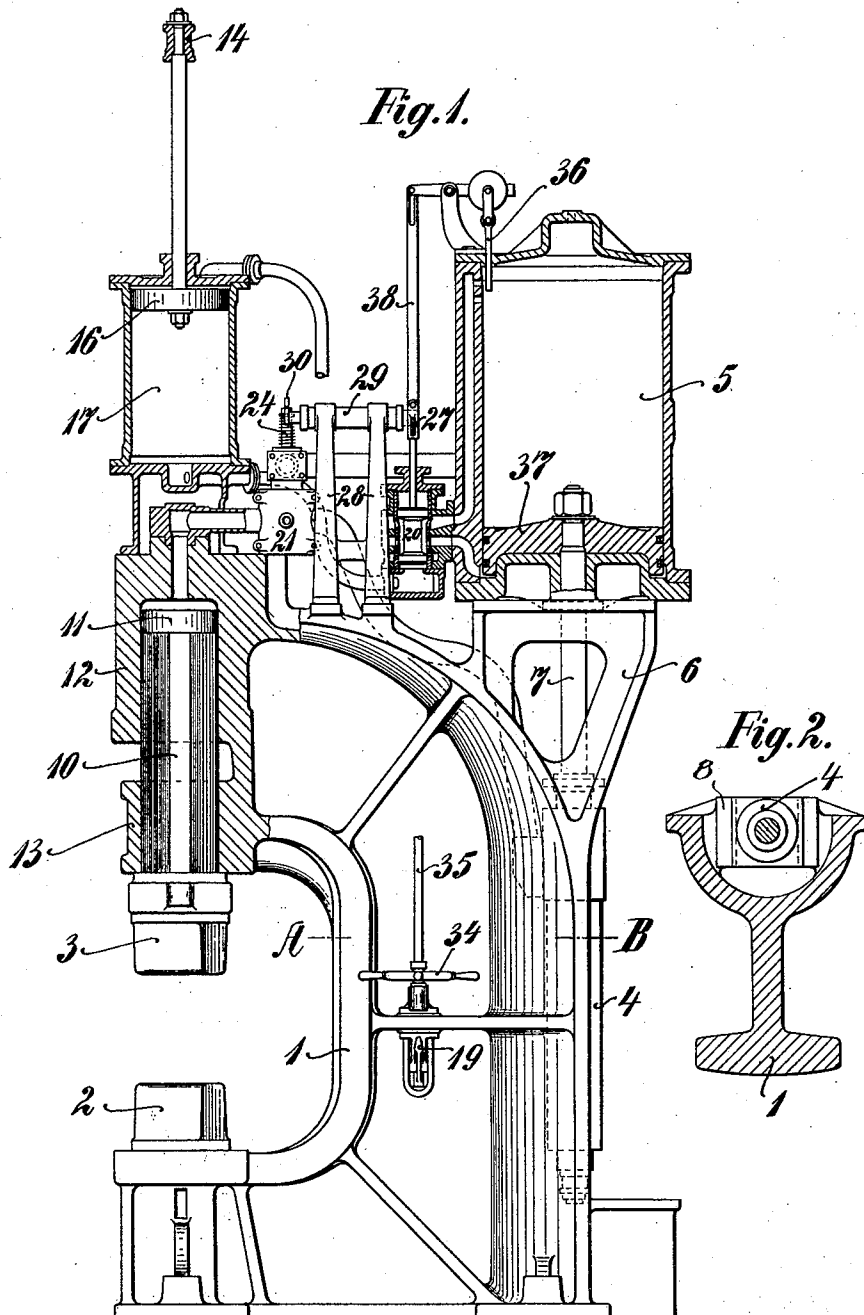


M. ROTHE.
HYDRAULIC PRESS.
APPLICATION FILED AUG. 27, 1908.

1,024,024.

Patented Apr. 23, 1912.

4 SHEETS—SHEET 1.



Witnesses:
L. C. Parkley.
L. A. Sands.

