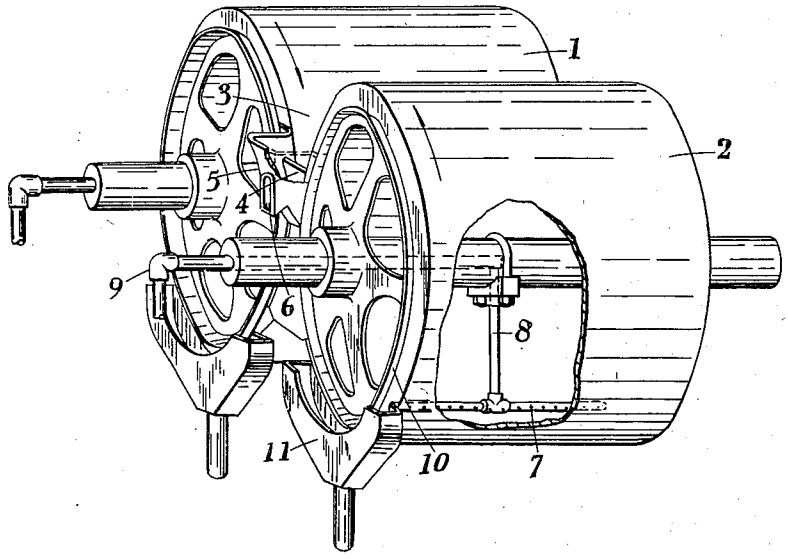
April 18, 1933. H. HARRIS 1,903,897

APPARATUS FOR CASTING METALS

Filed Aug. 9, 1930 4 Sheets-Sheet 1

Fig.1.



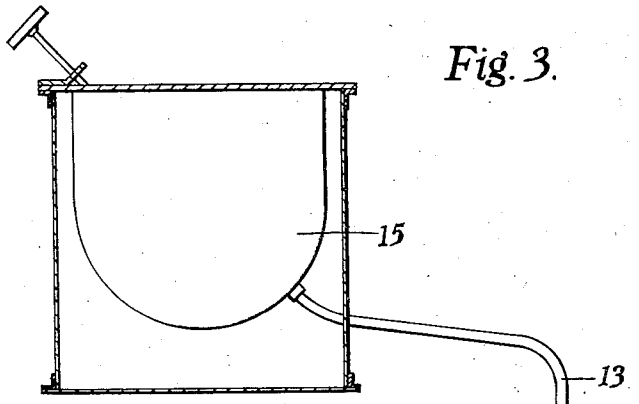
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APPARATUS FOR CASTING METALS

Filed Aug. 9, 1930 4 Sheets-Sheet 2

Fig. 3.



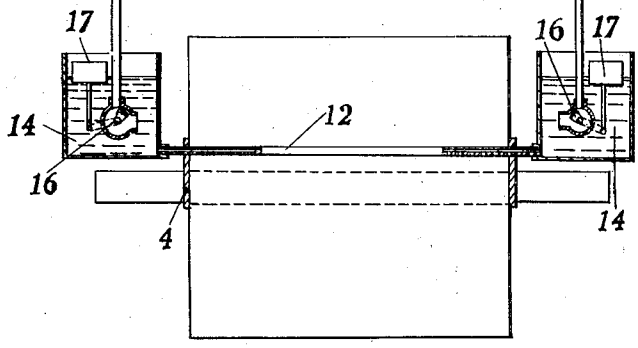
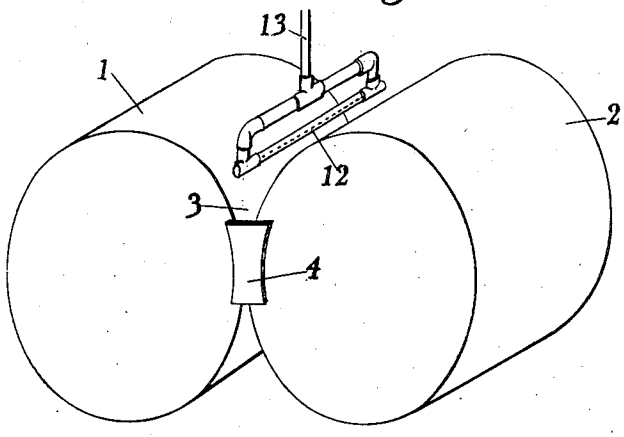


Fig. 2.



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APPARATUS FOR CASTING METALS

Filed Aug. 9, 1930 4 Sheets-Sheet 3

Fig. 4.

