Oct. 30, 1928. 1,689,501

F. J. RODE

MECHANICAL LOCKING DEVICE FOR PRESSURE PADS

Filed June 6, 1927 3 Sheets-Sheet 1

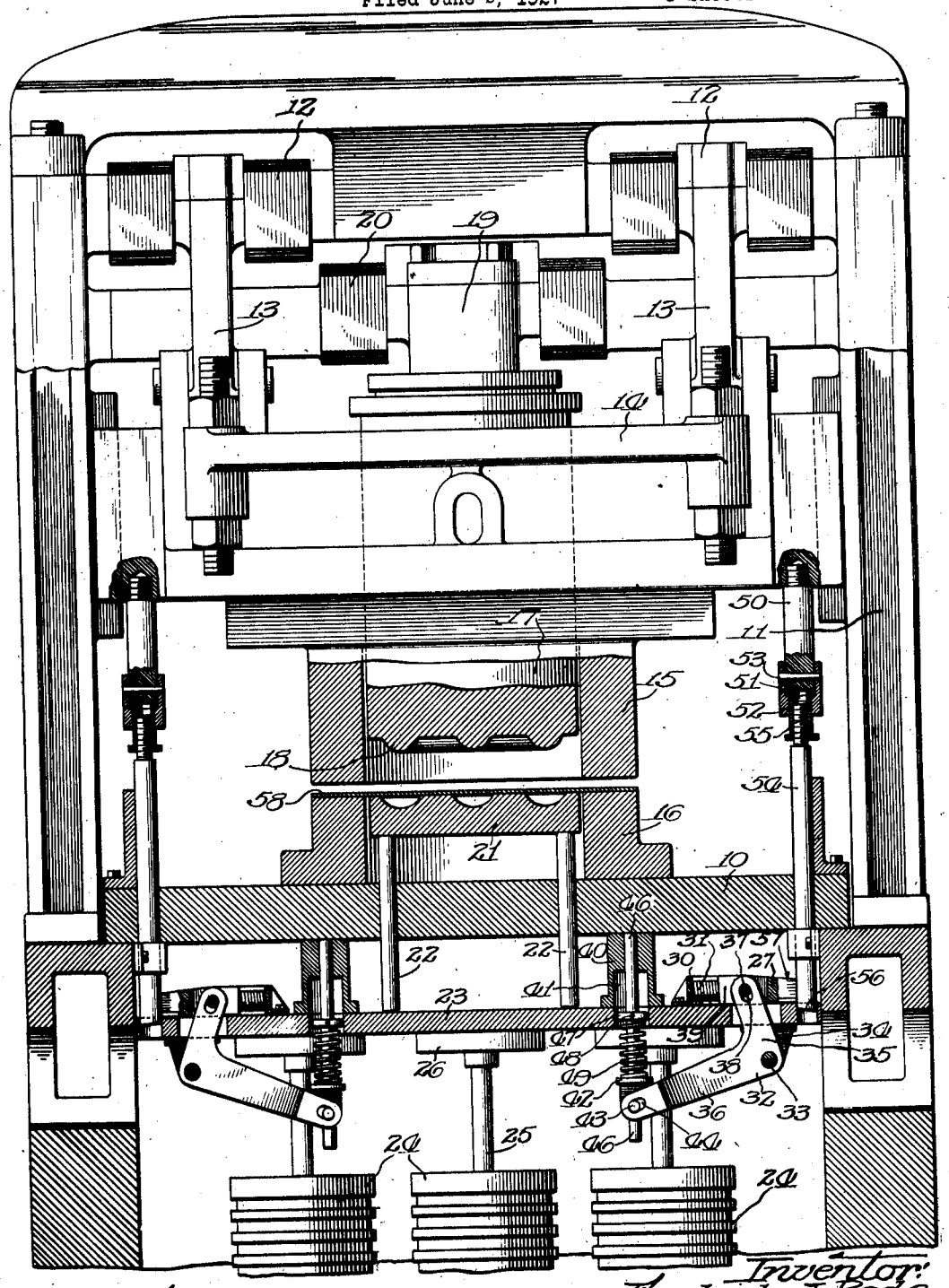


Fig. 1.

