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Mixture for Brass and Aluminum Castings.

Four quarts silica or good, sharp sand.
Two quarts brass moulding sand.
Quarter-pint boiled linseed oil.

The more water the mixture will carry the harder and stronger the core will be when baked.

No. 1 Core Mixture for Steel Castings, ½ to 2¼ in.

This mixture is used without grinding.
Six quarts silica sand.
One quart flour.
Quarter-pint boiled linseed oil.

Cores, 2½ in. and above.

Eighteen quarts silica sand.
Three quarts fire clay.
One and quarter quarts flour.
Half-pint boiled linseed oil.

These steel mixtures must be very thoroughly mixed by hand when a more suitable way is not available. The fire clay can be increased or decreased according to the hardness of the core produced by the particular sand in use.

No. 2 Mixture for Steel Castings, ½ to 2¼ in.

This mixture should be ground thoroughly in a mill.
Six quarts silica sand.
Quarter-pint boiled linseed oil.
One and a-half pints flour.

Cores, 2½ in. and above.

Six quarts silica sand.
Three pints flour.
Quarter-pint boiled linseed oil.

We know that in practice many foundries have departed a long way from these mixtures, but believe that the formulae given above will serve as a guide in working our core machine mixtures.

In some cases all cored holes are bored in the machine shop. Under these circumstances a perfectly smooth hole is not necessary. It is only essential that the core leave the casting readily, and that it does not leave a hard scale in the hole. This may usually be accomplished by the use of a good grade of sand and a moderate amount of flour and oil in the binder.

At this point, however, it may be well to state that flour as sold to the foundryman is not a definite compound, and that many so called core flours are loaded with plaster of Paris, ground gypsum, etc. Now, these adulterants may or may not have an effect on the scale which the hot iron will form when it strikes the core, but they certainly do have an effect on the bonding properties of the flour, and a few dollars thrown off the price per ton on these heavily loaded flours may be far more than offset by the reduction in the bonding power of the material; hence, in figuring your core mixtures it is well to see that you are really using flour.

To return to the subject of machine-made cores, it is of interest to note that with the advent of the core machine many agricultural implement manufacturers have discovered that machine-made cores can produce true, round, parallel holes, which will vary less than one one-hundredth of an inch in diameter, and that by the use of suitable blacking on the cores these holes can be cleaned perfectly, so that shafts may be safely run in bearings which are cored to receive them, and are given no subsequent machining. In like manner, wheels are run on axles without machine work. In fact, the machine-made core has revolutionized the design of several agricultural implements and these castings in which machine-made cores are used.

EXPERIMENTS CONDUCTED.

The speaker had carried on a series of experiments with a large variety of core mixtures in the attempt to determine what was best for use in his own foundry, and also in the foundries of many users of his core machines. Some of the materials experimented with have been interesting. For instance, some years ago the black loam from a celery swamp was tried in core mixtures with sharp sand, and it was found that when this was dried and ground, tempered and put through a core machine, it produced a core which left the work readily and gave a remarkably clean hole, and it may be that some foundrymen will find material of this kind good for his particular needs. The vegetable mixture contained in it shrinks in the core oven and gives ample vent to the core, and it burns out in the casting, causing the core to be very rotten, indeed. Great care must be taken in baking such cores as they will burn very easily. It would be probable, however, that it might be difficult to obtain a sufficient supply of this material in most localities.

One of the most recent materials experimented with is a natural core sand produced at the quarries of the Ballou White Sand Company, Millington, Ill., and there are on exhibit here to-night cores produced from this sand. It has been found that this grade of sand works in the core machine more freely than any other grade of sand that has ever come under the speaker's observation, as will be demonstrated later in the evening when the machine is in operation.

Before closing the talk I believe it will be of interest to speak of the manner in which the mixtures for the large cores used in connection with core boxes in our own foundry are treated at present.

These mixtures were formerly made by hand from a mixture of 50 per cent. new, sharp sand and 50 per cent. new No. 4 Zanesville, which is a loam sand with two parts compound. We decided that if the old core sand could be passed through a suitable mill that the bond could be made much more efficient and the old sand used over, but as we could not find an over-driven mill of the type that suited us, we designed and manufactured one. This was put into operation recently, and to our surprise we find that we can now use 90 per cent. of old sand in the mixture, and that we have been able to cut out the more expensive sand that we formerly used in our core mixture, so that at present we have 90 per cent. old sand and 10 per cent. new, sharp sand from a local sand bank.

Formerly we used two parts to the hundred of dry core compound; now we use but one part to the hundred and a little molasses water. That is to say, it has been found that the dry core compound in the old core prints, and also in the interior of the larger cores, is still active, and when thoroughly incorporated with the new mixture by grinding in the mill it becomes effective when the core is baked.

The saving effected in labor and materials will pay for the mill in considerably less than a year, and we think others will find it equally advantageous, and hence we have decided to put it on the market with our other foundry specialties.

BAKING OF CONES.

The subject of core mixtures would not be complete without some treatment of the baking of cores. In the baking of an ordinary core two processes take place. First, the water used as a temporary bond is expelled as vapor; and second, by the application of a higher heat the permanent bond is made effective. The natural or clay bonds are made effective by drying, for at the temperature of an ordinary core oven these bonds do not vitrify.

Such bonds as linseed oil, corn oil, resin, pitch, etc., become effective by first being made more fluid under the influence of heat so that they spread rapidly through the sand grains; and second, by being partially oxidized or changed chemically so hat as the core cools it hardens.

This is particularly true in the case of linseed oil or corn oil. Where flour is used as a binder the hardening process is essentially the same as the making of bread; in other words, through the action of the heat and the expulsion of the moisture, the gluten in the flour is made effective.

An efficient core oven should have the largest possible amount of the space in the oven occupied by cores. To accomplish this in the case of machine-made cores requires a rectangular oven with straight drawers. The drawers should be so designed that the expansion or contraction of the oven will not cause them to bind, and at the same time the drawers should be so arranged that the front of the oven is closed, no matter whether the drawers are pushed back into the oven in baking position or drawn out into the charging position.

To secure these advantages the oven exhibited here to-night has been designed, and the fuel used can be either coke, coal, gas or fuel oil.