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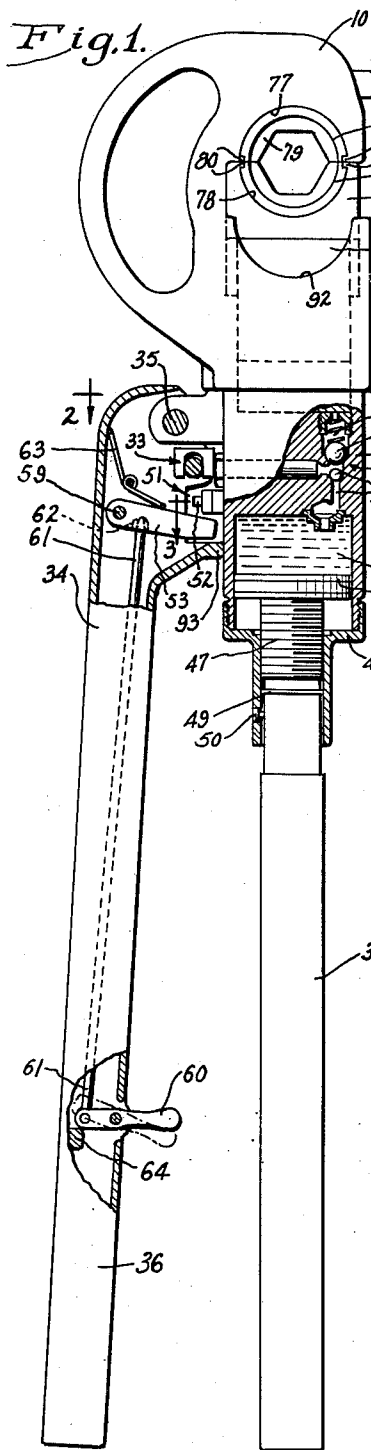
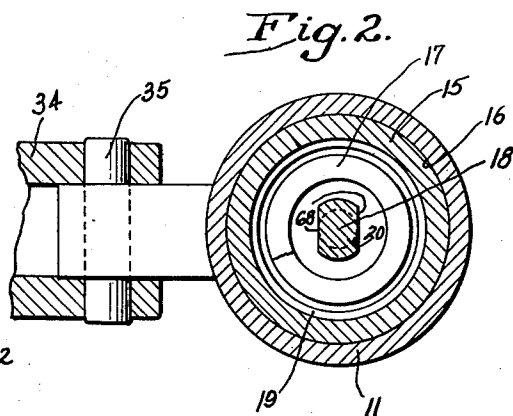
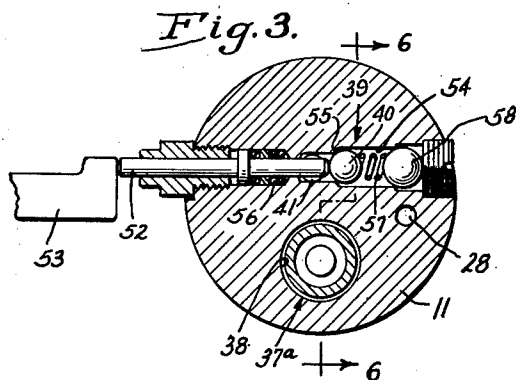
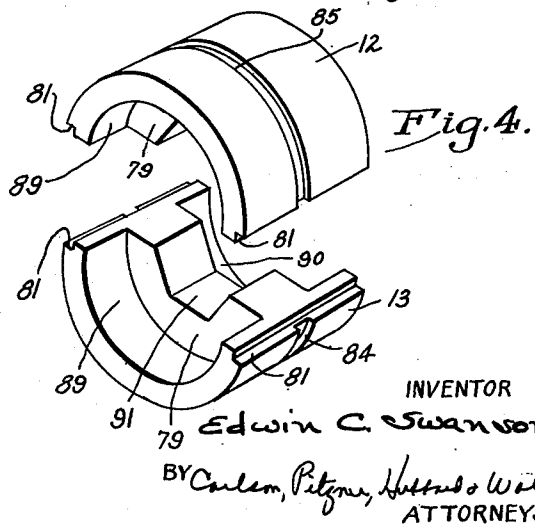
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HYDRAULIC PRESS