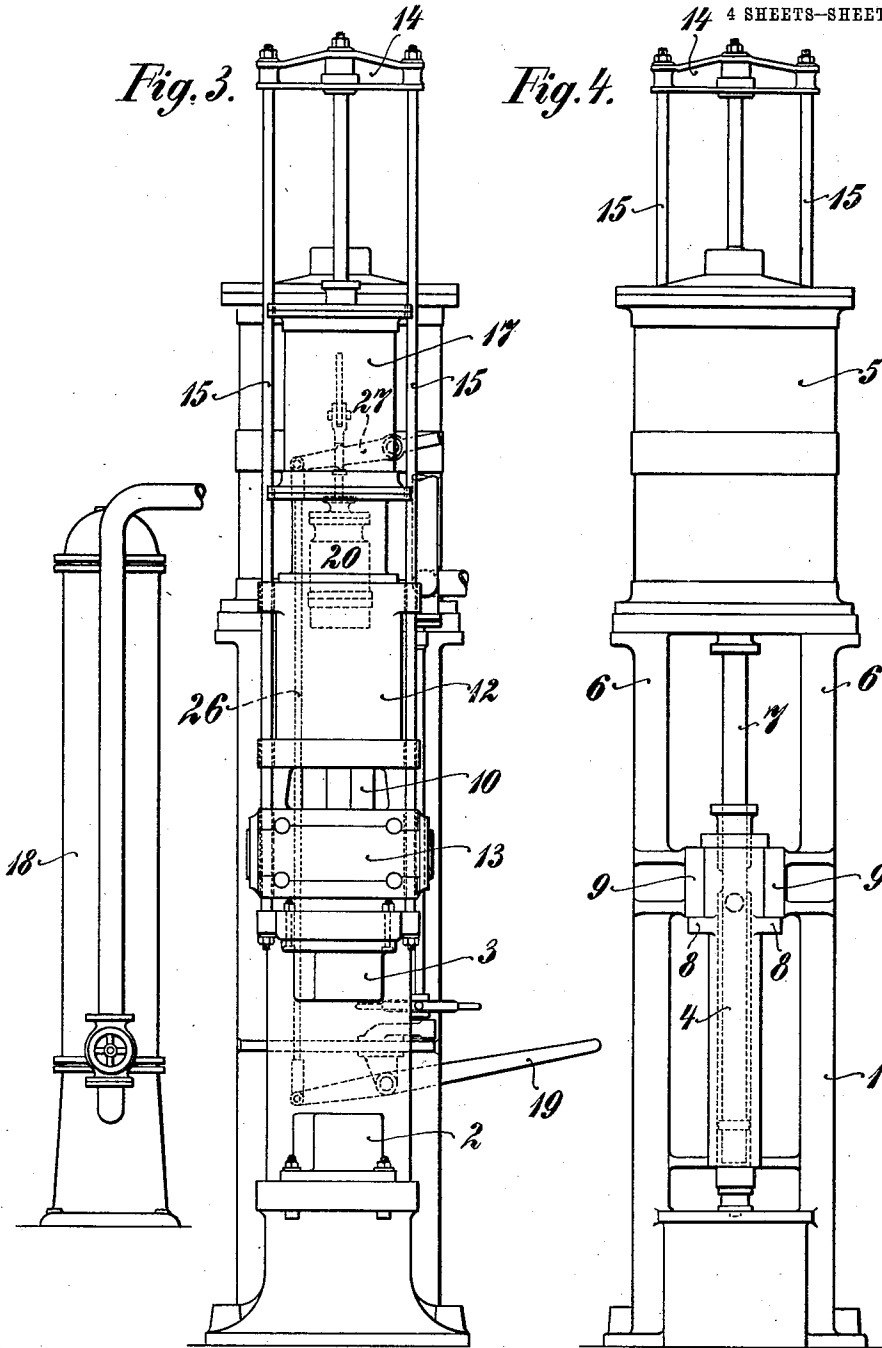
Inventor
per Moritz Rothe
James S. Appelman
Attorney.

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4 SHEETS—SHEET 2.



Witnesses:
L. C. Barkley.
L. A. Sands.

