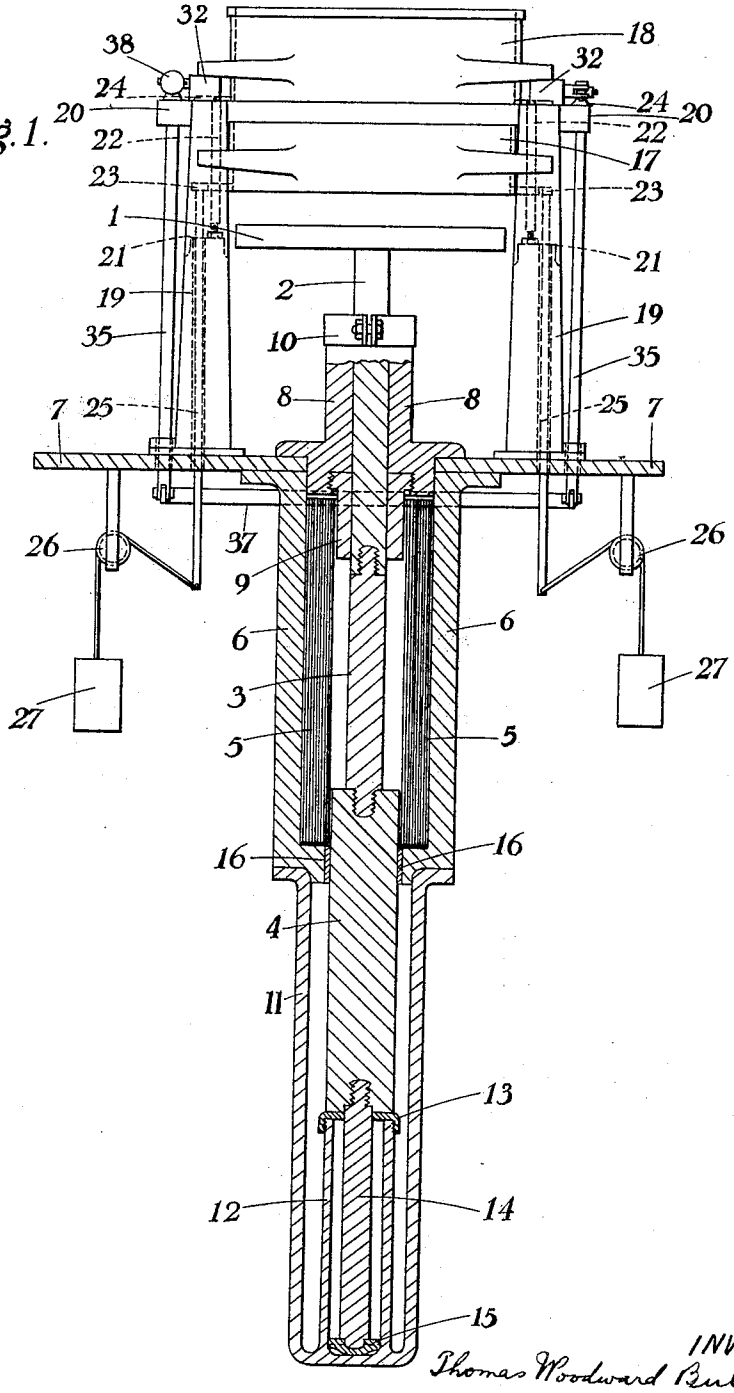
Sept. 13, 1932. T. W. BULLOCK 1,877,494

MACHINE FOR PUSHING FOUNDRY MOLDS OUT OF THEIR BOXES

Filed June 23, 1931 3 Sheets-Sheet 1

Fig. 1.