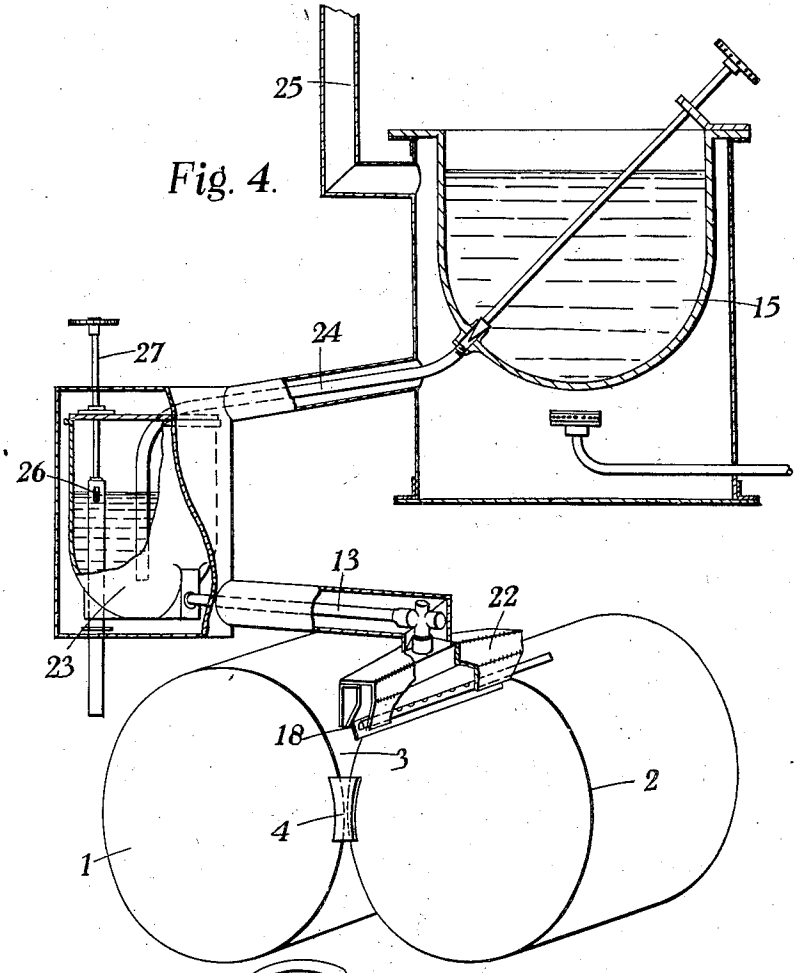
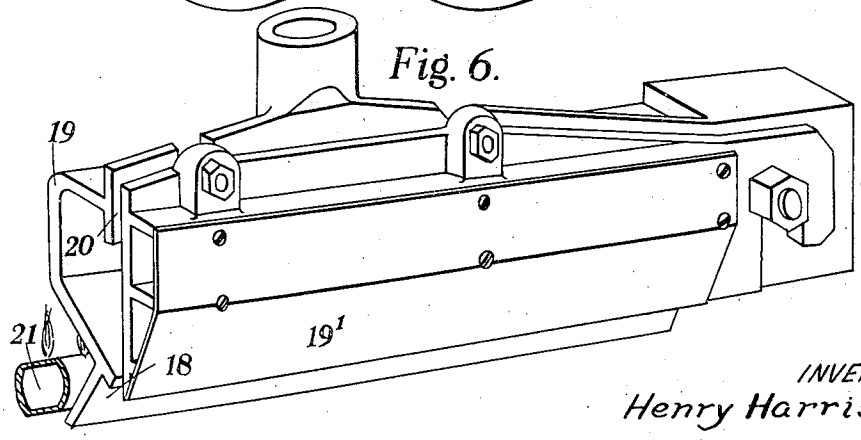


Fig. 6.



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APPARATUS FOR CASTING METALS

Filed Aug. 9, 1930 4 Sheets-Sheet 4

Fig. 5.

