Nov. 15, 1932. E. BROCKEL 1,887,917

STEREOTYPE PLATE CASTING MACHINE

Filed Sept. 23, 1931

Fig. 1.

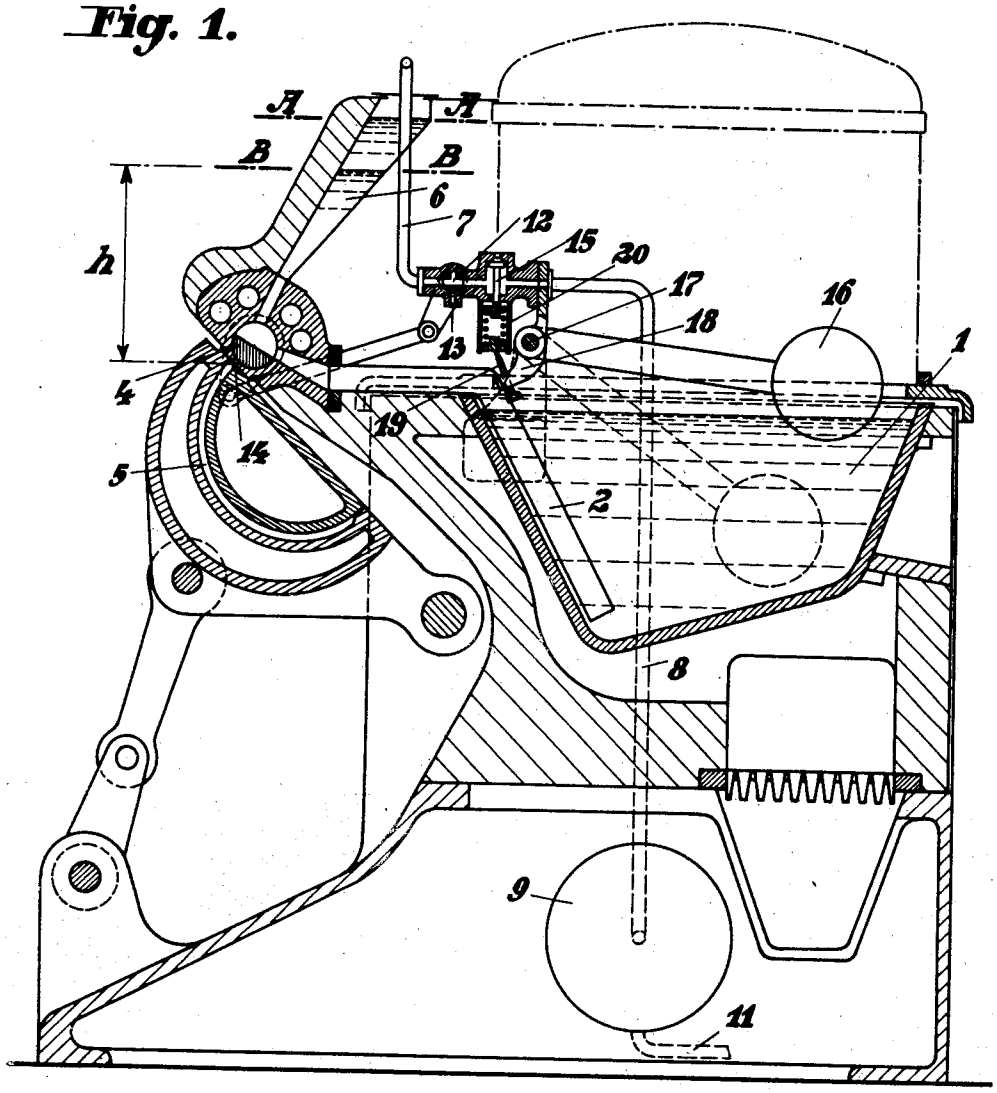


Fig. 3.



Fig. 4.

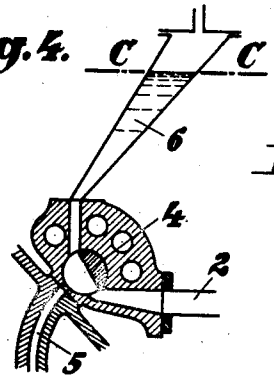


Fig. 5.

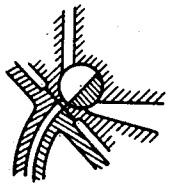


Fig. 2.