INVENTOR
Thomas Woodward Bullock

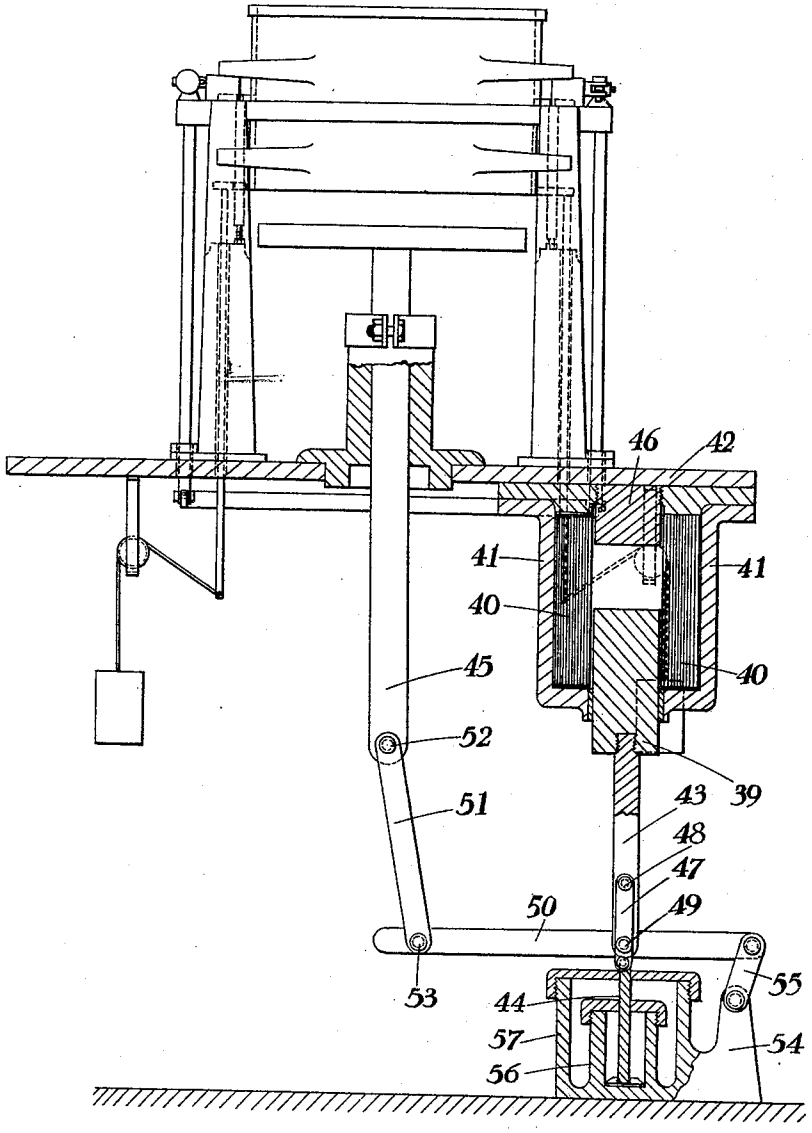
BY
Byrnes, Stebbins, Parmelee & Blenko
ATTORNEYS

Sept. 13, 1932. T. W. BULLOCK 1,877,494

MACHINE FOR PUSHING FOUNDRY MOLDS OUT OF THEIR BOXES

Filed June 23, 1931 3 Sheets-Sheet 2

Fig. 2.



