A. H. PEHRSON.

MANUFACTURE OF BAR AND TUBE SHAPED ARTICLES FROM MOLTEN METAL.

APPLICATION FILED JAN. 30, 1913.

1,088,171.

Patented Feb. 24, 1914.

3 SHEETS—SHEET 1.

Fig. 1.

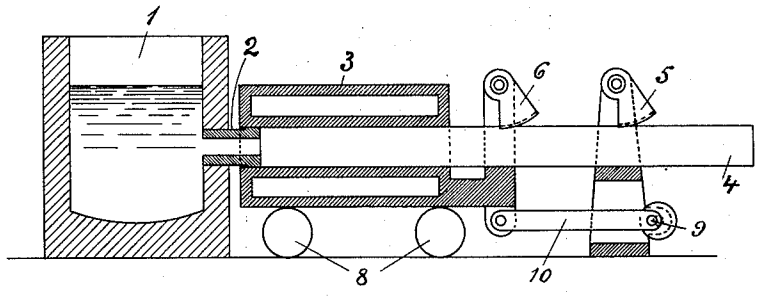


Fig. 2.

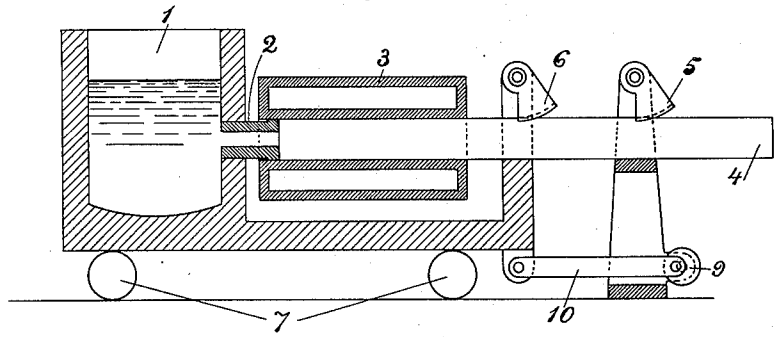
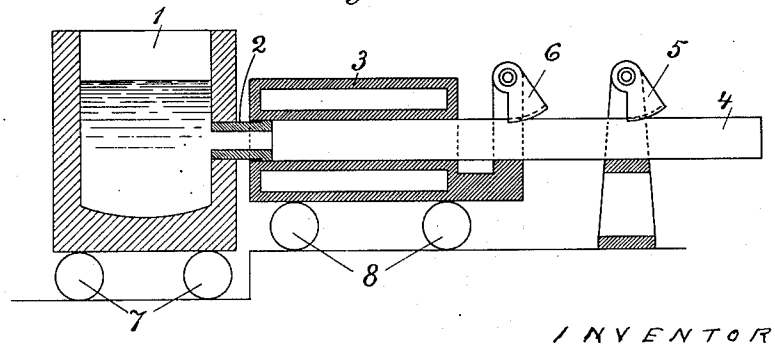


Fig. 3.



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Fig. 4.

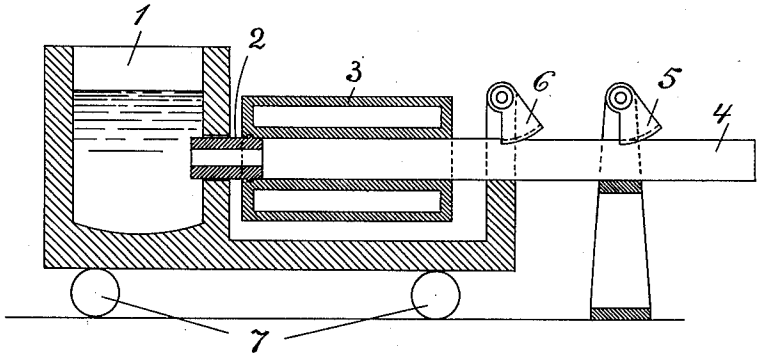


Fig. 5.

