

Nov. 5, 1935.

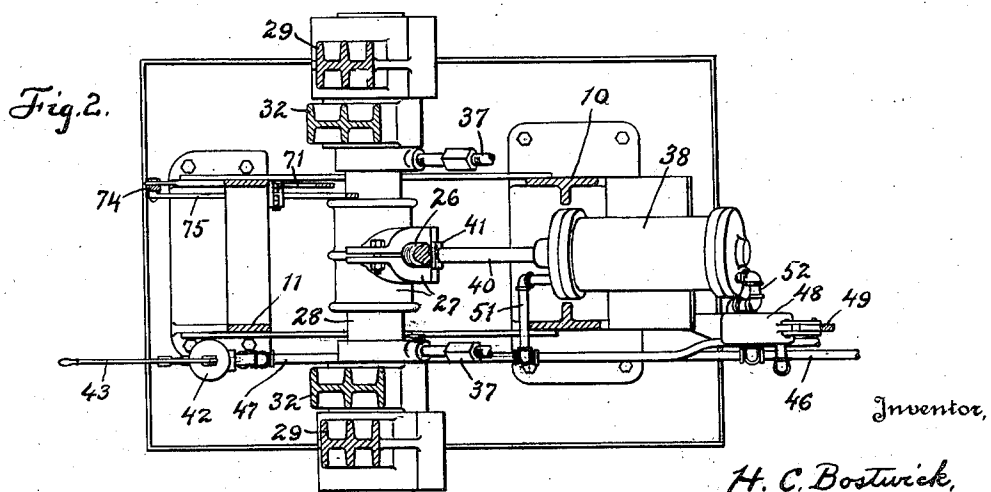
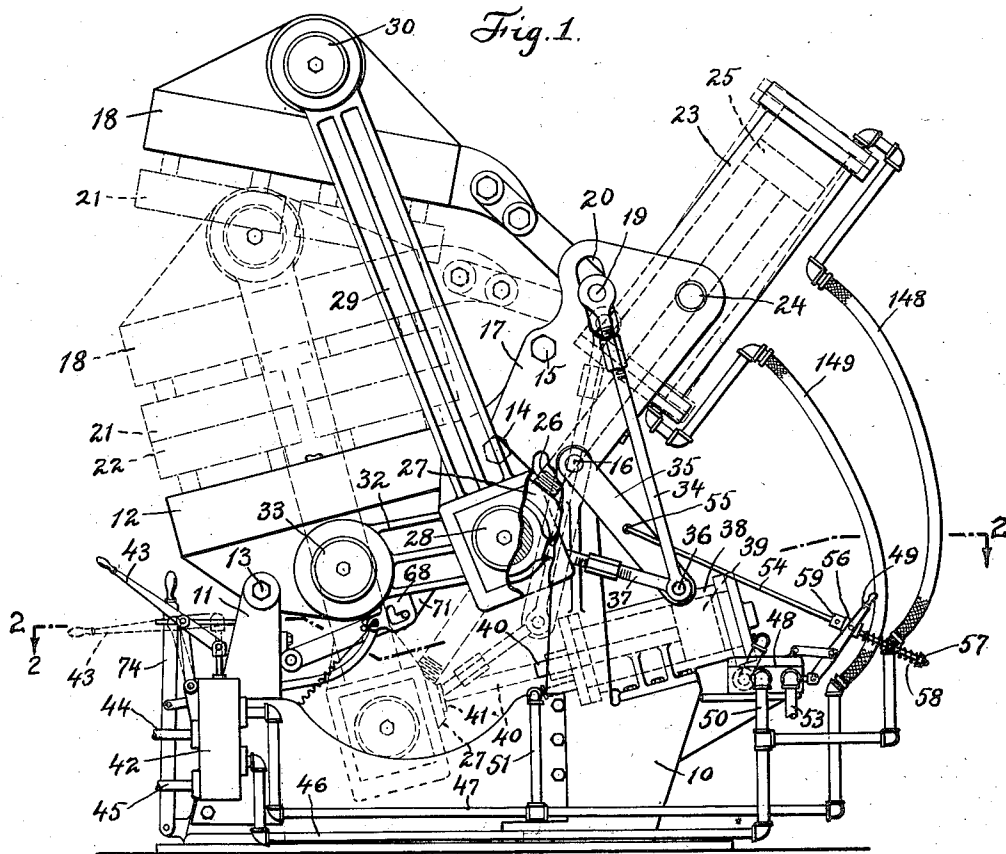
H. C. BOSTWICK

2,019,888

VULCANIZING PRESS

Filed Aug. 14, 1934

2 Sheets-Sheet 1.



Nov. 5, 1935.