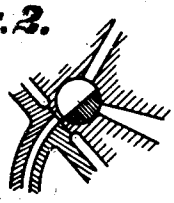
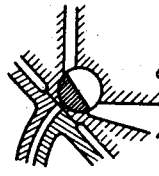


Fig. 6.



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STEREOTYPE PLATE CASTING MACHINE

Application filed September 23, 1931, Serial No. 564,485, and in Germany October 3, 1930.

In order to fill the mould of a stereotype plate casting machine with the molten metal, until now one of two ways is usually followed. Either the metal is pumped into the mould by means of a pump situated within the melting pot, or the melting pot is set up higher than the mould and provided with a cock, a slide valve or other valve through which the molten metal may flow into the mold. Machines of the first mentioned type have the advantage that the shut-off member is not continually subjected to the pressure of the contents of the pot, and consequently may be kept tight easier; on the other hand, the pumps occupy much room in the melting pots and have to be cleaned frequently. This is the case also in plate casting machines provided with a melting pot within which a vessel, connected with compressed air piping is placed, and at the bottom of which vessel a valve is situated wherefrom piping leads to the mould.

According to the invention, the metal by the aid of partial vacuum is caused to ascend into one end of a pipe, closed at the top, which is situated above the metal inlet of the mould and out of which the metal may, from above, flow into the mould. The other end of the pipe dips into the molten metal. The end, which is closed at the top may be connected alternately with a means for producing partial vacuum, such as a suction pump or a suction air vessel and, in order to raise the partial vacuum, with the outer air or a means for producing pressure above atmospheric.

It is known to evacuate the mould and with the aid of partial vacuum introduce the metal into the mould at the lower end thereof. In the novel machine according to the invention the molten metal is caused to ascend by partial vacuum, but then flow into the mould from above, so that the non-porously cast plate is subjected to the pressure of the molten metal, or, in certain cases, to additional pressure above atmospheric, whereby plates of particularly high density are obtained.

Figs. 1–3 of the drawing show a preferred form of the object of the invention;

Fig. 1 is a vertical section of the whole machine;

Figs. 2 and 3 show various positions of the controlling members;

Figs. 4–6 show various positions of the controlling members in a slightly alternative form of the invention.

In the machine according to Fig. 1, piping 2 leads from the bottom of the melting pot 1 to the body 3 of a cock provided with a three-ways plug 4. By means of this plug 4 the interior of the body of the cock may be put in communication with the mould 5 and the ascending pipe 6 which is closed on top. From the upper end of the ascending pipe 6, piping 7, 8, leads to the vessel 9, from which by a suction pump, not shown, through a pipe 11, air is continually withdrawn. Piping 7, 8 is provided with a three-ways cock 12 which in one position connects section 7 with section 8 and the vessel 9, and in the other position connects section 7 of the piping with the aperture 13 which leads into the outer air or an air pressure vessel.

The operation of casting with a machine according to Fig. 1 is as follows:—

As soon as the suction pump commences to work and assuming that the valve 4 is in the position shown in Figure 1, the metal will ascend through piping 2 and cock body 3 into the ascending pipe 6 situated above the metal inlet of the mould 5. The degree of partial vacuum is automatically controlled so that the metal will always ascend to the level A—A. Piping 2, cock body 3 and ascending pipe 6 are suitably heated to prevent the metal contained therein from cooling and solidifying.

Now after the mould 5 has been locked and brought into the working position shown in Fig. 1, the position of plug 4 shown in Fig. 1, in known manner, is altered to that shown in Fig. 2. At the same time the three-ways cock 12 is positioned as shown in Fig. 3. The outer air now, through aperture 13 and piping 7 enters the ascending pipe 6 at the top and forces the metal through slot 14 into the mould 5, thereby causing the level of the metal to sink from line A—A to line B—B. The metal now solidifies under a pressure pro-

portionate to the height h of the column of liquid metal. After solidification, plug 4 and three-ways cock 12 are reversed into the positions shown in Fig. 1. The mould 5 may now be opened and the plate removed. By the reversal of the three-ways cock 12 the ascending pipe 6 is again connected with partial vacuum vessel 9; the metal consequently rises again in the ascending pipe 6 to the level A—A; the machine is now ready for casting another plate. The partial vacuum within the vessel 9 is regulated by means of a regulating valve 15 in such manner that, independently of the quantity of metal contained in the melting pot 1, the level of the metal required for casting a plate will always reach the line A—A. To this end a float 16 is provided, which floats on the surface of the molten metal, and is fixed on a journal pin 17. A lever 18 is also fastened to the journal pin 17 and carries a set screw 19 which presses upon a spring 20, which in turn presses upon the valve 15, thereby maintaining the valve normally closed under a spring pressure which is proportionate to the level of the metal in the pot.