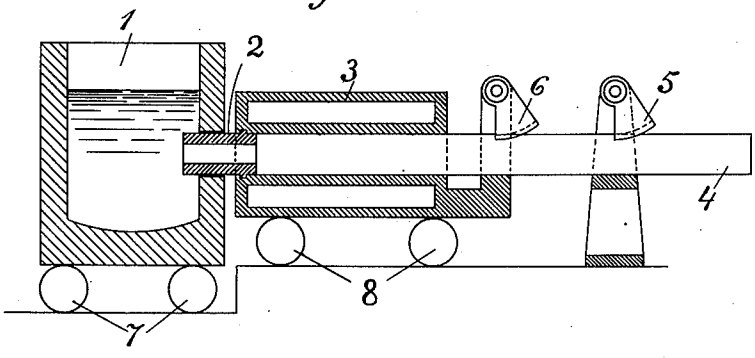
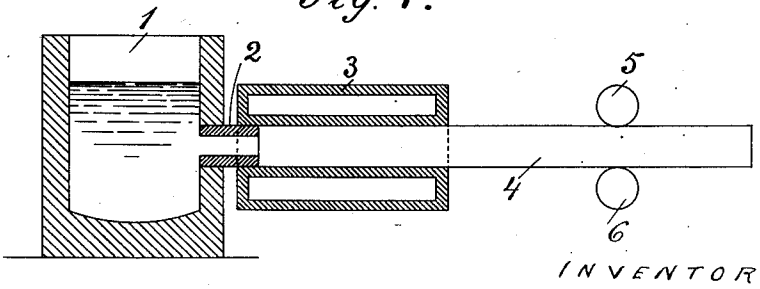


Fig. 7.



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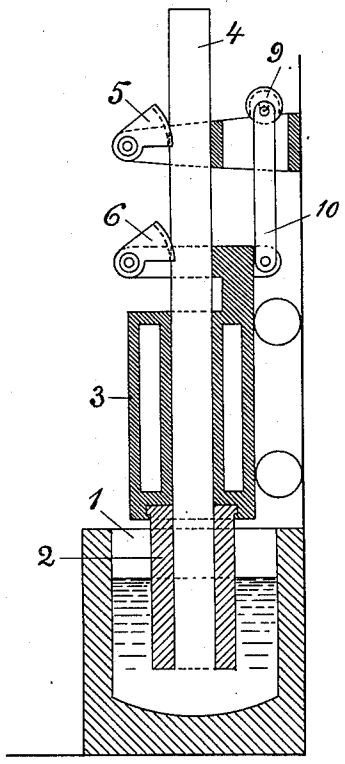
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3 SHEETS—SHEET 3.

Fig. 6.



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MANUFACTURE OF BAR AND TUBE SHAPED ARTICLES FROM MOLTEN METAL.

1,088,171. Specification of Letters Patent. Patented Feb. 24, 1914.

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To all whom it may concern:

Be it known that I, ADAM HELMER PEHRSON, a subject of the King of Sweden, residing at Guldsmadshyttan, Sweden, have invented new and useful Improvements in and Relating to the Manufacture of Bar and Tube Shaped Articles from Molten Metal, of which the following is a specification.

The manufacture of bar and tube-shaped articles directly from molten metal by continuously pouring metal from a furnace or receptacle into a cooling mold has in practice been attended with the difficulty that the pulling force necessary for feeding the newly molded goods forward has been liable to tear off the metal or at least to cause wrinkles and breaks in the surface of the bar or tube produced, thus giving an inferior product.

The present invention has for its object a method and means for avoiding the said inconveniences.

The method consists in that the mold during the pouring of the metal and the removal of the article as it is formed and solidified, is not kept stationary with respect to the furnace or receptacle for the molten metal but has a more or less uniform, reciprocating movement with respect to said furnace, while the nozzle which serves to introduce the molten metal into the mold may be connected either to the furnace or other receptacle or to the mold and is partly surrounded by the said part. The purpose of the said movement is first, that the newly molded article may have an increased time for solidifying, and also in some cases, if necessary, to allow of the introduction of a lubricant into the mold during the casting by means of the reciprocating movement and thus prevent the metal from sticking to the wall of the mold.