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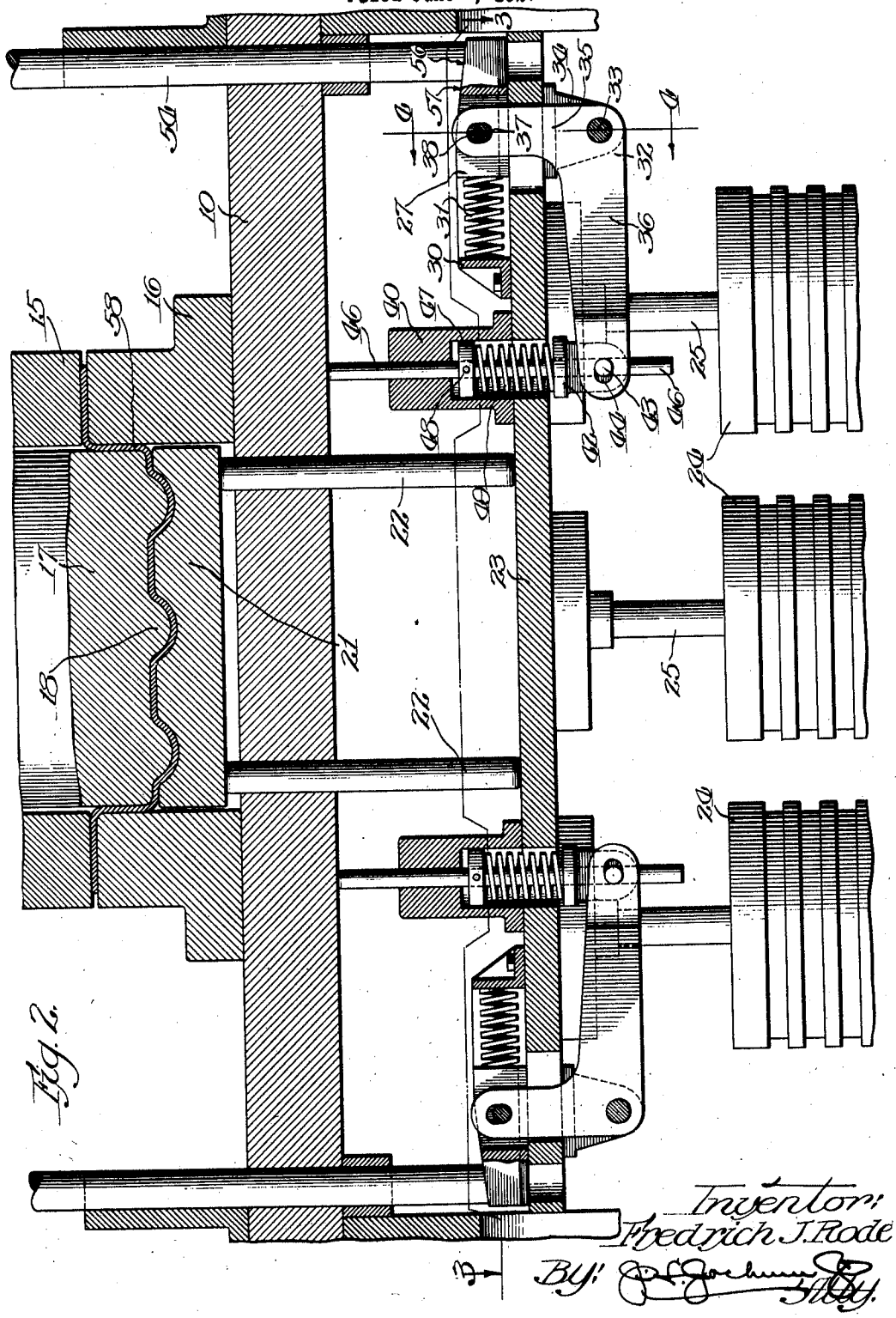


Fig. 2.

