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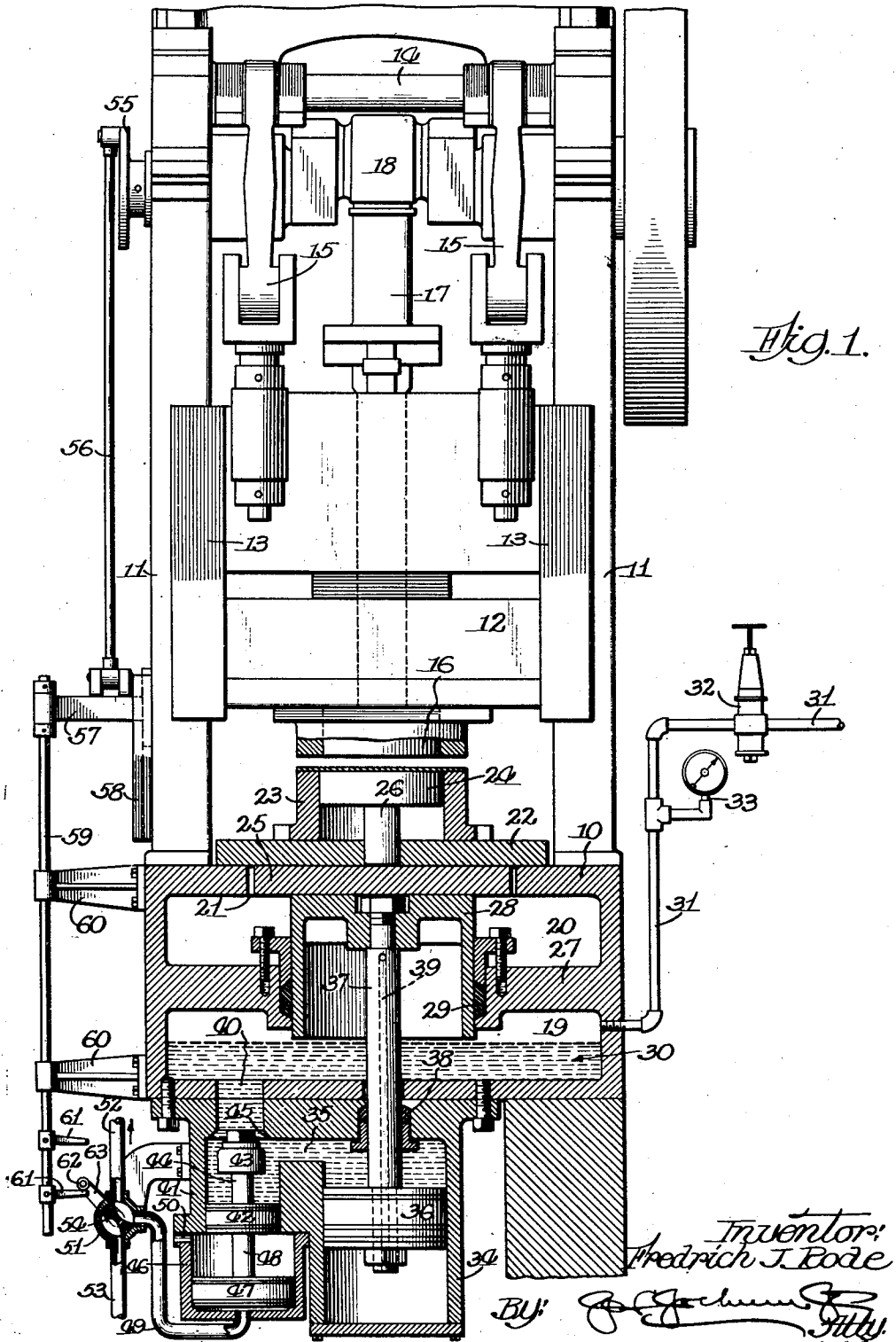
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1,834,111

