

April 16, 1935.

W. M. CHARMAN

1,997,677

PROTECTOR FOR HOT TOP RINGS

Filed Jan. 18, 1934

2 Sheets-Sheet 1

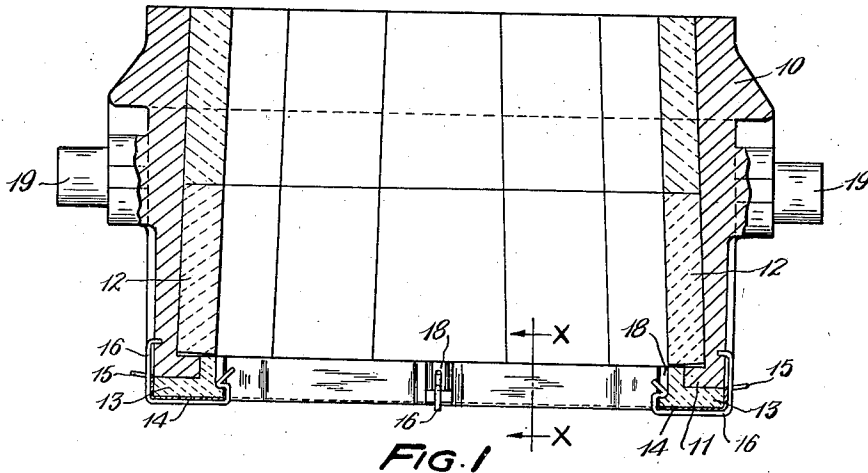


FIG. 1

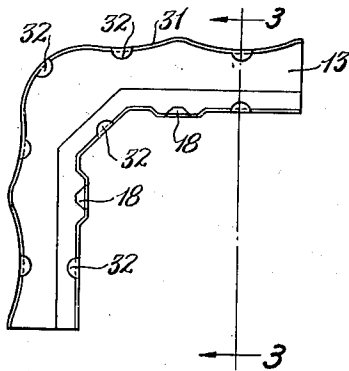


FIG. 2

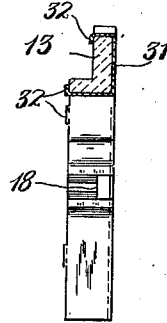


FIG. 3

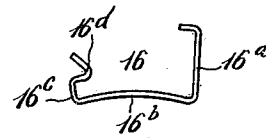


FIG. 13

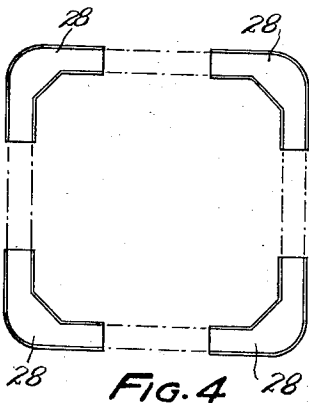


FIG. 4

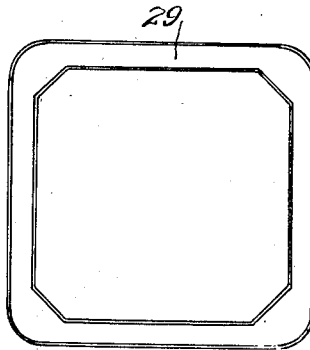


FIG. 5

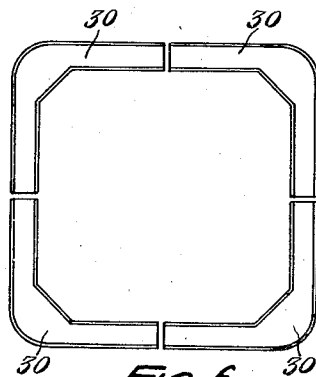


FIG. 6

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2 Sheets-Sheet 2

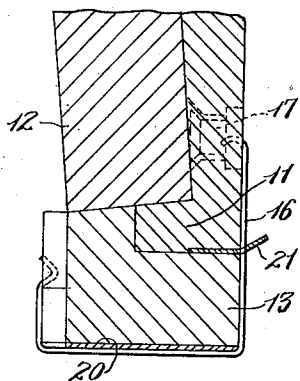


FIG. 7

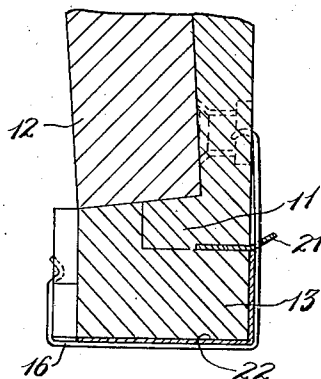


FIG. 8

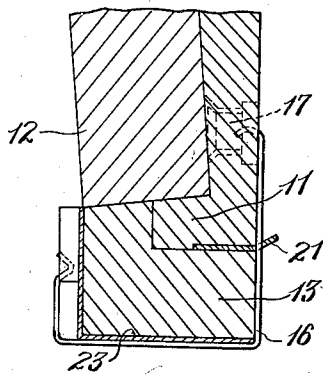


FIG. 9

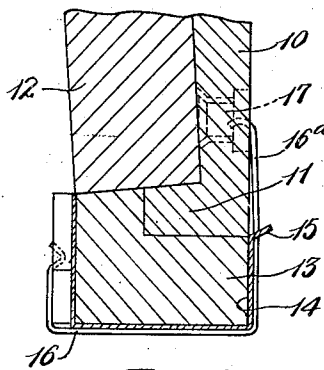


FIG. 12

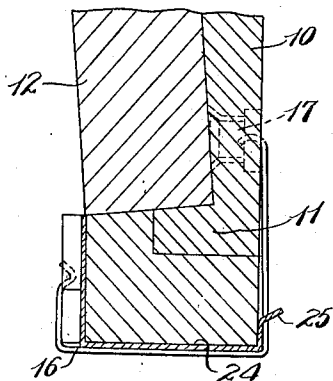


FIG. 10

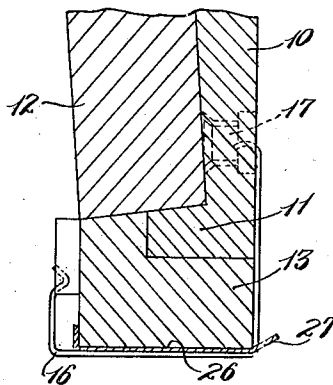


FIG. 11

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1,997,677

PROTECTOR FOR HOT TOP RINGS

Walter M. Charman, Cleveland Heights, Ohio

Application January 18, 1934, Serial No. 707,123

9 Claims. (Cl. 22—147)

This invention relates to protectors for hot top rings, that is to say replaceable refractory rings covering the lower ends of hot tops.

The casting of extremely large ingots is becoming more and more common. Such ingots may weigh ten or fifteen tons and in a few instances as much as twenty-five tons. Their value is accordingly great, and every precaution must be taken to insure against possible damage to such ingots. In the casting of this type of ingot, floating hot tops are generally used, and they are generally constructed with a cast iron or cast steel casing lined with refractory upon the inner walls and bottom ends. The lower course lining, which covers and protects the lower end of the casing and generally also a portion of the lower end of the upper course lining, is called usually the bottom