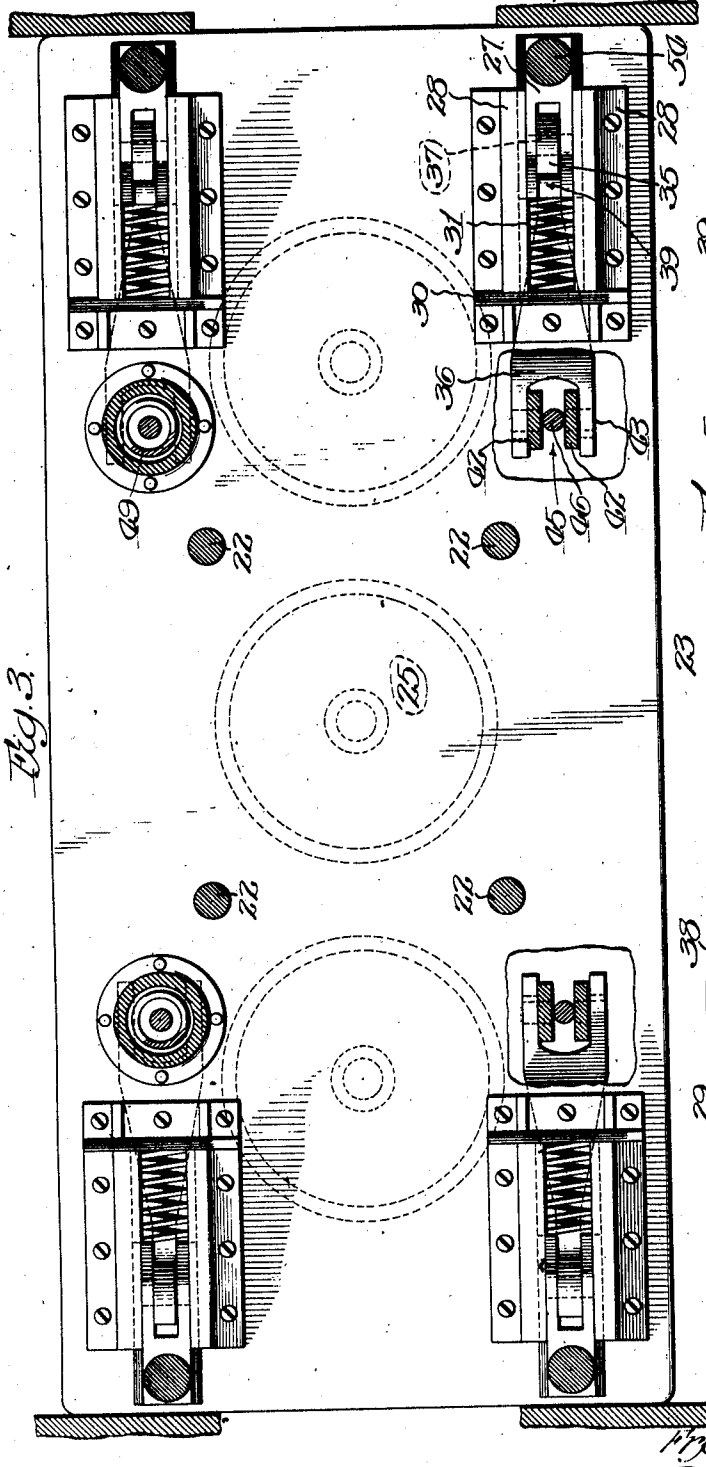
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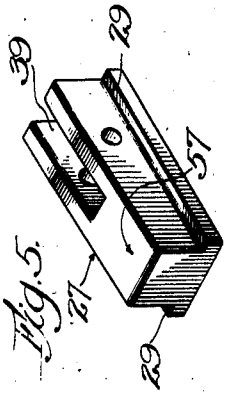
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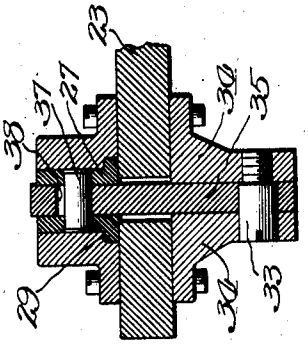
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MECHANICAL LOCKING DEVICE FOR PRESSURE PADS

