Sept. 26, 1933. F. W. HARBORD ET AL 1,928,562

MANUFACTURE OF METAL BILLETS, BARS, AND THE LIKE

Original Filed Oct. 23, 1929

Fig. 1.

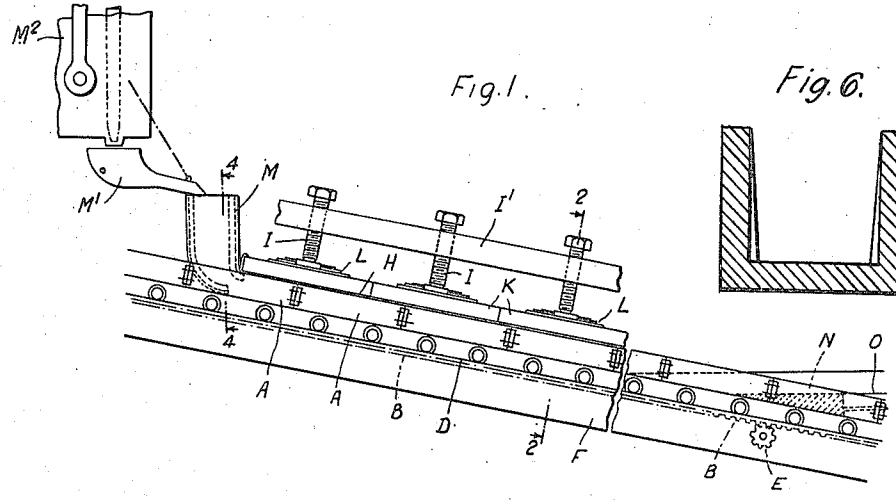


Fig. 6.

Fig. 2.

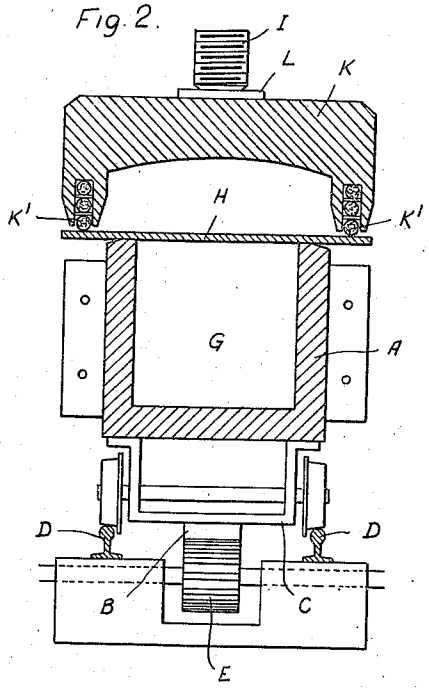


Fig. 3.

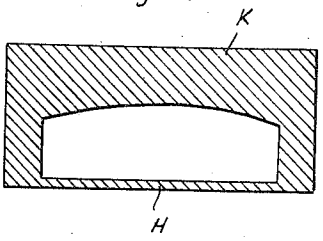


Fig. 4.

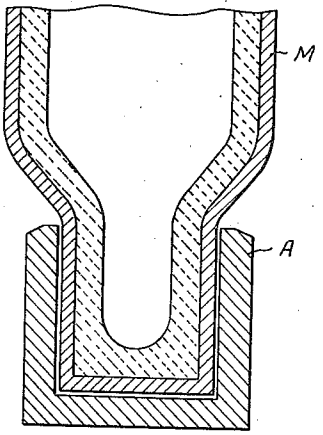
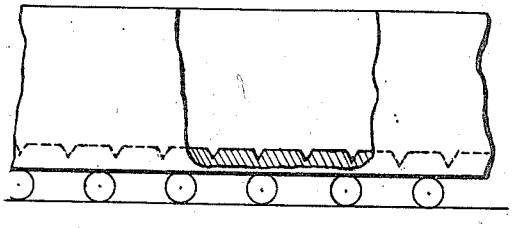


Fig. 5.



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MANUFACTURE OF METAL BILLETS, BARS, AND THE LIKE

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Original application October 23, 1929, Serial No. 401,872, and in Great Britain November 14, 1928. Divided and this application August 1, 1932. Serial No. 627,186

7 Claims. (Cl. 207—13)

This invention relates to the production, directly from molten metal, of billets, bars, blooms, slabs or the like of metal generally, and particularly of iron or steel or steel alloys. The product will for convenience be hereinafter referred to as a billet, independently of the shape or relative dimensions of the cross section of the product.

The present application is a division of our application for United States patent, Serial No. 401,872, filed October 23, 1929 (Patent No. 1,891,813 of December 20, 1932). In that specification two different types of moulds for carrying the invention into practice were described, one a continuous or circular mould, and the other a straight mould.

The present application relates to moulds of the latter type for the production of metal billets directly from molten metal.

According to the invention the apparatus comprises a mould having a straight channel of appropriate cross section, a cover or closure device comprising a flexible metal strip extending over part of the length of the said channel and forming therewith a mould cavity, means for maintaining close contact between this metal strip and the edges of the mould channel, means for maintaining a substantially continuous relative longitudinal movement between the channel and the closure device, simultaneously maintaining a supply of molten metal to the mould cavity to keep the latter substantially filled, and automatically stripping the billet or the like from the channel soon after its emergence from the mould cavity and with or without previous consolidation of the billet while still within the channel.

