June 9, 1931. F. C. WILSON 1,809,615

SAFETY DEVICE FOR HYDRAULIC PRESSES

Filed Nov. 22, 1929

Fig. 1.

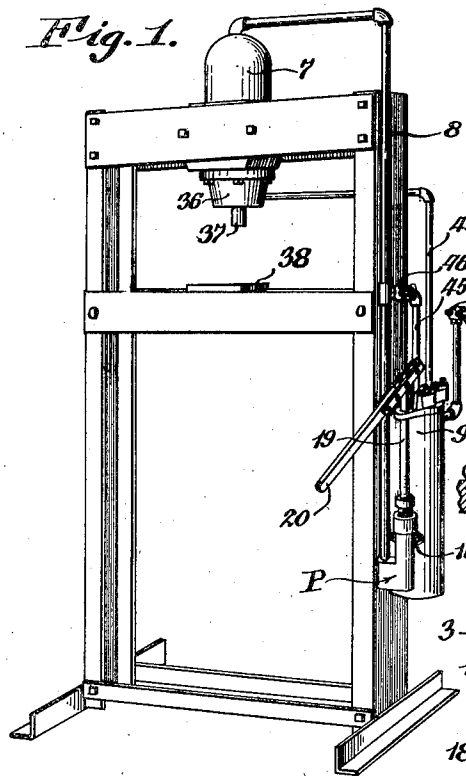


Fig. 4.

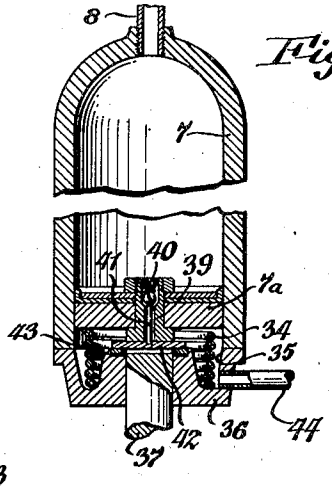


Fig. 2.

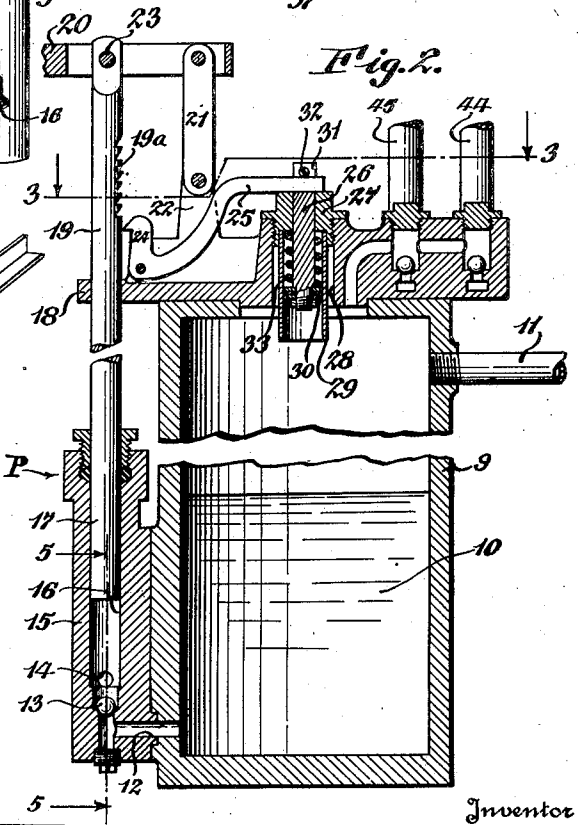


Fig. 5.

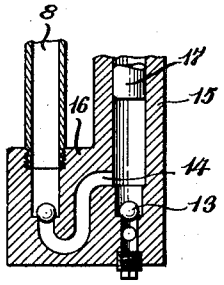


Fig. 6.