Thomas Woodward Bullock INVENTOR

BY

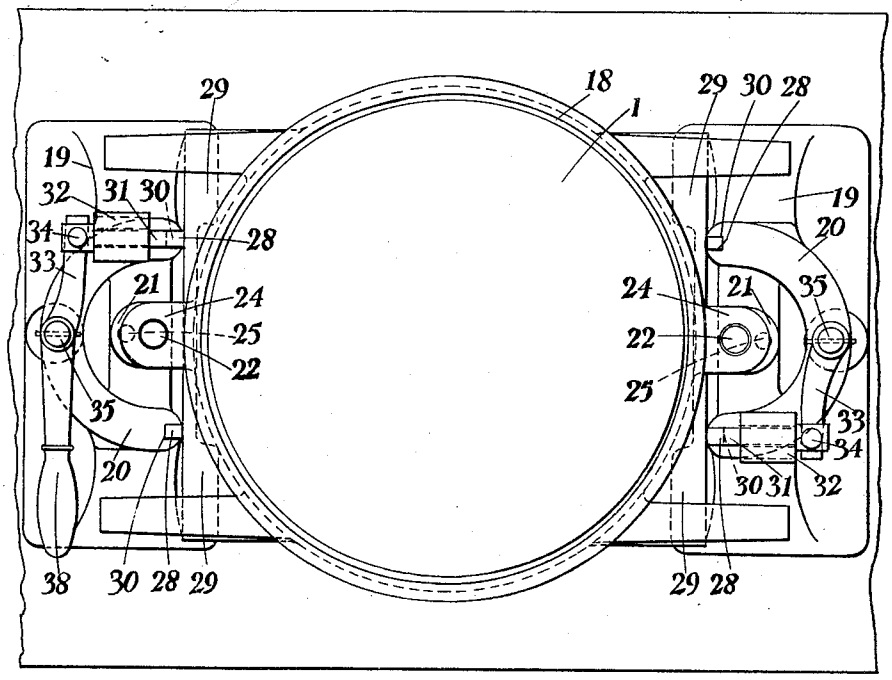
Byrnes, Stebbins, Parmelee & Bleeke ATTORNEYS

Sept. 13, 1932. T. W. BULLOCK 1,877,494

MACHINE FOR PUSHING FOUNDRY MOLDS OUT OF THEIR BOXES

Filed June 23, 1931 3 Sheets-Sheet 3

Fig. 3.



INVENTOR
Thomas Woodward Bullock

BY
Byrnes, Stebbins, Parmelee & Blenko
ATTORNEYS

Patented Sept. 13, 1932 1,877,494

UNITED STATES PATENT OFFICE

THOMAS WOODWARD BULLOCK, OF RAINHILL, ENGLAND, ASSIGNOR TO BRITISH INSULATED CABLES LIMITED, OF PRESCOT, LANCASHIRE, ENGLAND, A BRITISH COMPANY

MACHINE FOR PUSHING FOUNDRY MOLDS OUT OF THEIR BOXES

Application filed June 23, 1931, Serial No. 546,276, and in Great Britain July 5, 1930.

This invention deals with that type of foundry procedure in which the moulds after being made in a box are pushed out of this box and used for casting without the box. In making a two-part mould by that procedure it is usual to make each half of the mould in a box and then to place the boxes containing the two halves together in a pushing-out machine and press a pushing plate against the under surface of the mould and thereby drive the two halves of the mould together out of their boxes.

Such pushing-out machines have hitherto been operated by fluid pressure. By the present invention we provide for electric operation. For this purpose we use in combination electro-magnetic device such as an electro-magnet or solenoid and a dash-pot or equivalent frictional speed controlling device. This form of driving arrangement can be applied directly to the pressure plate. Alternatively the application may be indirect, utilizing some form of leverage or gearing. An indirect arrangement will generally be preferable since a long stroke of the pressure plate is usually required. By using the indirect application this long stroke can be obtained with a comparatively short stroke solenoid or magnet and with a more compact arrangement.

In the improved machine the boxes can be supported, brought into register and held in place in known manner. It is usual to arrange that the pushing-out takes place vertically upward so that the complete mould when pushed out stands above the boxes and can be lifted off the pressure plate which has been driven up through the boxes from below. In the direct application of the improved drive the spindle attached to the pressure plate can be extended by means of a non-magnetic portion to engage with the core of a solenoid, the coil and casing of which are arranged co-axially with the spindle. Below the core a further extension provides for connection to the piston of a dash-pot which is arranged in line with and directly below the core.

To avoid the considerable length of the direct drive arrangement and provide what is usually a more efficient design of solenoid, an indirect drive of the following kind may be used for example. In this arrangement the solenoid is disposed alongside the spindle of the pressure plate and its core is connected by a downwardly extending rod to a horizontal lever to which the spindle of the pressure plate is connected near one end, the lever being pivoted at the other. By this means a longer stroke for the pressure plate than that of the solenoid is obtained. To the lever at any appropriate point is connected the piston rod of the dash-pot. The connections between the core spindle and piston rod and the lever are made by means of links, or otherwise, so as to avoid interference with the straight line motions of these parts.

