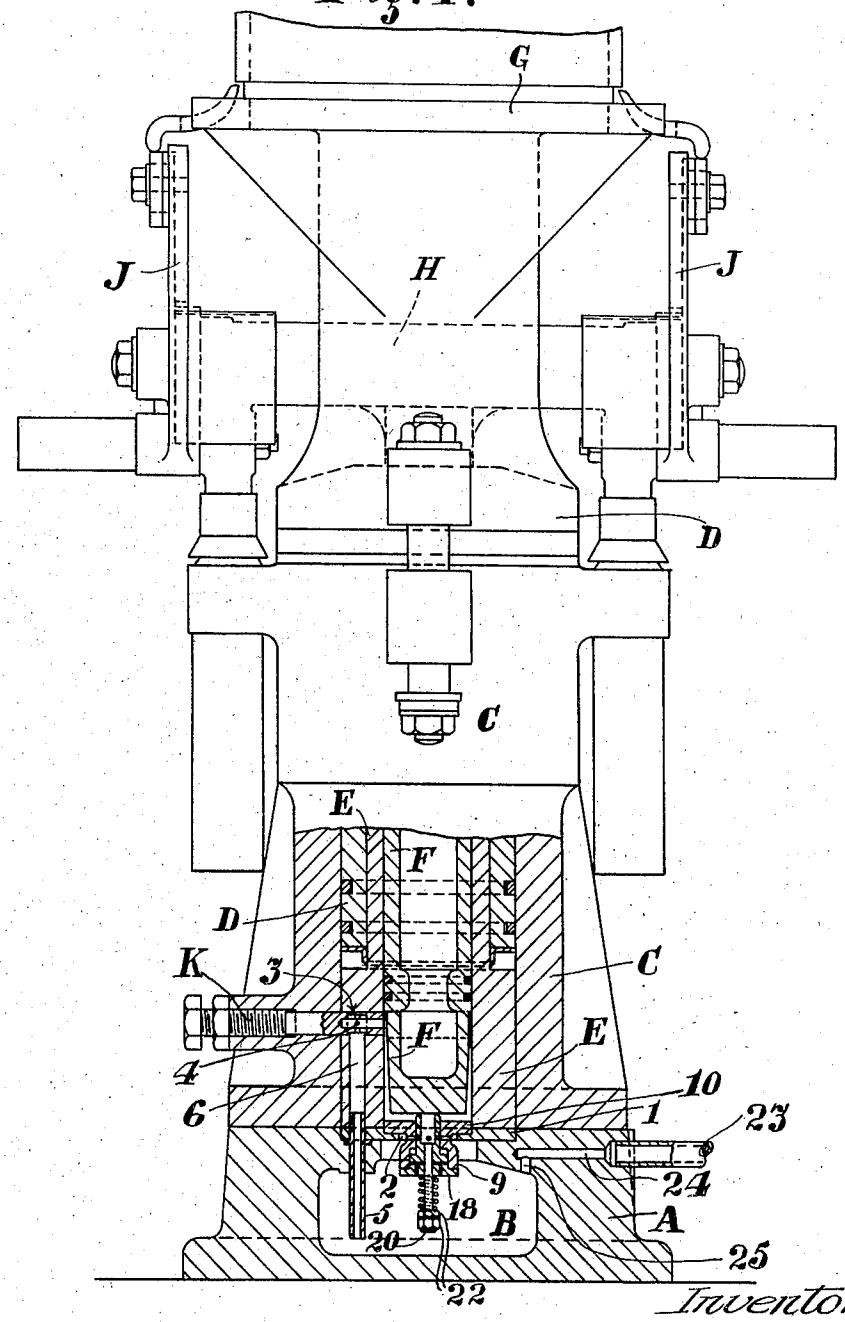
Dec. 2, 1924. 1,517,798

J. B. NEESHAM

MOLDING MACHINE FOR FOUNDRY USE

Filed April 13, 1923 2 Sheets-Sheet 1

Fig. 1.