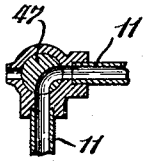
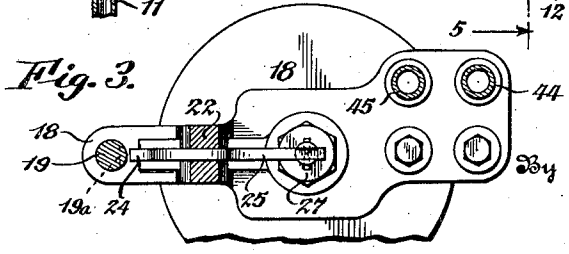


Fig. 3.



Inventor

Frank C. Wilson

By

Poppe and Powers

Attorneys

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UNITED STATES PATENT OFFICE

FRANK C. WILSON, OF ARCADE, NEW YORK

SAFETY DEVICE FOR HYDRAULIC PRESSES

Application filed November 22, 1929. Serial No. 409,176.

This invention relates to improvements in hydraulic presses and is directed in particular to presses of this type in which the fluid actuating medium is forced into the working chamber of the device either by compressed air or by a hand operated pump.

In the use of a press of this kind, the particular means by which the fluid medium is forced into the working cylinder of the same is determined with reference to the character of work to be performed, it being customary to utilize compressed air in light pressing operations while reserving the hand pump for those operations where greater pressures are required than can be practically obtained by compressed air.

A serious objection to presses of this kind, as heretofore constructed, has been the fact that when it is desired to operate a press by compressed air, the pressure created in the fluid reservoir by this means causes the fluid in the reservoir to back up against the piston of the hand pump. As the normal position of the hand pump is in a lowered position, this backing up of the fluid actuating medium in the pump cylinder forces the handle of the pump to the upward position of its stroke. This upward swinging movement of the pump handle is sudden and likely to result in the injury of anyone standing near enough to be struck by it at the time when compressed air is admitted into the fluid reservoir.

The principal object of the present invention is to avoid this objection, which object contemplates the attachment of a safety device to the fluid reservoir employed in conjunction with the press which is adapted, upon the admission of compressed air to the reservoir and before the handle of the hand pump has been thrown upwardly to lock said handle against movement.

A further object is to provide a safety device of the type described which will in no way obstruct or effect the operation of the hand pump when this manner of operation of the press is desired.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view of the safety device as applied to an arbor press.

Figure 2 is an enlarged longitudinal section of the fluid reservoir taken through the pump chamber and showing in detail the locking mechanism for the pump handle.

Figure 3 is a section taken along line 3—3 of Fig. 2.

Figure 4 is an enlarged section of the working cylinder of the press.

Figure 5 is a section taken along line 5—5 of Fig. 2.

Figure 6 is a detail section of the three-way valve employed in connection with the fluid reservoir which is adapted to release the pressure in the reservoir when the inlet from the source of supply of the compressed air is cut off.

Although the safety device is applicable to any desired type of press it is illustrated in connection with what has become known as an arbor press. The working cylinder 7 of the press is suitably connected as by a feed pipe 8 to a fluid reservoir 9.

As stated, the fluid actuating medium 10 contained within the said reservoir is forced up through the pipe line 8 into the working cylinder 7 of the press to operate the piston 7*a* in the said cylinder. This may be accomplished by compressed air, in which case the valve 10 (Fig. 1) is opened to permit compressed air (source not shown) through a supply pipe 11 into the reservoir 9. This pressure is transmitted to the piston by the fluid 10 in the reservoir which is forced through an outlet opening 12 past a ball valve 13 and an opening 14 into the feed line 8 by which it is conducted into the working cylinder 7.

It is to be noted, however, that compressed air for practical reasons is only desirable for light pressing operations, i. e. in the neighborhood of one and one-half tons more or less. Where greater pressures are desired it is preferred to utilize a hand operated pump by which pressure may be obtained with ease up to forty tons. For this purpose the reservoir 9 is provided with a pump P. The said pump includes a cylinder 15 which is secured in any suitable manner to the reservoir 9.

