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TOOL PRESS AND OPERATING MEANS THEREFOR

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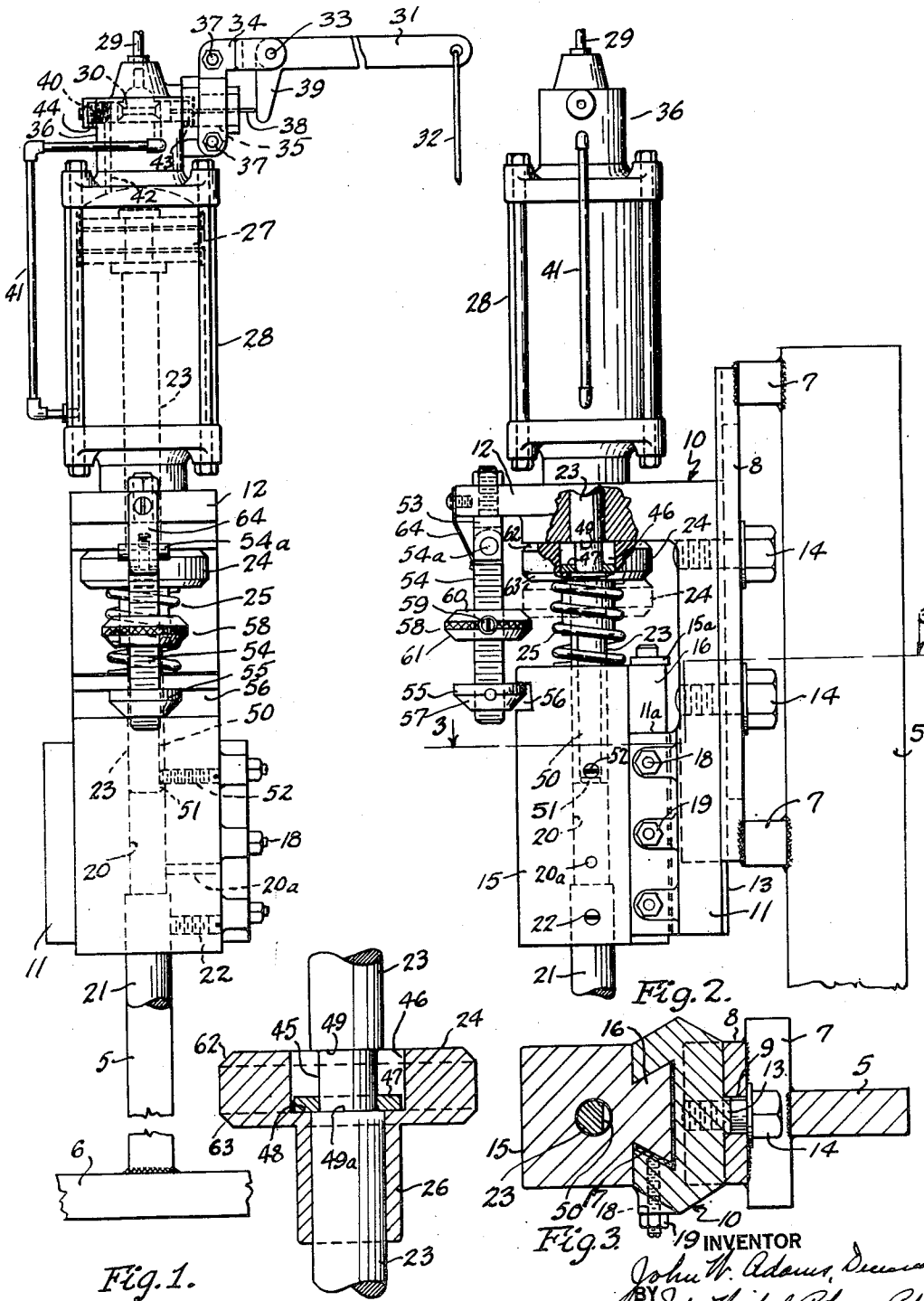


Fig. 1.

Fig. 4.

Fig. 3.

Fig. 2.

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TOOL PRESS AND OPERATING MEANS
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This invention relates to an air press, particularly to a press to take the place of a foot press to perform operations usually performed by such or a similar type press, and has for an object to provide a press of this type which will perform the operations of this and similar type presses with a minimum of effort on the part of the operator.

Another object is to provide a press of this type in which, for any given setting of the press, the force applied to operate the tool is uniform regardless of the pressure applied to the controlling foot treadle.

Another object is to provide an air press of this type in which the force of the fluid operated piston is first stored in a relatively heavy spring while the tool operating plunger is held stationary and then it is released to permit the energy stored in the spring to operate the plunger with a hammer blow effect.

