

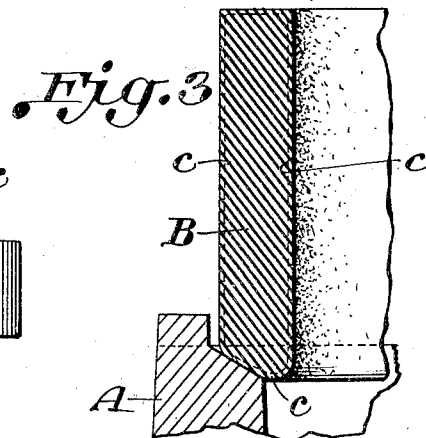
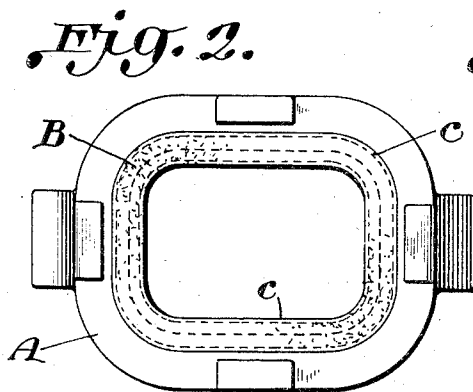
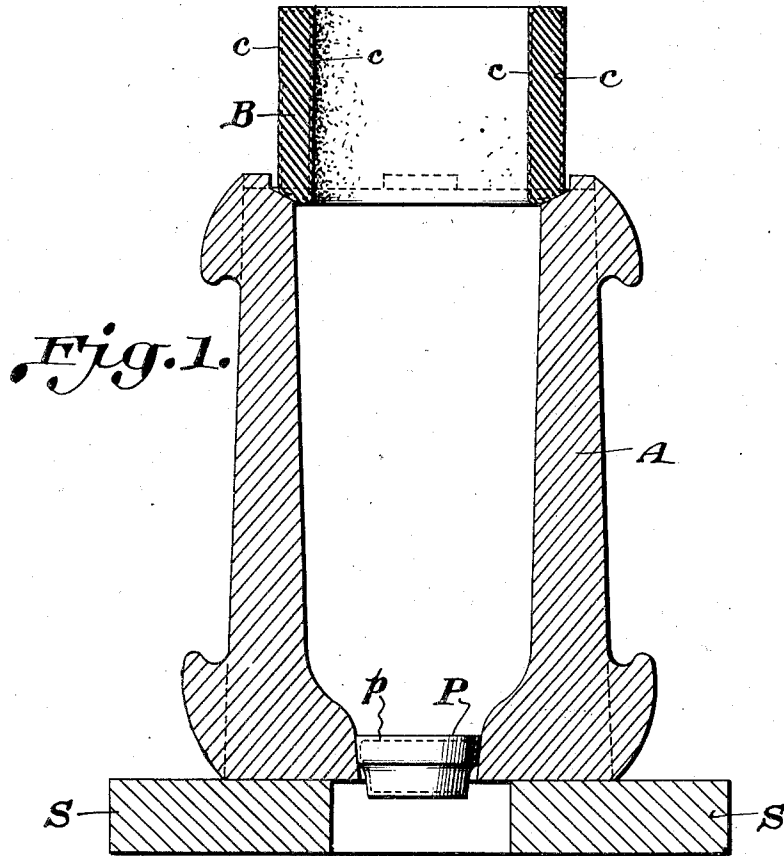
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SHRINK HEAD CASING FOR INGOT MOLDS

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UNITED STATES PATENT OFFICE.

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SHRINK-HEAD CASING FOR INGOT MOLDS.

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My improvements are illustrated in the accompanying drawings in which

Figure 1 shows a vertical central section of an ingot mold with a mold top feeder or shrink head casing applied thereto.

Figure 2 is a top plan view thereof.

Figure 3 is a detailed sectional view on an enlarged scale of a part of the mold and a part of the feeder.

The mold A shown in the drawings, is of the well-known Gathmann type. It is supported on a stool S and has a bottom opening closed by a plug P.

The feeder or shrink head casing is made of any suitable material or kind ordinarily employed in this art and it is treated with a substance or substances which increase its insulating qualities in the manner hereinafter described. The casing may be merely coated with such substance or substances or the substance or substances may be made to impregnate the casing to a suitable depth in the manner indicated at c. The plug P may be treated in a similar manner as indicated at p.