Filed June 6, 1927 3 Sheets-Sheet 3







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Patented Oct. 30, 1928. 1,689,501

UNITED STATES PATENT OFFICE.

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MECHANICAL LOCKING DEVICE FOR PRESSURE PADS.

Application filed June 6, 1927. Serial No. 196,792.

This invention relates to improvements in mechanical locking devices for pressure pads particularly adapted, though not necessarily limited in its use in double action sheet metal working presses, and one of the objects of the invention is to provide improved means for locking or maintaining the pressure pad at the limit of its lowermost movement to prevent the same from directly following the ram when the latter starts on its return movement.

A further object is to provide an improved locking device of this character which will be automatically rendered active and also inactive at predetermined times in the cycle of operation 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 front elevation of a double action sheet metal press, having a locking device constructed in accordance with the principles of this invention applied thereto, the same being shown partly in section, partly broken away and with parts omitted.

Figure 2 is an enlarged detail sectional view partly in elevation and partly in section with the parts in the position which they will assume when the ram reaches the limit of its lowermost movement.

Figure 3 is a horizontal sectional view taken on line 3—3, Figure 2, with parts omitted and parts broken away.

Figure 4 is a detail sectional view taken on line 4—4, Figure 2.

Figure 5 is a detail perspective view of one of the locking members.

Referring more particularly to the drawings the numeral 10 designates a bed or bolster plate of a press, 11 uprights, 12 a crank shaft connected to which by means of links 13, is a reciprocable ram 14. This ram has connected with it a member 15 which co-operates with a work holding member 16, the latter being mounted upon and secured to the bed plate 10.

A plunger 17 having a die face 18 is connected by means of a link 19 with a crank shaft 20 and the plunger 17 reciprocates within the member 15. Co-operating with the plunger and with the die face 18 thereof is a die member 21 which is supported by means of pins 22 that pass loosely through the bed plate 10. These pins 22 rest upon a pressure pad or plate 23, the latter being resisted in its movement in one direction by cushioning devices. The cushioning devices may be of any desired construction and are here shown as embodying cylinders 24 which receive a supply of fluid under pressure from any suitable source (not shown). Reciprocable in the cylinders 24 are pistons (not shown) to which piston rods 25 are connected and these piston rods are connected with the pressure pad or plate 23 by means of a head 26 connected with the piston rods and which heads are secured to the pressure pad in any suitable manner.

All of the above referred to parts are of the ordinary and well known construction.

The present invention particularly relates to the means for locking or maintaining the pressure pad or plate 23 in its lowermost position for preventing the same from returning directly with the ram as the ram starts to ascend. To that end there is provided a number of locking members 27, any number of which may be provided and are suitably located.

As the construction and operation of all of these locking members and the parts which directly co-operate therewith is the same, the specific description of one will apply equally as well to them all.

Mounted upon the pressure pad or plate 23 are suitable guides 28 in which the locking member 27 is reciprocable preferably by means of the guides engaging over flanges 29 on the bottom of the member 27. An abutment 30 is also mounted upon the pressure pad adjacent the locking member and interposed between the abutment 30 and the adjacent end of the locking member is a resilient element 31 preferably in the form of a coil spring which is normally under tension and tends normally to advance the locking member 27.

A bell crank lever 32 is pivotally supported as at 33 upon a suitable support 34 carried by the pressure pad 23. The arm

35 of the bell crank lever is shorter than the arm 36, the arm 36 being preferably twice as long as the arm 35.

