

July 24, 1951

N. P. GOSS

2,561,360

LUBRICATING MEANS FOR CONTINUOUS CASTING MACHINES

Filed March 3, 1948

3 Sheets-Sheet 1

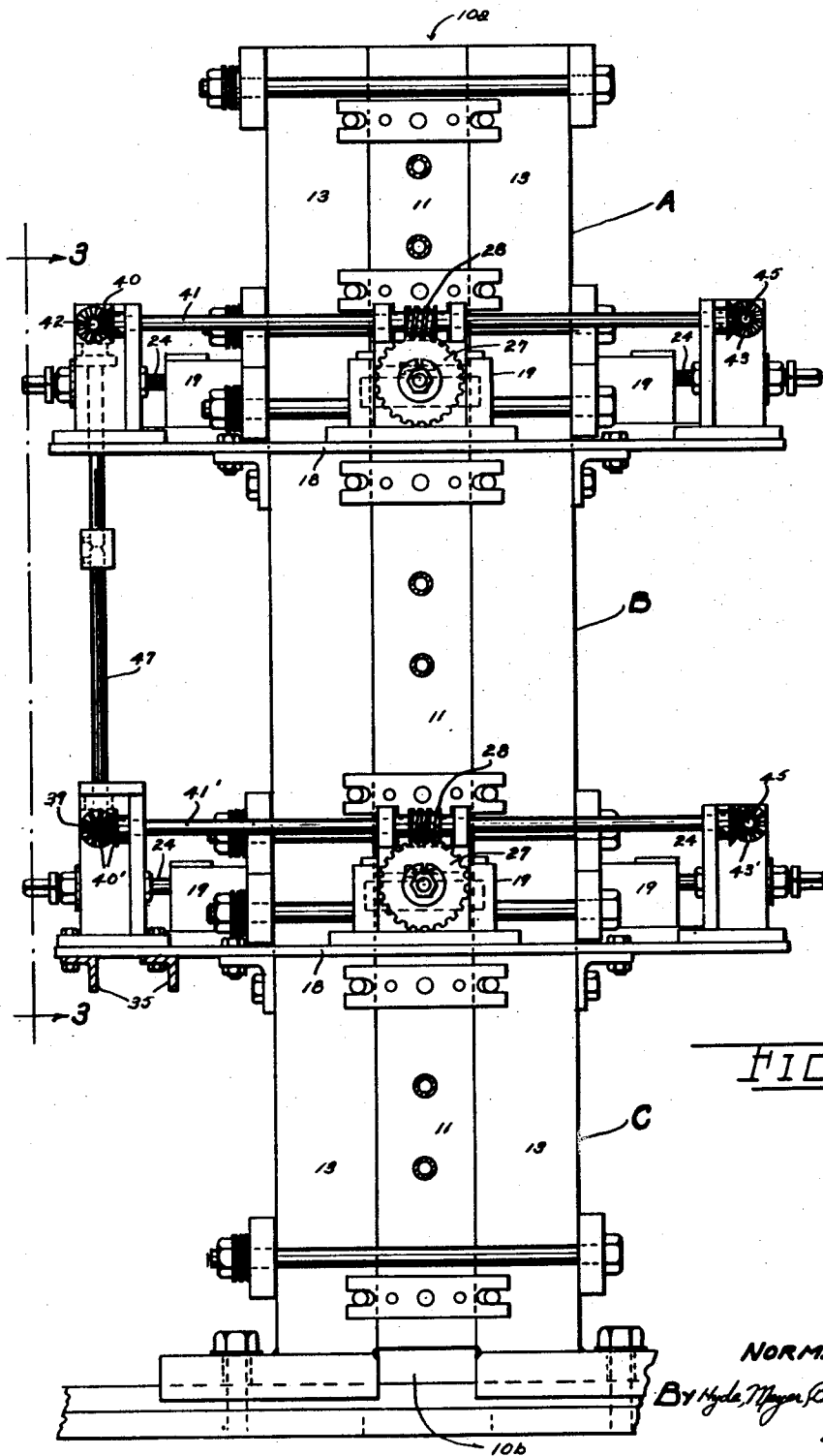


FIG. 1

INVENTOR
NORMAN P. GOSS

By Hyde, Meyer, Baldwin & Doran
ATTORNEYS

July 24, 1951

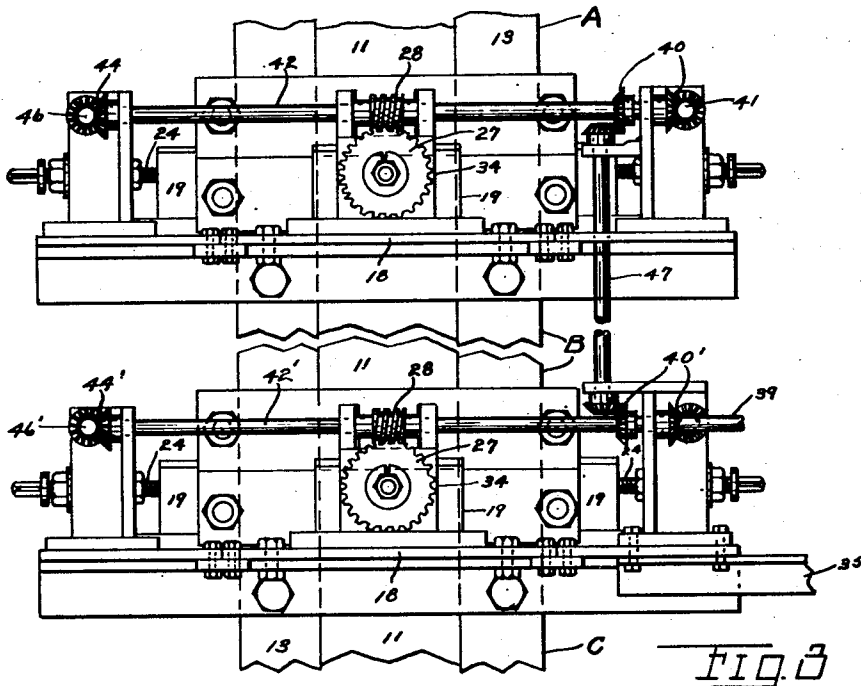
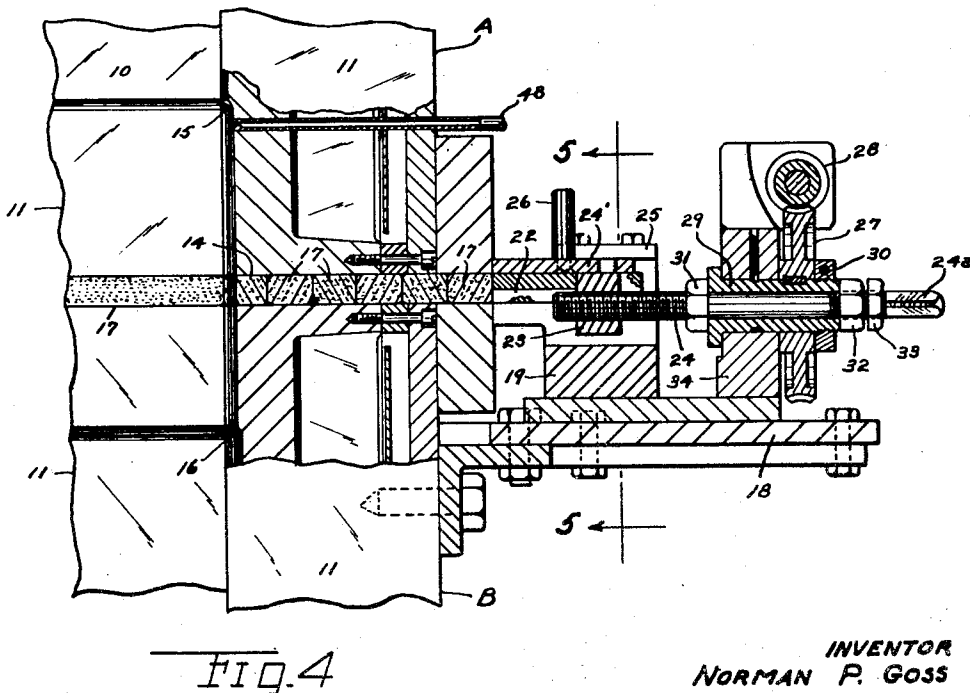
N. P. GOSS

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INVENTOR
NORMAN P. GOSS
By Hyde, Meyer, Baldwin & Dorn
ATTORNEYS

UNITED STATES PATENT OFFICE

2,561,360

LUBRICATING MEANS FOR CONTINUOUS
CASTING MACHINES

Norman P. Goss, Mayfield Heights, Ohio

Application March 3, 1948, Serial No. 12,796

2 Claims. (Cl. 22—57.2)

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This invention relates to improvements in lubricating means for a machine for the continuous casting of metals.

This application is a continuation in part of my copending application, Serial No. 653,285, filed March 9, 1946, now matured into Patent No. 2,510,100.

One of the objects of the present invention is the provision in combination with coacting vertical walls entirely surrounding a mold passageway on its several sides and having openings through the vertical walls, of means for feeding a solid lubricant through the openings in the walls.

Another object of the present invention is the provision in a continuous casting machine comprising the mold described in the preceding paragraph, of means for positively feeding a lubricant of a substantially solid character through the openings in the vertical walls in a measured manner coordinated with the movement of the metal through the mold passageway.