It is provided with a bore 16 which at its lower end is in communication with the outlet opening 14 of the pump cylinder and the outlet opening or duct 12 of the reservoir through the ball valve 13. A piston 17 is mounted for reciprocation in the bore 16 and is extended upwardly through an opening in the head 18 of the reservoir to provide a stem 19. An operating handle 20 is secured at its inner end by a link 21 to an upstanding ear portion 22 of the head 18.

The stem 19 of the piston is connected at its upper end to the handle 20 as at 23 at a sufficient distance from the link 20 to provide the necessary leverage. In the operation of the hand pump, fluid from the reservoir 9 is drawn in the duct 12 past the valve 13 during the upward movement of the handle 20 and during the downward movement of the said handle, the same fluid is forced out through the opening 14 into the pipe line 8 and working cylinder 9. It is to be understood, of course, that the relative sizes of the pump piston 17 and the working piston 7*a* are determined by the requirements of each particular case.

It is to be observed that in the use of the press, when compressed air is admitted into the reservoir through the pipe 11 the fluid is forced out through the discharge duct 12 into the pump cylinder. The fluid, of course, passes through the pump cylinder in its passage to the working cylinder of the press. During the admission of the compressed air a portion of the fluid being forced out of the reservoir into the feed line backs up against the piston 17 of the pump to force the same upwardly with a consequent upward movement of the pump handle 20. This upward movement of the pump handle is sudden and in order to avoid the possibility of injury to workmen or anyone standing near the press, I propose to provide means for locking the handle against movement when compressed air is admitted to the fluid reservoir.

The locking mechanism includes a pawl 24 pivoted to the head 18 of the reservoir and having an upwardly and laterally extending operating lever 25. The pawl 24 is adapted to engage teeth or notches 19*a* on the stem 19 to prevent upward movement of the said stem during such engagement. The pawl 24 is actuated by a plunger 26 which is suitably mounted in the head 18 beneath the lever 25 of the locking pawl. For this purpose a threaded plug 27 is secured in an opening 28 formed in the head 18 of the reservoir. A sleeve 29 is carried by the inner end of the plug 27 and provides a cylinder within which a piston 30 fixed to the plunger 26 is adapted to reciprocate. The upper end of the plunger 26 is preferably bifurcated to provide ears 31 between which the lever 25 extends, the lever being retained in this cooperative position with respect to the plunger by a pin 32 which extends over the said lever and connects both the ears 31 of the plunger. In order to normally hold the pawl 24 in an inoperative position a spring 33 is positioned about the plunger 26 between the piston 30 and the bottom wall of the plug 27.

With this construction of safety device it will be apparent that upon the admission of compressed air into the reservoir 9, the piston 30 will immediately be moved upwardly against the action of the spring 33, which movement is utilized to operate the pawl 24, into engagement with a tooth 19*a* of the stem 19 to prevent the same from being raised when the fluid backs up against the piston 17 of the hand pump. Ordinarily, of course, the pump handle will be in a lowered position but even if it is in a position intermediate the limit of upward and downward strokes the locking pawl will be effective as the teeth 19*a* are preferably provided along the stem of the piston 17 to such an extent that the pawl 24 may operatively engage a tooth 19*a* regardless of the position of the handle 20 of the pump. It is to be understood that the spring 33 is just strong enough to render the pawl inoperative when the pressure in the reservoir is released, this being preferred in order to insure the locking the stem 19 before the piston can react to the fluid which is being placed under a pressure.

While the construction of working cylinder 7 of the press and associated parts is not material to the invention, I preferably employ a construction which is the subject of a copending application. In general, the piston 9 which is operated by either the hand pump P or compressed air in the manner described is returned after its operation to its normal position by a spring 34 which is seated in an annular depression 35 in the lower head 36 of the cylinder. The piston 7*a* carries the usual operating plunger 37 which cooperates with the table 38 of the press.