The end of the arm 35 is connected with the locking member 27 through the medium of a pin 37 connected with the locking member and which enters a slot 38 in the end of the arm 35. The locking member 27 is preferably bifuricated as at 39 to receive the end of the arm 35.

By rocking the lever 32 about its pivot 33 it will be manifest that the locking member 27 may be retracted against the stress of the spring 31 and while being so retracted the energy will be stored in the spring so that at a proper time in the cycle of operation of the press the energy thus stored in the spring 31 will operate upon the locking member 27 to advance the same and thereby rock the lever 32 about its pivot in the opposite direction.

Mounted upon the pressure pad 23 is a member 40 having a chamber 41 therein.

A collar 42 is loosely pivotally connected with the extremity of the longer arm 36 of the bell crank lever 32 by means of pins or lugs 43 which are connected with the collar 42 and enter slots 44 in the end of the arm 36. The extremity of the arm 36 is bifurcated as at 45 (see particularly Figure 3) and the collar 42 is preferably bifurcated. A rod or member 46 passes loosely through the member 40, chamber 41, pressure pad 23 and through the collar 42. The bifurcated formation of the collar 42 and of the extremity of the arm 36 permit the collar 42 and arm 36 to move freely and independent with respect to the rod 46. Connected with the rod 46 is another collar 47 which is secured to the rod as at 48 and against movement with respect thereto. A resilient element, preferably in the form of a coil spring 49 is disposed between the collars 42 and 47 and encompasses the rod 46 therebetween. The spring 49 is of an initial tension or stress less than the tension or stress of the spring 31 so as not to interfere with the operation of the spring 31. At the proper time in the cycle of operation of the press energy is stored in the spring 49 sufficient to momentarily overcome the stress of the spring 31 so as to retract the locking member 27 against the stress of the spring 31 after which operation the springs 31 and 49 will equalize or counterbalance each other.

Connected with a reciprocable part of the press, preferably the ram 14, is a rod 50 which depends therefrom and has connected to the lower end thereof by means of a shouldered sleeve 51, a threaded sleeve 52. The sleeve 51 is connected to the rod 50 preferably by means of a pin 53 and the sleeve 52 is provided with internal screw threads.

A rod section 54 is provided with a reduced threaded extremity 55 adapted to be threaded into the sleeve 52, and the lower extremity of the rod section 54 is preferably slightly beveled as at 56 to co-operate (in a manner to be set forth) with a beveled surface 57 on the locking member 27.

The rod section 54 is connected with the section 50 by means of the threaded sleeves 51—52 and threaded extremity 55 for the purpose of permitting an adjustment of the rod 54 with respect to the rod section 50 so as to properly position the extremity 56 of the rod section 54 with respect to the locking member 27, and to determine at what point in the cycle of operation of the press the locking member 27 will be projected by the spring 31.

In operation and assuming the parts to be in the position shown in Figure 1, the pressure pad being at the limit of its upward movement and which movement is limited by the engagement of the members 40 with the lower face of the bed plate 10, and the ram 14 lowered to a position just before the member 15 engages the work 58, and the die member 21 being maintained in its upper position by the fluid pressure in the cushions 24, the member 15 will upon a further lowering movement of the ram 14 contact with the work 58 and co-operate with the member 16 to clamp the work.

When the parts are in the position shown in Figure 1, the locking member 27 will be retracted and the lower end of the rod section 54 will be positioned in front of the end of the locking member 27 so that the resilient element 31 will hold the extremity of the locking member 27 against the side face of the rod section 54. The friction created between these parts will not be sufficient to retard or interfere with the lowering movement of the pressure pad 23.

In this position of the locking member 27 the spring 31 will be under full tension, whereas the spring 49 will be free from tension, or substantially so.