Inventor
John Birch Neesham.
By E. F. Goodwin & Co. Atty+

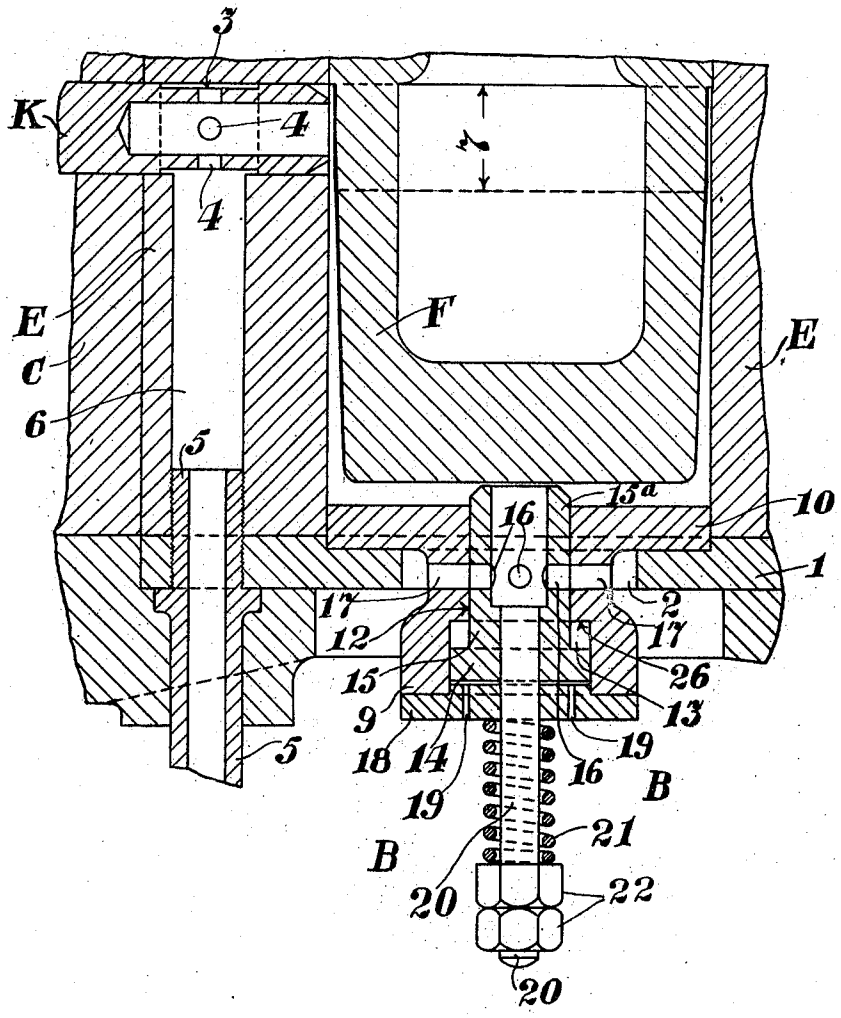
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J. B. NEESHAM

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Filed April 13, 1923 2 Sheets-Sheet 2

Fig. 2.



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Patented Dec. 2, 1924. 1,517,798

UNITED STATES PATENT OFFICE.

JOHN BIRCH NEESHAM, OF GLASGOW, SCOTLAND, ASSIGNOR TO JOHN MACDONALD & SON LIMITED, OF GLASGOW, SCOTLAND.

MOLDING MACHINE FOR FOUNDRY USE.

Application filed April 13, 1923. Serial No. 631,749.

To all whom it may concern:

Be it known that I, JOHN BIRCH NEESHAM, of 4 Kelvinside Gardens, Glasgow, Scotland, a subject of the King of Great Britain, have invented a certain new and useful Improved Molding Machine for Foundry Use, of which the following is a specification.

This invention relates to foundry molding machines.

In such machines having lifting rams operated by liquid pressure the upward movement of the lifting ram is generally too rapid and jerky to draw the pattern from the mould without damage, whereas it is desirable that the pattern shall be withdrawn from its mould without shock or jar.

To this end it has been proposed that the inlet orifice of the pressure fluid should be above the bottom of the ram and that a small by-pass should be provided from the orifice to a point below the ram, in order that the ram should start and stop slowly. In another construction where the inlet orifice was below the ram it was proposed to attach to the bottom of the ram a fin to pass into the orifice and partially choke it during a very small portion of the stroke so that the ram should start and stop slowly.

I have found it undesirable that the lift should be in two stages, and prefer that the rate of lift should increase gradually from the start to near the end of the stroke. I have also found that there is no necessity for a gradual check at the end of the exhaust stroke. Accordingly I provide a foundry molding machine having a lifting ram operated by liquid under pressure, in which the liquid is so admitted into the cylinder that the rate of upward travel of the lifting ram is caused to increase gradually from a minimum at or near the bottom of its stroke up to a maximum at or near the top of the stroke. The desired effect may be obtained by tapering the lower end of the lifting ram and providing in the side wall of the ram cylinder, adjacent to the top of the tapered portion when the ram is in lowermost position, a valve through which the operating liquid is forced into the cylinder, whereby, as the ram rises, the tapered portion gives a gradually increasing passage at the valve for the flow of the liquid and so allows a gradually increasing quantity of the liquid to enter the ram cylinder in unit time.