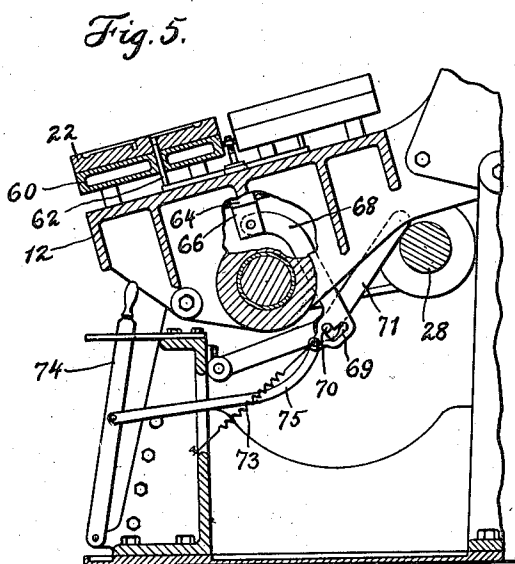
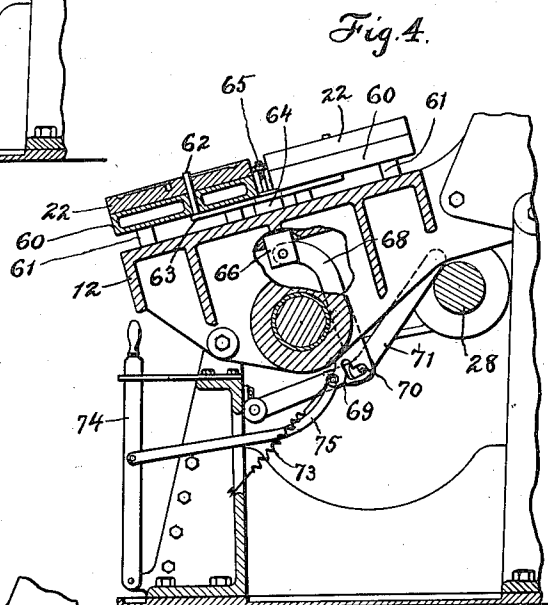
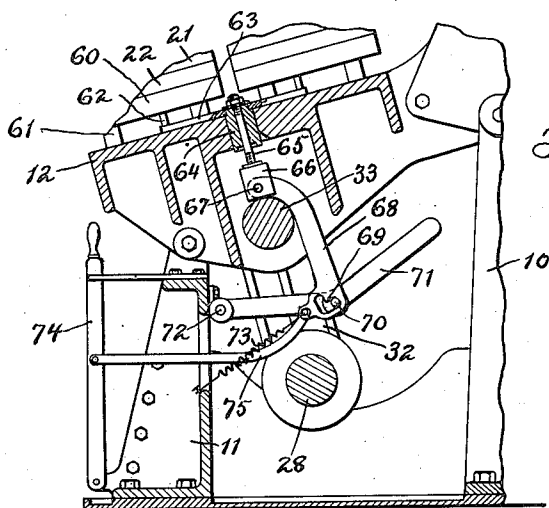
H. C. BOSTWICK

2,019,888

VULCANIZING PRESS

Filed Aug. 14, 1934

2 Sheets-Sheet 2



Inventor

H. C. Bostwick,

By Robert M. Pierson

Attorney

UNITED STATES PATENT OFFICE

2,019,888

VULCANIZING PRESS

Henry C. Bostwick, Coventry Township, Summit County, Ohio, assignor to The Akron Standard Mold Company, Akron, Ohio, a corporation of Ohio

Application August 14, 1934, Serial No. 739,723

14 Claims. (Cl. 18—17)

This invention relates to toggle presses for molding, or molding and vulcanizing rubber and other plastics.

