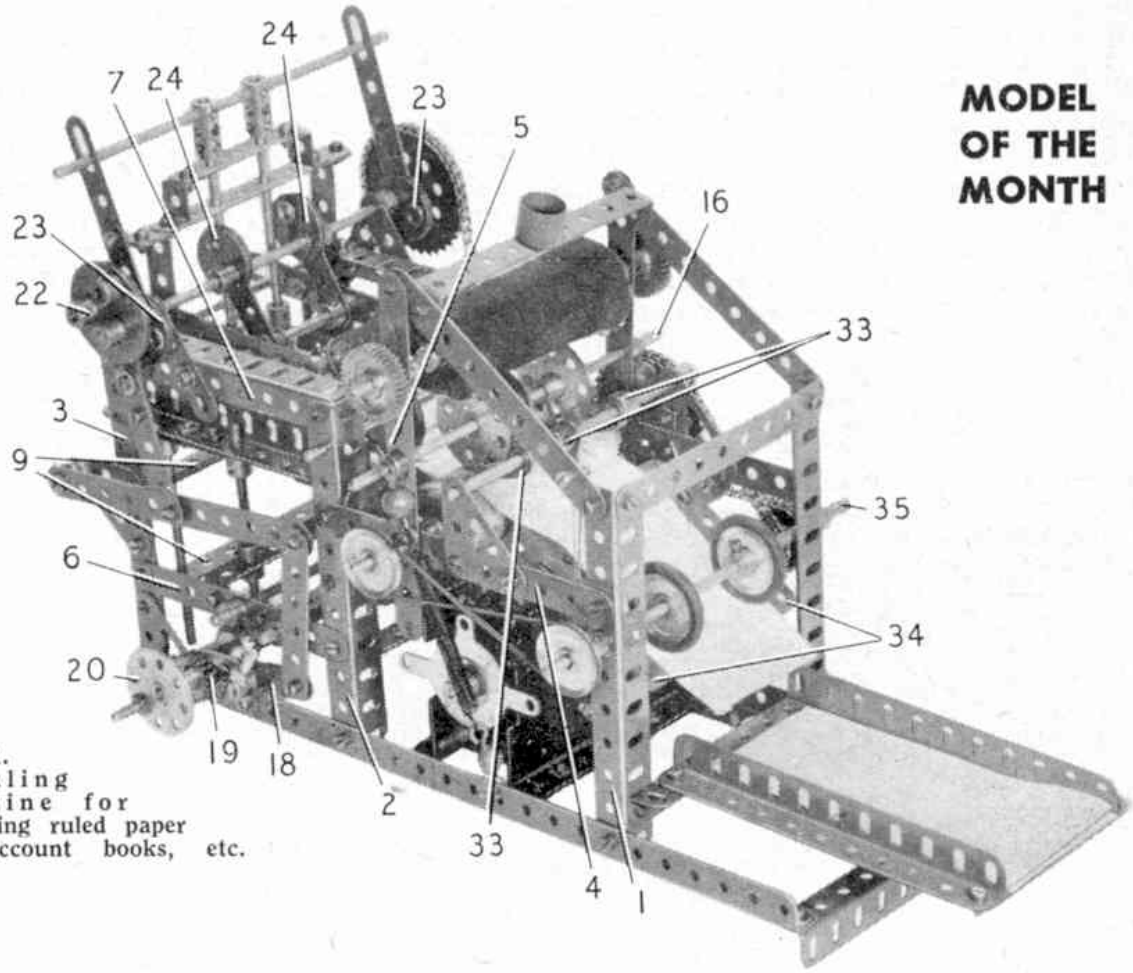

Fig. 1. A Ruling Machine for producing ruled paper for account books, etc.

Paper Ruling Machine

WE have included in the Model of the Month subjects from time to time models of machines that will "do something", that is, carry out some kind of useful work. Among these have been a machine that folds lengths of woven cloth into bales, a machine for filling boxes automatically with pills or other articles, and a wire covering machine. We are adding this month a fine model of a printer's paper ruling machine, which is designed to print rule lines on paper, for use, for example, in the making of ledgers and other account books.

The model is shown complete in Fig. 1 on this page and while it is not at all difficult in construction, the building of it should provide plenty to interest the constructor. The model is driven by an E20R(S) Electric Motor and is most realistic when in operation.

As usual readers who wish to build the Ruling Machine can obtain full constructional details and a list of the parts required to build it simply by writing to the Editor enclosing a twopenny stamp to cover the cost of postage.

Readers living in Canada, Australia, New Zealand, South Africa, Rhodesia, Ceylon, United States of America and Italy can obtain the instructions by writing to our main agents for those countries, also of course, enclosing appropriate stamps for postage.

We advise readers who wish to build this model to apply for the instructions as soon as possible because there is sure to be a big demand and we cannot guarantee to supply Model of the Month instructions after the end of the month in which the model is illustrated in the *Meccano Magazine*. So to avoid disappointment write for your copy as soon as you receive this issue.