

United States Patent Office.

JOHN JOSEPH CHARLES SMITH, OF PHILADELPHIA, PENNSYLVANIA.

Letters Patent No. 85,340, dated December 29, 1868.

IMPROVEMENT IN CLAY MOULDS FOR CASTING METALS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern :

Be it known that I, JOHN JOSEPH CHARLES SMITH, of Philadelphia, in the county of Philadelphia, and State of Pennsylvania, have invented a new and improved Mode of Making Dies, Moulds, &c.; and I do hereby declare the following to be a full, clear, and exact description of the same.

The object of this invention is to make dies, moulds, &c., by means of casting alloys of copper into certain moulds, and obtaining, by means of pressure on the metal when in a semi-fluid state, a perfect impression of the moulds.

It is well known to those acquainted with the nature of metals, especially the alloys of copper, that they become "mushy" or semi-fluid before they solidify, but this semi-fluid state lasts only for a moment. The one part of my invention consists in keeping them for a sufficient length of time in the mushy state, so that pressure may be applied on the metal, to obtain a perfect impression of the mould or design.

It is also known that the alloys of copper, if poured into a mould of metal, will chill or solidify very rapidly, even if the mould is heated, and, if pressure is applied, will often unite with the metal mould.

Another disadvantage, and that not the least, is the expense of a metal mould, and, in some cases, the impossibility of making moulds for certain articles.

To overcome these disadvantages, and produce the favorable conditions named, are the objects of my invention. These objects I accomplish in the following manner:

I take of the clay composition, used for black-lead crucibles, or clay composition used for the best fire-brick. This clay, when dry, I reduce to a fine powder, and then moisten with water to about the same extent as sand used for ordinary moulding. I have a cast-iron box of the size and shape of the die or mould to be cast. This box is provided with a hole in the bottom and a plunger or follower. This iron box I fill with the aforesaid moist powder of clay composition, in a loose state. Then I take my pattern, which may be of metal, or hard plaster of Paris, or hard wood, (if of plaster of Paris or wood it must be varnished with shellac varnish,) and oil the same with good oil on the surface; then I apply to the same a thin layer of slush with a brush. Said slush is made of the same clay composition as used for the mould, but ground to a fine paste-like consistency. After this, I place the pattern on the clay in the iron box, face down, and apply pressure to it by means of a press—say about four hundred pounds to the square inch of surface. This pressure will condense the moist-clay powder as hard as stone. The pattern may be easily withdrawn, and a perfect and sharp mould of the patterns is obtained, which, when well dried out, is ready for further operations.

The operation of casting in a mould, made as above stated, is as follows:

I take the mould and heat it gradually, then bring it into a snuffle-furnace, and bring it to about the same heat as is required to melt the metal to be cast into

it. While this is being done, the metal is to be melted in another furnace. Then I take the heated mould out, and pour in as much of the metal as is necessary to make the objects to be cast, then put the plunger or follower on top of the metal, put the whole into a screw-press, and, when the metal in the mould assumes the semi-fluid or "mushy" state, which takes place gradually, I apply pressure to the plunger, say about fifty to seventy pounds to the square inch of the surface. When cooled off enough to be solid, the whole is taken apart, and a perfect cast and impression of the mould is obtained.

The metal compositions best adapted for this method of casting are the different alloys of copper and tin. Other metals and alloys may also be cast in this manner with good success, but not with such perfection as the first-named alloys.

In a patent of mine, dated September 20, 1859, re-issued, February 3, 1860, I describe a method of making moulds, dies, &c., out of an alloy of copper and tin, but this last-named process is somewhat difficult and expensive in its operation, as I had used metallic patterns, and therefore it was difficult to perform, because if the metal were heated a little too much, it would unite with the pattern, and the pattern was lost. Furthermore, the alloy had to be mixed with great care, to be useful, and in making large moulds or dies it required great practice; but the new process, which I have described, is very easy to learn, and I am not confined to such a particular mixture of the alloys.

Among the advantages of my invention are the following:

First, clay moulds may be made to resist a great degree of heat, and under the influence of heat acquire the necessary strength to resist the pressure used in casting under pressure.

Second, the clay being a non-conductor of heat, has a highly-beneficial effect in retaining the metal in its "mushy" or semi-fluid state for a sufficient length of time for the casting to be accomplished.

Third, the clay moulds are not in any degree liable to stick or unite to the metal in casting.

Fourth, my clay composition, by reason of its porous nature, permits the escape of the air and gases confined in the moulds, and which causes great trouble with metal moulds.

I do not claim as new the method of compressing clay powder in a moist state, by ramming or stamping, as done in the ordinary way of moulding; neither do I claim as new the application of pressure to metal in the mushy state; but

I claim as new, and desire to secure by Letters Patent—

A mould made of moist-clay powder, under high but slowly-applied pressure, for use in casting metals, substantially as described.

JOHN JOSEPH CH. SMITH.

Witnesses:

MICHAEL SMITH,
OCTAVIUS KNIGHT.