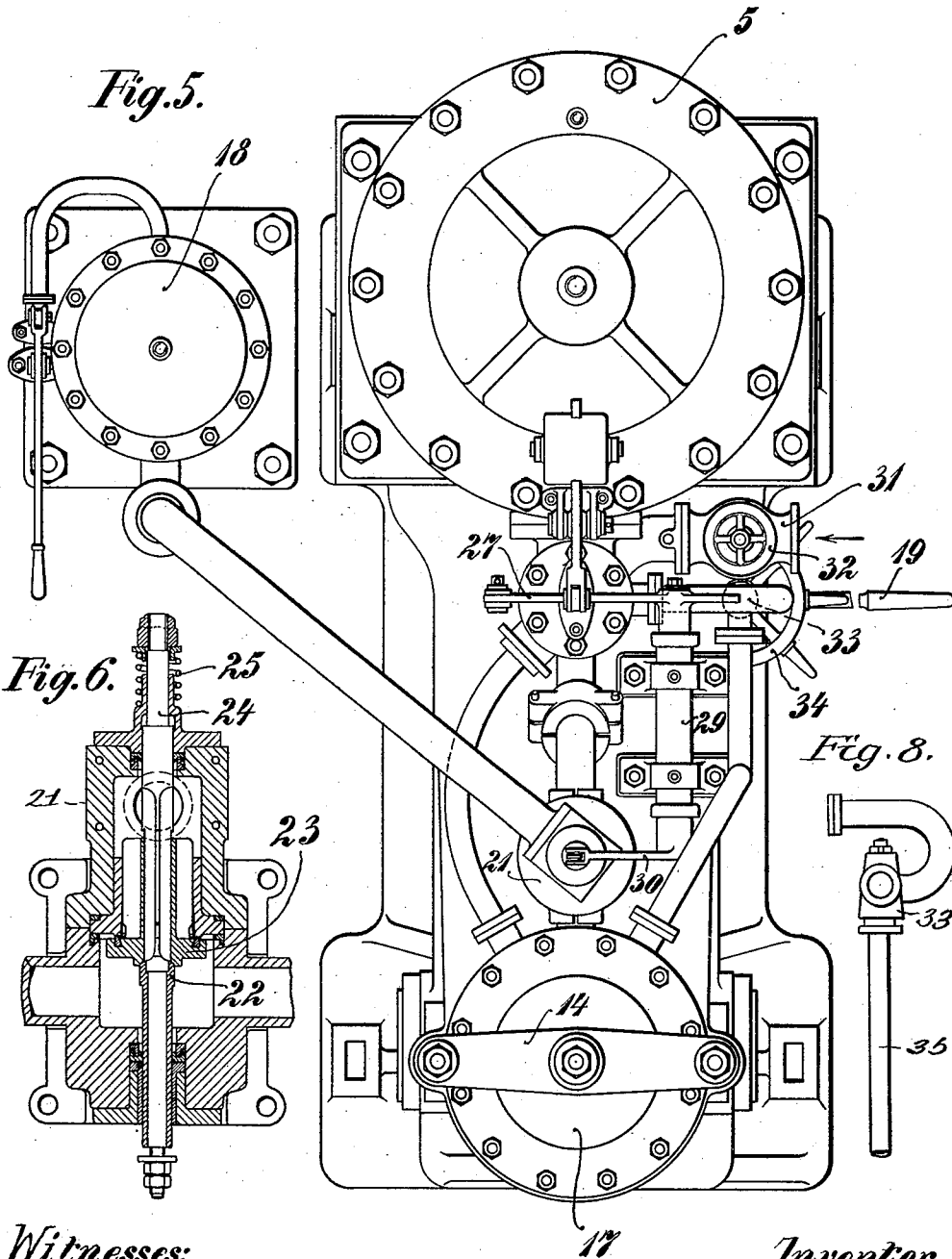
Inventor
Mauritz Rothe,
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4 SHEETS-SHEET 3.



Witnesses:
L. C. Barkley.
L. A. Sands.

