have ever been made. Each ram is 90 in. external finished diameter, and has a working stroke of 65 ft. The gauge pressure in the presses during operation is very nearly 600 lbs. per sq. inch. The inside diameter of the press is 7 ft. 8½ in., giving a water space of 1¼ in. all round between the ram and the press. The rams are

ONE OF THE MAIN RAMS AT FULL STROKE.

built of cast iron, 3¼ in. thick, made up in sections. Each section is 5 ft. 3 in. long, and is bolted to the adjacent one by bolts through inside flanges, for which purpose forty 1¼ in. bolts are used. The joints between the sections are made with a gasket of pure copper, rolled true to gauge, 1/10 in. thick by ¾ in. wide. This gasket is brazed in the form of a ring. The ends of the ram sections are rabbeted to fit into one another, and have male and female corrugations. The copper is put in flat, and when the joint is screwed down tightly it becomes corrugated, making the joint absolutely tight.

It is interesting to note the principles employed in the construction of the presses of the European locks. In the two largest ones the arms are 2 meters in diameter. In one the presses are made of cast iron sections, strengthened by steel hoops shrunk on the outside of them. In the other the presses are made of steel hoops piled upon one another and rabbeted together, watertightness being secured by a copper lining or bag, on much the same principle as the ordinary double-tube bicycle tire, the hoops providing the strength, and the copper lining the tightness.

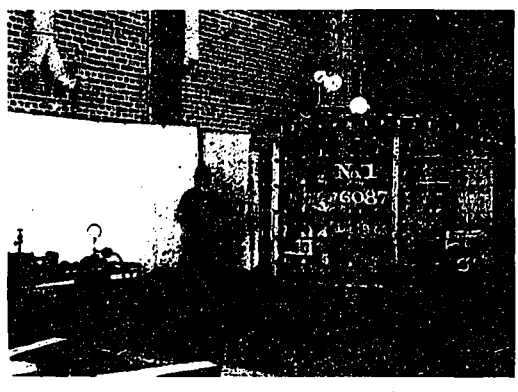
The presses of the Canadian locks are made of plain steel castings, built up similarly to the rams. This method has proven eminently satisfactory in the tests, and in practical operation it leaves nothing to be desired. The internal diameter of the castings is 7 ft. 8¼ in. The thickness of the metal is 3½ in., and the length of the sections 5 ft. 3 in. The sections are flanged at both ends. The flanges are faced and rabbeted male and female. The corresponding faces of the rabbets are also corrugated male and female to receive a soft copper gasket, similar to that used in the rams. In addition to the copper a lead gasket is also used in the press joint, placed in a V-shaped groove cut in the flanges about three inches outside the circle of the copper gasket. The lead was put in round, ¾ in. in diameter and distorted to nearly fill the groove in the process of making the joint. Fifty-six bolts, 1⅝ in. in diameter, were used in each of the press joints.

The top of each press is finished with a stuffing box of rectangular form, 1 in. wide and 10 in. deep. This box contains twelve rings of braided hemp and tallow packing, which, before using, were about 1 in. square. The hemp is tightened down by a steel gland or follower with thirty-six stud bolts tapped into the top section. Each press is braced to the walls of the well near the top by adjustable struts, enabling the press to be accurately centred before the erection of the lock chambers began.

The pipe connecting the presses near the top, immediately below the stuffing boxes, in an extra heavy, lap-welded, wrought iron pipe, 12 in. in diameter, and ½ in. thick. Through this pipe all the water displaced by a descending ram is driven into the other press, causing its ram to rise. Midway between the presses, immediately under the centre of the middle tower, a gate valve is placed in the 12 in. pipe, to make connection from one press to the other, or shut it off as occasion may require. The body of this valve is a steel casting. The valve is controlled solely by the lockmaster in his cabin on the top of the middle tower. Besides the main gate valve there are two auxiliary valves, which are operated automatically by the lock during its motion. These valves serve as a protection against possible accident to the gate valve, and each is closed by the chamber on reaching the end of its stroke, the closing being started about the last ten feet of stroke.

HYDRAULIC TESTS.

After manufacture, and before erection, all the castings of the presses and rams were subjected to a rigid hydraulic test at a gauge pressure of 1,200 lbs. per square inch, being twice the working pressure. A number of these castings were tested to 2,000 lbs. gauge pressure. These higher tests proved so satisfactory that it was considered unnecessary to continue the tests beyond the 1,200 lb. limit. This hydrostatic testing was of absorbing interest, and gave results of importance and value in what was hitherto a practically unexplored field. The higher



A, A—Spring on Tape. B—Vernier on Scale.

HYDRAULIC TEST OF STEEL PRESS AND IRON RAM SECTION SHOWING MEASURING TAPES AND GENERAL ARRANGEMENT.

pressure, 2,000 lbs., gave stresses approaching the elastic limit of the metal, and proved beyond a doubt the perfectly homogeneous character of the castings. When it