METAL WORKING PRESS

Filed Dec. 18, 1930

2 Sheets-Sheet 1



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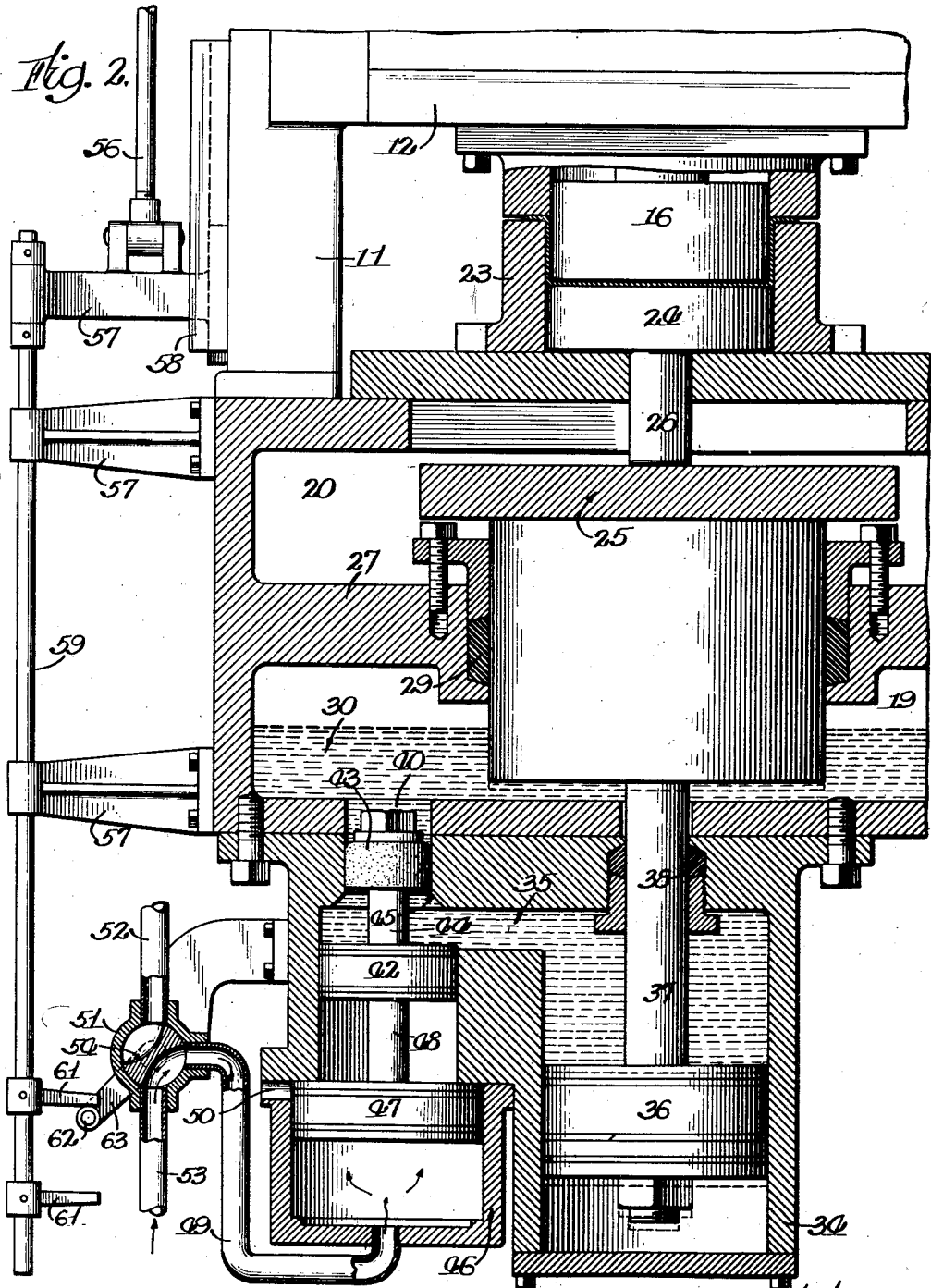
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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METAL WORKING PRESS

Application filed December 18, 1930. Serial No. 503,117.

This invention relates to improvements in metal working presses in which the material is shaped by means of co-operating dies, one of which is reciprocable toward and away from the other, and in which press there is employed a pressure pad which is resisted in its movement in one direction by means of a cushioning device.

Heretofore hydraulic locking devices have been employed for locking the pressure pad at the limit of its movement in one direction, thereby preventing the same from immediately following the ram or movable die as they start to ascend.

Good results have been obtained with such hydraulic locking devices, but it has been found in practice that the liquid employed in the locking device usually contains air bubbles which, as the ram starts to ascend, will cause the pressure pad to "kick back" to a certain extent, or follow the ram as it starts to ascend, and although such movement of the pressure pad may not in some instances be to any great extent, it has been found that oftentimes a slight backward movement or "back lash" of the pressure pad causes considerable damage.