In order to prevent the piston 7*a* from being forced downward to such an extent as to blow out the lower head of the cylinder, a valve is provided in the piston 7*a* which is adapted to release the pressure from behind the piston 7*a* when there is danger of blowing out the lower head should the piston continue further. To this end the upper end of the plunger is provided with a duct 39 controlled by a spring loaded ball check 40 which rests upon the upper end of a stem 41. The stem 41 rests upon a cross pin 42. As the piston 9 approaches the desired limit of its downward movement, the pin 42 will strike a shoulder 43 formed in the head 36 and move upward in its slot relative to the plunger 37, thus raising the ball 40 from its seat. Thereupon the oil will be forced through the duct 39 into the annular chamber 35 and will pass from there through a bypass pipe 44 to the reservoir 9.

The feed pipe 8 is provided with a drain pipe 45 which is normally closed by a hand valve 46. The pipe 11 which supplies compressed air to the reservoir includes preferably a three-way valve 47 of the type shown in Figure 6 and is adapted to provide a vent for the reservoir when the supply is cut off thereby releasing the pressure in the reservoir and enable the locking pawl to return to an inoperative position.

In the use of the press, as stated, compressed air is utilized for light pressing operations. It is also preferred to utilize compressed air in heavier operations to bring the plunger 36 into contact with the work. The hand pump is then used to continue the operation, the use of compressed air initially being preferred because of the greater speed at which the plunger can be brought into engagement with the work. It will thus be obvious that compressed air is utilized in every operation of the press while the hand pump is also used in certain of the operations and is necessary where high pressures are desired.

The safety device is simple in construction and can be readily and inexpensively applied as an attachment to those presses constructed without such a safety lock it only being necessary to provide a new head for the fluid reservoir and to notch the stem of the pump piston.

Having described my invention, I claim:

1. A hydraulic press including a working cylinder, said cylinder having a piston adapted to operate the movable members of the press and being in communication with a fluid reservoir, means for applying pressure to the fluid in said reservoir to operate said piston, an auxiliary hand pump in communication with said reservoir and adapted upon operation to force fluid from the same into the working cylinder of the press, and means operative upon pressure being applied to the fluid in said reservoir to lock the operating handle of said pump against movement.

2. A hydraulic press including a working cylinder, said cylinder having a piston adapted to operate the movable member of the press and being in communication with a fluid reservoir, means for admitting compressed air into said reservoir to force fluid therein into the working cylinder of the press, an auxiliary hand pump in communication with said reservoir and also adapted to force fluid from said reservoir into the working cylinder of the press, and means operative upon admission of compressed air into said reservoir to lock the handle of said pump against movement.

3. A hydraulic press including a working cylinder, said cylinder having a piston adapted to operate the movable member of the press and being in communication with a fluid reservoir, means for admitting compressed air into said reservoir to force fluid therein into the working cylinder of the press, an auxiliary hand pump in communication with said reservoir and also adapted to force fluid from said reservoir into the working cylinder of the press and means operative upon the admission of compressed air into said reservoir to lock the handle of said pump against movement, said locking means being rendered ineffective upon the release of the compressed air from the reservoir.

4. A hydraulic press including a working cylinder, said cylinder having a piston adapted to operate the movable member of the press and being in communication with a fluid reservoir, means for applying pressure to the fluid in said reservoir to operate said piston, an auxiliary hand pump in communication with said reservoir and also adapted to force fluid from said reservoir into the working cylinder of the press, the stem of said pump being provided with a stop, and a pawl pivoted on the head of said reservoir toward and away from the stop, and means operative upon pressure being applied to the fluid in said reservoir to pivot said pawl into engagement with said stop and thereby lock said pump handle against movement.

5. A hydraulic press including a working cylinder, said cylinder having a piston adapted to operate the movable member of the press and being in communication with a fluid reservoir, means for applying pressure to the fluid in said reservoir to operate said piston, an auxiliary hand pump in communication with said reservoir and also adapted to force fluid from said reservoir into the working cylinder of the press, the stem of said pump being provided with a series of notches and a pawl pivotally mounted on the head of said reservoir for movement toward and away from the notches in said stem and means operative upon the admission of compressed air into said reservoir to pivot said pawl into engagement with a notch in said stem and thereby prevent movement of the operating handle of said pump, said means including a plunger connected to said pawl and operable by pressure within the fluid reservoir.

In testimony whereof I affix my signature.

FRANK C. WILSON.