A separate exhaust valve may be provided and arranged to open on the return stroke of the ram to exhaust the liquid rapidly from the ram cylinder and thereby expedite the speed of operation of the machine. The operating liquid may be contained in a chamber formed in the base of the machine and forced into the cylinder by compressed air or other pressure fluid, and the exhaust valve may be so arranged between the chamber and the bottom of the ram cylinder that when the pressure fluid is admitted to the chamber to raise the ram, the valve is closed but opens automatically, to return the liquid rapidly from the cylinder to the chamber, when the pressure in the chamber is relieved to lower the ram.

Oil is particularly suitable for use as the operating liquid.

These and other features of the invention will be disclosed as embodied in one constructional form of the invention which is illustrated, by way of example, on the accompanying drawing, whereon:—

Fig. 1 is a part sectional elevation of the molding machine embodying the features of the invention.

Fig. 2 is an enlarged sectional view of the lower part of the lifting ram cylinder and appertaining parts.

The molding machine comprises a base A, having an oil chamber B, and an outer cylinder C which is secured to the base. A jarring ram D is slidably arranged in the outer cylinder, between the inner wall of the latter and a hollow intermediate stepped or shouldered sleeve E, and a lifting ram F is slidably arranged within the sleeve which constitutes the mould lifting ram cylinder. The jarring ram is operated by pressure fluid admitted to the cylinder C below the same while the lifting ram, as hereinafter more fully explained, is operated by means of the oil contained in the chamber B which oil is forced into the sleeve by compressed air admitted into the chamber. The upper part of the jarring ram D is bifurcated and forms two arms supporting the machine table G, while a cross head H attached to the lifting ram is arranged between said arms and supports lifting brackets J.

The bottom part of the intermediate shouldered sleeve E rests on a plate 1 accommodated in a recess at the upper part of the oil chamber B and provided with an aper-

ture 2 connecting the interior of the hollow intermediate shouldered sleeve with the interior of the oil chamber B. A longitudinally adjustable oil inlet valve K is screwed into the outer cylinder, with its hollow inner end projecting into a passage 3 in the intermediate shouldered sleeve. Ports 4 are provided in the wall of the hollow part of the oil inlet valve and serve to provide communication between the oil chamber B and the intermediate shouldered sleeve, the oil passing through an oil pipe 5, and a passage 6 in the sleeve in which said pipe is fixed. The valve K co-acts with the wall of the mould lifting ram F to regulate the supply of oil to the interior of the sleeve E. If the valve is screwed towards the ram the space between them is reduced and consequently the possible flow of liquid is reduced.

For a portion of its length, namely the portion 7 adjacent to the inner end of the oil valve K, the outer wall of the lifting ram F is undercut, and, thereafter, is tapered gradually to the bottom of the ram, as clearly shown in Fig. 2.

An exhaust valve is arranged between the bottom of the lifting ram cylinder and the oil chamber B, the casing 9 of said valve being provided with a flange 10 which engages in a recess in the plate 1. Said casing is hollow, and has a small bore 12 and a large bore 13, within which latter is slidably arranged the head, or flange 14 of a plunger 15 constituting the valve member, the tail, or stem 15^a of the plunger being slidably arranged in the smaller bore 12. The upper part of the plunger is hollow and is provided with radial ports 16 which, in the normal position of the plunger, register with ports 17 formed in the valve casing. The open outer end of the latter is closed by a cover 18 having ports 19 adapted to admit pressure fluid to the interior of the valve casing into the larger bore 13 thereof beneath the plunger head 14. A rod 20, screwed into the plunger 15, is slidably arranged in an aperture in the cover 18 of the valve casing, and is provided with a spring 21, whose pressure, against the cover 18, can be adjusted by means of nuts 22, 22, screwed on to the rod. It will be obvious that the tendency of the spring 21 is to hold the plunger 15 downwards in the valve casing.