Examples of the application of the invention as outlined above are illustrated by the accompanying drawings which show the electro-magnetic driving device coupled directly and indirectly to the pressure or pushing-out plate.

Figure 1 is a part sectional elevation of a pushing-out machine of the directly coupled type,

Figure 2 is a part sectional elevation of a pushing-out machine of the indirectly coupled type, and

Figure 3 is a plan view to a larger scale of the upper part of the machine, the construction of which is identical in both the directly and indirectly coupled types.

In the direct coupled type of pushing-out machine the electro-magnetic operating mechanism and the pushing plate are arranged co-axially as shown in Figure 1. The pushing plate 1 is carried upon a spindle 2 which is rigidly attached by means of a non-magnetic metal extension 3 to the core 4 of a solenoid 5. The solenoid is housed within a cylindrical metal housing 6 attached to the base plate 7 of the machine which also supports the cylindrical guide 8 for the spindle 2 and its extension 3. An extension 9 attached to the base of the guide 8 forms a bearing for the spindle of the pushing plate and its length limits the extent of the upward movement of the solenoid core 4. The limit of the downward movement is adjustably

regulated by a split metal strap or collar 10 which grips the pushing plate spindle 2 by means of a nut and bolt, and in the lower position, as indicated in the Figure 1, rests upon the top face of the guide member 8. To the bottom of the solenoid housing 6 is attached a cylinder 11 closed completely at its lower end and containing therein a dash-pot control 12 closed at the top by a screw-cap 13 through which passes a tail rod extension 14 to the solenoid core 4. The speed of the upward and downward movements of the core 4 and the parts connected therewith is regulated by the braking action of a piston 15 attached to the lower end of the tail rod 14 which moves within a suitable fluid contained by the dash-pot 12. The solenoid core 4 is constrained to work smoothly in a bearing 16 incorporated in the lower part of the solenoid housing 6. The dash-pot 12, its supporting housing 11, the tail rod 14 and the accessories appertaining to this lower portion of the arrangement as described above are constructed of a non-magnetic metal which will in no way interfere with the magnetic operation of the solenoid core 4.

The mould is contained in two boxes, a lower one 17 and an upper one 18, these being registered and supported during the pushing-out operation in a known manner. There are erected upon the machine base 7 two pedestals 19 the upper sections of each of which are divided into two pillars bridged at the top by outwardly curved bridge pieces 20 illustrated in Figure 3. At the bottom of the cavities formed by the extensions of the pedestals 19 are formed bosses 21 from which rise vertical guide rods 22 which form a good sliding fit within holes provided in lugs 23 and 24 extending from the sides of the moulding boxes 17 and 18. By this arrangement the two halves of the mould contained within the boxes are exactly registered with each other. Passing upwards freely through each pedestal is a supporting rod 25 which is attached at its lower end by means of a chain passing over a pulley 26 to a weight 27. The weights are sufficiently heavy to support the empty bottom box 17 when it is placed in position with the lugs 23 in contact with the supporting rods 25. They are insufficient to support the box containing the mould which sinks down until the mould rests upon the upper surface of the pushing plate 1 where it remains supported. The top box 18 is supported on top of the pedestal extensions by means of four small lugs 28 extending from corner pieces 29 which are made integral with the box walls, the lugs 28 being designed to rest within slots 30 formed within the inner ends of the bridge pieces 20. Two of the lugs 28, one on each side of the box and diagonally opposite to each other, are covered by catches 31 sliding in bearings 32 attached to the bridge pieces 20 as shown in Figure 3; the restraining influence of these catches is sufficient to prevent the box from rising with the mould during the pushing-out stroke. Each catch is pivotally connected at the point 34 to a lever arm 33 which is rigidly attached to a vertical rod 35 passing through and supported by the bridge piece 20. The lower ends of the rods pass freely through the base plate 7 and are connected by a link arrangement 37 in such a manner that they rotate simultaneously about their vertical axes when one of them is operated by means of a handle extension 38 to one of the lever arms 33. Thus by moving the handle 38 to the left the catches 31 are outwardly withdrawn to allow free passage of the lugs 28, and movement in the reverse direction brings the catches into position above the lugs thereby preventing upward movement of the top box 18.