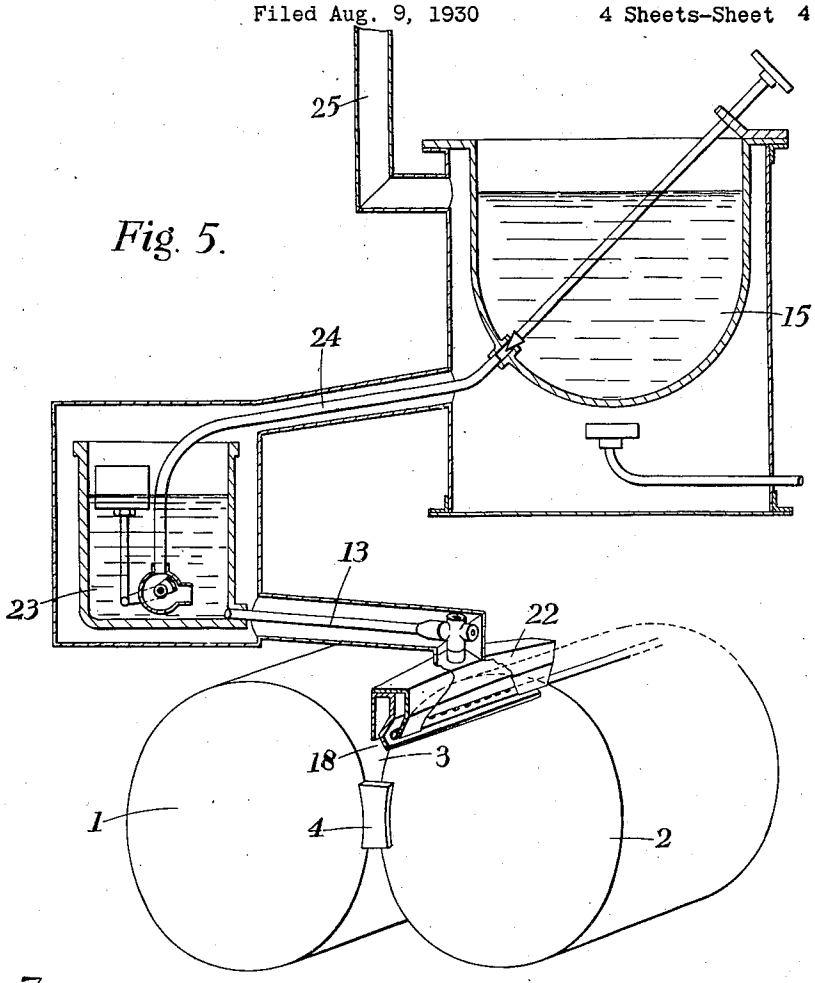
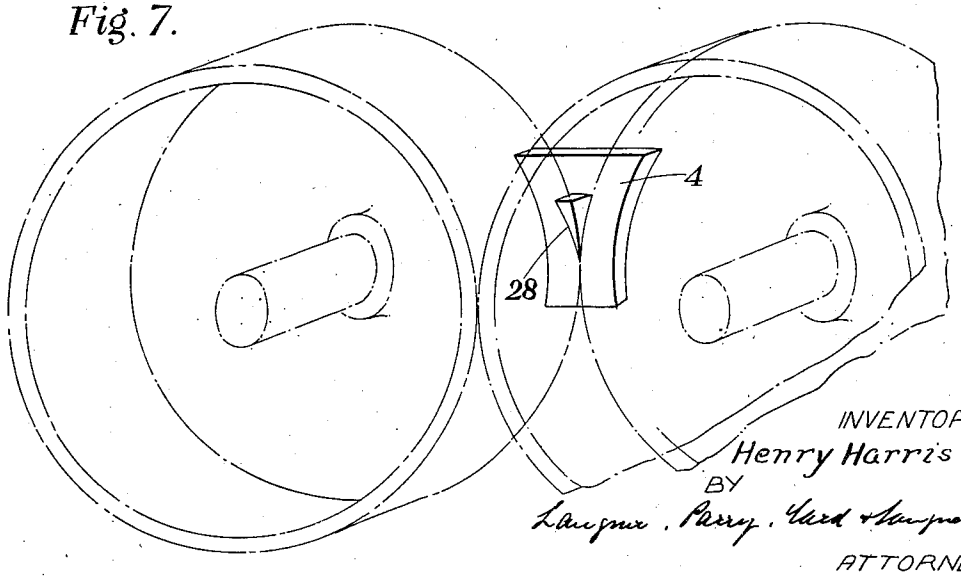


Fig. 7.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR CASTING METALS

Application filed August 9, 1930, Serial No. 474,166, and in Great Britain August 27, 1929.

This invention relates to apparatus for casting metals.

The usual process of rolling metals and alloys from billet or ingot form requires repeated passes through heavy and costly rolling machinery involving the expenditure of much power, time and labour. Moreover in the case of certain metals and alloys such for instance as zinc and the alloys of lead and antimony the process is further complicated by the necessity of giving the metal or alloy suitable heat treatment between the various stages of rolling.