One of the principal objects is to obtain higher molding pressures than have heretofore been feasible, without increasing the pressure of the hydraulic supply or other medium. This enlarges the capacity of the press for uses such as molding mechanical goods of either soft or hard rubber, where molds are employed having a plurality of cavities or a large total area imposing excessive resistance of the solid plastic material. To effect the final closure, I employ a booster ram having a large mechanical advantage over the main press toggle operated by the main ram. A further object is to provide a toggle press with improved means for holding the planes of the two heads or platens substantially parallel during the first part of the opening movement and thereafter relatively moving them in an angular relation. Another object is to bring the booster ram automatically into action when the press is nearly closed by the operation of the main ram, and to automatically release the pressure of the booster ram and retract its plunger when the press starts to open, to permit its opening by the main ram. A still further object is to provide an improved work ejector for toggle presses.

Of the accompanying drawings, Fig. 1 is a side elevation, partly broken away and in section showing, in the open position, a press embodying my invention.

Fig. 2 is a horizontal section, approximately on the line 2—2 of Fig. 1, and illustrating the position of parts when the press is closed.

Figs. 3, 4 and 5 are partial vertical sections illustrating an ejector mechanism, Fig. 3 being a central section showing the position of said mechanism when the press is closed, Fig. 4 being a section mainly in a plane toward the observer and showing the ejecting position with the press open, and Fig. 5 being a similar section with the press open, showing the retracted mold-loading position of the ejector.

In the drawings, 10 is a rear base frame and 11 a forward pedestal or auxiliary base frame, and 12 is a fixed lower press head or platen supported by the two frames at a slight forward inclination, the front support being by a pin 13 and rear support by a series of pins 14, 15, and 16 on a pair of side plates 17 incorporated in the upper part of the rear base frame.

18 is a movable upper press head or platen carrying a pivot pin 19 guided by the frame

plates 17. This pivot pin is movable in a pair of slots 20 formed in said frame plates and extending parallel with the central axis of the fixed lower head 12, said pin being moved by mechanism hereinafter described so that during the first part of the opening movement of the upper head 18 the plane of said head remains parallel with that of the fixed lower platen, and during the remainder of the opening movement the upper head swings on its pivot to the fully-open position represented in Fig. 1.

The upper and lower halves 21, 22 of a multiple mold or plurality of molds, which will generally be steam-jacketed, are shown in broken lines in Fig. 1 and detachably secured in a suitable manner to the respective platens.

A familiar type of toggle and ram mechanism is shown for operating the upper platen 18, the same comprising a double acting hydraulic cylinder 23 pivoted by trunnions 24 in bearings on the frame plates 17, a piston 25 in said cylinder having a rod 26 extending through the lower cylinder head and pivotally connecting at its lower end through a rod-head 27 with the middle of the knuckle pin 28 of a double toggle each side of which is composed of a pair of long links 29 whose upper ends are pivoted to the upper press head 18 by a pin 30 and their lower ends pivoted on the knuckle pin 28, and a pair of shorter links 32 whose lower ends are pivoted on the knuckle pin and their upper ends pivoted to the lower side of the fixed lower press head 12 by a pivot pin 33. With this arrangement, the upper press head is swung toward its closed position by admitting hydraulic pressure to the upper end of the cylinder 23 while its lower end is exhausted, causing the piston and its rod 26 to move downwardly and swing the toggle links 29 and 32 toward their straightened or folded positions; and the press is opened by the opposite movement upon admitting hydraulic pressure to the lower end of the cylinder and exhausting its upper end.

