

angular holes and are to be filled with concrete. The remainder of the compartments are circular and are to be filled with broken rock, being designed circular so as to better withstand the bursting pressure due to the broken stone filling. Each block contains eight 10-in. grout holes. There are only five shapes of blocks. The bottom course 34 ft. x 3 ft. 4 ins. x 21 ft. 10 ins., the second 31 ft. x 3 ft. 6 ins. x 21 ft. 10 ins., the standard blocks 31 ft. x 4 ft. 1 1/2 ins. x 21 ft. 10 ins., the two top blocks 26 ft. x 4 ft. 1 1/2 ins. x 21 ft. 10 ins., these latter being made by leaving out the front compartments of the standard blocks and the special blocks with a rounded corner to form the corners of the pier and landing quay. The blocks, which contain about 30 yards of concrete and from 2 1/2 to 3 tons of reinforced steel and weigh about 62 1/2 tons, are manufactured in a block yard on the site of the works.

Steel forms consisting of four ridged outside pieces and collapsible inside pieces are used. The forms are bolted down to the platforms and held together at the top by means of clamps. In stripping a block, each outside form is lifted independently, and those in each compartment are collapsed and lifted out.

The arrangement of reinforcing steel in the blocks is very simple, consisting mostly of long bars running right through them.

The simplicity of the system of reinforcement is illustrated by the fact that the reinforcement for a block is erected in 30-man hours. Little difficulty is experienced in making ten blocks per day, and under very favorable conditions as many as sixteen have been made in a single day. After seasoning for a month the blocks are either stored in a storage yard or placed into the quay walls. About 3,600 blocks are required to complete the quay walls for the first unit and all but about 800 have now been made in two working seasons.

The quay walls are constructed of stacks of reinforced concrete blocks, placed one directly above the other, and securely bonded and bedded by means of mass concrete in the front and middle compartments and by old railway rails grouted into the 10-in. grout holes.

The method employed in constructing the quay walls is as follows:—

The foundations are prepared and concrete pedestals 5 ft. x 6 ft. from a few inches to several feet deep are constructed every 22 feet along the line of the wall; upon these pedestals the bottom blocks rest, the adjacent corners of successive stacks of blocks resting on the same pedestals.

When the pedestals are more than 4 inches deep they are connected by a concrete wall about 2 feet thick at the top. The wall is left 3 inches lower than the pedestals.

By means of the 150-ton locomotive crane, sufficient blocks are loaded on to flat cars to complete one stack. The crane then travels to the scene of operation and the blocks are sent out to it one by one. They are lifted and put in position just touching the guide posts and then lowered into place. As soon as the block is on the bottom, the boom of the crane is lifted a few inches and the block raised about 2 feet and finally lowered into place. This has the effect of bringing the block hard up against the guide posts. The crane travels out over the empty stacks of shells, a very important construction feature which does much to promote the progress of the work.

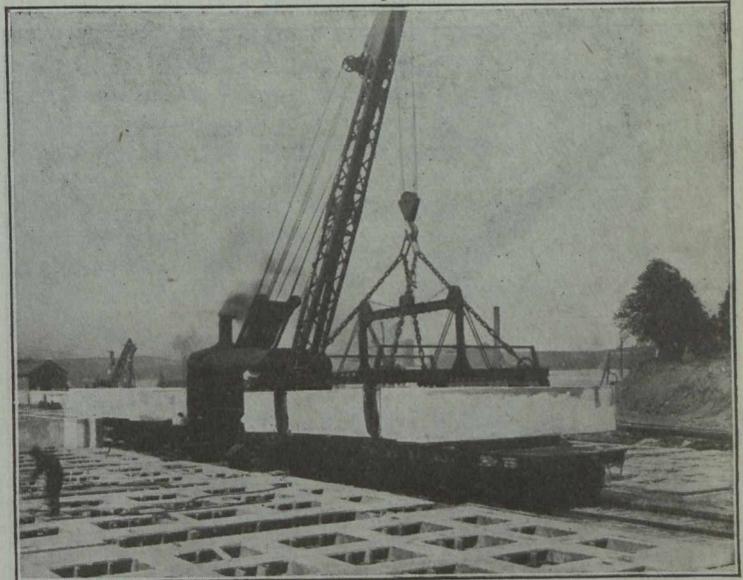
Following the block-setting comes the filling of the stacks with concrete. Before concreting takes place, bags of sand or wooden shutters are placed along the bottom of the wall between the pedestals back and front to prevent the concrete running out and a small quantity

of rubble is placed between the stacks for the same purpose.

The concrete, consisting of 1 part cement, 2 1/2 parts sand and 5 parts broken stone, is conveyed from the yard mixing plant at night, or when blocks are not being made, in 1 cubic yard bottom-dumping buckets and placed by means of a locomotive crane standing on the walls. Great care is taken that the buckets do not deposit their concrete until they are on the bottom. Two floating mixing plants are also used for this work at times. The concrete in the front pockets of the blocks is left 6 inches below the top of the standard block, so as not to interfere with granite setting. Old railway rails are then placed in the grout holes extending from top to bottom of the stacks of blocks and grouted in with a 1:2:4 concrete.

After the concreting is completed dredged rock is placed in all the circular compartments of the blocks and the wall is then ready for the granite face work and mass concrete top wall.

To commence the block setting timber trestles were built to the shore ends of north quay basin No. 1, the



Crane Loading Block onto Flat Car. Note Specially Designed Lifting Tongs.

north and south quays of pier "A," and to a point near the centre of the bulkhead passenger landing quay and block setting has taken place from all these points.

Foundations.—There are three classes of foundations encountered on this work. Most of the walls are founded upon rock; about 600 feet at the centre of the passenger landing quay and the pier head are on rubble mounds, and about 400 feet on the passenger landing quay on a glacial deposit of red boulder clay.

Where rock was encountered above grade it was removed by dipper dredges, the surface cleaned and the pedestals built by means of a large diving bell.

The diving bell consists of a large steel chamber 38 ft. x 26 ft. x 7 ft. high, and is provided with separate man and material shafts and locks. It is capable of sinking and refloating itself by means of a water ballast tank and can work in any depth of water from 25 to 55 feet.

Eight or ten men usually work inside the diving bell, the water being kept out by compressed air. The bell is tended by a wooden scow 100 ft. by 32 ft. 8 ins., fitted with high and low air compressors, pumps, electric light,