UNITED STATES PATENT OFFICE.

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MOLD FOR CASTING METALS.

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To all whom it may concern:

Be it known that I, EUGENE C. SMITH, a citizen of the United States, residing at Providence, county of Providence, State of Rhode Island, have invented certain new and useful Improvements in Molds for Casting Metals, of which the following is a specification.

The object of the invention is the production of a mold for casting metals, by means of which the most delicate outlines and designs of a finely hand-wrought pattern can be perfectly reproduced in a mold taken from such a pattern. A mold for this purpose should resist exposure to the heat necessary for drying it, and also the heat of the melted metals poured into it, without being fractured or cracked. At the same time, such molds should be porous enough to admit a free escape of the gases usually generated by fluid metals.

My invention consists of a mold composed of plaster of paris and non-melting fiber, such as fiber of asbestus.

I carry out my invention in the following manner:—Fine, short asbestus fiber or pulp is mixed with water to about the consistency of a thick, creamy, but still flowing, mass, being well stirred and mixed. I then mix plaster of paris with water in the usual way known to those skilled in the working of plaster. To two parts of this plaster mixture, I add about one part of the asbestus mixture. Both are then well stirred together to form a uniform mass which is applied to, and cast on, the pattern from which a mold is to be taken, in substantially the same manner as in making a plaster mold. The making of the second half or other parts of a mold is performed in the same manner as above. When I have formed my molds as stated, I place them in a drying oven and expose them to a moderate heat, say 250° to 300° Fahrenheit for about ten to twelve hours more or less so as to evaporate the greater portion of the moisture and render the molds at least apparently dry. Then I slowly increase the heat to about 1,000° or a low red heat, and retain this heat for two or three hours, more or less, when I let the molds cool off slowly. They are then ready to receive the casting.

By the foregoing means, I produce a perfect mold in every respect; practically useful for producing small sharp castings, also castings of considerable surface but very thin and light in body.

Furthermore with my invention, I obtain a material for molds of sufficient strength to permit the use of elastic rubber patterns having many deep and fine undercuts in their designs. The elastic patterns can be drawn from a mold made of my composition without breaking away the deep undercuts in the design. This cannot be done by any other process of molding known to me. Molds made of my composition—of plaster of paris and asbestus fiber—can be used for casting metals in them with most satisfactory results either by pressure applied to the fluid metal by some one of the known patented contrivances, or by means of simply pouring the metal into my mold as is done ordinarily in using sand or loam molds.

If my molds are to be filled with metal by pressure, the heat for drying them is not brought to so high a degree; but when the metal is to be poured, as in the ordinary way, of casting metal, my molds must be rendered perfectly free from moisture and the sulphur and crystallization water contained in the plaster, which can only be fully removed by a low red heat.

All other combinations of plaster and other materials which I am aware of for making molds could not resist exposure to a low red heat without cracking and crumbling into pieces.

The manner in which I make my molds is simple but efficient.

In order to convey a clear idea of the novelty and utility of my invention, I will here state a few facts concerning the use of molds made of plaster of paris mixed with sand, burnt clay-dust or ashes (in the ordinary manner) into which fluid metals such as britannia, zinc, brass (or other metals into which copper enters largely) sterling silver or gold could be cast successfully. For a practical useful mold such compositions could be used only for metals melting at a low degree of heat.

It is well known by those skilled in the art of casting metals, that metals (even those melting at as low a heat as 600° Fahrenheit) cannot be cast successfully and sharp in a plaster of paris mold, or the compositions men-

tioned, unless the fluid metal is forced into the mold by pressure. Such mechanical pressure is indispensable if the mold is of pure plaster, or the compositions above mentioned, because a mold made of such compositions will not stand the heat required to expel all moisture and sulphureted crystallization water contained in the plaster without cracking and crumbling to pieces. Therefore, mechanical pressure must be applied to overcome counteractions of gases and vapors generated by the heat of the fluid metal.

The above only applies to metals melting at a low heat. Metals melting at a high heat, say, 1,000° to 2,000°, cannot be cast in plaster molds, or molds made of the mentioned compositions, even with mechanical pressure because the heat of the metal acts on the fine surface of the mold and destroys it. Consequently a rough casting is the result.

I may here make a few explanations concerning molds made of pure plaster, or mixtures of sand, ashes, loam, &c., with plaster. It is well known that the crystallization of a portion of the water, used in the mixing of ground calcined plaster, gives it the property of setting, or hardening into a solid mass. It is also known that this water of crystallization cannot be fully expelled from the plaster until about 800° or 900° Fahrenheit are applied, but when subjected to this heat the plaster cracks and crumbles in pieces. In order to overcome this trouble resort has been had to the mixture of sand, brick-dust, ashes, &c., with the plaster to produce a mold that would stand the heat necessary for expelling the water of crystallization and sulphur in the plaster and render it fit to receive metal castings that melt at a high heat. I have made a great many experiments with such mixtures with plaster for molds but never met with satisfactory or practical results nor has any one else to my knowledge.

In order to give an idea of the novelty and utility of my invention, I wish to state that it has been the aim of founders and artisans to use molds made of plaster, or compositions of the same for casting metals, especially brass, bronze, German and sterling silver, gold, &c., because the most delicate outlines and design of a given pattern can be more accurately and sharply reproduced in a plaster mold, than in a mold made of sand or loam.

I am fully aware that metals melting at a low degree of heat are cast in pure plaster molds. Such metals as type-metal, tin, britannia, and zinc have been cast in plaster molds with success, but the metal had to be forced into the molds by mechanical pressure. Sterling silver and some low melting brass compositions have been cast in plaster molds by pressure but the results with these metals were never satisfactory or practical, even though cast under pressure. The molds could not withstand the heat necessary to dry them perfectly and effectually. Consequently they cracked when the red-hot metal was injected. They also became soft and the pressure on the metal caused it to penetrate into the mold, producing a rough casting and obliterating all fine outlines and design.

By using the mixture of plaster of paris and asbestus as specified, I produce a strong and fine mold and one which will answer all purposes such as withstanding heat, pressure, &c.

The short fine fiber holds the plaster together and its fire-proof qualities enables the mold to stand the heat necessary for drying without cracking or crumbling. This composition yields a mold into which I can pour the metal the same as in a dry sand mold. The metal lies perfectly to the surface of the mold and produces a casting as perfect in every detail as the original patterns.

A mold made and burned in the manner described, retains all the most delicate outlines, and the material being such a poor conductor of heat the metal does not chill rapidly; consequently very thin castings of considerable surface can be made to perfection.

My molds can also be filled with metal forced in by pressure and produce better castings in every respect than with molds made of plaster, or mixtures of sand, ashes, &c., with plaster.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. A mold to receive metal castings consisting of a mixture of asbestus fiber, or pulp, with plaster of paris, substantially as described.

2. A mold to receive metal castings consisting of a mixture of non-melting fibers and plaster, substantially as described.

3. The method of making molds herein described consisting in mixing asbestus fibers or pulp with water to the desired consistency, mixing plaster with water, then adding said mixtures together and thoroughly mixing them forming said mixture into the desired shape of the mold and then baking said mold, substantially as specified.

EUGENE C. SMITH.

Witnesses:
V. E. SMITH,
T. Y. ETHERIDGE.