For moving the pivot pin 19 of the upper press head, there is provided an auxiliary double toggle composed of a pair of upper, adjustable, turnbuckle links 34 carrying said pin at their upper ends, a pair of shorter lower links 35 pivotally suspended by their upper ends from the frame pin 16 and connected at their lower ends with the knuckle pin 36 carried by the longer links, together with a pair of adjustable turnbuckle links 37 whose forward ends pivotally surround the knuckle pin 28 of the main toggle and whose rear ends are pivoted on the knuckle

pin 36 of the auxiliary toggle, for operating the latter by the movement of the main toggle. In the closed position of the press, the knuckle of the main toggle has drawn forward the knuckle of the auxiliary toggle and the pivot pin 19 of the movable head 18 is then in its lowest position in the slots 20. During the opening movement, the links 34, 35 of the auxiliary toggle are swung backward in a partial unfolding movement which, together with the initial movement imposed by the main toggle 29, 32, causes the upper head to remain substantially in parallelism with the lower one during the first part of the opening movement, following which, through the more rapid upward movement of the main toggle links 29, 32, the upper head is swung on its pivot pin 19 while the latter continues to rise slowly until the operating links 37 reach a position at right angles to the longer links 35 of the auxiliary toggle, after which said pin 19 descends slightly. During the closing movement, the reverse operations take place and during the final part thereof, the plane of the upper platen remains substantially parallel with that of the lower one. When the press is fully closed, the pin 19 is at or near the bottom of the slots 20, but does not sustain any substantial part of the molding pressure, the latter being taken by the mold members and the two heads through the main toggle and its pins.

To provide a sufficient opening movement in this type of press and to sustain the weight of the pivoted upper head and the toggles when the latter are nearly straightened as illustrated in full lines in Fig. 1, the line of pressure of the ram used for that purpose must be at an acute angle to the folded toggle in the closed position, as shown. Heretofore, this has limited the press pressure obtainable with a given hydraulic pressure, but by employing the booster ram now to be described, I am able to greatly increase the capacity with the same hydraulic pressure, besides providing successive molding pressures of smaller and larger magnitude which are very desirable in some classes of molding and vulcanizing work, such as hard rubber.

The double-acting cylinder 38 of a booster ram is mounted on the main base frame 10 under the main ram cylinder, fixedly in this case, although not necessarily so. It contains a piston 39 having a rod 40 extending through the forward cylinder head and adapted, when the press is nearly closed, to contact with the face of an abutment member or wear plate 41 on the main rod head 27. Under these conditions, the pressure of the booster ram is exerted in a direction substantially at right angles to the position of the main toggle links 29, 32, so that the booster ram has a maximum mechanical advantage over the toggle and can therefore exert a final squeezing pressure of very large magnitude upon the press platens, supplementing that of the main ram, which acts at some disadvantage owing to the inclination of its rod 26 at an acute angle to the folded position of the main toggle. To allow for the swinging movement of the main toggle which effects the opening of the press, the rod 40 is retracted by a rearward movement of the booster piston.

For controlling the action of the main and booster rams, I have shown a forwardly-located master 4-way valve mechanism which may be of any suitable type, such as the device 42 embodying a valve cylinder containing a multiple

piston valve operated by a handle lever 43 and controlling cylinder ports connected respectively with a hydraulic supply pipe 44, an exhaust pipe 45, a combined exhaust and inlet pipe 45 leading to the rear ends of the respective main and booster ram cylinders 23 and 38, and a combined inlet and exhaust pipe 47 leading to the forward ends of said respective ram cylinders; together with a secondary control valve device 48 for the booster ram, which may be generally similar to the master controller and including a valve cylinder containing a piston operated by a handle lever 49 and controlling cylinder ports having the necessary pipe connections. Where automatic press timing is substituted for manual control, the master controller 42 may be dispensed with and its office performed by suitable diaphragm valves and pilot valves in accordance with familiar practice.

The two pipes or conduits 46 and 47 include flexible hose sections 148 and 149 to allow for pivotal movement of the main ram cylinder, the press-closing pipe 46 has a branch connection 50 to the cylinder of the secondary controller 48, and the press-opening pipe 47 has a branch connection 51 to the forward end of the booster cylinder 38. A combined inlet and outlet pipe 52 extends from the cylinder of the secondary controller 48 to the rear end of the booster ram cylinder 38, and said secondary controller cylinder has an exhaust pipe 53.