Original Filed Oct. 15, 1954

2 Sheets-Sheet 1



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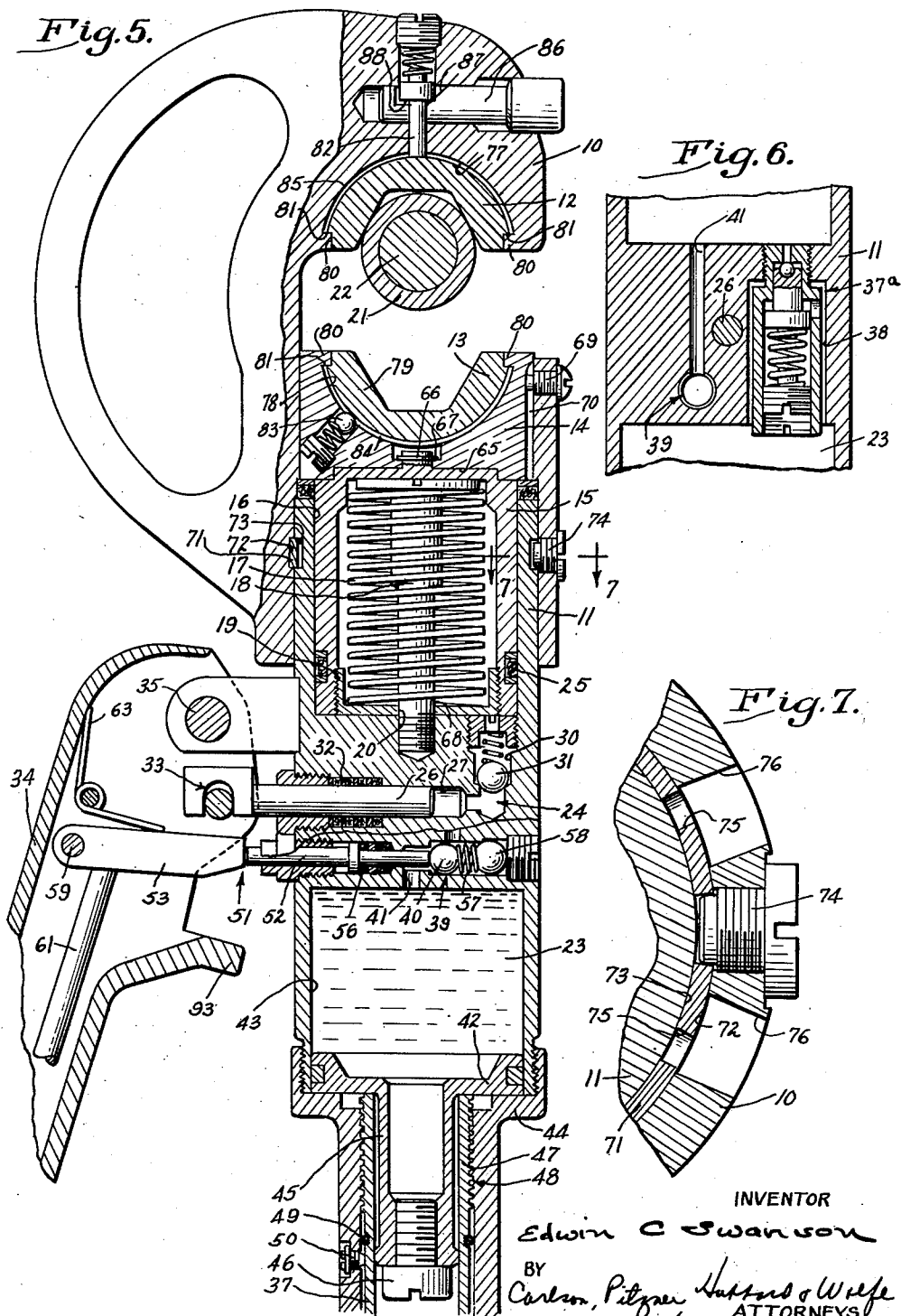
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2,815,646

HYDRAULIC PRESS

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Original application October 15, 1954, Serial No. 462,443. Divided and this application January 12, 1956, Serial No. 558,746

3 Claims. (Cl. 60—52)

This invention relates to portable presses of the type used in splicing electrical cables and having two dies one of which is fixed in a head carried by a body and the other of which is carried by a ram reciprocable in a cylinder in the body and shiftable toward the fixed die to apply clamping pressure against a splicing sleeve disposed between the dies and encircling the ends of cables to be joined together. More particularly, the invention relates to a hydraulic press having a main pump operated by relatively swinging two handles toward and away from each other to pump fluid into the cylinder to advance the movable die toward the fixed die under high pressure and an auxiliary pump for advancing the movable die quickly under low pressure.