It is one of the objects of the present invention to overcome these difficulties and objections and to provide in a locking device of this character means for causing the pressure pad to be moved to a still further extent after it has reached the limit of its movement under the stress of the ram and after the locking of the pressure pad has become effective, and which means will be responsive in its action to the action of a movable part of the press.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts, hereinafter more fully described and claimed and shown in the accompanying drawings illustrating this invention, and in which

Figure 1 is a view partly in elevation, partly in section and partly broken away of a metal working press having a locking device

constructed in accordance with the principles of this invention applied thereto, and showing the parts in their normal position.

Figure 2 is a view on an enlarged scale of the locking device and a portion of the press, with the parts of the locking device in operative positions to restrain the pressure pad against return movement.

Referring more particularly to the drawings the numeral 10 designates generally the base of the press, having uprights 11 and a reciprocable member 12 movable in guides 13, upon the upright.

The reciprocable member 12 is given its motion from a crank shaft 14 through the medium of links 15, and which shaft is rotated from any suitable source.

In the present form of the invention this locking device is shown as being applied to a double action press, but it is to be understood that the same may be applied with equal efficiency to a single action press.

In the drawings the numeral 16 designates a die member which co-operates with the ram and which is connected by means of a link 17 to another crank shaft 18.

The bed 10 has formed therein and as an integral part thereof a cushioning device consisting of a chamber 19 and a chamber 20, the latter being open as at 21, and supported upon the base 10 and forming a closure for the opening 21 is a bed plate 22 upon which a die or work holder 23 is mounted, and which latter encompasses a die or member 24.

The die or member 24 is supported by a pressure pad 25 through the medium of one or more pins 26 disposed between the die or member 24 and the pressure pad and resting upon the latter.

Reciprocable through a partition 27 which separates the chambers 19 and 20 is a piston 28 provided with suitable packing 29, and the piston 28 forms a support for the pressure pad 25.

The chamber 19 contains a predetermined supply of liquid 30 supplied thereto in any suitable manner and through a suitable opening (not shown).

Fluid pressure such as air or the like is delivered into the chamber above the liquid 30

through a pipe 31 which receives its supply from any suitable source.

A pressure regulating-valve 32 is provided in the pipe line 31 and a pressure indicating gage 33 is also arranged therein.

All of the above referred to parts are of a known construction.

When the ram descends to operate upon the work, the pressure pad 25 is depressed, which forces the piston 28 downwardly against the pressure in the chamber 19 and will be yieldingly resisted in such movement by such pressure in the chamber 19. After the work has been completed and the ram starts to ascend, the piston 28 and with it the pressure pad 25 will be returned to normal position by the pressure in the chamber 19 supplied through the pipe 31.

In order therefore to prevent the pressure pad 25 from returning with the ram immediately it starts to ascend, hydraulic means are provided for temporarily locking the pressure pad against such return movement.

An effective locking device suitable for the purpose embodies a cylinder 34 which is supported in any suitable manner, preferably from the bottom of the chamber 19 and the cylinder is provided with an inlet opening 35 on one side of a piston 36 reciprocable therein. The piston 36 is connected by means of a piston rod 37 with the piston 28 and the piston rod extends through the chamber 19 and is provided with suitable packing 38.

An opening 39 is provided in the piston rod 37 which forms communication between the cylinder 34 on the bottom of the piston 36 and the chamber 19 so as to permit fluid to pass out of the cylinder 34 so as not to interfere with the descent of the piston 36 and also into the cylinder 34 from the chamber 19 so as, at a predetermined time in the cycle of operation of the press, to permit fluid under pressure to enter the cylinder 34 to operate upon the lower face of the piston 36 to assist in returning the pressure pad to normal position.

The passage 35 has communication with another passage 40 through the wall of the chamber 19, so as to establish communication between the chamber 19 and the cylinder 34 on the top side of the piston 36.

A chamber 41 is provided with which the passage 40 has communication and with which the passage 35 also has communication and constitutes a supplemental chamber or cylinder for receiving liquid from the chamber 19.

Arranged in the chamber 41 is a piston 42 with which a valve 43 is connected by means of a valve stem 44 and the valve 43 is adapted to be seated upon a seat 45 to close the passage 40 and thereby cut off communication between the chamber 19 with the chamber 41 and the cylinder 34.