Still another object of the present invention is the provision of means of feeding a solid lubricant through all of the vertical walls surrounding a mold passageway at a coordinated measured speed.

Still another object of the present invention is the provision of novel mechanism for the feeding of lubricant blocks into a hollow mold passageway.

Another object of the present invention is the provision of a jet of non-oxidizing gas in the space between the skin of the congealing metal and the adjacent wall of the mold so as to protect the congealing metal against oxidation and so as to blow foreign bodies, if any, out of the space between the congealing metal and the mold wall.

Other objects and advantages of the present invention will be apparent from the accompanying drawings and description and the essential features will be set forth in the appended claims.

In the drawings,

Fig. 1 is a side elevational view of one embodiment of my invention;

Fig. 2 is a top plan view of the device of Fig. 1;

Fig. 3 is a fragmental side elevational view taken from approximately the position of the line 3—3 of Fig. 1;

Fig. 4 is an enlarged fragmental sectional view taken along the line 4—4 of Fig. 2, while

Fig. 5 is a fragmental sectional view taken along the line 5—5 of Fig. 4.

My invention is shown as applied to a continuous casting apparatus of the general character

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disclosed and claimed in United States Patent No. 2,225,373, granted to me December 17, 1940. In such apparatus I provide a generally vertical mold passageway 10 surrounded on four sides by the vertical walls 11. The mold passageway is open at the top as indicated at 10a for the introduction of molten metal and is also open at the bottom as indicated at 10b so that molded metal may be continuously withdrawn at the bottom by means of pinch rolls or the like as disclosed in my above-mentioned patent. The walls 11 are preferably hollow and water-cooled as taught in the copending application of myself and William C. Fox, Serial No. 689,918, filed August 12, 1946, now abandoned. The walls are also preferably formed of sections supported slidably by wings 12 in corner posts 13, with a slotted opening 14 (Fig. 4) between adjacent wall sections on each side of the mold passageway all as taught in my copending application, Serial No. 653,285, filed March 9, 1946, now matured into Patent No. 2,510,100. In my copending application just mentioned, I have explained how this construction permits expansion of the mold walls in every direction so as to avoid distortion of the mold walls. Preferably also, I incorporate in the present apparatus the slight offsets indicated at 15 and 16 in Fig. 4 whereby the cross-sectional dimension of the mold passageway 10 is suddenly increased by an amount equal to a few thousandths of an inch at various levels in the mold passageway. This construction is more fully explained and claimed in my copending application Serial No. 745,569, filed May 2, 1947, now matured into Patent No. 2,527,545.

In the present invention I show means for feeding briquetted blocks 17 of graphite or other suitable lubricant through the slotted openings 14 between adjacent vertical wall sections. In Fig. 1, I have shown three adjacent wall sections A, B, and C, and it should be understood that there are slotted openings 14 between the walls 11 on each of the four sides of the die between the levels A and B and between the levels B and C.

At each of these slotted openings 14, I provide mechanism exactly like that shown in Figs. 2, 4, and 5 and now to be described. On a bracket or platform 18 is mounted a U-shaped casting 19 which is provided with a hollow central trough 20 at right angles to the adjacent wall of the mold passageway. On each side of the trough 20 is provided a shoulder 21 on which slides a guide plate 22. Secured to the guide plate 22 is a nut 23 which has threaded engagement with a screw

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24. Means is provided to rotate the screw and since the nut 23 is held against rotation, the actuation of the screw will cause the nut to press against a plate 22 which in turn engages a series of graphite blocks 17 so as to push the same through a slotted opening 14 toward the mold passageway 10. Flanges 25 bolted to the casting 19 hold the plate 24' and the guide members 22 in proper position as clearly shown in Figs. 4 and 5. Upstanding handles 26 may be provided on the plate 24' for manual movement of this plate as a cover over the block 17, if necessary or desirable.

The means provided for rotating the screws 24 preferably comprises means extending on all sides of the die passageway so that lubricant blocks may be simultaneously moved inwardly toward the die passageway on all sides thereof. The means here shown in combination with each of the screws 24 comprises a worm gear 27 in driving relationship with the screw 24 and a worm 28 coacting with the worm gear. As clearly shown in Fig. 4, the gear 27 is keyed to a sleeve 29 and is held on the sleeve by a clamping collar 30. The sleeve 29 loosely surrounds the screw 24 and is normally held in engagement with the screw by means of the nuts 31 and 32 which are threaded on the screw 24 and when jammed toward each other cause the sleeve 29 to rotate in unison with the screw 24. A lock nut 33 will hold the parts in this position. The sleeve 29 is rotatably supported in a bracket 34 which is rigidly mounted on a base common with the casting 19.