One object of the invention is to provide a novel hydraulic press which, as compared to prior presses of the above character, is easier for the operator to manipulate both to advance and to retract the movable die.

Another object is to provide a novel disengageable connection between one handle and the body enabling the swinging motion of the handle to be utilized selectively either to actuate the high pressure pump or to release pressure fluid from the cylinder for retraction of the movable die.

A more detailed object is to arrange an actuator for the disengageable connection on a handle in a novel manner to enable the operator to release the pressure fluid without removing his hand from the handle.

The invention also resides in the novel construction and arrangement of one handle for actuation of the auxiliary pump while the operator retains one hand on such handle.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

Figure 1 is a side elevational view of a hydraulic press embodying the novel features of the present invention, some of the parts being broken away and shown in section.

Figs. 2 and 3 are fragmentary sectional views taken respectively along the line 2—2 and 3—3 of Fig. 1.

Fig. 4 is a perspective view of the dies.

Fig. 5 is a fragmentary enlarged diametrical sectional view similar to Fig. 1 showing the parts in different positions.

Fig. 6 is a fragmentary sectional view taken along the line 6—6 of Fig. 3.

Fig. 7 is a fragmentary sectional view taken along the line 7—7 of Fig. 5.

In the drawings, the invention is shown for purposes of illustration embodied in a hydraulic press which is particularly suited for use in splicing electrical cables and which comprises generally a cylindrical body 11 and a C-shaped head 10 mounted thereon and carrying a fixed die 12 spaced from the body. A cooperating die 13 is mounted in a die holder 14 carried by a hollow ram or piston 15 which is reciprocable toward and away from the fixed die in a cylinder 16 in the body and is

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normally urged into a retracted position shown in Fig. 5 by a spring 17. The latter encircles a bolt 18 threaded into the body and acts between the head of the bolt and a cup 19 threaded into the ram and having a hole 20 receiving the shank of the bolt. In service use, the movable die 13 is advanced toward the fixed die to apply pressure to opposite sides of a splicing sleeve 21 disposed between the dies and to clamp the sleeve to a cable 22 telescoped within the sleeve.

To advance the ram 15 and shift the die 13 thereon axially toward the fixed die 12 under high clamping pressure, fluid such as oil is forced under pressure into the cylinder 16 from a reservoir 23 in the body 11 by a pump 24, a seal ring 25 seated in an annular groove on the exterior of the ram preventing the escape of pressure fluid between the ram and the cylinder wall. The pump includes a piston 26 reciprocable in a bore 27 which extends transversely through the body and communicates with the reservoir 23 through an inlet passage 28 (Figs. 1 and 3) and a check valve 29 and with the ram cylinder 16 through an outlet passage 30 (Figs. 1 and 5) and a check valve 31. At its outer end, the piston 26 extends through a packing 32 to the exterior of the body and is pivotally and slidably connected at 33 to an elongated hollow lever 34 which is fulcrumed at 35 on the body adjacent one end of the lever and the connection 33 with the piston. The other end portion 36 of the lever and a tubular extension 37 of the body constitute handles which are grasped by the operator and swung toward and away from each other to advance and retract the piston 26, thereby actuating the pump.

Build-up of pressure in the ram cylinder 16 is limited to a predetermined value by an overload or pressure relief valve 37^a (Figs. 3 and 6) which normally closes a passage 38 between the cylinder and the reservoir and, when it opens, produces a drop in the pressure of the ram cylinder fluid. To permit retraction of the ram 15 under the action of the return spring 17, pressure fluid is released from the ram cylinder 16 by opening a normally closed exhaust valve 39 having a movable element 40 and located in a passage 41 (Figs. 3, 5 and 6) extending between the cylinder and the reservoir.

One end wall of the reservoir 23 is defined by a follow-up piston 42 which is reciprocable in and is sealed around its periphery against a cylindrical wall 43 of the reservoir, a cap 44 threaded on the end of the body limiting outward movement of the piston. The reservoir is filled through a hollow axial extension 45 of the piston (Fig. 5) which is threaded to receive a plug 46 and telescopes into the inner end portion 47 of the body handle 37. The latter has a coarse thread engagement 48 with the cap 44 and its inner end abuts the outer side of the piston and constitutes an adjustable stop movable beyond the cap to advance the piston and force oil into the ram cylinder 16 to project the ram 15 outwardly at a rapid rate by turning the body extension into the body, the piston 42 and the cylinder 43 thus constituting an auxiliary or fast take-up pump whose actuator is the handle 37. Turning of the latter out of the cap 44 normally is limited by abutment of a snap ring 49 on the exterior of the handle with a stop screw 50 on the cap, the stop screw being retractable for removal of the handle during filling of the reservoir.