After the work has been thus clamped by the members 15 and 16 the plunger or member 17 will be lowered so that the die 18 will engage the work and co-operate with the die 21 to shape the work. As the member 17 descends the member 21 will be lowered causing the pressure pad 23 to be lowered against the resistance pressure in the cylinders 24, through the medium of the pins 22. As the pressure pad 23 is lowered the locking member 27 as well as the member 40 will be lowered, but the rod section 54 will be held stationary, with the result that the end of the locking member 27 will slide over the side face of the rod section 54. As soon as the surface 57 of the locking member 27 passes below the extremity 56 of the rod section 54 the stress or energy stored in the resilient element 31 will move or "shoot" the locking member 27 forwardly beneath the

extremity 56 of the rod section 54. As the pressure pad 23 is lowered and as the rod 46 and collar 47 thereon are stationary the sleeve 42 will slide over the rod 46 and the stress of the resilient element 49 (if there is any in such element at that time) will become weaker.

When the member 27 is moved forwardly under the end of the rod section 54 the longer arm 36 of the bell crank lever will be raised thereby creating energy in the resilient element 49 by placing the same under stress by moving the collar 42 towards the stationary collar 47. The chamber 41 in the member 40 is provided so as not to contact with the collar 47. The energy in the spring 49 will continue to be built up until the member 40 engages the lower face of the bed plate 10 to arrest the ascending movement of the pressure pad 23.

When the end of the member 27 is beneath the extremity 56 of the rod section 54 as shown in Figure 2, the ram will be at the limit of its downward movement as is also the plunger or member 17, and the pressure pad 23 will then be locked against return movement as the rod sections 50 and 51 will be held stationary until the ram 14 starts to ascend.

When the ram 14 rises the member 15 will be raised in advance of the raising of the plunger or member 17 so that the pressure pad 23 will be retained or locked in its down position against directly following the ram 14 when it ascends. After the ram 14 and member 15 have ascended for a short distance the plunger or member 17 will rise and the pressure in the cylinders 24 will raise the pressure pad 23 until the member 40 engages the lower face of the bed plate 10. During this raising movement of the pressure pad 23 the tension on the resilient element 49 is being built up. When, however, the pressure pad 23 is arrested in its movement by the member 40 engaging the bed plate 10 a sufficient stress will be built up in the resilient element 49 to withdraw the locking member 27 from beneath the extremity 56 of the rod section 54, the difference in the leverage between the arms 36 and 35 of the bell crank lever 32 co-operating with the resilient element 49 to overcome the stress of the resilient element 31 to cause the locking member 27 to be withdrawn. The extremity of the locking member 27 will then move along the side face of the rod section 54.

As soon as the member 40 engages the lower face of the bed plate 10 the ram will continue to ascend and with it the members or rods 54. The wedging or binding force of the beveled or inclined end of the rod section 54 with the inclined surface 57 of the locking member 27 will then be released sufficiently to permit the stress in the spring or resilient element 49 to withdraw the locking member 27 against the stress in the spring 31.

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. A sheet metal working press embodying a pressure pad, means for yieldingly resisting the movement of the pad in one direction, a reciprocable element, a member connected with the said element for movement therewith, the said member having a shoulder adjacent said pad, a spring controlled locking member carried with the pad and adapted to be automatically projected beneath said shoulder to be engaged therewith at the limit of the lower-most movement of the pad for locking the pad against return movement, and spring influenced means rendered active by the movement of the pad in one direction for automatically retracting the said locking member at a predetermined time in the cycle of operation of the press.

2. A sheet metal working press embodying a pressure pad, means for yieldingly resisting the movement of the pad in one direction, a reciprocable element, a member connected with the said element for movement therewith, the said member having a shoulder adjacent said pad, a spring controlled locking member carried with the pad and adapted to be automatically projected beneath said shoulder to be engaged therewith at the limit of the lower-most movement of the pad for locking the pad against return movement, and normally inactive spring influenced means automatically rendered active by the movement of the pad in one direction for overcoming the stress of the first said spring automatically rendered active at a predetermined time in the cycle of operation of the press to retract the said locking member.