An additional chamber 46 is provided adja-

cent the chamber 41 and a piston 47 is reciprocable in the chamber 46. The piston 47 is connected by means of a piston rod 48 with the piston 42 so that the pistons 47 and 42, together with the valve 43 constitute a unit.

Leading into the chamber 46 beneath the piston 47 is a pipe 49 and outlet openings 50 are provided in the wall of the chamber 46 above the piston 47.

The pipe 49 has communication with a two way valve casing 51 and leading from the casing 51 is an exhaust pipe 52, while leading into the casing 51 is a fluid supply pipe 53.

Within the valve casing 51 is a valve 54 and when the latter is in the position shown in Figure 1, fluid will be exhausted from the chamber 46 beneath the piston 47, through the exhaust pipe 52, the piston 47 being moved to the position shown in Figure 1 by the pressure of the liquid upon the piston 42. This will open the valve 43 so that the fluid pressure in the chamber 19 above the liquid 30 therein will cause the liquid to flow under pressure through the opening 40 and into the cylinder 34 above the piston 36 and also into the chamber 41 during the movement of the pressure pad 15 under the stress of the ram.

Just before the ram starts to ascend, or at any predetermined time in the cycle of operation of the press, the valve 54 is operated so as to be shifted from the position shown in Figure 1 to the position shown in Figure 2, thereby connecting the supply pipe 53 with the pipe 49 so that fluid under pressure from any suitable source will be delivered into the chamber 46 beneath the piston 47 to raise the piston 47 and with it the piston 42 and the valve 43, causing the valve 43 to be seated so as to trap or confine the liquid in the cylinder 34 and chamber 41 and prevent any liquid from flowing into or out of the cylinder and chamber. This will lock the pressure pad 25 against return movement.

After the pressure pad has reached the limit of its movement under the stress of the ram and the piston 36 is at the limit of its movement in the cylinder under the stress of the ram, the pressure pad will be locked against return movement. It has been found in practice, however, that the liquid employed in the hydraulic locking means often contains air bubbles, with the result that when the ram starts to ascend these air bubbles will expand and will cause the pressure pad to start to follow the ram immediately it recedes.

By the provision of the supplemental chamber 41 and the piston 42, and as the valve 43 is being seated by a fluid pressure upon the piston 47, a portion of the liquid in the supplemental chamber 41 will be forced therefrom through the opening 35 into the cylinder 34 above the piston 36 to move the latter and also the pressure pad 25 to lower the pressure pad 25 a short distance beyond the limit

of its movement under the stress of the ram, thereby compensating or overcoming any tendency of any air which might be contained in the liquid from causing the pressure pad 25 to "kick back" at the starting of the receding movement of the ram.

As the ram is approaching the limit of its receding movement, or at any predetermined time in the cycle of operation of the press, the valve 54 will be automatically shifted from the position shown in Figure 2 back to the position shown in Figure 1, so as to relieve the pressure in the chamber 41 beneath the piston 47 and to allow the fluid pressure in the chamber 19 to return the pressure pad to normal position.

As soon as the pressure in the chamber 46 beneath the piston 47 is relieved, and as the ram ascends, pressure upon the liquid will cause the liquid to act upon the piston 42, to lower the pistons 47—42 to open the valve 43 to allow the liquid to escape from the cylinder 34.

Any suitable means may be provided for operating the valve 54, but it is preferable to operate the same from a movable part of the press, such as one of the crank shafts to which a crank 55 is connected, and the crank 55 is connected through the medium of a rod 56 to a reciprocating member 57, movable in a guide 58. Connected to the member 57 and depending therefrom is a rod 59 movable in suitable guides 60 and carried by the rod 59 are arms 61 which may be adjusted upon the rod and these arms 61 are adapted to operate upon a projection or anti-friction roller 62 carried by an arm 63 connected with the valve 54 so that upon the raising movement of the member 57 one of the arms 61 will engage the projection 62 on the arm 63 to shift the valve in one direction and when the member 57 is lowered the other arm 61 will operate to shift the valve 54 in the opposite direction.

While the preferred form of the invention has been herein shown and described, it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:—

1. In a metal working press, a cushioning device for yieldingly resisting the movement of a movable part of the press in one direction, means operating to temporarily lock said part against return movement when said part has reached the limit of its operative movement against the stress of the cushioning device, and means for imparting a further movement to said part beyond the limit of its said operative movement.