To simplify the operation of the press and enable the operator to retract the ram 15 after a clamping operation without removing his hands from the handles 36 and 37, the present invention contemplates utilizing the swinging motion of the handles both to open the exhaust valve 39 and to actuate the pump 24 while still permitting independent actuation of the latter. This is accomplished by transmitting the motion of the lever 34 to the movable

element 40 of the valve 39 through a connection 51 which normally is disengaged permitting actuation of the pump with the valve closed (Fig. 3) but which may be engaged selectively from a point on the lever handle 36 for shifting the valve element 40 to open position (see Fig. 5) as an incident to swinging the lever toward the body. Generally, the connection comprises a valve actuator 52 shiftable on the body 11 between valve open and valve closed positions and accessible from the exterior of the body and a member 53 carrier by the lever 34 and movable relative thereto between an inactive out-of-the-way position (see Fig. 1) in which the member moves freely past the actuator and an active position in which the member is aligned with and engages the actuator as shown in Fig. 3 to shift the same to its valve open position when the lever is swung toward the body as shown in Fig. 5.

In the present instance, the movable valve element 40 is a ball shiftable in a bore 54 in the body 11 toward and away from an annular seat 55 facing along the passage 41 away from the reservoir. The actuator 52 is a pin extending through the body to the exterior thereof at one end and reciprocable in a packing 56 from its valve closed position far enough behind the seat 55 that the ball 40 engages the latter (Fig. 3) to its valve open position in which the inner end of the pin engages the ball and holds the same away from the seat (Fig. 5). A spring 57 acting between the valve ball and a second ball 58 sealing the outer end of the bore 54 yieldably urges the valve ball against the seat and, acting through the valve ball, urges the pin to its outer valve closed position.

The shiftable member 53 is a bar whose outer end is pivoted at 59 on the lever 34 for swinging of its inner end longitudinally of the lever between an active position of alignment with the valve actuator pin 52 (Figs. 3 and 5) and its inactive out-of-the-way position to one side of the pin so that the bar moves freely past the pin and remains out of engagement therewith as shown in Fig. 1. Selective engagement of the connection 51 from a point on the handle 36 is effected by shifting a trigger 60 in the form of a lever fulcrumed on the handle and acting through a rod 61 which is pivotally connected at one end to the trigger and extends therefrom along the interior of the handle toward the bar, the trigger projecting from the handle for actuation by the index finger of the hand of the operator grasping the lever handle 36. At its other end, the rod is received in a recess 62 on one side of the bar and abuts the latter. A spring 63 acting between the pump lever 36 and the other side of the bar urges the bar toward its inactive position and the trigger against a stop 64 on the lever.

The head 10 preferably telescopes on the body 11 and is swiveled thereon by a connection 71 to enable the operator to locate the handles 36 and 37 relative to his body in positions most convenient for actuation of the pump. To permit the movable die 13 to swivel with the head while the ram 15 is fixed against rotation relative to the body, the die holder 14 and the ram are formed separately from each other, but are connected for axial reciprocation together and rotation relative to each other. Herein, the die holder 14 is a cylindrical block having an annular recess 65 on its inner end receiving a complementary axial projection on the outer end of the ram 15, a boss 66 on the latter projecting axially through the die holder and having a snap ring 67 thereon retaining the holder on the ram for reciprocation therewith. The connection between the ram and the body 11 permitting axial movement but preventing rotation of the two relative to each other comprises the bolt 18 which is tightened into the body and the cup 19 which is turned tightly into the ram, the bolt shank being flattened on opposite sides as indicated at 68 (Figs. 2 and 5) and the cup hole 20 being of a corresponding shape to prevent rotation between the cup and the bolt. A connection providing similar relative movement between the die holder 14 and the body

11 comprises a retractable screw 69 (Fig. 5) threaded through the body from the exterior thereof and into an axially extending slot 70 on the exterior of the die holder.