When it is desired to raise the lifting ram, compressed air is admitted into the oil chamber through an air inlet pipe 23 and passages 24 and 25 in the machine base A. The pressure of the air on the oil forces the latter upwards through the pipe 5, passage 6, ports 4 in the adjustable oil valve K and, through the hollow interior of the latter, into the interior of the intermediate shouldered sleeve E beneath the lifting ram F which commences to rise. The speed of the ram gradually increases, as the latter rises owing to the taper on the ram causing a gradually increasing outlet for the oil between the inner end of the oil inlet valve K and the adjacent outer wall of the lifting ram.

Simultaneously with the commencement of the upward movement of the lifting ram, the exhaust valve plunger 15 commences to move upwards in the valve casing 9 owing to the entry of compressed air, from the oil chamber B, through the ports 19 in the cover 18, said air forcing the plunger upwards against the downward pressure of the spring 21.

In its normal or lowest position, the lifting ram F rests on the upper part of the plunger 15, thereby closing the open end of the hollow stem 15^a and, (by presenting a small area of the lifting ram to the pressure of any compressed air that might rush through the ports 17 in the valve casing and ports 16 in the plunger) preventing the ram from lifting before the said ports pass out of register. The upward travel of the plunger 15 continues until the plunger head 14 contacts with the shoulder 26 on the valve casing, when the ports 16 are closed and the plunger is prevented from further movement, being held in its highest position by the pressure of the compressed air on the plunger head. Oil continues to flow into the interior of the intermediate shouldered sleeve E to raise the lifting ram to the top of its stroke.

When it is required to lower the lifting ram, the compressed air is exhausted from the oil chamber B. Air then exhausts from the bore 13 of the exhaust valve casing and the spring 21 forces the plunger 15 downwards to its normal position, with the ports 16 in the plunger registering with the ports 17 in the valve casing, thus providing an outlet for the exhaust of the oil which flows rapidly from the interior of the intermediate shouldered sleeve into the hollow stem 15^a of the plunger 15 and into the oil chamber B, through the ports 16 and 17. Oil also exhausts to the oil chamber through the hollow interior of the adjustable oil valve K and through the passage 6 and oil pipe 5, but it is obvious that the rate of escape of the oil through the said valve, passage, and pipe, is not sufficiently high for economical working.

Under a modified arrangement instead of tapering the lower end of the lifting ram, as previously described, the latter may be provided with a tapered longitudinal recess, that is to say, the depth of the recess below the surface of the outer wall of the ram increases gradually from the upper end of the recess (at the level of the bottom of the oil inlet passage 3) to the bottom of the ram.

As previously stated, the speed of the lifting ram gradually increases as the ram rises, thus ensuring that the mould is lifted from the pattern gradually, without shock or jar. The rate of upward movement of the lifting ram may be varied by adjusting the distance of the inner end of the oil inlet valve K from the adjacent outer wall of the lifting ram.

The oil for operating the lifting ram is used over and over again and the supply in the chamber B only requires to be occasionally replenished.

Having now fully described my invention what I claim and desire to secure by Letters Patent is:—

1. A foundry molding machine having in combination, a mould lifting ram arranged for operation by liquid under pressure and means on the ram for gradually increasing the rate of upward travel of said ram to a maximum near the end of its stroke.

2. A foundry molding machine having in combination, a cylinder, a mould lifting ram arranged for upward sliding movement by liquid under pressure admitted to said cylinder, and means on the ram so disposed relatively to a liquid inlet in the cylinder wall that the rate of upward travel of said ram is gradually increased to a maximum near the end of its stroke.

3. A foundry molding machine having in combination, a cylinder, a mould lifting ram arranged for operation within the cylinder by liquid under pressure, means for gradually increasing the rate of upward travel of the ram to a maximum near the end of its stroke, and means in the cylinder wall for assisting in regulating the possible supply of the operating liquid to said cylinder.

4. A foundry molding machine having in combination, a cylinder, a mould lifting ram arranged for operation within the cylinder by liquid under pressure, means for gradually increasing the rate of upward travel of the ram to a maximum near the end of its stroke, and a valve adjustably arranged in the cylinder wall for assisting in regulating the possible supply of the operating liquid to said cylinder.

5. A foundry molding machine having in combination, a cylinder, a mould lifting ram arranged for operation within the cylinder by liquid under pressure, a tapered portion on the ram and a liquid inlet to the cylinder so disposed relatively to said tapered portion that the flow of liquid is varied to gradually increase the rate of upward travel of the ram to a maximum near the end of its stroke.