2. In a metal working press, a cushioning device for yieldingly resisting the movement

of a movable part of the press in one direction, means operating to temporarily lock said part against return movement when said part has reached the limit of its operative movement against the stress of the cushioning device, and means for imparting a further movement to said part beyond the limit of its said operative movement and while the said part remains locked against return movement.

3. In a metal working press, a cushioning device for yieldingly resisting the movement of a movable part of the press in one direction, means operating to temporarily lock said part against return movement when said part has reached the limit of its operative movement against the stress of the cushioning device, and fluid pressure controlled means for imparting a further movement to said part beyond the limit of its said operative movement.

4. In a metal working press, a cushioning device for yieldingly resisting the movement of a movable part of the press in one direction, means operating to temporarily lock said part against return movement when said part has reached the limit of its operative movement against the stress of the cushioning device, and fluid pressure controlled means for imparting a further movement to said part beyond the limit of its said operative movement, said fluid pressure controlled means being responsive in its operation to another movable part of the press.

5. In a metal working press a fluid pressure cushioning device for yieldingly resisting the movement of a movable part of the press in one direction, said cushioning device constituting a part and parcel of the press, fluid pressure means for temporarily locking said part against return movement, and means for imparting to said movable part a further movement in the first said direction and while said part is locked against return movement.

6. In a metal working press a fluid pressure cushioning device for yieldingly resisting the movement of a movable part of the press in one direction, said cushioning device constituting a part and parcel of the press, fluid pressure means for temporarily locking said part against return movement, and fluid pressure controlled means for imparting to said movable part a further movement in the first said direction and while said part is locked against return movement.

7. In a metal working press a fluid pressure cushioning device for yieldingly resisting the movement of a movable part of the press in one direction, said cushioning device constituting a part and parcel of the press, fluid pressure means for temporarily locking said part against return movement, and fluid pressure controlled means for imparting to said movable part a further move-

ment in the first said direction and while it is locked against return movement, the last recited fluid pressure controlled means being responsive in its action to the action of a movable part of the press.

8. In a metal working press, a cushioning device for yieldingly resisting the movement of a movable part of the press in one direction, hydraulic means for temporarily locking said part against return movement, and means operating automatically to increase the pressure of the liquid in said locking means for causing the said movable part of the press to move a further distance in its first said direction of movement beyond its effective movement in the first said direction.

9. In a metal working press, a cushioning device for yieldingly resisting the movement of a movable part of the press in one direction, hydraulic means for temporarily locking said part against return movement, and fluid pressure controlled means operating automatically to increase the pressure of the liquid in said locking means for causing the said movable part of the press to move a further distance in its first said direction of movement beyond its effective movement in the first said direction.

10. In a metal working press, a cushioning device for yieldingly resisting the movement of a movable part of the press in one direction, hydraulic means for temporarily locking the said movable part against return movement, and fluid pressure controlled means responsive in its operation to a movable part of the press for increasing the pressure of the liquid in said hydraulic locking means for causing the first said movable part of the press to move a further distance in the first said direction of movement beyond its effective movement in the first said direction.

11. In a metal working press a cushioning device for yieldingly resisting the movement of a movable part of the press in one direction, hydraulic locking means for temporarily locking said movable part against return movement, said hydraulic means embodying a cylinder and piston relatively movable, and means for forcing the liquid into the cylinder for maintaining the cylinder and piston against relative movement to prevent return of said movable part, and means operating automatically when said movable part has reached the limit of its effective movement, to increase the pressure of the liquid in said cylinder to move said movable part a further distance in the first said direction of movement thereof.

12. In a metal working press, a work holder having a predetermined extent of effective movement in one direction during the formation of the work, an hydraulic locking device for temporarily locking the said holder against return movement when the holder has

reached the limit of its effective direction of movement, and means for causing the work holder to have a still further movement in the same direction after it has reached the limit of its said effective direction of movement.

13. In a metal working press, a work holder having a predetermined extent of effective movement in one direction during the formation of the work, an hydraulic locking device for temporarily locking the said holder against return movement when the holder has reached the limit of its effective direction of movement, and means for causing the work holder to have a still further movement in the same direction after it has reached the limit of its said effective direction of movement, the said means embodying mechanism operating automatically to increase the pressure of the liquid in the said hydraulic locking means.