The handle lever 49 of the secondary controller might be subject only to manual operation, in which event the operator would have to wait until the press is nearly closed before applying the pressure of the booster ram, but I prefer to make its operation automatic and to this end have provided a rod 54 whose forward end is pivoted at 55 on one of the shorter links 35 of the auxiliary toggle and its rear portion slidably mounted in a block 56 pivoted upon the hand lever 49, together with a nut 57 on the end of said rod, a spring 58 interposed between the nut and the block 56 for yieldingly imparting a forward swinging movement to the hand lever when the auxiliary toggle links 34, 35 approach the limit of their forward swinging movement during closure of the press, and a collar 59 fixed on said rod and adapted to engage the pivot block 56 with some lost motion during the opposite swinging movement of said auxiliary toggle links when the press is being opened.

In the operation of my described invention, the press being open as shown in Fig. 1, to close said press, the handle lever 43 of the master controller 42 is swung downwardly to the broken-line position. This exhausts the forward ends of the main and booster ram cylinders 23 and 38 through the pipe 47 and admits hydraulic pressure to their rear ends through the pipe 46, except that the admission to the rear end of the booster cylinder is deferred until the links 29, 32 of the main toggle have swung downwardly nearly to the limit of their press-closing position. Thereupon, if automatic control of the booster ram through the rod 54 is omitted, the hand lever 49 is manually swung forward to charge the rear end of the booster cylinder; or if the operation is automatic as illustrated, the forward swinging of said hand lever is effected at the proper time by the pressure of the nut 57 on rod 54, yieldingly exerted through the spring 58 upon the pivot block 56. The booster piston rod 40 is thereby projected forwardly against the main-ram rod-head 27 on the knuckle pin 28 of the

main toggle, to augment the closing pressure of the latter, imposed by the main ram. The booster ram pressure being thereby exerted substantially at right angles to the main toggle, with the maximum mechanical advantage thereof, a very powerful final press squeeze through the agency of both rams and the main toggle is exerted upon the mold or molds 21, 22 and contents thereof.

In the reverse operation of opening the press, the hand lever 43 of the master control valve is swung upwardly to the full-line position in Fig. 1. This directly exhausts the rear end of the main ram cylinder 23 through the pipe 46 and admits hydraulic pressure to its forward end through the pipe 47, the rear end of the booster cylinder at first remaining connected through 52, 48 and 50 with the pipe 46, which now contains only exhaust pressure. The main ram, through the toggle 29, 32, opens the press, the rod-head 27 forcing back the rod and piston of the booster ram cylinder 38 while water pressure is received in the forward end of the latter from the pipe 47 and exhaust from its rear end takes place into the pipe 46. The rearward and upward swinging of the toggle pin 28, through the rod 37, secondary toggle link 35, rod 54 and collar 59 thereon, reverses the lever 49 of the secondary controller during the early part of the opening movement, and the pressure in the forward end of the booster ram cylinder causes its rod 40 to be retracted out of the way of further retracting movement of the rod-head 27.

It will be understood that other well-known forms of ram, such as screw-and-nut and motor operated by a different medium such as electricity, may be substituted for the hydraulic type, with appropriate controls in place of the described valves, without substantially changing the principle of operation.

On certain classes of work for which a press of this type is adapted, including hard rubber articles such as steering wheels containing a metallic reinforcement which prevents the molding blank from being laid as a flexible sheet over the lower half of the open mold, it is desirable to provide a form of work ejector which may be retracted after an ejecting operation while the mold is still open, to permit reloading of the mold. Such a work ejector is shown in Figs. 3, 4 and 5, but the upper parts thereof are omitted from Fig. 1 for clearness of illustration.

The illustrated multiple mold in this case is an arrangement of four steering-wheel molds with their lower halves 22 symmetrically disposed upon the fixed lower press head 12 and mounted upon individual steam plates 60 which are attached to said press head in spaced relation thereto by suitable supporting members 61.

Through each mold member and steam plate, slightly offset from the center thereof, projects an ejector or knock-out pin 62 operated by one of the arms of a four-armed spider plate 63 whose hub is attached to the upper end of a tubular sliding stem 64 centrally mounted in a guide aperture on the press head 12. In said stem is slidably mounted an actuating rod 65 having a stop head at its upper end and a block 66 at its lower end. To the block is pivoted at 67 the upper end of a strut link 68 having an L-shaped slot 69 in its lower end, which receives a pin 70 mounted on a bent lever 71, the latter being pivoted at 72 on the pedestal 11. A pull-spring 73 connects the lower end of link 68 with a fixed point on the frame for yieldingly retracting said link or forwardly swinging it with reference to the lever.