ring. It may be made in a single piece for smaller size hot tops, but is generally constructed of two or more pieces for the larger sizes. These refractory bottom rings are advantageously held in place, until the metal has been poured, by spring clips such as are shown in my copending application for patent Serial No. 681,541, filed July 21, 1933.

On account of the somewhat remote possibility that portions of these rings might spall off during the pouring of the metal which in the case of very large ingots may consume as much as eight or nine minutes time, I have devised the sheet metal protectors or sheaths herein disclosed for preventing any such portions from falling into the molten metal and being embedded in the ingot.

The principal object of the invention therefore is the provision of means for preventing the inclusion of refractory masses in ingots due to breakages in the hot top.

Other objects and features of novelty will appear as I proceed with the description of those embodiments of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which

Figure 1 is a central, vertical, sectional view through a hot top embodying the invention.

Fig. 2 is a top plan view of a quarter section bottom ring and sheath of a modified form.

Fig. 3 is a side view of the same partly in vertical section on the line 3—3 of Fig. 2.

Figs. 4, 5 and 6 are top plan views of different forms of sheaths made in accordance with the invention.

Figs. 7 to 11 inclusive are fragmental, vertical, sectional detail views of modifications, these

views corresponding in position substantially to the line X—X of Fig. 1.

Fig. 12 is a similar view of the same construction as that shown in Fig. 1.

Fig. 13 is a detail view of one of the spring clips which may be employed for attaching the bottom ring and the sheet metal protector or sheath to the casing of the hot top.