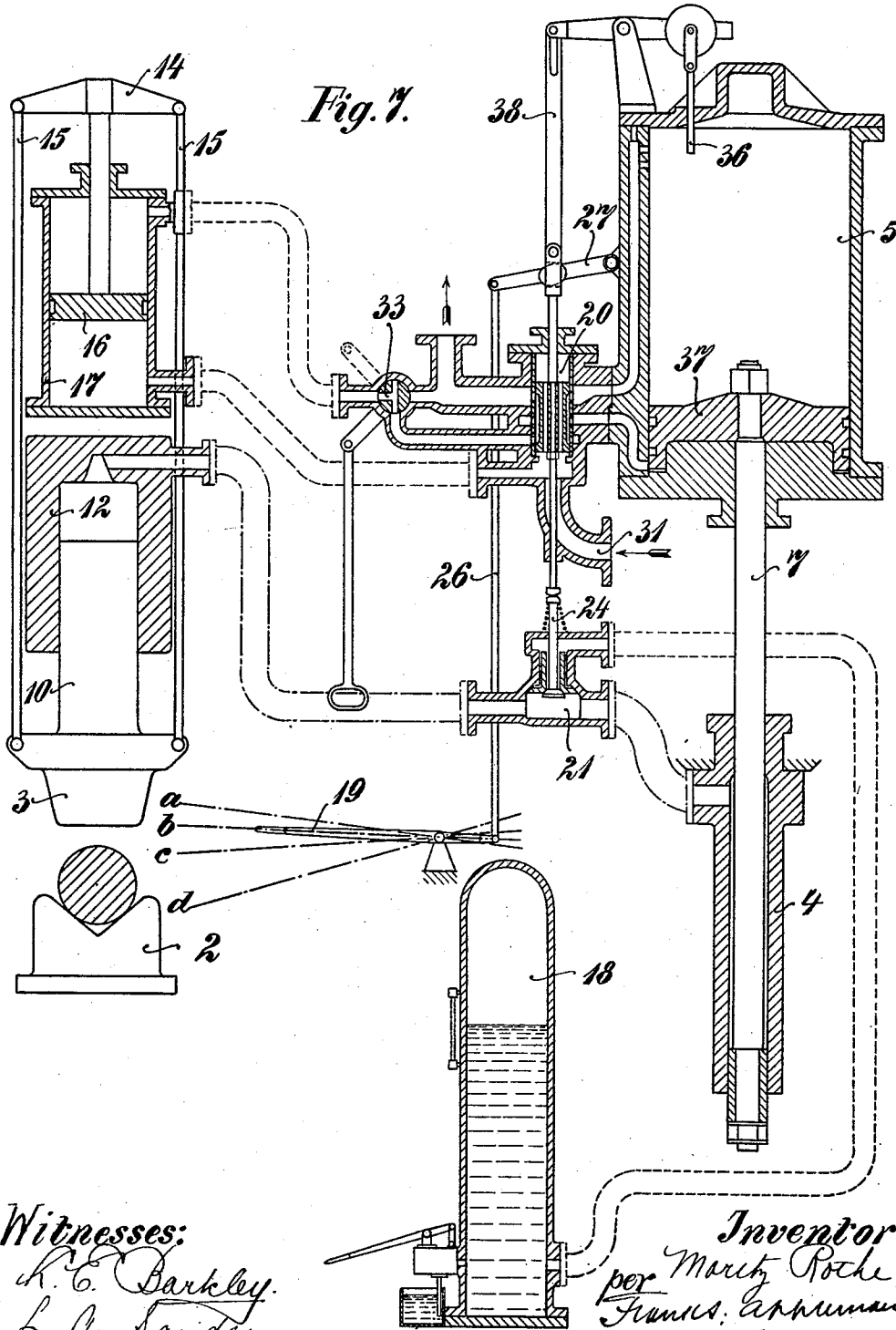
Inventor
M. Rothe
per Frank A. Appelman
Attorney.

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4 SHEETS—SHEET 4.



UNITED STATES PATENT OFFICE.

MORITZ ROTHE, OF DEUTZ, NEAR COLOGNE, GERMANY.

HYDRAULIC PRESS.

1,024,024.

Specification of Letters Patent.

Patented Apr. 23, 1912.

Application filed August 27, 1908. Serial No. 450,478.

To all whom it may concern:

Be it known that I, MORITZ ROTHE, a subject of the King of Prussia, German Emperor, residing at Deutz, near Cologne, in the Province of the Rhine, Kingdom of Prussia, German Empire, have invented a certain new and useful Hydraulic Press, of which the following is a specification.

This invention relates to a press operated in known manner by steam and hydraulic pressure, and it has for its purpose to obtain a more compact and convenient structure for such press.

More particularly the invention purports to provide a frame of the steam hammer type upon which the parts of the intensifier can be mounted in close proximity to the press but without adding deleterious strains thereto.

To this end the invention includes the formation of the frame to receive the steam cylinder and hydraulic cylinder of the intensifier joined by a piston rod working in tension. Further for convenience of operation the controlling valves are arranged upon the frame between the intensifier and the press in such manner that the length of the connecting pipes is reduced as far as possible.

The invention also includes means adapting the press particularly to the purpose of planishing. To this end a connection is provided by which the upper side of the drawback cylinder may be permanently connected with exhaust.

These various features of the invention will be found more fully described in the following description and more particularly pointed out in the subsequent claims.