The lever 71 and connected parts are adapted to be raised, for projecting the ejector, by the toggle knuckle pin 28 encountering the rear portion of said lever. For thereafter retracting the ejector pins while the press is open, a hand-lever 74, pivoted at its lower end upon the pedestal 11, is provided at the front of the press and connected by a link 75 with the lower end of the strut link 68, for rearwardly swinging the latter to bring the pin 70 into the forward, upright portion of the slot 69 and allow the spring 73 to depress the ejector parts.

In the operation of this ejector mechanism, the press being closed, the ejector is retracted as shown in Fig. 3, being held in a depressed position by spring 73 and the weight of the parts, with the spider 63 resting on the upper surface of the head 12 and the block 66 resting on or near the head-supporting pin 13. During the opening movement, and toward the end thereof, the toggle pin 28, encountering the lever 71 as shown in Fig. 4, swings the latter upwardly, and through the pin 70 raises the strut link 68 and with it the block 66, rod 65, spider stem 64 abutting against said block, spider 63 and knock-out pins 62 to eject the vulcanized articles from the lower mold members 22, whereupon said articles may be removed, the knock-out pins retracted by a rearward swinging of hand lever 74 so that the spring 73 may bring the pin and slot into the relation shown in Fig. 5, depressing the strut link and connected parts and permitting a reloading of the mold members with fresh blanks. On again closing the press, the toggle pin 28 descends, allowing the lever 71 and parts 65, 66 and 68 also to drop. The weight of lever 71 brings the pin 70 into the lower portion of the slot 69, and the pull of the spring 73 swings the strut link forward to move the right-hand end wall of the slot against the pin and automatically restores the hand lever 74 to its forward position shown in Fig. 3.

It will be understood that the described ejector mechanism could be omitted where not required for a particular class of work, and that other changes could be made in the described embodiment of my invention without departing from the scope thereof as defined in the claims.

I claim:

1. A molding press comprising a movable press head, a toggle and coacting main ram for operating said head, and a booster ram acting on the head through said toggle with greater mechanical advantage than the main ram, for augmenting the pressure on said head during the completion of its closing movement.

2. A molding press comprising a movable press head, a head-operating toggle comprising links which fold toward a straightened position during the press-closing movement, a main ram for operating said toggle, and a booster ram having a plunger withdrawable from the toggle to permit the latter's press-opening movement and acting on the toggle substantially at right angles to the latter's position when the press is closed, for augmenting the final closing pressure.

3. A molding press comprising fixed and pivoted press heads, a toggle connecting them and folding toward a straightened position as the press closes, a pivoted main ram cylinder having a plunger connecting with the knuckle of said toggle for opening and closing the press and acting along a line at an acute angle to the toggle in the closed position, and a booster ram cylinder having a plunger acting on said toggle knuckle substan-

tially at right angles to the toggle in said closed position and retractible from the toggle to permit the press-opening movement of the latter.

4. A molding press comprising a fixed lower
5 press head, a pivoted upper press head, a toggle
comprising a pair of long links pivoted at their
upper ends to said upper head and a pair of short
links pivoted at their upper ends to the lower head
and at their lower ends by a knuckle joint to the
10 lower ends of the long links, a main ram includ-
ing a pivoted double-acting cylinder having a
plunger connecting with the knuckle of said toggle
for operating said upper head and sustaining its
weight and that of the toggle with the latter
15 nearly straightened in the open position, and act-
ing at an acute angle to the folded toggle in the
closed position, and a double-acting booster ram
cylinder having a plunger acting on said toggle
knuckle substantially at right angles to the folded
20 toggle in the closed position and retractible from
the toggle to permit the press-opening movement
of the latter.

5. A molding press comprising a pivoted press
head, a toggle foldable to close said head and in-
25 cluding a knuckle pin, a main fluid-pressure ram
including a double-acting pivoted cylinder hav-
ing a piston rod provided with a head at its outer
end surrounding said knuckle pin, and a fluid-
pressure booster ram including a double-acting
30 cylinder having a piston rod adapted for move-
ment against the main-ram rod head substan-
tially at right angles to the toggle when the press
is closed, for augmenting the closing pressure, and
retractible from said rod head to permit the press-
35 opening movement.

