Transportability.

Where this type of pump is used in connection with excavation work, in cofferdams, caissons, quarries and mines, where the location of the pump must be frequently changed both in a horizontal and a vertical direction, it has proved a wonderful advantage as a time saver. It needs but to be hung on a rope and does not have to be lined up on a firm, level foundation so as to accommodate any transmission belts, shaft or chain, as would be necessary in a centrifugal or the average reciprocating pump and its engine.

Capacity.

Mr. W. R. Emerson, Vice-President, stated in a recent interview with the author, "Our standard pump will lift three times as much water as any other sinking pump of equal weight. It will pump three times as much water as any sinking pump that can be placed in the same space, and, furthermore, it can be had of a capacity four times as great as that of any other pattern of sinking pump." The above statement appears plausible when we consider that the cigar-shaped body of the pump makes it ideal for use in a mine shaft or as a sinking pump where the shaft area in cofferdams, sumps and caissons is very much confined.

Steam Control.

The mechanism for controlling the admission of steam alternately to the two cylinders, is all encased so as to be entirely protected from any danger of injury or clogging by dirt or other accumulation. The Emerson pump can be operated with perfect success, although nine-tenths submerged in water. The admission and cut-off valve is a flat rotary valve turned by a very small engine which is hidden in the upper end of the pump, the exhaust pipe of which empties into the suction pipe of the pump. Thus no steam is liberated and this pump is ideal for underground work where greasy steam in the air would cause discomfort for the workmen.

It is a matter of such importance as to deserve emphasis, that the engine is at the top, and hence no part of it or of the rotary valve is ever reached by the material being pumped. The steam chamber above the flat rotary valve is always filled with steam as long as the throttle is open. As shown in the sketch, the rotary valve has an open segment and when this latter is over the port leading to one of the chambers, this chamber is supplied with steam at boiler pressure, which is later shifted automatically to the other chamber.

CORES, CORE SAND AND CORE-MAKING MACHINERY.*

By C. H. Wadsworth.

(Continued from Last Week.)

A word with regard to such cores may be of interest. In the first place, where these cores have to stand up against quite a body of metal, it is often necessary that they be exceedingly stiff. This necessitates the use of core wire. The ordinary annealed iron wire is too soft for this purpose. Some foundries have overcome this difficulty by stretching the wire about 10 per cent. of its length, which hardens it and stiffens it. The same result may be obtained by having the wire passed a certain number of times through the drawing dies after its last annealing. Such wire as this is being manufactured by one firm in the United States. The mixture for these very small cores should be made of good, sharp silica sand and some very good, strong core binder. The expense per pound of mixture is a consideration which drops out of sight entirely in comparison with the necessity for having strong, accurate cores which can be handled, and which will not fail when the metal strikes them.

MACHINE-MADE CORES.

We will now consider cores known as machine-made cores. The line of core machines exhibited here to-night are the result of experiments carried to a successful conclusion to overcome difficulties met in foundry practice which had come under the speaker's observation.

The first machine developed was one to produce cylindrical cores from 1 in. to 1½ in. in diameter. Dies were afterward fitted to this same machine, which enabled us to make cores to 2¼ in. in diameter and down to ⅜ in. At first it was supposed that only cylindrical cores could be made, on account of the fact that it was observed that the core as it came from the die always rotated. Later, however, an attempt was made to turn out square cores, and as this proved successful many other irregular shapes of prismatic cross-section have been successfully turned out on the standard machine.

It was natural that some foundries would demand larger cores than the first machine could produce, and so a new one was designed, known as the No. 2, which was capable of turning out cores up to five inches in diameter. This was successful, and the design was later changed so as to enable it to make cores up to seven inches in diameter.

When the first machine was brought out it was intended to be operated by hand, but in response to the demand which came from certain customers power attachments were supplied. When the larger machine was designed it was intended as a power machine only, but experiments showed that by using a large flywheel it was possible to turn out any size of core by hand, and later there came an enquiry for a machine capable of turning out slab cores, and to meet this demand the multiple spindle core machine was designed, and it has proved very successful, indeed.

The next step was naturally to use the multiple spindles for turning out several cores in parallel, and a machine of this type is on exhibition. The next demand received was one that at first sight seemed a staggerer. It was for one which should turn out small, square cores which should not vary more than two 1,000 of an inch above or below the required size; in other words, should be held within four 1,000 inch as the total limit of error.

To accomplish this the multiple spindle principle was used, special dies designed for the purpose, and the cores turned out very satisfactory in all particulars. One point worthy of note is that these core machines could never have been designed and made successful without keeping in very close touch with the work which they were doing. Occasional visits to the factories where they were installed has given opportunity to study the weaknesses and to correct them, and this has resulted in the improvement of the machine and bringing it to its present state of excellence.

Core machine mixtures are an important part of the core machine business. They vary greatly, depending upon the size of the core used and the available material. As in all core mixtures, sharp sand is the base of the mixture. Flour has also been found to be the best binder for most core sands, but it has also been found advantageous to add a small quantity of boiled linseed oil to the mixture.

In the case of very small cores, a relatively larger amount of oil and flour is required, and the amount of water used in tempering the mixture must be kept as low as possible, as too much water will cause the sand to pack in the die and block the machine. The larger the die the smaller the amount of bonding material necessary, and the larger quantity of water the mixture can carry.

RECOGNIZED STANDARD MIXTURES.

Certain standard mixtures have been developed and recommended as a basis for experiment, but as the core sand used in each district is liable to vary from that used in other districts, the natural bond in the sand will have a varying effect, and hence the amount of bond to be added must vary to suit. As something to work on in beginning to experiment the following mixtures are recommended:—

Mixture for Grey Iron for Cores, ⅜ to 2⅛ in.

Twelve quarts silica, lake or clear, sharp sand, free from loam or clay.

Two quarts flour.

Half-pint boiled linseed oil.

For Cores, 2⅛ to 7 in.

Fifteen quarts sharp sand.

Three quarts Zanesville or a loam sand.

Three pints flour.

Half-pint boiled linseed oil.

(Continued on Page 51.)

*Extracts from a paper read at the Lewis Institute, Chicago.