With the foregoing and other objects in view, the construction illustrated in the accompanying drawing forming a part of this specification has been devised. It is, however, to be understood the invention is not limited to the specific details of construction and arrangement shown, but may embody various changes and modifications within the scope of the invention.

In this drawing:

Fig. 1 is a front elevation of the improved press;

Fig. 2 is a partial side elevation and partial section of the operating mechanism thereof;

Fig. 3 is a transverse section substantially on the line 3—3 of Fig. 2, and

Fig. 4 is a detail section of the compressing collar.

This invention relates to a press designed primarily for relatively light work, such as that performed by the well-known foot press, although it is not limited to this, but can be made in various sizes and for heavier work if desired. The operations are such as operating a punch, die or other tool, and in the usual form of foot press the tool is operated by pressure of the foot on a relatively long depending lever. It will be evident that after operation of such a device for some time the operator becomes fatigued and slows down in his work, and also as a consequence there may be considerable variation in the operating pressure applied to the tool. These objections are obviated in the present device.

The structure shown comprises a frame including an upright member 5 secured to a bed or base 6 mounted on any suitable support such as a bench (not shown). The bed 6 may be of any length and width to provide the desired support

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and also to provide a support for the work being operated upon. It may be a relatively heavy block or plate, and the upright member 5 may be a rectangular bar, as shown, of suitable size welded to the base. Secured to the front of the upright bar 5 by any suitable means such as welding are a pair of vertically spaced crossed blocks 7, and welded to the front of these blocks is an upright supporting strip or bar 8 provided with a vertical slot 9. Mounted on the front of this bar 8 is a bracket 10 including an upright body portion 11 and a horizontal supporting arm 12 at its upper end. The upright portion 11 seats against the face of the bar 8 and has a vertical rib 13 guided in the groove 9 permitting vertical adjustment of the bracket 10, and it may be clamped in any adjusted position by any suitable means, such as the clamping screws 14.

Guided for vertical reciprocating movements in the bracket 10 is a plunger 15, this plunger preferably being provided with a tapered or dove-tailed rib 16 on its rear wall, guided in a similarly shaped guide groove in the bracket 10. There may be an adjustable shim or bearing strip 17 on one side to take up wear and provide for proper fit of the rib in the guideway, the shim being adjustable by adjusting screws 18 secured in adjusted position by lock nuts 19. The plunger 15 is provided with a longitudinal passage 20 in the lower end of which may be mounted the shank 21 of any suitable tool to be operated, such, for example, as a punch, and it may be secured by any suitable means, such as a set screw 22. In the upper part of passage 20 is the lower end portion of a piston rod 23 and slidable on this rod is a compressing collar or block 24. Embracing the rod 23 is a relatively heavy coil spring 25 between the collar or block 24 and the plunger 15, and the collar 24 may be provided with a depending skirt 26 forming a guide for the spring.

Mounted on the arm 12 is an operating piston 27 in a cylinder 28 operated by suitable fluid pressure, such as compressed air. The piston is a double-acting piston and is operated by air from any suitable source through the supply pipe 29, and is controlled by any suitable valve 30 operated by a suitable control lever 31 by means of a depending chain or wire 32 to any suitable foot pedal or hand lever (not shown). The lever is pivoted at 33 to a supporting bracket 34 which may be a split bracket clamped to an extension 35 on the cylinder head 36 by any suitable means, such as the bolts 37. The valve 30 is of standard construction and is mounted in the cylinder head and has an extending pin 38 engaged and oper-

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ated by a depending lug 39 on the lever 31. The valve is normally held in the inactive position shown by a suitable spring 40. When in the position shown, air pressure passes through the pipe 41 to the under side of the piston 27 and holds it in its upper position. When the lever 31 is depressed the valve is shifted to the left, permitting air to flow through the duct 42 to the upper side of the piston to thus force it downwardly. This movement cuts off communication of the air supply to the pipe 41 and connects it to an air outlet 43 to permit the air under the piston to escape. When pressure on the lever 31 is released the valve is returned by the spring 40 to the position shown, supplying air pressure to the under side of the piston to force it upwardly and connecting the space above the piston to the outlet 44 to let this air escape.