The swivel connection 71 between the head 10 and the body 11 comprises a split ring contracted around the body and having axially facing surfaces abutting against opposed walls of registering grooves 72 and 73 formed in the telescoping parts of the head and the body to receive the ring. To permit removal of the head from the body, the groove 73 in the latter is made at least as deep as the radial thickness of the ring so that the ring 71, when contracted, is completely within the periphery of the body. A spreading screw 74 is threaded through the head and enters between the circumferentially facing ends of the ring to expand the latter into the head groove 72, this groove having a depth less than the radial thickness of the ring so that the ring, when expanded, overlaps the sides of both grooves. To insure contraction of the ring into the body groove 73 when the spreading screw 74 is retracted, registering radial holes 75 and 76 are formed in the ring and the head (Fig. 7) to receive the pivoted legs of a suitable plier-type ring contracting tool (not shown).

The dies 12 and 13 are seated in recesses 77 and 78 formed in and opening toward each other from the head 10 and the die holder 14 and complementary in shape to the outer surfaces of the dies. To provide a large backing area and permit their formation in simple turning operations, the dies are shaped generally as half cylinders, webs 79 projecting radially and inwardly from their inner peripheries. The axes of the recesses and the dies extend transversely of the axis of the ram 15 and the body 11 and the dies are retained in the recesses against movement outwardly along this axis by flanges 80 projecting toward each other from opposite edges of each recess and fitting over shoulders 81 spaced rearwardly from the flat sides of the dies to enable the latter to close and completely encircle the splicing sleeve 21 during a clamping operation.

Releasable locks 82 and 83 retain the dies 12 and 13 against endwise movement out of the recesses 77 and 78, the lock 83 on the die holder 14 comprising a spring urged ball carried by the die holder and movable radially into a circumferential groove 84 on the movable die. To permit replacement of the movable die 13 while the head 10 is assembled on the body 11, the head preferably is recessed as indicated at 92 (Fig. 1) in alignment with the die when the latter is in its retracted position. The lock 82 for holding the fixed die 12 in the head 10 comprises a pin yieldably urged radially of the head recess 77 and into a similar groove 85 in the fixed die. The outer end of the pin is flat and the groove is of rectangular cross section so that the fixed die is held positively in the head. This lock is released by inward shifting of a slide 86 (Fig. 1) having a cam surface 87 thereon engageable with a follower shoulder 88 on the pin 82 to retract the latter. To render the dies interchangeable and simplify formation of the grooves 84 and 85, the latter preferably are of the same cross section and extend completely around the peripheries of the dies. Thus, they may be formed by turning operations at the same time the peripheries of the dies are cut.

By duplicating the dies 12 and 13 and shaping the same as described above, the die peripheries, the grooves 84 and 85 therein, and the interior recesses 89 on one side of the webs 79 may be formed in simple turning operations performed on a bar. Then, after the dies have been separated from the bar by cutting the latter along an axial plane, recesses 90 on the other sides of the webs are formed by a turning operation and the dies are separated by cutting along a radial plane. Finally, a recess 91 in the web and cuts for the shoulders 81 may be made with a single milling cutter acting on a plurality of dies arranged side by side with their axes aligned.

In the operation of the novel press described above, let

it be assumed that the parts have been assembled and that a splicing sleeve 21 is positioned in the fixed die 12 as shown in Fig. 5 with the movable die 13, the reservoir piston 42, and the pressure release bar 53 on the lever 34 all in their retracted or inactive positions. To perform a clamping operation, the movable die first is advanced rapidly toward the fixed die and against the splicing sleeve by turning the body handle 37 into the cap 44. Then, the ram 15 and the movable die 13 thereon are advanced farther at a slow rate and a high damping pressure is applied by swinging the handles 36 and 37 toward and away from each other to actuate the pump 24, the trigger 60 being released so that the exhaust valve 39 is closed. During such swinging of the handles, inward movement of the lever 34 is limited by engagement of a step 93 thereon with the exterior of the body as shown in Fig. 1. As soon as the dies are closed under the predetermined clamping pressure, the overload valve 37 opens thereby reducing the pressure in the ram cylinder 16 and indicating to the operator that the clamping operation has been completed.

Usually, the press is shifted axially along the sleeve 21 to clamp the latter at several axially spaced points. Between successive clamping operations and prior to such shifting of the press, the movable die 13 is retracted partially by turning the handle 37 to shift the same outwardly relative to the end cap 44 and by opening the exhaust valve 39. To open the latter, the operator first swings the handles 36 and 37 apart. Then, while both hands of the operator remain in the same position on the handles, the operator moves his index finger on the lever handle 36 to the trigger 60 and pulls the latter downwardly to raise the bar 53 into alignment with the exhaust valve actuator pin 52. With the bar 53 still held in its active position, the handles are swung together and the bar pushes the actuator pin inwardly to unseat the movable ball element 40 of the exhaust valve 39 far enough to open the latter as shown in Fig. 5. The handles are held in this partially closed position until the ram has retracted under the action of its return spring 17 to a partially retracted position determined by the setting of the handle 37 relative to the end cap. Next, the trigger 60 is released for movement of the bar 53 to its inactive position under the action of its spring 63, the press then being in condition for another clamping operation.