The invention is illustrated in the accompanying drawings wherein—

Figure 1 shows the press in side elevation partly in section. Fig. 2 shows a section through the frame taken on the line A—B of Fig. 1 looked at from below. Fig. 3 shows a front elevation with the low pressure reservoir arranged at the side. Fig. 4 shows a rear elevation. Fig. 5 a plan view to a larger scale. Fig. 6 shows the filling valve in section to an enlarged scale, and Fig. 7 is a diagram illustrating the press, for use in describing its method of action. Fig. 8 is a detail of the piping in Fig. 5.

The essential features of the invention are best seen in Figs. 1 to 4. The frame 1

of the press is formed substantially in the manner usual for steam hammers and is provided with an anvil or table 2 and a pressure head 3. The back part of the frame, as well seen in Fig. 2, is made very broad and is forked in section in order to provide space for the introduction of the hydraulic cylinder 4 of the intensifier. The steam cylinder 5 of the intensifier is supported on brackets 6 cast on the frame at the bend and permitting the piston rod 7 to pass down between them. As this rod is only to work in tension during the application of pressure, it is possible to employ an extremely light method of fastening for the hydraulic cylinder of the intensifier which as seen in Fig. 4, engages by lateral projections 8 under a yoke piece 9 in the forked part of the frame. The pressure head 3 is arranged in well known manner on the lower end of a powerful piston rod 10, the piston 11 of which works in the pressure cylinder 12. In order to prevent any possibility of turning of the pressure head, the rod 10 is preferably formed of an angular section as is indicated in the drawings, and passes through a correspondingly shaped guide 13 beneath the pressure cylinder 12. In spite of this special formation of the piston rod, the pressure piston is, however, formed circular in the usual way and is packed by leather sleeves or the like against the wall of the cylinder. The moving of the pressure head toward and from the work piece is effected by means of the rods 15 extending downward one at each side of the cylinder and connected above by a cross piece 14 which is attached to the rod of the piston 16 working in the steam cylinder 17 of the drawback. The low pressure reservoir 18 is arranged as a separate piece of apparatus near the press and is connected by a suitable pipe with the filling valve. All the necessary controlling devices for the regulation of the steam and water portions of the apparatus are arranged in a particularly convenient and easily accessible manner above the frame between the two steam cylinders 5 and 17. The control of all the regulating apparatus is effected by means of a single hand lever 19 worked from the base of the machine. The flow of steam is controlled by means of a balanced slide valve 20 arranged in a cylindrical casing and adapted to move longitudinally therein while the flow of

water is controlled by the valve 21 shown in Fig. 6 on an enlarged scale. This latter valve consists essentially of two concentric valve parts 22 and 23 which open inward. These valves open automatically when the external pressure in the pipe from the filling container exceeds the internal pressure; but in order to make it possible to open the valves from outside when required, as during the raising of the pressure head, the inner valve part 22 is connected with a rod 24 which can be pressed down against the action of a spring 25. This is done in the example shown by the lever 19 through convenient connecting members. The movement of the lever 19 is transmitted through the rod 26 and pivoted lever 27 to the steam controlling slide valve 20. The lever 27 is mounted to turn with a shaft 29 supported in the bearing blocks 28, this shaft having at its other end a pressure arm 30 engaging over the valve spindle 24 for depressing this latter. The rod 24 has projections extending over the guide sleeve of the outer valve 23, but not in contact therewith in the uppermost position of the rod. Consequently as the rod is depressed the inner valve first opens and when the lost motion is taken up the outer valve opens also so that the passage available is quickly enlarged. By opening the inner valve alone a slow motion of the pressure head is obtained. From the steam controlling apparatus the steam is carried through pipes to both sides of the piston in the cylinder 5. The steam flows into the valve through the passage 31 which can be closed by the cock 32. In the steam passage leading to the top of the draw back cylinder, a special three-way cock 33 is arranged (Fig. 8) which makes it possible to directly connect the space above the piston with the exhaust pipe; it is seldom required to make this connection, but when necessary it is done by turning a hand wheel 34 connected to a rod 35 operated from the base of the machine. It will be convenient here to describe a device which serves for the automatic return of the steam controlling slide valve after the completion of the stroke of the steam intensifier. As seen in Figs. 1 and 7, a rod 36 loaded by means of a weight at the top, projects through the cover of the steam cylinder and this rod engages with a two-armed lever so that when it is struck upward by the piston 37 it will press downward the rod 38 connected to the outer arm of the lever. The rod 38 operates directly on the lever arm 27 to move downward the slide valve 20. Pipes extend from the filling valve 21 to the working cylinder 12 of the pressure head, to the hydraulic cylinder 4 and to the low pressure reservoir 18.