Referring to Fig. 1, I have shown a cast metal casing 10 having an internal bottom ledge 11, upon which is supported an upper course lining 12 of refractory material. The lining 12 is a semi-permanent lining and may remain in the casing through a large number of heats. In order to protect the lower end of the casing and the portion of the lining 12 which overhangs the ledge 11, there is provided a bottom ring 13 of rigid refractory material. This ring may be made in one or a plurality of pieces, and the term "bottom ring" as used hereinafter is to be understood to cover a multi-piece as well as a one-piece ring. A one-piece ring of this character is illustrated and described somewhat more in detail in the copending application of Philip R. Ward and myself, filed December 23, 1932, Serial No. 648,611, which has been issued as Patent No. 1,956,895, dated May 1, 1934.

It will be observed that the bottom ring 13 completely covers the lower surface of the body portion of the hot top, comprising the casing and the upper lining course, and protects them against possible damage from the hot metal. The bottom ring is so mounted that it may break away from the hot top when the latter is removed from the ingot, the ring remaining upon the ingot, and a new one being mounted upon the hot top for each heat.

The metal protectors or sheaths forming the subject of the present invention extend across at least a portion of the bottom surface of the ring 13, and preferably enclose also the inner and outer walls of the ring. The preferred form is shown in Figs. 1 and 12 where it is numbered 14. It is made usually in a plurality of pieces, each of which is formed preferably as a metal stamping to fit snugly over the corresponding surfaces of the ring. The outer wall of the stamping in this case extends upwardly to a point even with the top surface of the ring, and from that point is bent outwardly to form a wiper strip 15 which is adapted, when the hot top is in use, to dam the upward flow of molten metal around the hot top, that is between the hot top and the inner wall of the mold.

The ring 13 and the sheath 14 are supported

and held in position by suitable means. In the preferred form of the invention the means for supporting the ring 13 is utilized for supporting also the sheath, and there is no other means of attachment between the sheath and the ring. One suitable means for accomplishing this purpose is shown in the drawings, and consists of a series of wire spring clips 16. Each clip has a relatively long outer upright arm 16a with a hook or projection at its upper end adapted to extend into a renewable socket member 17 set into the wall of the casing. The bottom portion 16b is bowed up slightly when not flexed, as shown in Fig. 13, and the inner upright arm 16c terminates in a rebent projection 16d which is adapted to take into a socket 18, a series of which are formed in the inner walls of the ring 13 in positions opposite the socket members 17 of the casing. This clip is shown somewhat more in detail in my copending application Serial No. 681,541, previously mentioned.

When the ring and sheath are to be assembled upon the hot top, the latter is mounted in a cradle having sockets to receive the trunnions 19 (Fig. 1). The hot top is then turned upon the trunnions to an inverted position, after which the ring 13 is put in place. The sheath 14 is then positioned over the ring. Next the clips 16 are put in position to hold the ring and sheath to the casing. In mounting the clips the first operation is to insert the projection on the long outer arm of the clip into the socket member 17. The clip is then swung around to bring the bowed part 16b into engagement with the bottom of the sheath and the short arm of the clip against the inside wall of the ring. Pressure is then exerted to bend the part 16b straight and to force the projection 16d over the lower corner of the socket 18, when the projection 16d snaps into the socket. The clip is thereafter firmly held in position by its own resilience. The number and size of clips used will, of course, vary with the size of the hot top.

When the assembled hot top has been mounted upon the mold and the metal is poured, the heat will soften the spring clips. Consequently when the hot top is thereafter stripped from the ingot the clips will readily yield, that is to say they will break or pull out of the socket member 17.

In Fig. 7 I have shown a sheath 20 which extends across the lower surface of the ring only, being held in position by the clips 16 as in the preferred form of the invention. The sheath 20 does not have an outwardly extending flange forming a wiper strip. On the contrary, the wiper strip 21 is a separate element mounted in a shallow rabbet on the lower side of the ledge 11, and held against displacement by the ring 13.

The construction of Fig. 8 is like that of Fig. 7, except for the fact that the sheath 22 in this case has an outer wall enclosing the outer wall of the ring 13.

The construction of Fig. 9 is like that of Fig. 7 except that the sheath 23 has an inner wall enclosing the inner wall of the ring 13.

Fig. 10 illustrates a modification of the form of the invention illustrated in Fig. 12, but in this case the sheath 24 has a complete inner wall extending to the top of the ring 13, while its outer wall extends only part way up the outer wall of the ring, where it has an outwardly extending flange 25 constituting a wiper strip.