My invention relates to that part of a mold for casting steel ingots known as the shrink head casing or mold top in which the upper portion of the ingot is cast and in which a pool of molten metal is maintained during the freezing or solidification of the ingot to supply liquid steel to the pipe or cavity formed in the ingot while solidifying. Such feeders or casings have heretofore been usually made of refractory material such as fire brick. They have also been made of a mixture of blast furnace slag and cement and of loam and other materials, having as a rule low conductivity and relatively low refractory value. When such feeders are brought into contact with the molten metal of forming ingots, they will to some extent melt or slag. However, such casings have been more or less efficient in delaying the freezing or solidification of the upper portion of the molten metal until the body of the ingot has solidified and pipe formation therein prevented.

In the use of feeders or casings heretofore employed, it has been observed that there are considerable variations in the insulating values of the material of which they are made in casings of different sizes. After carefully considering these variations I have discovered what I believe to be the principal cause of the differences in the heat conserv-

ing values of large as compared with small casings. Practically all of the material used, when expense is considered, in the manufacture of heat conserving casings, has a melting point or slagging point lower than that of liquid steel at the time it is teemed or poured into the mold. In molds of 12 inches or larger horizontal cross section, and sometimes even in molds of smaller section, it is found upon examination after solidification of the ingot body, as well as the ingot top, that a considerable part of the refractory casing is fused and adheres directly to the shrink head part of the ingot. This causes difficulties when the steel is reheated for rolling, as the particles of the casing which have adhered to the ingot are further slagged and melted owing to the high heat of the soaking pits or reheating furnaces and frequent cleaning of the pits and furnaces is required. Such molten slag, as it runs down is apt to adhere to the skin surface of the body of the ingot and cause spotty or streak-like surface decarbonization of the steel.

It is evident that the fusion of the refractory material of the casing is caused by the heat of the molten metal in the mold top. When a close contact occurs caused by the adhesion of the casing to the ingot top, there is a decided increase in the extraction of the heat units from the ingot.

According to my present invention, I materially improve the insulating properties of such shrink head casings by treating them with a material, the melting point of which is higher than the temperature of molten steel. Such treatment may be given to casings made of fire clay, furnace slag or other suitable materials without losing any of their good qualities while greatly increasing their efficiency as heat insulators. In carrying out my invention, the material may be applied to the casing by means of a spray or brush or by a dipping operation. The casing may be merely coated or it may be impregnated to a suitable extent. The material, as before stated, which I employ, has a melting point higher than that of molten steel. Preferably I employ a flat mixture of well-slacked lime or a mixture of lime and magnesia, or I may use a lime containing a high percentage of magnesia. When lime alone mixed with water is used, a sludge should be formed of about the consistency of molasses. When lime and magnesia are employed I preferably use 70 parts by weight

of lime to 30 parts by weight of magnesia and a suitable quantity of water.

Before my invention is applied to the casings I heat them sufficiently to drive out any moisture which they may contain so that the coating which is applied while the casing is hot, may penetrate the casings to the desired extent as well as effect the drying of the coating from the interior of the casing outwardly.

While my improvements are applicable to practically all kinds of standard mold tops, feeders or shrink head casings, I preferably use casings made in the following manner:

Crushed blast furnace slag is mixed in a dry state with Portland cement in proportions of ten parts by weight of slag to one part by weight of cement. After the materials are thoroughly blended, they are moistened with water and the moistened mixture is thoroughly kneaded, care being taken to use only sufficient water to insure the moistening of the slag and cement sufficiently to obtain a proper setting of the cement. In this condition the material may be molded to proper shape and then dried in a hot air circulating furnace. When the casings are thoroughly dry and while still hot, they are coated with a lime sludge or with other material similar to that hereinbefore mentioned, either by dipping, spraying or brushing. The casings are then ready for use as soon as the coating has dried.

I find it very desirable that in any case the coating for the casing should be applied thereto while the casing is hot or after it has been heated to the desired extent. In this way the moisture is driven from the sludge or the coating and there will remain

a hard coating accomplishing the purposes hereinbefore mentioned.

I have found also that there is an advantage in treating the bottom closing plug P with the refractory material above described. When so treated, the plug will be prevented from melting or softening on its outer surface.

I claim as my invention:

1. An ingot mold top or shrink head casing made of porous, refractory material, the melting or slagging point of which is lower than the temperature of liquid steel and which has its surface structure impregnated and coated with material, the melting or slagging point of which is higher than the temperature of liquid steel.

2. An ingot mold top or shrink head casing comprising a mixture of blast furnace slag and Portland cement, the melting or slagging point of which is lower than the temperature of liquid steel and which has its inner walls impregnated and coated with material, the melting or slagging point of which is higher than the temperature of the liquid steel.

3. An ingot mold top or shrink head casing comprising a mixture of refractory material and a binder, having its inner walls impregnated and coated with a substance which prevents the deleterious action of the gas-producing constituents of the mixture and which material has a higher melting or slagging point than the temperature of liquid steel.

In testimony whereof, I have hereunto subscribed my name.

EMIL GATHMANN.