The chief object of the present invention is to avoid the above mentioned disadvantages and to enable finished articles such as thin sheets or tubes to be obtained from metals or alloys of comparatively low melting point in a simple manner direct from the molten state.

The conception of feeding molten metal to a space formed between travelling surfaces such as between spaced rotatable drums and of providing means to control the temperature of such surfaces and in some cases to also control the temperature of a core or former in order to solidify and simultaneously shape the metal as a continuous solid product is now new. Whereas however the conception is relatively simple there are considerable difficulties in operating industrially.

The present invention employs temperature controlled surfaces travelling convergently towards a predetermined gap such as the surfaces of two rotatable drums spaced apart on parallel axes and is characterized by maintaining in a riding condition upon the surfaces a bulk of the metal or alloy of such a height that there are in effect three zones namely (1) a top or molten zone where the metal or alloy is arriving, (2) a bottom or solid zone where the metal or alloy has become solid and has been compressed and moulded at the gap and is in process of leaving the same, and (3) an intermediate or plastic zone where the metal or alloy is in a state of incipient solidification and has developed on the travelling surfaces two adherent plastic cakes in process of being carried along by said surfaces towards the solid zone.

In order to maintain a predetermined height or "head" of metal or alloy in the convergent space between the travelling surfaces in the preferred embodiment of apparatus for carrying out the invention namely in the convergent space between spaced parallel drums, this space is converted into a receiving trough or hopper by means of flat end plates adapted to bear accurately against the flat ends of the drums, the said plates being pressed into position by spring pressure. The head of metal or alloy in the trough or hopper is maintained at the required height in any suitable manner, such as by providing an overflow weir for metal or alloy supplied in excess of requirements.

The space in the trough or hopper may be occupied solely by the metal or alloy fed to it, or it may be occupied partly by a partition or core. For example in the case of requiring two metals in layered or "sandwich" condition, the additional metal may be fed through the orifice exposed to the adjacent solidifying metal so that the two metals become united and issue together.

In order to prevent or minimize oxidation of the metal or alloy the apparatus or a part thereof may, if desired, be enclosed in an atmosphere of a neutral or reducing gas.

In order that the invention may be clearly understood and readily carried into effect I will now described the same more fully with reference to the accompanying drawings in which:—

Figure 1 is a perspective view of a pair of drums arranged and equipped to operate in accordance with the invention.

Figure 2 is a perspective view of a pair of the drums and supply piping for the molten metal or alloy.

Figure 3 is a sectional elevation in illustration of means for controlling the rate of delivery of the molten material to the drums.

Figures 4 and 5 are part sectional elevations and part perspective views of two further embodiments of means for controlling the supply of molten metal or alloy to a pair of drums.

Figure 6 is an enlarged sectional perspective view of the delivery portion of the arrangement shown in Figures 4 and 5.

Figure 7 is an enlarged detail view of a particular form of side plate hereinafter described for closing up the ends of the receiving space between the drums, the latter being shown in dot and pick lines to indicate their relation to the plate.

Referring first more particularly to Figure 1, it will be seen that two drums 1 and 2 are arranged on parallel horizontal axes spaced apart at a distance which leaves a narrow gap between them at the line of nearest approach. The convergent space 3 between the upper halves of the drums is formed into a molten metal container or hopper by providing end plates 4 bearing against the ends of the drums. As shown in Figure 1 the end plate 4 is embodied in a form of weir by which the surface of the molten material may be maintained at a predetermined level. For this purpose the top edge of the plate 4 is shown located at a lower level than a second plate or casing 5 having an outlet 6 so that excess molten material will flow over the top edge of the plate and pass out through the outlet 6.

The drums while rotating in the direction of the arrows are maintained at the requisite temperature by any suitable means such as by water sprayed onto their interior surface through perforated piping 7 carried by a radial pipe 8 in communication with a supply pipe 9 arranged axially within each drum shaft. The pipe 8 may be adapted to be angularly adjustable around the axis of the drum.

The water may be discharged from the interior of each drum by a circular discharge rim 10 beneath which is a funnel 11 for receiving the water.

The molten metal or alloy is delivered as suitable temperature to the space 3 by any convenient means such as a pipe or trough; in order however to operate with strict regard to the rate of supply in relation to the rate of delivery of the moulded solid product, supply means may be provided to deliver the metal or alloy in a uniform manner along the space 3. For example as shown in Figure 2, the delivery pipe 12 may extend horizontally along the space 3 and be uniformly perforated and connected at its ends to a supply pipe 13 situated midway between the ends.