3. A sheet metal working press embodying a pressure pad movable in one direction by the action of the ram, a member connected with the ram for movement therewith, a shoulder on said member disposed adjacent the said pad, a locking member carried with the pad, a resilient element operating on said member and tending normally to project said locking member beneath said shoulder, a lever connected with said locking member for retracting it, and means automatically rendered active at a predetermined time in the cycle of operation of the press and operable upon said lever to rock the same to retract the said locking

member against the stress of the said resilient element.

4. A sheet metal working press embodying a pressure pad movable in one direction by the action of the ram, a member connected with the ram for movement therewith, a shoulder on said member disposed adjacent the said pad, a locking member carried with the pad, a resilient element operating on said member and tending normally to project said locking member beneath said shoulder, a lever connected with said locking member for retracting it, a normally inactive resilient element, and means for automatically creating energy in the last recited resilient element, at a predetermined time in the cycle of operation of the press, sufficient to cause the last said element to overcome the stress of the first recited resilient element to rock said lever to retract said locking member.

5. A sheet metal working press embodying a pressure pad movable in one direction by the action of the ram, a member movable with the ram and operable adjacent said pad, a shoulder on said member, a locking member carried with said pad and adapted to be projected under said shoulder to lock the pad at the limit of its lowering movement, a spring tending normally to project said locking member, a lever movable with and with respect to the pad and operable to retract said locking member, a normally inactive resilient element operable upon said lever, and means responsive to the movement of the pad in one direction for creating energy in the last said resilient element to cause the same to temporarily overcome the stress of the said spring to retract the locking member to unlock the pressure pad, the said spring and resilient element being then counterbalanced.

6. A sheet metal working press embodying a pressure pad movable in one direction by the action of the ram, a shoulder movable with the ram adjacent said pad, a locking member carried by the pad, a spring normally tending to project said member beneath said shoulder to lock the pad against return movement, a bell crank lever pivotally connected with the pad, one arm of the lever being longer than the other, the shorter arm of the lever being operatively connected with the locking member, normally inactive resilient means operable upon the longer arm of the lever, and means whereby energy will be automatically created in the said resilient means at a predetermined time in the cycle of operation of the press to overcome the said spring to retract said locking member.

7. A sheet metal working press embodying a pressure pad movable in one direction by the action of the ram, a shoulder movable with the ram adjacent said pad, a locking member carried by the pad, a spring normally tending to project said member beneath said shoulder to lock the pad against return movement, a bell crank lever pivotally connected with the pad, one arm of the lever being longer than the other, the shorter arm of the lever being operatively connected with the locking member, and normally inactive means responsive in its operation to the movement of the pad in one direction for operation upon the longer arm of said lever to retract the locking member against the stress of said spring.

8. A sheet metal working press embodying a pressure pad, a member provided with a shoulder responsive to the action of a movable part of the press and disposed adjacent the pad, a locking member carried with the pad, means tending normally to project said locking member beneath said shoulder to lock the pad against return movement, a bell crank lever, one arm of the lever being longer than the other, means connecting one of said arms with the locking member, normally inactive resilient means operable upon the other end of the arm, and means whereby the movement of the pad in one direction will render the said normally inactive means active to create energy therein to retract the said locking member against the stress of the first recited means.

9. A sheet metal working press embodying a pressure pad, a member provided with a shoulder responsive to the action of a movable part of the press and disposed adjacent the pad, a locking member carried with the pad, means tending normally to project said locking member beneath said shoulder to lock the pad against return movement, a bell crank lever, one arm of the lever being longer than the other, means connecting one of said arms with the locking member, normally inactive resilient means operable upon the other end of the arm, and means whereby the movement of the pad in one direction will render the said normally inactive means active to create energy therein to retract the said locking member against the stress of the first recited means, the fourth recited means operating automatically at a predetermined time in the cycle of operation of the press to cause the stresses of said spring and the said resilient means to become equalized.