If the melting pot contains much metal and the float 16 consequently occupies the position indicated in Fig. 1 of the drawing by full outlines, the pressure of the spring 20 upon the cone 15 of the valve is low. Consequently the partial vacuum effected will, relative to the outside air, also be low, as the cone 15 of the valve will admit outside air as soon as a certain degree of pressure is reached. At low level of the metal in the melting pot 1, the pressure exercised by the spring 20 will be higher; partial vacuum then approaches absolute vacuum and the metal will in this case also rise to the level A—A. The metal in the mould will consequently solidify under the same pressure h, no matter whether the melting pot 1 contains little metal or much metal.

As already mentioned, the piping 7 in the position shown in Fig. 3 may, through aperture 13, be connected with a means for producing pressure above atmospheric, such as a pressure air vessel, instead of the outer air. In that case preferably the suction side of a double acting pump will be connected with the partial vacuum vessel 9, and the pressure side with the pressure air vessel connected with aperture 13.

With the body of the cock in the positions shown in Figs. 4, 5 and 6, it is possible to evacuate the mould. If the mould is open, plug 4 in the position shown in Fig. 6, and the three-ways cock 12 in the position shown in Fig. 3, the metal in the melting pot will be level with the metal in the piping 2. After locking the mould 5, plug 4 is brought into the position shown in Fig. 4 and ascending pipe 6 is connected with the vessel 9 by revolving the three-ways cock 12 into the position according to Fig. 1. The partial vacuum in the vessel 9 will then at the same time suck the air from the tightly fitting mould and cause the metal contained in the melting pot 1 to ascend, through piping 2, to the level C—C (Fig. 4). The metal will also fill the mould, thus forcing the residual air to escape through ascending pipe 6. This operation occupies about 2 to 3 seconds. As soon as the metal has reached the level C—C, the plug will be brought into the position shown in Fig. 5 and the three-ways cock 12 into the position shown in Fig. 3. The pressure of the outer air now bears fully upon the metal and the plate will solidify under a pressure proportionate to the height h. After revolving the plug 4 into the position shown in Fig. 6, the metal in the ascending pipe 6 flows back into the melting pot 1 and the mould 5 may be opened. The same succession of operations is repeated when casting the next plate.

What I claim is:

1. A casting machine of the character described comprising, in combination, a melting pot, a mould, a valve casing having a valve chamber in communication with the upper end of the mould, a molten metal supply pipe opening at one end into the pot below the level of the metal therein and at its other end into said valve chamber, a container for molten metal located above the valve casing and opening at its lower end into said valve chamber, a source of sub-atmospheric pressure connected with the upper end of said container, means for cutting off communication between said container and said source of sub-atmospheric pressure and for establishing communication between the upper end of said container and a higher pressure at least as high as atmospheric pressure, and a valve within said valve chamber movable to a position to establish communication between said pipe and said container and to simultaneously deny communication of both said pipe and said container with the mould, and also to another position in which communication of the pipe with both the container and the mould is denied and communication is established between the container and the mould.

2. A casting machine as set forth in claim 1 in which the valve is movable to a position to establish communication simultaneously between the molten metal supply pipe, the mould and the container.

3. A casting machine as set forth in claim 1 including means operable in response to variations in the level of the metal in the pot to assure that for a constant degree of sub-atmospheric pressure to which the container is subjected for elevating metal from the pot into said container, the molten metal always will rise in said container to a predetermined level irrespective of the level of the metal in the pot.

4. A casting machine as set forth in claim 1 including means to assure that for a constant degree of sub-atmospheric pressure to which the container is subjected for elevating molten metal from the pot into said container, the molten metal always will rise in said container to a predetermined level irrespective of the level of the metal in the pot.

5. A casting machine as set forth in claim 1 including a pipe connection between the upper end of the container and the source of sub-atmospheric pressure, a valve in said pipe controlling communication between the pipe and a source of higher pressure at least as high as atmospheric pressure, a spring engaging said valve, and a member floating on the metal in the pot and operating through said spring to maintain the valve normally closed under a spring pressure which increases with lowering of the level of the liquid in the pot.

In testimony whereof I affix my signature.

ERNST BROCKEL.