The piston 27 is mounted on the piston rod 23 on which the compressing collar or block 24 slides. This is preferably a lost motion connection so that the piston is permitted some movement before operating the compressing collar and thus the initial action of the piston on the collar is a hammer-like blow. This not only permits a quicker start to the piston and operating rod 23 as they start when not under load, but the hammer-like blow together with the momentum of the piston and rod due to their speed or movement built up when not under load produces greater force for compression of the spring and therefore permits the use of a smaller power device. In the present construction the collar 24 is provided with a recess 46 leading from its upper side in which is a ring or flange 47 which is of less height than the length of the recess 46 so that it has limited movement therein. This ring is slidable on a reduced portion 45 of the piston rod, so that it is between two spaced shoulders 49 and 49a on the rod. It engages a shoulder 48 at the bottom of the recess 46 to force the collar 24 downwardly on downward movement of the piston which presses shoulder 49 against the ring 47. The rod 23 on which the collar 24 is mounted has lost motion connection with the plunger 15 so that the rod 23 may move downwardly a determined amount independently of the plunger. In the present construction one side of the rod 23 is flattened, as indicated at 50, this flat terminating a short distance above the lower end of the rod 23 to form a lug or shoulder 51 and above this lug or shoulder is a lifting screw 52 which will limit upward movement of the rod 23 with respect to the plunger, and continued upward movement of the rod will then lift the plunger. There is preferably a vent opening 20a from the passage 20 below the rod 23.

Mounted on the arm 12 is a trip means for controlling the operation of the plunger 15. This comprises a depending support 53 in which is pivotally mounted a threaded screw 54, it being pivoted to the support 53 at 54a. Mounted at the lower end portion of this screw is a tripping dog 55 normally seating in a recess 56 in the upper portion of the plunger 15, and the dog has a tapered lower cam surface 57 so that as the plunger moves upwardly it may shift this dog outwardly so that the dog will not interfere with the upward movement of the plunger. Adjustably mounted on the screw 54 is a dog adjusting nut 58 which may be adjusted longitudinally on the screw and secured in any position by any suitable means, such as a set screw 59. This nut has inclined cam surfaces 60 and

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61 on its upper and lower sides respectively, and the compressing collar 24 has similar inclined cam surfaces 62 and 63. A flat spring 64 mounted on the arm 12 engages the trip screw 54 and tends to swing it backwardly or to the right as shown in Fig. 2 so as to retain the tripping dog 55 in the recess 56.

The operation is as follows:

In normal position preparatory for the operation of the tool, the parts are shown in the position of Figs. 1 and 2, with the piston 27 held in its upper position by the air pressure, and the plunger 15 held in its upper position by the tripping dog 55 seating in the recess 56. In this position the compressing collar 24 is also in its upper position, the arm 12 acting as a stop to limit its upward movement. Depression of the lever 31 by the foot treadle will shift the air valve 30, supplying air to the upper side of the piston 27, which will force the piston downwardly, together with the piston rod 23. When the piston 27 is in this upper position the shoulder 49 on the piston rod 23 is spaced above the ring or flange 47, and therefore the piston 27 will have a certain amount of movement before it will have any effect on the collar 24, and it will therefore develop a sort of hammer blow against this collar. As stated above, this not only permits a quicker start to the piston and operating rod 23 as they start when not under load, but the hammer-like blow together with the momentum of the piston and rod due to their speed or movement built up when not under load produces greater force for compression of the spring and therefore permits the use of a smaller power device. When shoulder 49 hits the ring 47 in the recess 46 in this collar it will force the collar downwardly, loading the spring 25 by compressing it, and after it has moved enough to compress and load the spring the inclined surface 63 on the collar 24 engaging the inclined surface 60 on the nut 58 will force the tripping dog 55 outwardly, or to the left as viewed in Fig. 2, but removing this tripping dog from the notch 56 and releasing the plunger 15, which will then be forced downwardly with a hammer blow under action of the loaded or compressed spring 25 for the working operation of the tool carried by the plunger. Downward movement of the plunger may be limited by a stop 15a engaging the top wall 11a of bracket 11, so that should the plunger be operated with no tool in it, the force will not be on lug 51 and screw 52 to shear them off. As the pressure is released from the foot treadle, the air valve 30 is returned to its normal position, releasing the air pressure above the piston 27 and supplying air to the cylinder below this piston. The piston is then shifted upwardly, carrying with it the piston rod 23 and through the action of the lug 51 on the screw 52 will lift the plunger 15, spring 25 and collar 24 to the upper or original position preparatory to the next operation, at which time the dog 55 is seated in the notch 56 by action of the spring 64. As the collar 24 moves upwardly its upper inclined surface 62, by camming action on the surface 61 of the adjusting nut, will force it outwardly and permit the collar 24 to move upwardly past this nut. Similarly, the upper end of the plunger 15 will engage the inclined surface 57 on the dog 55 to force it outwardly to permit the upper end of the plunger to move past this dog.