In the accompanying drawing Figure 1 shows a diagrammatical vertical section of an apparatus for carrying out the present invention, said apparatus having a stationary metal receptacle with a fixed nozzle and a reciprocatable molding and cooling pipe; Fig. 2 shows a corresponding section of an apparatus with a movable metal receptacle and a stationary pipe and Fig. 3 a corresponding section of an apparatus where the receptacle as well as the pipe is movable. In all these figures the nozzle is secured to the receptacle. Figs. 4 and 5 show, on the contrary, forms where the nozzle is secured to the molding pipe which is stationary in Fig. 4 and movable in Fig. 5, while the receptacle in both cases is movable. Fig. 6 shows an apparatus with vertical cooling pipe and Fig. 7 an apparatus with continuous feed of the article produced, both in diagrammatical vertical sections.

In Fig. 1 the apparatus consists of a receptacle 1 for the molten metal, provided with a nozzle 2 partly surrounded by the molding pipe 3 which is provided with a cooling jacket. At the beginning of the operation, a bar 4 filling the pipe 3 is inserted into the same and is prevented by a ratchet device 5 from partaking of the movement of the said pipe in one direction, but upon the movement in the opposite direction on the other hand, is clamped by the ratchet device 6 arranged on the pipe 3 and is carried along with same.

The two ratchet devices 5 and 6, the former of which is pivoted to a stationary frame and the latter to the pipe 3, in the form shown consists of friction ratchets, *i. e.*, segmental pieces bearing with their arcs against the bar 4, the arc of each ratchet being eccentric with respect to its pivoting pin in such manner, that the center of the arc lies to the right of that of the pin. The angle between the radius of the arc at the contact point between the ratchet and the bar and the line from said point to the pin center is less than the friction angle whereby the well-known effect is obtained, that when the bar attempts to move to the left with respect to the ratchet, the resultant pressure between said parts goes to the left of the pin center and thus tends to rotate the ratchet in a clockwise direction, the ratchet and the bar thus mutually locking each other. A relative movement of the bar to the right with respect to each ratchet is, on the contrary, possible.

When the molten metal has been introduced into the cooling pipe through the nozzle 2 and begun to stick to the bar in solidifying the pipe 3 together with its contents is moved to the right, for instance by means of a crank and pitman mechanism 9, 10, and on rollers 8. A relative movement of the bar to the left with respect to the pipe being excluded, as above stated, by action of the ratchet 6, the bar then will be kept stationary with respect to the pipe, *i. e.*, be carried forth by it. On the contrary, the ratchet 5 does not prevent this movement of the bar

to the right with respect to the stationary frame. The bar thus will permit the inflowing of new metal into the pipe 3, according as the pipe is drawn off the nozzle 2. This metal sticks to the bar or to the newly solidified metal. The molding and cooling pipe then is returned by the crank mechanism to its original position—moved to the left in Fig. 1—, the ratchet 5 then retaining the bar with respect to the stationary frame. With respect to the pipe the metal thus is fed forward through a certain distance.

By repeating the series of operations just described further portions are cast on to the material, thus forming the bar or tube-shaped article desired.

The above-mentioned lubricant, the main object of which is to prevent the entering metal from sticking to the mold, and which should be uniformly spread over the inside of said mold, is simply introduced by being applied in a suitable manner to the outside of the nozzle and transmitted to the mold 3 by the aforesaid reciprocating movement of the latter.

In the modification shown in Fig. 2 the receptacle 1 and the nozzle 2 screwed thereinto are movable to and fro by means of crank and pitman 9, 10, upon rollers 7, while the cooling pipe 3 is stationary. In this case, only one ratchet device 5 is necessary for retaining the bar while the receptacle is drawn backward, while the feeding forward of said bar is immediately effected by the forward movement of the receptacle, but there may however also be a ratchet device 6′ connected to the movable receptacle for facilitating this action.

In Fig. 3, both the metal receptacle 1 and the cooling pipe 3 are movable upon rollers 7 and 8 respectively, the movements of said members being of course so governed that a relative reciprocating motion will take place between them. In this case, there is one stationary ratchet device 5 and one such device 6 which is connected to the cooling pipe as in Fig. 1. The manner of operation is practically the same as in Fig. 1.