The method of working and controlling

the press can now be described most conveniently by reference to the diagram of Fig. 7. In this diagram all the parts are indicated by the same letters as in the previous figures, but to make the explanation simpler various parts are shown quite diagrammatically or in different positions from those which they occupy in practice. The filling valve 21 is shown arranged beneath the slide valve 20 and the rod of this valve is extended downward so as to operate directly upon the rod 24 of the filling valve. As already stated in the specification all the necessary movements of the press in ordinary working are controlled by the hand lever 19. This can occupy four distinct main positions. In the position shown in the diagram Fig. 7 and indicated by the letter *b*, no movement is taking place in the press. This is therefore the stationary position. The slide valve then stands so that no steam can pass to the steam intensifier or to the upper side of the draw-back piston 16. The underside of this latter piston is, however, under steam pressure but in this position of the parts no motion can take place because the filling valve is closed and the flow of water out from the pressure cylinder 12 is thus prevented. In order to cause the pressure head 3 to be raised, the lever 19 is brought to the position *a*. In this position nothing is altered from the previous one except that the rod 24 is pressed downward in the filling valve so that the water can pass back out of the pressure cylinder 12 into the low pressure reservoir 18. Consequently the steam pressure under the piston 16 causes this to rise so lifting the pressure head 3. In this position of the press the work piece can be placed ready for the next pressure. When now it is desired to force down the pressure head 3 on to the work piece, the lever 19 is pressed downward into the position *c* causing the slide valve to be raised so that steam can pass to the top of the piston 16. The slide valve is lifted so far that the under edge of the inflow opening leading to the upper side of the piston 16 is left quite free. The pressure head 3 then falls under its own weight and the steam pressure until it comes upon the work piece. At the same time the pressure cylinder 12 becomes filled with water from the container 18, this water being under a pressure of about three atmospheres and assisting the downward movement. It is only after this that the actual working pressure is applied when the hand lever 19 is moved into its lowest position *d*. By this means the slide valve 20 is so raised that its lower edge leaves open the passage leading to the lower side of the actuating piston 37 of the intensifier so that the water contained in the cylinder 4 of the intensifier is forced into the pressure cylinder 12. Very high pressure can thus be obtained de-

pending of course upon the dimensions chosen for the cross section of the pressure piston. The working pressure is maintained until the steam piston 37 of the intensifier has reached its highest position in the cylinder 5. Shortly before the piston 37 reaches its uppermost position it strikes upon the rod 36 which protrudes into the cylinder and through the medium of the two-armed lever and the rod 38 it moves the steam valve 20 down until the under side of piston 37 is connected to exhaust or to position C. The whole machine then remains stationary until the hand lever 19 which has already been lifted a little through the downward movement of the steam valve is raised farther into the middle position *b*. In this position the steam valve 20 connects the upper side of the draw-back piston 16 to exhaust so that the steam pressure which is continually applied to the underside of piston 16 can again take effect. So long however, as lever 19 is in the position *b* and thus the filling valve 22 is closed, the water cannot return from cylinder 12 to the reservoir. For the time being, therefore, there is only a small upward movement of the pressure head due to water returning into cylinder 4 and depressing piston 37. To raise the pressure head 3 farther the process above described must be repeated, *i. e.* lever 19 must be brought into the position *a* in which the filling valve is opened and the water can return from cylinder 12 to the low pressure reservoir 18. If it is desired as for instance in forming holes or in stamping or bending to give several strokes of the pressure head one after the other, care must be taken that the pressure piston does not move back between the several compressions. This is easily attained if lever 19 is not lifted above the position *b* but is operated between positions *b* and *d*. If the lever is now pressed down the steam obtains access to the top of piston 16 and moves the pressure piston 10 down until it rests upon the work piece. During this movement the cylinder 12 is filled from the reservoir 18 through the opening of the filling valve. When the pressure head reaches the work piece lever 19 is pressed right down whereupon the working pressure is applied through lifting of the piston 37. If therefore lever 19 is kept between the limits *b* and *d* any desired number of successive strokes can be given. If it is desired to give compression in which the pressure head always comes to rest at exactly the same level, as for example in the planishing of the work piece, in which a compression of a very few millimeters is sufficient, care is to be taken that the steam space above the draw-back piston 16 is always in connection with the outflow passage. This is easily effected by the use of the three-way cock 33 between the slide