The amount of compression of the operating spring 25 and therefore the load placed on this

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spring before tripping of the dog 55 can be varied and adjusted by adjustment of the nut 58, and it will be seen that for any given adjustment of this nut the same force is always applied to the punch or other tool regardless of the pressure applied to the foot treadle. Therefore there will be no variation in the pressure applied to the tool by variation of foot pressure applied to the foot treadle due to fatigue of the operator. Also, the pressure for any given tool may be readily and easily adjusted for best operation of that particular tool.

Having thus set forth the nature of the invention, what is claimed is:

1. A tool operating press of the character described comprising a stationary frame, a guide means carried by the frame, a reciprocable plunger mounted in said guide means adapted to operate a tool to press it against work to be operated upon, an operating means mounted on the frame, a compressing member connected with the plunger by means permitting limited relative movement between them, a connection from the operating means to the compressing member, a spring between said member and the plunger adapted after loading to operate the plunger to operate the tool to press it against the work, a trip means mounted on the frame and engaging the plunger to normally hold the plunger in retracted position, and means operated by the operating means for releasing the trip means after operation of the compressing member to load the spring.

2. A tool operating press of the character described comprising a stationary frame, a guide means carried by the frame, a reciprocable plunger mounted in said guide means adapted to operate a tool to press it against a work piece, an operating means mounted on the frame, a compressing member connected with the plunger by means permitting limited relative movement between them, a connection from the operating means to the compressing member, a coil spring between said member and the plunger adapted after compression to operate the plunger to operate the tool to press it against the work, a trip means mounted on the frame and engaging the plunger to normally hold the plunger in retracted position including an adjustable member in the path of movement of the compressing member and shiftable by movement of the compressing member to release the trip means after operation of this member to compress the spring.

3. A tool operating press of the character described comprising a stationary frame, an upright guide carried by said frame, a reciprocable plunger mounted in said guide adapted to operate a tool to press it against a work piece, a rod having lost motion connection with the plunger, a compression collar on said rod, a coil spring embracing the rod between the collar and the plunger, an operating means connected with said rod and adapted to operate the collar to compress the spring, a trip means normally holding the plunger in elevated position, and cooperating means on the trip means and the collar to release the trip means by movement of the collar after compression of the spring.

4. A tool operating press of the character described comprising a frame, an upright reciprocable plunger mounted in said frame adapted to carry a tool to press it against a work piece, a compressing collar mounted above the plunger and connected therewith by a lost motion connection, a coil spring between the collar and the

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plunger adapted to operate the plunger after compression by said collar to press the tool against the work, an operating means mounted above the collar and connected therewith by said lost motion connection including an abutment on the collar and an abutment operated by the operating means normally spaced above the first abutment to engage it on operation of said means, a trip holding the plunger normally in raised position, and means operated by movement of said collar after compressing the spring to release said trip.

5. A tool operating press of the character described comprising a reciprocable plunger adapted to operate a tool to press it against a work piece, a compressing member having lost motion connection with the plunger, a coil spring between said member and the plunger and adapted to operate the plunger to press the tool against the work, an operating means, an operating rod connected to said means having lost motion connection with said compressing member to operate it to compress the spring including a shoulder on the rod normally spaced above an aligned shoulder on said member, a trip normally holding the plunger in retracted position, and means operated by movement of said member to release the trip after a given movement of this member to compress the spring.

6. A tool operating press of the character described comprising a frame, a plunger guided for vertical movement adapted to carry a tool to press it against a work piece, a compressing collar above the plunger connected therewith by a lost motion connection, a coil spring between the collar and the plunger adapted to operate the plunger after compression by the collar to press the tool against the work, an operating means above the collar, an operating rod connected with said means connected to the collar by a lost motion connection including normally spaced aligned abutments on the rod and collar, a trip normally holding the plunger in elevated position and including a threaded member, an adjustable nut on said threaded member normally spaced from the collar, and cooperating camming surfaces on said nut and the collar adapted to release the trip after a given movement of the collar to compress the spring.

7. A tool operating press of the character described comprising a frame, a bracket mounted for vertical adjustment in said frame and provided with an upright guide, a plunger mounted for vertical reciprocating movement in said guide, means for mounting a tool on said plunger to press it against a work piece, a compressing collar above the plunger mounted on a rod having lost motion connection with the plunger, a coil spring embracing said rod between the collar and the plunger and adapted to operate the plunger after compression by said collar to press the tool against the work, said bracket including a supporting arm above the collar, an operating means mounted on said arm and connected with the collar, a depending trip member mounted on said arm normally holding the plunger in elevated position, and an adjustable nut mounted on said trip member adapted to cooperate with said collar to release the trip by movement of the collar after it has had a given movement to compress the

spring.

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Administratrix of the Estate of John W. Adams,
Deceased.

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