The construction of Fig. 11 is like that of Fig. 10 with the exception that the sheath 26 has only a short inner wall and has no outer wall, the flange 27 projecting outwardly directly from the

horizontal portion of the sheath to constitute a wiper strip.

The various constructions shown in Figs. 7 to 12 inclusive are samples of the possible forms which the sheath may take, but it will be appreciated that other modifications are within the scope of the invention. Such a sheath as 20, Fig. 7, is fairly satisfactory for most hot tops, but I consider it best to have the sheath enclose at least a portion of the side walls of the ring as well as the bottom wall thereof. When all of the exposed surfaces of the ring are covered by the sheath there is, of course, no possibility whatever that any material which may spill off the ring will fall into the metal being poured.

In Figs. 4, 5 and 6 I have shown different arrangements of sheaths. In these figures each sheath or sheath section has inner and outer walls, but no outwardly extending flange or wiper strip is illustrated. In Fig. 4 the sheath sections 28 are used at the corners only of the hot top. It is in the corner portions that the ring 13 is of the greatest width, and consequently most likely to spill.

In Fig. 5 I have shown the sheath 29 made in a single piece and adapted to cover completely the entire bottom ring of the hot top. The sheath of Fig. 6 is also adapted to cover the entire bottom ring, but in this case it is made in four sections 30.

In Figs. 2 and 3 I have shown a sheath section 31 covering completely the bottom and two side walls of a ring 13 made in four parts for a large size hot top. In this form of the invention the sheath section is attached to the ring section by means of tabs 32 on the upper edges of the sheath walls, these tabs being bent down against the upper surfaces of the ring when the parts are assembled.

It will be apparent that in all forms of the invention as herein illustrated the sheath extends across the lower surface of the refractory ring, and in most cases upwardly along at least a portion of the side walls as well, and that it is preferably although not necessarily continuous around the perimeter of the hot top, and that should the heat of the molten metal while being poured so affect the refractory material of the bottom ring that cracks would occur and portions of the refractory break loose, such separated portions would be prevented from falling and would be held in position by the sheath until the molten metal rose to the point where it would engage the hot top. At that time in the process of casting the ingot the hot top would float upon the metal and no breakage of refractory which might occur thereafter could do any damage.

Having thus described my invention, I claim:

1. In a hot top, a body portion, a refractory bottom ring covering the lower end of the body portion, and a metal sheath carried by the hot top extending entirely across the lower surface of said ring.

2. In a hot top, a body portion, a refractory bottom ring covering completely the lower end of the body portion, a metal sheath covering the lower surface of said ring, and means for securing said sheath and said ring to the body portion.

3. In a hot top, a body portion, a refractory bottom ring covering the lower end of the body portion, a metal sheath extending entirely across the lower surface of said ring and up one wall thereof, and means for securing said sheath and said ring to the body portion.

4. In a hot top, a body portion, a refractory bottom ring covering the lower end of the body portion, a metal sheath extending entirely across the lower surface and both side walls of said ring, and means for temporarily securing the sheath and ring to the body portion.

5. In a hot top, a metal casing, a refractory bottom ring covering completely the lower end of the casing, a metal sheath for the bottom ring extending across the bottom surface thereof, and means for temporarily securing said sheath and said ring to the casing.

6. In a hot top, a body portion, a refractory bottom ring covering completely the lower end of the body portion, a metal sheath extending entirely across the lower surface of said ring, and common means for securing both said ring and said sheath to the body portion.

7. In a hot top, a metal casing, a refractory bottom ring covering the lower end of the casing, a metal sheath for the bottom ring extending across the bottom surface thereof, and a series

of metal clips supported by the casing and extending beneath said sheath for supporting both the bottom ring and the sheath.

8. In a hot top, a body portion, a refractory bottom ring covering the lower end of the body portion, a metal sheath extending around the hot top covering the lower surface of the ring and extending upwardly along the outer sides of the ring, the upper edge of the outer wall of the sheath being bent outwardly to dam the flow of metal upwardly around the hot top, and means for securing said ring and said sheath to the body portion.

9. In a hot top, a casing, a refractory bottom ring covering the lower end of the casing, a metal sheath extending around the hot top covering the bottom wall of said ring, and common means for securing said ring and said sheath to the casing, said means being adapted to yield when the hot top is stripped from the ingot.

WALTER M. CHARMAN.