April 6, 1926. 1,579,743

J. H. WARLOW, JR

METHOD OF AND MEANS FOR CASTING STEEL OR OTHER INGOTS OR CASTINGS

Filed April 25, 1923

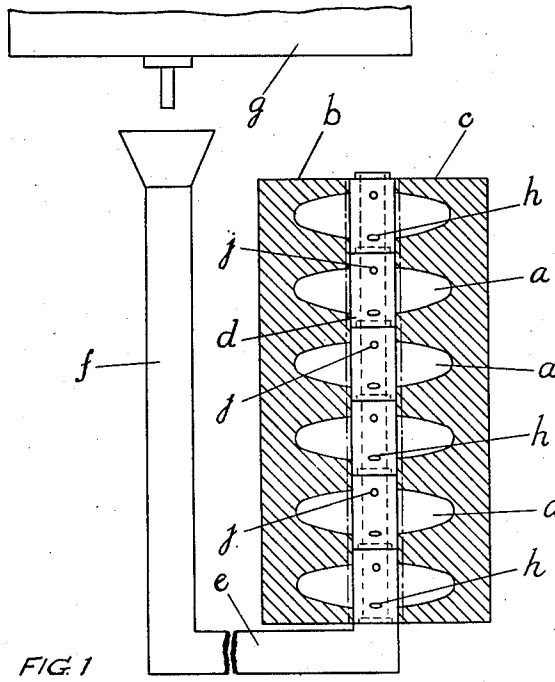


FIG. 1

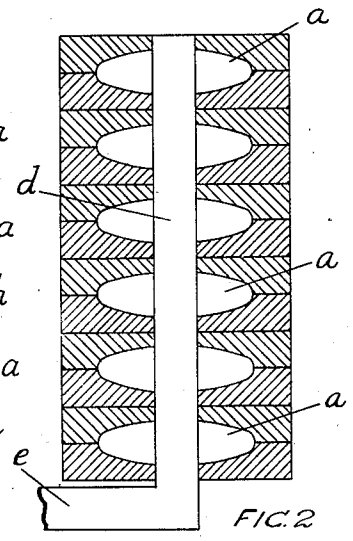


FIG. 2

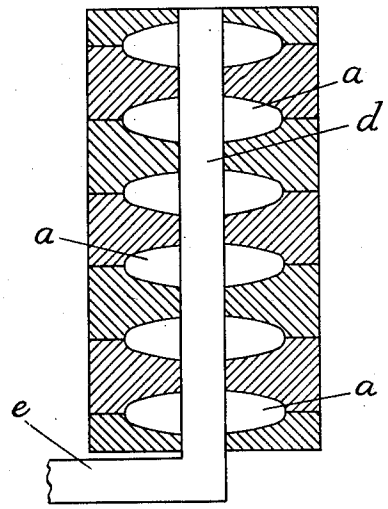


FIG. 3

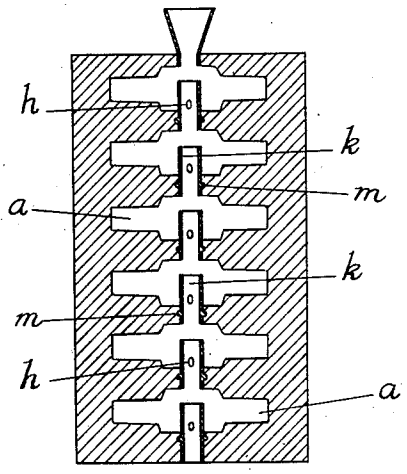


FIG. 4

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METHOD OF AND MEANS FOR CASTING STEEL OR OTHER INGOTS OR CASTINGS.

Application filed April 25, 1923. Serial No. 634,421.

To all whom it may concern:

Be it known that I, JOHN HARRIES WARLOW, Junior, of "Stoneleigh," Godstone Road, Rotherham, in the county of York, England, a subject of the King of Great Britain and Ireland, have invented certain new and useful Improved Methods of and Means for Casting Steel or Other Ingots or Castings, of which the following is a specification.

This invention relates to the method of and means for casting steel or other ingots or castings into moulds arranged in tiers or superimposed and has for its object to expedite the casting of a very large quantity of metal into comparatively small ingots without chilling of the flowing metal so frequently experienced.