Means is provided for rotating any one of the screws 24 when desirable. This means as clearly shown in Fig. 4 comprises a squared end 24a on the outer end of each screw 24. Obviously, upon backing off the nut 32, the screw 24 is freed from the sleeve 29 after which a wrench or crank handle may be applied to the squared end so as to rotate the screw 24 by hand, thus bringing the graphite blocks 17 to the desired coordination with graphite blocks on other sides of the mold passageway.

The means for causing movement of all of the screws 24 simultaneously is clearly shown in Figs. 1 and 2. On a pair of angles 35 is mounted a plate 36 upon which is fastened a motor 37 supplied by electrical current from a source not shown. This motor drives through a reduction gearing 38 to a shaft 39 which is shown in section in Fig. 1. Through beveled gears 40', shaft 47 and gears 40, identical shafts and gears are driven on the two levels shown in Fig. 1. Through gears 40, shafts 41 and 42 are driven and these in turn through beveled gears 43 and 44, respectively drive shafts 45 and 46. On shafts 41, 42, 45, and 46 are mounted worms 28, each of which operates a mechanism similar to that described in connection with Figs. 4 and 5, so that all of these devices operate simultaneously to turn the respective screws 24 so as to feed graphite blocks simultaneously into slotted openings 14 on the four sides of the mold passageway. At the lower level, shafts 41' and 45' and other shafts equivalent to those shown at 42 and 46 drive all of the lubricant feeding devices between the sections B and C.

I find that when casting molten steel in a device of the character described, it is sufficient if the graphite blocks are driven inwardly a few thousandths of an inch per minute.

I find that when using my present invention in combination with the step construction indicated at 15 and 16 in Fig. 4, it is possible by feeding the graphite blocks simultaneously inwardly on

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all sides of the mold passageway to center the continuously cast metal so that it does not have a tendency to run to one side or the other of the mold passageway.

I also find that utilizing the solid graphite blocks and feeding them through the slotted openings 14, as clearly shown in Fig. 4, provides a continuous face for the side walls of the mold passageway, thus preventing escape of the newly formed metal at these points. I also find that if the graphite blocks are pressed against the sides of the metal being cast, it closes the slight air gap between the skin on the cast metal and the inner face of the wall portions 11, thus preventing undesirable air circulation at this point. Furthermore, I find that the graphite blocks have a high coefficient of heat transmission and, therefore, heat is absorbed out of the steel being cast through the graphite blocks 17.

Another improvement in my continuous casting apparatus is disclosed in Fig. 4 where I provide a small tube or conduit 47 passing through one of the vertical wall portions 11 and extending to the inner face of the wall portion so as to communicate with the slight air gap between the congealing metal and the inner face of the mold passageway. Through this pipe 48 I feed a jet, preferably of non-oxidizing gas, such as nitrogen, hydrogen, or carbon dioxide or other hydrocarbon, so as to prevent oxidation of the surface of the metal adjacent the inner walls of the mold passageway. It is an object of this invention to keep the surface of the bar of metal going through the mold in a non-wetting condition. An oxide coating on the metal will cause it to become wetting and this oxide coating will cause the metal being cast to stick to the walls of the mold passageway. It should be understood that as many of the pipes 48 will be supplied around the walls of the mold passageway as necessary in order to supply the non-oxidizing gas at all points around the periphery of the metal bar being cast. Another advantage of this stream of non-oxidizing gas is that it can escape upwardly and in so doing will carry particles of foreign matter upwardly and out so as not to cause undesirable friction between the congealing metal and the walls of the die passageway.

What I claim is:

1. In a mold for the continuous casting of metal having coacting vertical walls entirely surrounding a mold passageway on its several sides, and wherein said passageway is open at the top for the introduction of molten metal and is open at the bottom for the continuous removal of molded metal, and wherein there are slotted openings extending entirely through each of said vertical walls at approximately the same level on all sides of said passageway, the combination therewith of solid blocks of lubricant filling said openings, and driving means for advancing said blocks on all sides toward said passageway at substantially equal rates, whereby to center the metal in said passageway, said driving means including positive mechanical driving mechanism on each side of said passageway and positive mechanical connections between the driving mechanism on each side with said driving mechanism on every other side.

2. In a mold for the continuous casting of metal having coacting vertical walls entirely surrounding a mold passageway on its several sides, and wherein said passageway is open at the top for the introduction of molten metal and is open at the bottom for the continuous removal of

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molded metal, and wherein there are slotted openings extending entirely through each of said vertical walls at approximately the same level on all sides of said passageway, the combination therewith of solid blocks of lubricant filling said openings, and driving means for advancing said blocks on all sides toward said passageway at positively correlated rates, said driving means including positive mechanical driving mechanism on each side of said passageway and positive mechanical connections between the driving mechanism on each side with said driving mechanism on every other side.

NORMAN P. GOSS.

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