THE LATERAL PRESSURE OF LIQUID CONCRETE.

The lateral pressure of liquid concrete is a most important question for the constructing engineer. In a paper before the Institution of Civil Engineers Mr. H. St. G. Robinson has presented some notes on a series of experiments to ascertain this pressure. The first experiments were conducted about five years ago, during the construction of a heavy retaining wall, by placing boards between the uprights of the vertical forms and noting the deflections caused by the various heads of concrete.

These experiments, however, were thought to be somewhat unreliable, owing to want of refinement, and Mr. Robinson has since carried out further experiments of a similar nature, but with an apparatus constructed to secure more accurate results. This consists of a strong cast-iron chamber, fitted with a sheet-rubber working face, and is arranged so as to be readily fixed in position on the forms. The chamber is filled with water or other suitable fluid, and the pressure exerted by the concrete against the working face is recorded on two sensitive low-pressure Bourdon gauges, conveniently situated behind the chamber.

In the apparatus first used the chamber was formed of timber lined with zinc; this, however, distorted on becoming wet and was abandoned in favor of cast iron. A glass tube water-column was also fitted for recording the pressures, but it was thought that the movement of the pressure face caused by the displacement of the water was not conducive of accuracy, as it caused the concrete to arch over, a movement that does not occur when Bourdon gauges are used.

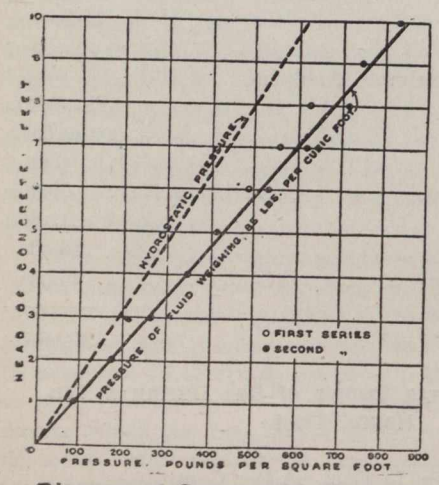


Diagram of Comparative Pressures.

A large number of experiments were made on different types of concrete structure. In heavy walls, large piers, and other members of fair size the lateral pressure exerted was found to be fairly uniform and practically constant for equal heads; but in reinforced-concrete columns of small dimensions, thin walls, and other light concrete work, the effect of friction between the more or less rough timber forms and the concrete, together with the arching action, was found to reduce the pressure considerably.

Two sets of experiments are recorded in the diagram, having been selected from a number made; they represent those in which the conditions were most favorable.

The first series of tests was made during the building of a long wall about 3 feet thick, constructed on concrete weighing 140 pounds per cubic foot and composed of slow-setting cement, sand and crushed granite in the proportions of 1:3:6, by volume. In mixing sufficient water was used to bring it to a thoroughly plastic condition, requiring little or no tamping to consolidate. The concrete was laid more rapidly than is usual in this class of work, being carried up as rapidly as the mixing and placing would permit to a height of 8 feet above the centre of the pressure face, during which time a light, iron bar provided with a turned-up end was used for churning the semi-liquid mass. Four complete sets of readings were taken, and each point on the curve represents the average value at that head.

The second series was carried out on large piers 4 feet square, the concrete in this case being a 1:2:4 mixture of cement, sand and Thames ballast, weighing 145 pounds per cubic foot. The conditions as to mixing and laying were similar to those of the first tests, and the concrete was carried up to a height of 10 feet above the centre of the pressure face. Each point of this second series represents the average of six readings.

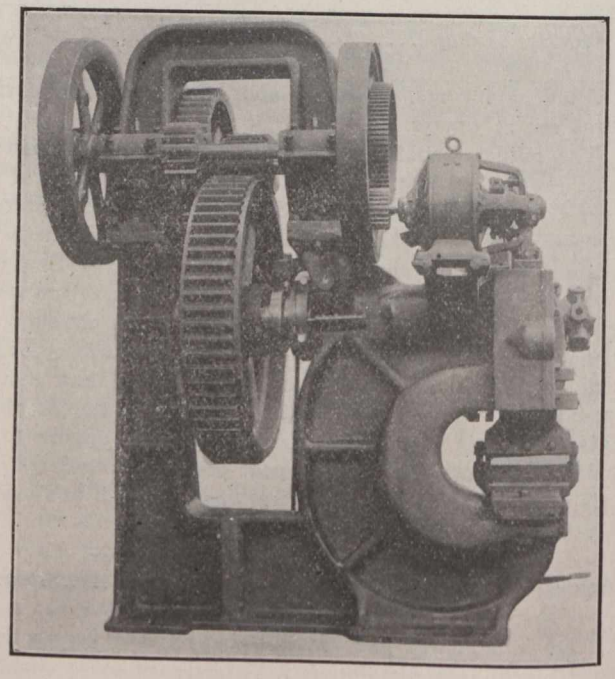
In the first series the temperature was fairly uniform throughout, while in the second considerable variation was experienced; but the effect of the differences in temperature on the lateral pressure cannot be traced, and would appear to be very small.

The general conclusion to be drawn from these and other experiments is that the lateral pressure of concrete for average conditions is equivalent to that of a fluid weighing 85 pounds per cubic foot. For concrete in which little water is used in mixing the pressures are rather less, having an equivalent fluid value as low as 70 pounds per cubic foot in very dry mixtures.

PUNCH AND SHEAR PRESS.

Economy of floor space, always an important item, is particularly so in a machine shop when it is desired to install any additional tools. The accompanying illustration will indicate how this may be effected in the case of a motor-driven punch and shear press, made by the Cleveland Punch and Shear Works, Cleveland, Ohio. The arrangement of overhead gearing renders it possible to make a very compact machine and one that is economical of floor space.

The machine complete with its motor weighs approximately 50,000 pounds. It is designed for very heavy work,



Motor-Driven Punch and Shear Press.

having sufficient capacity to shear twelve inches of 1½-inch flat bars, and to punch a five-inch hole in 1½-inch plate. The various attachments such as those for angle shearing, bar shearing, and punching are interchangeable.

The motor is of 25 horsepower capacity at 230 volts, and is of the well-known direct-current, commutating pole type, specially adapted for this kind of work by the Westinghouse Electric and Manufacturing Company.