Hitherto, in casting ingots in moulds superimposed or arranged in tiers and wherein the molten metal is caused to flow upwards, the molten metal is run into and fills the bottom mould whence it passes into the next mould and so on, that is, it is pushed or raised from one mould to another by the continuing or following stream of molten metal constantly flowing into the bottom mould. This method has not, however, proved successful owing to the fact that in passing from mould to mould the metal chills so rapidly owing to the large area of chilling surface formed by the walls of the moulds that the liquid metal rapidly loses its fluidity and by the time the metal reaches the second or third mould from the bottom it frequently has become so viscous that no further flow is possible.

In other cases a group of superimposed moulds has been arranged around a runner disposed centrally of the group of moulds, the molten metal issuing endways or sideways into each mould and in such cases the runner is not in contact with the molten metal in the surrounding moulds, consequently the steel is likely to chill during pouring.

According to this invention the method of casting metal bodies having a central hole, consists in causing molten metal to flow upwards through a mounting passage located within and passing through the heart of each mould of a superimposed series, said mounting passage simultaneously serving as a central core for each resulting hollow body, causing the molten metal to issue directly from said core from within each mould at the heart thereof and separately thereinto whereby the moulds are filled separately and successively upwards from the heart thereof, the molten metal in each filled mould surrounding the core at the heart thereof and sustaining the heat around said core so as to retain fluidity of the molten stream within the mounting passage and subsequently removing the core from the heart of each resultant casting.

Referring to the drawings filed herewith:—

Fig. 1 is a diagrammatic illustration of one form of apparatus for carrying out this invention and as applied to casting annular or disc ingots of steel.

Figs. 2, 3 and 4 are modified forms.

a, *a*, *a* are moulds superimposed or built up in any well known manner, as for instance in Fig. 1 by two halves *b* and *c*, and *d* is a central refractory runner or core forming a mounting passage for the molten metal and passing through the heart of each mould or compartment and communicating through a channel *e* with a runner *f* fed directly from the ladle *g*. Outlets *h*, *h*, *h* are provided in the central refractory runner *d* communicating with the moulds *a* and vent holes *j*, *j*, *j* for the escape of displaced air are also provided.

The method of operation is as follows:

Having arranged, for example, thirty moulds (in five stacks of six moulds each) around a runner *f* with the refractory runners *d* placed in position, the steel is poured from the ladle *g* down runner *f* where it flows along the channel *e* into the runner *d* and as it rises to the height of the first outlet *h* it issues therethrough into the first mould at the heart thereof the air displaced escaping through the vent holes *j*. As soon as the first mould is filled, the steel then rises again in the runner until it reaches the next outlet *h* through which it flows into the second mould also at the heart thereof and so on until the whole of the moulds are filled.

It will be seen that by providing the runner *d* only such steel as passes through the outlets *h* comes into contact with the chilled walls of the moulds so that the continuing molten stream of steel in the runner *d* is kept hot and fluid by the liquid steel in the filled moulds immediately surrounding

said runner, as the only points of contact it has with the rapidly freezing steel in the moulds is by the small orifices *h* and *j*.

As a result, the steel which fills the top mould of the stack is practically as hot and fluid as that which flows into the bottom mould, any loss of heat being simply due to the extra length of time the steel has been held in the ladle and not to its having had to pass through any or each one of the preceding moulds. Each ingot, when cold, will have part of the core or runner *d* in its centre which has to be cleared from the steel by punching out thereby leaving an ingot with a central hole therein.

A modified construction of mould is shown in Fig. 2, in that the moulds *a*, *a*, *a* are built up in twelve pieces, and in Fig. 3, a further modification shows the moulds built up in seven pieces.

The refractory runner *d* may be reinforced by a steel tube or other support, as shown in chain lines in Fig. 1, and further, it may very conveniently be formed of spigoted and socketed open ended tubular bricks as shown in Fig. 1.

Fig. 4 shows a still further modified form of mould for casting steel ingots, in which the core or runner is made discontinuous and the vent holes are dispensed with.