10. A sheet metal working press embodying a pressure pad, a member provided with a shoulder responsive to the action of a movable part of the press and disposed adjacent the pad, a locking member carried with the pad, means tending normally to project said locking member beneath said shoulder to lock the pad against return movement, a bell crank lever, one arm of the lever being longer than the other, means connecting one of said arms with the locking member, a stationary member, a collar connected with

the other arm of the lever and loosely slidable upon the last said member, a fixed collar on said stationary member, and a normally inactive resilient element disposed between said collars, the said slidable collar co-operating with the said stationary collar and operating automatically at a predetermined time in the movement of said pad to create energy in the said resilient element to overcome the stress of the first recited means to retract said locking member.

11. A sheet metal working press embodying a pressure pad, a member provided with a shoulder responsive to the action of a movable part of the press and disposed adjacent the pad, a locking member carried with the pad, means tending normally to project said locking member beneath said shoulder to lock the pad against return movement, a bell crank lever, one arm of the lever being longer than the other, means connecting one of said arms with the locking member, a stationary member, a collar connected with the other arm of the lever and loosely slidable upon the last said member, a fixed collar on said stationary member, and a normally inactive resilient element disposed between said collars, the said slidable collar co-operating with the said stationary collar and operating automatically at a predetermined time in the movement of said pad to create energy in the said resilient element to overcome the stress of the first recited means to retract said locking member, the said collars then co-operating to cause the stresses of the locking member projecting means and the said resilient element to be equalized.

12. A locking device for pressure pads of sheet metal working presses embodying a locking member carried with the pad, resilient means normally tending to move the locking member in one direction, a bell crank lever carried with the pad, one arm of the lever being longer than the other, means connecting one arm of the lever with the locking member, a stationary guide, a collar movable freely thereupon, means connecting the collar with the other end of said lever, a second collar spaced from the first said collar and secured to the said guide against movement with respect thereto, and a normally inactive resilient element disposed between the said collars, said collars operating at a predetermined time in the cycle of operation of said pad, to create energy in the said resilient element sufficient to overcome the stress of the first recited resilient means to retract the said locking member against the stress of the latter.

13. A locking device for pressure pads of sheet metal working presses embodying a locking member carried with the pad, resilient means normally tending to move the locking member in one direction, a bell crank lever carried with the pad, one arm of the lever being longer than the other, means connecting one arm of the lever with the locking member, a stationary guide, a collar movable freely thereupon, means connecting the collar with the other end of said lever, a second collar spaced from the first said collar and secured to the said guide against movement with respect thereto, and a normally inactive resilient element disposed between the said collars, said collars operating at a predetermined time in the cycle of operation of said pad, to create energy in the said resilient element sufficient to overcome the stress of the first recited resilient means to retract the said locking member against the stress of the latter, the said collars also operating to cause the stresses of the said resilient means and resilient element to be substantially equalized directly after the said locking member has been retracted.

14. A locking device for pressure pads of sheet metal working presses embodying a locking member carried with the pad, resilient means normally tending to move the locking member in one direction, a bell crank lever carried with the pad, one arm of the lever being longer than the other, means connecting one arm of the lever with the locking member, a stationary guide, a collar movable freely thereupon, means connecting the collar with the other end of said lever, a second collar spaced from the first said collar and secured to the said guide against movement with respect thereto, and a normally inactive resilient element disposed between the said collars, said collars operating at a predetermined time in the cycle of operation of said pad, to create energy in the said resilient element sufficient to overcome the stress of the first recited resilient means to retract the said locking member against the stress of the latter, all of said parts with the exception of the said guide and stationary collar being movable with the said pressure pad.

15. In a press for drawing sheet metal and the like, cushioning means, a pressure pad movable against the resistance of said cushioning means, a spring influenced locking member adapted to move automatically into a position in which to arrest the return movement of the pressure pad, and spring influenced means adapted to withdraw said member from its locking position so as to permit the pad to return to its normal position.

In testimony whereof I have signed my name to this specification, on this 16th day of May, A. D. 1927.

FREDRICH J. RODE.