14. In a metal working press, a work holder having an effective movement in one direction, hydraulic locking means for temporarily locking said holder against return movement and embodying a cylinder and piston relatively movable, means for creating a liquid pressure between the cylinder and piston to maintain them against relative movement, and means operating automatically to force an additional amount of liquid between the cylinder and piston to effect a relative movement thereof to cause said work holder to have a further movement in the first said direction of movement thereof, after said work holder has been locked against return movement.

15. In a metal working press, a work holder having an effective movement in one direction, hydraulic locking means for temporarily locking said holder against return movement and embodying a cylinder and piston relatively movable, means for creating a liquid pressure between the cylinder and piston to maintain them against relative movement, and fluid pressure controlled means operating automatically to force an additional amount of liquid between the cylinder and piston to effect a relative movement thereof to cause said work holder to have a further movement in the first said direction of movement thereof, after said work holder has been locked against return movement.

16. In a metal working press, a work holder having a predetermined distance of effective movement in one direction, hydraulic means for temporarily locking said holder against return movement and embodying a relatively movable cylinder and piston, means for forcing liquid into the cylinder to maintain the cylinder and piston against relative movement, a chamber, having communication with said cylinder, said chamber receiving a supply of liquid, and means for forcing liquid from said chamber into the cylinder

to cause said work holder to have a further movement in the same direction and beyond the limit of its said effective movement.

5 17. In a metal working press, a work holder having a predetermined distance of effective movement in one direction, hydraulic means for temporarily locking said holder against return movement and embodying a
10 relatively movable cylinder and piston, means for forcing liquid into the cylinder to maintain the cylinder and piston against relative movement, a chamber having communication with said cylinder, said chamber receiving a supply of liquid, and fluid pressure
15 controlled means for forcing liquid from said chamber into the cylinder to cause said work holder to have a further movement in the same direction and beyond the limit of its
20 said effective movement.

18. In a metal working press, a work holder having a predetermined distance of effective movement in one direction, hydraulic means for temporarily locking said holder
25 against return movement and embodying a relatively movable cylinder and piston, means for forcing liquid into the cylinder to maintain the cylinder and piston against relative movement, a chamber having communication with said cylinder, said chamber receiving a supply of liquid, a piston in said chamber, and fluid means for moving the last said
30 piston to force liquid from said chamber into said cylinder to cause a relative movement of the cylinder and piston to move said
35 work holder in the first direction of movement and beyond the limit of its effective movement and after the work holder is locked against return movement.

40 19. In a metal working press, a work holder having a predetermined distance of effective movement in one direction, hydraulic means for temporarily locking said holder against return movement and embodying a
45 relatively movable cylinder and piston, means for forcing liquid into the cylinder to maintain the cylinder and piston against relative movement, a chamber having communication with said cylinder, said chamber receiving a supply of liquid, a piston in said chamber, and fluid means for moving the last said
50 piston to force liquid from said chamber into said cylinder to cause a relative movement of the cylinder and piston to move said
55 work holder in the first direction of movement and beyond the limit of its effective movement and after the work holder is locked against return movement, the said fluid controlled means being responsive in
60 its operation to a movable part of the press.

20. In a metal working press, a work holder having a predetermined distance of effective movement in one direction, hydraulic means for temporarily locking said holder
65 against return movement and embodying a

relatively movable cylinder and piston, means for forcing liquid into the cylinder to maintain the cylinder and piston against relative movement, a chamber having communication with said cylinder, said chamber receiving a supply of liquid, means for forcing liquid from said chamber into the cylinder to cause said work holder to have a further movement in the same direction and beyond the limit of its said effective movement, and means co-operating with the last said means and rendered active by the operation of the latter to close the liquid supply opening of said chamber and cylinder as the liquid is being forced from said chamber.

In testimony whereof I have signed my name to this specification, on this 19th day of November, A. D. 1930.

FREDRICH J. RODE.

DISCLAIMER

1,834,111.—*Fredrich J. Rode*, Chicago, Ill. METAL WORKING PRESS. Patent dated Dec. 1, 1931. Disclaimer filed July 27, 1945, by the inventor; the licensee, *E. W. Bliss Company*, approving and consenting.

Hereby enters this disclaimer to claims 1 to 13 inclusive, and claims 17 and 19 in said specification.

[*Official Gazette September 4, 1945.*]