In this form, the core or runner is composed of a number of small tubular bricks *k*, *k* placed axially above one another each at a distance apart and one such tubular brick to each ingot to be cast, whereby the stream of molten steel in its upward flow bridges, in its travel, the space between each tubular brick *k* as the moulds are filled and flows continuously upward. Preferably, they are each disposed with their lower end slightly protruding through the bottom of each mould and their upper end two-thirds up the height of each mould and as the molten steel flows up the bricks, the distance between each brick is such that the force of the rising stream of molten steel is sufficient to carry itself into and through the next brick as each preceding mould is filled by the molten metal issuing from the outlets *h* and the top of each brick. The bricks are held in position in the mould by annular flanges *m*, *m* thereon engaging complementary annular recesses in the partitions or walls dividing the moulds and each ingot when cast has a tubular brick *k* in its centre which is punched out as before.

The particular spacing apart of the tubular bricks *k*, *k* is controllable by the rate of teeming and by the internal diameter of said bricks, for example, the smaller the diameter and the quicker the rate of teeming, the greater can be their distance apart.

What I claim and desire to secure by Letters Patent is:—

1. The hereinbefore described method of casting metal bodies having a central hole, consisting in causing molten metal to flow upwards through a mounting passage located within and passing through the heart of each mould of a superimposed series, said mounting passage simultaneously serving as a central core for each resulting hollow body, causing the molten metal to issue directly from said core from within each mould at the heart thereof and separately thereinto whereby the moulds are filled separately and successively upwards from the heart thereof, the molten metal in each filled mould surrounding the core at the heart thereof and sustaining the heat around said core so as to retain fluidity of the molten stream within the mounting passage and subsequently removing the core from the heart of each resultant casting.

2. Means for casting metal bodies having a central hole, wherein molten metal is conveyed in a stream upwards through a mounting passage located within and passing through the heart of each mould of a superimposed series, said mounting passage simultaneously serving as a central core for each resulting hollow body, the molten metal issuing directly from said core from within each mould separately and successively upwards and the core being subsequently removed from the heart of each resultant casting.

3. Means for casting metal bodies having a central hole comprising superimposed moulds, a core positioned centrally of and passing through the heart of each of said moulds and forming a mounting passage for molten metal through the heart of each mould, means for permitting molten metal to issue from said core into each mould from within and at the heart thereof and means for conveying molten metal to the core.

4. Means for casting metal bodies having a central hole comprising superimposed moulds, a core positioned centrally of and passing through the heart of each of said moulds and forming a mounting passage for molten metal through the heart of each mould, said core being constituted by a plurality of tubular open ended bricks placed end to end with one brick to each mould, means for permitting molten metal to issue from each brick into its respective mould from within and at the heart thereof, and means for conveying molten metal to the core.

5. Means for casting metal bodies having a central hole comprising superimposed moulds, a core positioned centrally of and passing through the heart of each of said moulds and forming a mounting passage for molten metal through the heart of each mould, said core being constituted by a plurality of tubular open ended bricks disposed in axial relation to one another and spaced

apart, one brick to each mould, means for permitting molten metal to issue from each brick into its respective mould from within and at the heart thereof, and means for conveying molten metal to the core.

6. Means for casting metal bodies having a central hole comprising superimposed moulds built up in integral halves, a core positioned centrally of and passing through the heart of each of said moulds and forming a mounting passage for molten metal through the heart of each mould, means for permitting molten metal to issue from said core into each mould from within and at the heart thereof, and means for conveying molten metal to the core.

7. Means for casting metal bodies having a central hole comprising moulds built up in individual halves, a core positioned centrally of and passing through the heart of each of said moulds and forming a mounting passage for molten metal through the heart of each mould, means for permitting molten metal to issue from said core into each mould from within and at the heart thereof, and means for conveying molten metal to the core.

8. Means for casting metal bodies having a central hole comprising superimposed moulds arranged in multiple, a core positioned centrally of and passing through the heart of each of said moulds and forming a mounting passage for molten metal through the heart of each mould, means for permitting molten metal to issue from said core into each mould from within and at the heart thereof, means for supporting the tubular bricks within each mould, and means for conveying molten metal to the core.

In testimony whereof I have signed my name to this specification.

JOHN HARRIES WARLOW (JUNIOR).