6. A foundry molding machine having in combination, a cylinder, a mould lifting ram arranged for operation within the cylinder by liquid under pressure, a tapered portion on the ram and a liquid inlet to the cylinder so disposed relatively to said tapered portion that the flow of liquid is varied to gradually increase the rate of upward travel of the ram to a maximum near the end of its stroke, and means for rapidly exhausting said liquid from the cylinder after the mould lifting operation is completed.

7. A foundry molding machine having in combination, a cylinder, a mould lifting ram arranged for operation within the cylinder by liquid under pressure, means to vary the flow of liquid to gradually increase the rate of upward travel of the ram to a maximum at or near the end of its stroke, means for regulating the supply of operating liquid to the cylinder, and a valve in the cylinder for rapidly exhausting said liquid from the cylinder after the mould lifting operation is completed.

8. A foundry molding machine having a cylinder, a mould lifting ram arranged for operation within the cylinder by liquid under pressure, means to vary the flow of liquid to gradually increase the rate of upward travel of the ram to a maximum at or near the end of its stroke, and a liquid exhaust valve in the cylinder comprising in combination, a casing and a plunger arranged for movement within said casing in one direction by pressure fluid and in the other by resilient means.

9. A foundry molding machine having in combination, a hollow base, a cylinder supported by said base, a mould lifting ram arranged for operation within said cylinder by liquid under pressure, a tapered portion on the ram and a liquid inlet in the wall of the cylinder adjacent to the top of said tapered portion when the ram is in lowermost position, whereby the rate of upward travel of the ram is gradually increased to a maximum near the end of its stroke, a valve for assisting in regulating the supply of the operating liquid to the cylinder and an exhaust valve projecting into the hollow base and arranged for operation by pressure fluid admitted to the hollow base.

10. A foundry molding machine having in combination, a cylinder, a mould lifting ram arranged for operation within the cylinder by liquid under pressure, means to vary the flow of liquid for gradually increasing the rate of upward travel of the ram to a maximum near the end of its stroke, a supply valve in the cylinder wall, means for adjusting the position of the valve relatively to the side of the ram whereby the space between the valve and the said side is varied to regulate the possible supply of liquid to the chamber.

11. A foundry molding machine having in combination, a cylinder, a mould lifting ram arranged for operation within the cylinder by liquid under pressure, means to vary the flow of liquid for gradually increasing the

rate of upward travel of said ram to a maximum at or near the end of its stroke, and an exhaust valve comprising a recessed plunger, a spring to move the plunger in one direction, a casing surrounding the plunger and having small orifices to admit the pressure fluid behind the plunger to move it against the spring and large orifices adapted when the pressure fluid is not acting to coincide with similar orifices leading through the plunger wall to the recess therein for the exhaust liquid.

12. A foundry molding machine having in combination, a cylinder, a mould lifting ram arranged for operation within the cylinder by liquid under pressure, a tapered portion on the ram and a liquid inlet in the wall of the cylinder adjacent to the top of the tapered portion when the ram is in lowermost position, whereby the rate of upward travel of the ram is gradually increased to a maximum near the end of its stroke, and an exhaust valve comprising a recessed plunger, a spring to move the plunger in one direction, a casing surrounding the plunger and having small orifices to admit the pressure fluid behind the plunger to move it against the spring and large orifices adapted when the pressure fluid is not acting to coincide with similar orifices leading through the plunger wall to the recess therein for the exhaust liquid.

13. A foundry molding machine having in combination, a cylinder, a mould lifting ram arranged for operation within the cylinder by liquid under pressure, a tapered portion on the ram, a liquid inlet in the wall of the cylinder adjacent to the top of the said tapered portion when the ram is in lowermost position, whereby the rate of upward travel of the ram is gradually increased to a maximum near the end of its stroke, and an exhaust valve; the said inlet comprising a supply valve in the cylinder wall having means for adjusting the position of the valve relatively to the side of the ram whereby the space between the valve and the said side is varied to regulate the possible supply of liquid to the ram chamber, and the said exhaust valve comprising a recessed plunger, a spring to move the plunger in one direction, a casing surrounding the plunger and having small orifices to admit the pressure fluid behind the plunger to move it against the spring and large orifices adapted when the pressure fluid is not acting to coincide with similar orifices leading through the plunger wall to the recess therein for the exhaust liquid.

14. A foundry molding machine including a fluid pressure operated mould lifting ram, and means whereby the ram will directly control and cause a gradual increase of the flow of fluid thereto for causing the upward travel of the ram to gradually increase to a maximum near the end of its stroke.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN BIRCH NEESHAM.

Witnesses:

MARY GREEN,

AGNES TILMOVER.