To retract the movable die 13 completely, the handle 37 is turned outwardly of the cap far enough to permit abutment of the reservoir piston 42 with the cap as shown in Fig. 5 and the exhaust valve 39 is opened in the manner described above. The press then may be removed from the cable 22 by shifting the same axially beyond the sleeve 21 and then radially so that the cable which is of smaller diameter passes between the dies and through the open part of the C-shaped head 10.

It will be apparent that during successive clamping operations the operator may advance the movable die 13 quickly by actuating the auxiliary pump formed by the follow-up piston 42 and the reservoir wall 43, apply high clamping pressure to the movable die by actuating the high pressure pump 24, open the exhaust valve 37^a, and retract the movable die while, at all times, keeping both hands on the handles 36 and 37. As a result, the operator may retain positive control of the press and manipulate the same easily even when the press is inconveniently located relative to the operator's body as may occur, for example, when the splicing operations are performed on overhead high voltage electric power lines or in cramped quarters such as tunnels. Such operation is made possible not only by utilizing the handle 37 itself as the actuator for the auxiliary pump, but also, by the disengageable connection 51 with its trigger operating member 60 located on the handle 36 for manipulation by a finger of the operator's hand.

This application is a division of my copending application Serial No. 462,443, filed October 15, 1954.

I claim as my invention:

1. In a hydraulic press, the combination of, a body having a cylinder with a ram reciprocable therein and yieldably urged toward a retracted position, a cylindrical fluid reservoir communicating with said cylinder through a passage in said body and having one end wall defined by the inner side of a piston reciprocable axially of the reservoir, valve means in said passage blocking fluid flow from said cylinder to said reservoir while permitting fluid flow in the opposite direction, an elongated first handle extending outwardly from said body in alignment with the axis of said piston and having its inner end portion threaded into said body, the inner end of said handle abutting the outer side of said piston to limit outward movement thereof relative to said wall and movable inwardly to advance said piston to force fluid from said reservoir into said cylinder to advance said ram as an incident to turning the handle into said body, a pump for forcing fluid under high pressure from said reservoir to said cylinder, and actuating means for said pump including a second elongated handle connected to said pump and pivoted adjacent one of its ends on said body for swinging of its other end toward and away from the outer end of the first handle to actuate the pump.

2. In a hydraulic press, the combination of, a body having a cylinder with a ram reciprocable therein and yieldably urged toward a retracted position, a fluid reservoir communicating with said cylinder through a passage in said body and having one wall defined by a member movable inwardly and outwardly to decrease and increase the reservoir volume, valve means in said passage blocking fluid flow from said cylinder to said reservoir while permitting fluid flow in the opposite direction, an elongated handle having one end portion threaded into said body and abutting said member for shifting the latter inwardly to force fluid into said cylinder from said reservoir under low pressure to advance said ram as an incident to turning of the handle into the body, the other end portion of said handle extending outwardly from said body, a pump for forcing fluid under high pressure from said reservoir to said cylinder, and a second elongated handle connected to said pump and pivoted adjacent one end on said body for swinging of its other end toward and away from the projecting end of said first handle to actuate the pump.

3. In a hydraulic press, the combination of, a body having a cylinder with a ram reciprocable therein and yieldably urged toward a retracted position, a fluid reservoir communicating with said cylinder through a passage in said body and having one wall defined by a member having inner and outer sides and movable inwardly and outwardly to decrease and increase the reservoir volume, valve means in said passage blocking fluid flow from said cylinder to said reservoir while permitting fluid flow in the opposite direction, an elongated handle having one end portion threaded into said body adjacent said outer side of said member and connected to the member for shifting the same inwardly to decrease the volume of said reservoir and force fluid into said cylinder from the reservoir under low pressure to advance said ram as an incident to turning of the handle into the body, the other end portion of said handle extending outwardly from said body, a pump for forcing fluid under high pressure from said reservoir to said cylinder, and a second elongated handle connected to said pump and pivoted adjacent one end on said body for swinging of its other end toward and away from the projecting end of said first handle to actuate the pump.

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