valve and the upper side of the piston. If this cock is brought into the position shown in dotted lines in Fig. 7 the required connection is made between the upper side of the piston and the outlet passage. The hand lever is only moved between its middle position *b* and its lower position *d* in carrying out such work. The filling valve remains closed and the pressure piston when rising always comes to rest at the same distance above the work piece. The movement of the pressure head is determined by the mass of water forced to and fro by the intensifier while the upward movement is effected by the continuous pressure of steam under the piston 16 when the resistance to upward movement is removed.

What I claim is:

1. In a hydraulic press having a steam intensifier, the combination of a frame of steam-hammer type supporting the pressure cylinder and an anvil, a flange of U-shaped cross section at the back of said frame, brackets on the shoulder of said frame, a steam cylinder for the intensifier mounted upon the brackets and a hydraulic cylinder for the intensifier mounted in the U-shaped flange.

2. In a hydraulic press having a steam intensifier, the combination of a frame of steam-hammer type supporting the pressure cylinder and an anvil, a U-shaped flange at the back of said frame, brackets on the shoulder of said frame, a cross-piece upon the U-shaped flange, a steam cylinder for the intensifier mounted on the brackets, a hydraulic cylinder for the intensifier mounted in the U-shaped flange beneath the steam cylinder, lugs upon said hydraulic cylinder engaging below the cross-piece and means for supplying steam to the lower end of the steam cylinder.

3. In a hydraulic press having a steam intensifier, the combination with the frame, pressure head, and steam and hydraulic cylinders and pistons of the intensifier of a steam controlling valve and a water controlling valve both arranged in proximity one to the other on the top of the frame and between the intensifier and the press whereby the connecting pipes between the parts are kept as short as possible.

4. In a hydraulic press having a steam intensifier, the combination with the frame, pressure head and steam and hydraulic cylinders and pistons of the intensifier of a steam controlling valve and a water controlling valve arranged adjacent to one another on the frame, a rocking shaft and levers thereon adapted to operate both valves, a hand lever near the base of the frame and connecting members between said hand lever and the rocking shaft.

5. In a hydraulic press having a steam intensifier, the combination with the pressure

cylinder, the draw-back cylinder, the steam and hydraulic cylinders of the intensifier and the pistons thereof, of a steam slide valve, connections therefrom to the upper and lower parts of draw-back cylinder, a three-way cock in the connection to the upper part, and a pipe from said cock to exhaust, whereby the upper part of the draw-back cylinder may be directly connected to exhaust, to limit the lift of the pressure head for planishing.

6. In a hydraulic press having a steam intensifier, the combination of a frame of steam-hammer type supporting the pressure cylinder and an anvil and hollowed at the back, transverse supports across said hollowed back, a steam cylinder mounted above said supports, a hydraulic cylinder mounted in said supports within the hollow, pistons in said steam and hydraulic cylinders, a piston rod joining said pistons and means for admitting steam to the lower side of the steam cylinder, said rod being constructed and arranged to perform the working stroke under tension.

7. In a hydraulic press the combination of an anvil, a pressure head, a pressure cylinder, a drawback cylinder, a piston in said cylinder connected to the pressure head, means for admitting steam above or below said piston and means for connecting the

upper side of said piston permanently to exhaust.

8. In a hydraulic press having a steam intensifier, the combination with a frame of steam-hammer form supporting the pressure head and an anvil, brackets on the shoulder of said frame, a steam cylinder for the intensifier mounted on said brackets, a hydraulic cylinder for the intensifier mounted below said brackets and a steam controlling valve and a water controlling valve arranged upon the frame between the steam cylinder of the intensifier and the press.

9. In a hydraulic press having a steam intensifier, the combination with a frame of steam-hammer form supporting the pressure cylinder and an anvil, of a drawback cylinder arranged above said pressure cylinder, brackets on the shoulder of said frame, a steam cylinder for the intensifier on said brackets and valves controlling the steam and water supply arranged between said intensifier cylinder and drawback cylinder.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MORITZ ROTHE.

Witnesses:

M. KÜPPERS,
H. STELZER.