6. A molding press comprising an upper press
head having a movable pivot on which it swings
during the latter part of the opening movement,
a coacting lower press head, a toggle connecting
40 said heads and foldable to close the press, means
for moving said toggle, and means located below
said pivot and operated by the lower part of said
toggle for raising the pivot to maintain the planes
of the heads substantially parallel during the
45 early part of the opening movement.

7. A molding press comprising a fixed lower
head, an upper head having a slidable pivot
laterally offset therefrom, on which it swings dur-
ing the latter part of its opening movement, a
50 main toggle connecting the heads and foldable to
close the press, a power ram for operating said
toggle, and a secondary toggle operated from the
knuckle of said main toggle and connected with
said pivot for coacting with the main toggle
55 to maintain the planes of the heads substantially
parallel during the early part of the opening
movement.

8. A molding press comprising a movable press
head, a main ram and toggle for opening and
60 closing the press, a booster ram having a plunger
acting on said toggle at a greater advantage than
the main ram and only during the completion
of the press-closing movement for augmenting
the closing pressure, and means automatically
65 operated by the movement of said press head for
controlling and timing the action of the booster
ram.

9. A molding press comprising a movable press
head, a toggle connected therewith, a double-
70 acting, fluid-pressure main ram for operating said
toggle to open and close the press, a double-act-
ing, fluid-pressure booster ram having a plunger

acting on said toggle at a greater advantage than
the main ram and only during the completion of
the press-closing movement for augmenting the
closing pressure, and a control-valve device auto-
5 matically operated by said toggle and adapted to
bring the pressure of said booster ram to bear
on the press head after the latter has nearly
completed its closing movement, and to release
said pressure during the opening movement.

10. A molding press comprising fixed and piv- 10
oted press heads, a main toggle and a secondary
toggle for imparting opening movements to said
pivoted head at first with its plane substantially
parallel with that of the fixed head and then
angularly thereof, a double-acting, fluid-pressure 15
main ram for operating said toggles, a double-
acting, fluid-pressure booster ram acting on the
main toggle for augmenting the closing pressure,
valve means controlling said rams, including an
operating member controlling the booster ram, 20
and a connection from the secondary toggle for
imparting opposite movements to said operat-
ing member during respective opening and closing
movements of said secondary toggle.

11. A molding press comprising coacting press 25
heads and mold members thereon, a press-oper-
ating toggle, a work ejector associated with one
of said heads and mold members and operated
by the toggle to eject the molded article as the
press opens, and means for retracting said ejector 30
while the press is in its fully-open position to
permit reloading of said mold member.

12. A molding press including a lower press
head and mold member, an associated work
ejector, press-operating means, an ejector-oper- 35
ating lever actuated by said means, a strut link
interposed between said lever and ejector, and
manually-operated means for changing the rela-
tion of said link and lever in the projected posi-
tion of the ejector to permit retraction of the 40
latter while the press is open.

13. A molding press comprising an upper mov-
able press head and a fixed lower press head each
carrying members of a multiple mold whereof the 45
lower members are spaced from the lower head, a
multiple ejector member movable in the space thus
provided and having individual ejector pins as-
sociated with the respective lower mold members,
an ejector actuating member slidably related
to said multiple member, a strut link connected at 50
its upper end with said actuating member, a
lever operated by the press for actuating said
link, one of said lever and link being formed
with an L-shaped slot and the other having a
pin in said slot, and means for swinging said 55
lever to change the relation of said pin and slot
for work ejection during the opening movement
of the press or retraction of the multiple member
and ejector pins while the press is open.

14. A molding press comprising relatively mov- 60
able press heads and mold members carried there-
by, a work ejector associated with one of said
heads and mold members, a press-operating
toggle, ejector-protecting means actuated by said
toggle during the press-opening movement, and 65
connections to said projecting means for re-
tracting the ejector while the press is fully open,
said connections and projecting means being au-
tomatically restored to a work-ejecting condition by
the closing movement of the press. 70

HENRY C. BOSTWICK.