The sequence of operations in the process of removing the moulds from the boxes is as follows. The bottom box 17 is placed in position upon the pushing plate 1, the top box 18 being placed upon the top of the pedestals 19 with the catches 31 in position above the lugs 28; both boxes are registered by the guiding rods 22. The solenoid 5 is excited causing the core 4 and hence the pushing plate 1 to move in an upward direction, the latter carrying with it the mould in the bottom box 17. The motion of the bottom box is arrested upon making contact with the top box 18 which is held down by the arrangements described. The diameter of the pushing plate 1 being slightly less than that of the moulding box interior, as represented by the plan view Figure 3, its motion is not prevented and it moves right through the boxes carrying with it the complete mould until the latter is in a convenient position above the top box 18 for removal from the machine.

Directly the bottom box 17 is emptied of its mould it tends to fall, but remains supported by the rods 25 under the influence of the balance weights 27.

The application of the solenoid drive in an indirect fashion is illustrated in Figure 2. The extent of the movement of the solenoid core 39 being in this case quite short, the solenoid 40, its housing 41, and the core 39 are modified in accordance with this shorter movement, and it is usually possible to provide a more efficient electro-magnetic combination than in the direct drive type. The solenoid housing is now displaced from the central axis of the machine being attached as shown to the machine base plate 42 in such a position that the core 39 with its extension 43 and tail rod 44 move parallel to the axis of the pushing plate spindle 45. A block 46 fixed in the upper part of the solenoid cavity limits the upward movement of the core 39. the lower end of the core extension 43 is pivotally connected by means of the double link 47

and the bearing rivets 48 and 49 to a horizontal lever 50, near the one end of which is connected by means of a double link 51 and bearing rivets 52 and 53 the pushing plate spindle 45. The other end of the horizontal lever 50 is pivotally connected to a fixed anchorage 54 by means of a short link 55. The ratio between the movements of the core 39 and the pushing plate spindle 45 is regulated by the comparative positions of the connections to the horizontal lever 50, and the use of the links 51, 47 and 55 allows the arrangement to operate without any interference with the straight line motions of the connected parts. As in the previous example the pushing and lowering movements of the core 39 is controlled by a dash-pot device 56 contained in a housing 57. Although in this example the tail rod 44 carrying the dash-pot piston is shown directly in line with the core axis, this arrangement may be connected to the horizontal lever 50 at any convenient point decided by the controlling action required.

The general details of the pushing-out machine, and its operation are similar to the previous example, and the same description of the pushing-out process is applicable to this second example.

The phrase "electro-magnetic device" used in this specification and the claims which follow is to be understood to mean a device such as an electro-magnet and armature or solenoid and core.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A pushing-out machine for foundry moulds comprising means for engaging a box or boxes containing a mould, a pushing member adapted to travel through the box when the latter is held in position, an electro-magnetic device operatively connected with the pushing member for producing the travel thereof and a frictional speed controlling device influencing the speed of movement of the said electro-magnetic device.

2. A pushing-out machine for foundry moulds comprising means for engaging a box or boxes containing a mould, a pushing member adapted to travel through the box when the latter is held in position, an electro-magnetic device, a frictional speed controlling device operatively associated with the electro-magnetic device and controlling the speed thereof and stroke multiplying gear forming an operative connection between the electro-magnetic device and the pushing member by which the stroke imparted to the pushing member by said device is made materially greater than the stroke of the said device.

In testimony whereof I affix my signature.

THOMAS WOODWARD BULLOCK.