To ensure that the cast metal shall grip the moving mould, the inside surface of the mould may be made uneven, as by having ribs or grooves cast or cut thereon, such ribs or grooves being so arranged that they do not interfere with the stripping of the billet from the mould or the maintenance of a good tight fit between the edges of the mould and the flexible strip closure device forming the top of the mould cavity.

The invention is illustrated by way of example in the accompanying drawing, wherein Fig. 1 is a somewhat diagrammatic elevation of an apparatus embodying a straight line mould, Fig. 2 is a transverse section on an enlarged scale taken on line 2—2 of Fig. 1; Fig. 3 a section of an alternative form of mould block; Fig. 4 is a section on an enlarged scale taken on line 4—4 of Fig. 1, Fig. 5 is an elevation partly in section on an enlarged scale of a mould channel having a grooved bottom, and Fig. 6 is a cross section of a mould channel having ribs formed on its side walls.

As therein shown, the movable mould or trough element is built up of a number of U-shaped metal blocks A bolted rigidly together so as to be movable as one piece in a longitudinal direction in a horizontal plane, or in a plane slightly inclined to the horizontal, such movement being conveniently effected by means of a rack B formed upon or secured to the under surface of a carriage C to which the sectional mould is bolted, this carriage being provided with rollers or wheels to run on rails D. One or more driving pinions E engaging the rack are suitably journalled in a fixed structure which may be the base or foundation F upon which the whole apparatus rests. The interior surface of the mould channel or trough may be smooth, or it may be made uneven as by having transverse grooves formed in its floor, as shown in Fig. 5, or ribs formed in its sides, as shown in Fig. 6.

The mould cavity G is closed on its upper side by a slightly flexible metal strip or plate H which is anchored at its front end and is urged into tight contact with the upper edges of the mould sections A by suitable means, such as screws I carried by a frame I' and adapted to press the fixed blocks K against the closure strip H, springs L being preferably interposed between the screws and the blocks K and a compressible or elastic packing K' being interposed between the blocks K and the closure strip H. The interior of the blocks K and the closure strip are freely water-cooled, a circulation of water being maintained in the interspace between these elements by any suitable arrangement of inlet and outlet pipes connected with a water supply.

In Fig. 3 an alternative construction of mould block is shown. In this case the closure plate H forms part of the block K which is hollow and is water-cooled as previously described. The molten metal is introduced into the mould cavity formed between the strip or plate H and the sectional mould A from a fixed casting pot M which is provided with a suitable refractory lining and which receives metal from a tun dish M' attached to the molten metal pot or ladle M^2. The other end of the mould cavity is initially stopped by a plug of metal, fireclay or other suitable material which, when it reaches a stripping device indicated at N, is displaced by the stripper which, fitting in the bottom of the mould cavity, engages under the solidified billet and separates it from the mould and leads it on to a roller bed O clear of the moving mould.

In the apparatus above described the block or strip forming the top of the mould is stationary, the only moving part being the bottom of the mould and its carriage and, of course, the billet cast in the mould. It is, however, possible to arrange that the block or closure portion of the mould can also be moved at an appropriate speed different from that of the mould itself, and the casting pot must then be moved at the same speed, so that the pouring point maintains a constant relation to the mold cavity. Or, the closure block or strip may be made the moving portion of the mould, while the main portion, that is the sectional mould A, may be stationary.

Having thus described the nature of the said invention and the best means we know of carrying the same into practical effect, we claim:—

1. An apparatus for producing metal billets, bars or the like, comprising in combination a mould having a straight channel of appropriate cross section and a cover or closure device, the said closure device comprising a flexible metal strip extending over part of the length of said channel and forming therewith a mould cavity, means for maintaining close contact between the said flexible strip and the edges of the said mould cavity, means for maintaining substantially continuous relative longitudinal movement between the mould channel and the closure device, means for simultaneously maintaining a supply of molten metal to the mould cavity, and means for automatically stripping the billet from the channel upon its emergence from the mould cavity.

2. An apparatus according to claim 1, wherein the mould cover or closure device comprises, in addition to the said flexible metal strip, a series of contiguous short blocks, said blocks being yieldingly pressed against the flexible metal strip to hold the latter against the open face of the mould channel.

3. An apparatus according to claim 1, wherein the mould cover or closure device comprises a series of blocks of channel section between the open faces of which and the mould channel the flexible metal strip is interposed.

4. An apparatus according to claim 1, wherein the mould cover or closure device comprises a series of short blocks disposed in rear of the flexible metal strip, means located in a fixed frame for applying pressure to said blocks to force them towards the face of the mould channel, and a spring interposed between each block and the said pressure-applying means.

5. An apparatus according to claim 1, wherein the mould cover or closure device comprises a series of contiguous short hollow blocks and the flexible metal strip which closes the mould channel is constituted by the inner walls of the said hollow blocks.

6. An apparatus according to claim 1, wherein the mould cover or closure device comprises a series of contiguous short blocks disposed in rear of the flexible metal strip, and a compressible packing interposed between the said blocks and the said strip.

7. An apparatus according to claim 1, wherein the interior of the mould channel is formed with an uneven surface.

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