In the arrangement according to Figure 3 the delivery pipe 12 is connected at its ends to two feed control tanks 14, 14, which receive the molten metal by way of the supply pipe 13 from a reservoir 15. In the metal in each tank 14 is submerged a valve 16 controlled by a float 17 so that a predetermined head of the molten metal is maintained in each tank, thereby ensuring a uniform rate of issue of the metal from the delivery pipe 12.

In the modified arrangements shown in Figures 4, 5 and 6, the molten metal is allowed to issue from a slit 18 in a delivery box, the exact width of the slit being determined by the gasket or spacing strip 20 (Fig. 6) inserted between two main parts 19, 19′ of the box. Alternatively the gasket may extend entirely around the abutting edges of the parts 19, 19′, and be perforated along that part which lies between the lowermost edge.

In order to preserve the requisite liquidity of the metal the box 19, 19′, may be externally heated as by a row of gas jets issuing from a pipe 21 extending along the underside of the box part 19.

The heat of the burnt gases from the gas jets may be used to heat the metal and for this purpose a jacket or housing 22 may be arranged around the delivery box 19, 19′ and extend along the pipe 13, around an automatic feed control tank 23, the pipe 24, and the reservoir 15. The hot air and gases rising from the gas jets of the pipe 21 are conducted by the jacket or housing 22 over the pipe 13, around the tank 23 and thence around the reservoir 15 escaping by way of the exit pipe 25.

The feed control tank 23 of Figure 5 contains a submerged valve and float operating automatically similarly to those in the tanks 14 of Figure 3. The control of the tank 23 in Figure 4 however is by means of an overflow pipe 26 adjustable in height by hand regulating means 27.

Reference will now be made to Figure 7. It will be appreciated that as the molten metal between the drums approaches the solid zone or zone of minimum cross sectional area which lies in the horizontal plane common to the axes of the drums it has reached a semi-plastic state and is being squeezed as it progresses. It therefore tends in part to retreat upwardly out of the pressure zone into the intermediate zone; such retreating action can take place freely at points intermediate the ends of the drums but at and near these ends the upward retreating effect of the semi-plastic mass undergoing pressure is confined to one side or direction only. At these ends therefore the tendency will be for the upwardly retreating mass to retreat in greater bulk than at intermediate points. It is to counteract such tendency that I provide the wedge shaped projection 28 on the end plates to project into the inter-drum spaces at the ends of the drums as shown in Figure 7. It will be understood that as the degree of retreating action fluctuates slightly, the projections 28 cause the semi-plastic metal to be pushed inwardly and be moulded at the ends with a bevelled formation during a rising tendency

and that during a subsequently falling tendency a cavity will remain near the projections which cavity during the next rising tendency will serve to absorb the rising surplus metal.

The moulding surfaces so far considered with reference to the drawings have been plain drum surfaces. Clearly however they may be grooved, ribbed or patterned.

What I claim is:—

1. Apparatus for casting metals or alloys direct from the molten state comprising two rotary drums spaced apart on parallel axes to present at their line of approach an outlet space for metal or alloy, means for regulating the temperature of the said rotary drums, end plates bearing against the end faces of said drums for converting the converging space above the outlet into a receiving trough, a downwardly pointing wedge-shaped projection on the internal face of each end plate, means for supplying molten metal or alloy to said trough and means for maintaining a determined depth of metal or alloy in said trough.

2. Apparatus for casting metals or alloys of low melting point such as lead direct from the molten state comprising axially parallel drums convergently rotating and forming between them a convergent space having a horizontal outlet of predetermined size, plates bearing against the end faces of said drums to convert said space into a molten metal receiving trough, means for maintaining within said space and in riding contact with the drum surfaces a continuously renewed mass of said metal or alloy of constant volume, means for regulating the temperature of the drum surfaces at the riding zone to stratify the metal or alloy received in molten state into three layers namely (1) a top molten layer where the metal or alloy is arriving, (2) a bottom solid layer where the metal or alloy has been compressed and moulded at the aforesaid outlet and is in process of leaving the same, and (3) an intermediate plastic layer where the metal or alloy is in a state of incipient solidification and has developed on the travelling surfaces two adherent plastic cakes, means containing reserve molten metal or alloy, means conducting the metal or alloy from the container and delivering it in a distributed manner to the receiving trough, a gas burner for keeping the delivery portion of the last mentioned means hot, and a continuous spaced casing extending over the conducting means and around the container for conducting the products of combustion thereover.

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

HENRY HARRIS.