In Fig. 4 the cooling pipe 3 is stationary and the metal receptacle 1 is movable on rollers 7 while the nozzle 2 is screwed into the pipe 3 and enters the receptacle with a sufficiently tight fit for preventing the metal from escaping around it. The operation of this device differs from that of Fig. 2 practically only therein that the period of introduction of new metal into the mold occurs when the receptacle moves toward the latter instead of away from it, as in Fig. 2. In this case, the hydraulic pressure of the molten metal in the receptacle forces in new metal in the mold at the same time feeding forward the solidified bar assisted by the ratchet 6′, while in moving the receptacle in the opposite direction, the bar is retained by the ratchet device 5 and in its turn retains the mold.

In Fig. 5 the metal receptacle 1 is movable on rollers 7 and the cooling and molding pipe 3 on rollers 8, the nozzle 2 being screwed into said pipe and entering the receptacle 1 with a tight fit. One stationary ratchet device 5 and one 6 connected to the molding pipe is employed. Otherwise, the manner of operation is practically identical to that of Fig. 4.

In Fig. 6 the molding and cooling pipe 3 is placed vertically above the receptacle 1 and movable up and down. Further it is screwed into a nozzle 2 which in lowering the pipe 3 plunges into the metal bath in the receptacle 1. This nozzle is comparatively thick, as it is exposed to wear from the molten metal on its outer as well as on its inner side. One stationary and one movable ratchet device 5 and 6 respectively are employed in this case. Otherwise, the manner of operation corresponds to the previously described arrangements.

It is obvious that any intermediary position for the molding pipe between the vertical one shown in Fig. 6 and the horizontal one illustrated in Figs. 1–5 may be employed, and also that the said pipe may occupy any position beneath the horizontal one.

The apparatus for carrying out the process in question can of course be further varied according to the material, shape and dimensions, etc., of the article produced. Thus it may for instance for less delicate metals be sufficient to substitute for the ratchet devices a suitable continuously acting drawing device for instance a pair of rollers. An arrangement of this kind is diagrammatically shown in Fig. 7. In this figure the numerals 1, 2, 3 and 4 as before, designate the metal receptacle, the nozzle, the cooling pipe and the metal bar respectively, while 5′ and 6^2 are a pair of rollers which embrace the latter and continuously feed it forward. In this case a casting of new metal on to the bar will take place also during the return movement of the molding pipe to its initial position, while the movements of said pipe will not act to feed forward the bar but only perform their original function to hasten the cooling action and to control the feed of the lubricant.

Finally, the speed, extent, etc., of the different movements specified above may vary between wide limits and the said movements be produced by any suitable means.

Having now particularly described the nature of my invention and the manner of its operation, what I claim is:

1. Apparatus for manufacturing longitudinally extended, profiled articles directly from molten metal comprising a receptacle for the molten metal, a discharge

nozzle therefrom, a molding pipe provided with a cooling jacket, said pipe being in alinement with the nozzle and forming a metal-tight joint therewith and means for effecting a relative reciprocating motion between the molding pipe and the receptacle.

2. Apparatus for manufacturing longitudinally extended, profiled articles directly from molten metal comprising a receptacle for molten metal, a discharge nozzle fixed to said receptacle, a molding pipe provided with a cooling jacket in alinement with the nozzle and partly embracing the same so as to form a metal-tight joint therewith, and means for effecting a relative reciprocating motion between the molding pipe and the receptacle.

3. Apparatus for manufacturing longitudinally extended, profiled articles directly from molten metal comprising a receptacle for molten metal, a nozzle, a molding pipe provided with a cooling jacket, reciprocating means for said pipe on said nozzle and means for bringing a lubricant on to the outside of the latter whereby it is introduced through the joint between the nozzle and molding pipe during the casting.

4. Apparatus for manufacturing longitudinally extended, profiled articles directly from molten metal comprising a receptacle for molten metal, a nozzle, a molding pipe provided with a cooling jacket in alinement with the nozzle and a ratchet device on said pipe acting to carry forth the metal article in a relative motion to said molding pipe away from said receptacle but to release it during a motion in the opposite direction.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ADAM HELMER PEHRSON.

Witnesses:
BIRGER NORDFELDT,
H. TELANDER.