

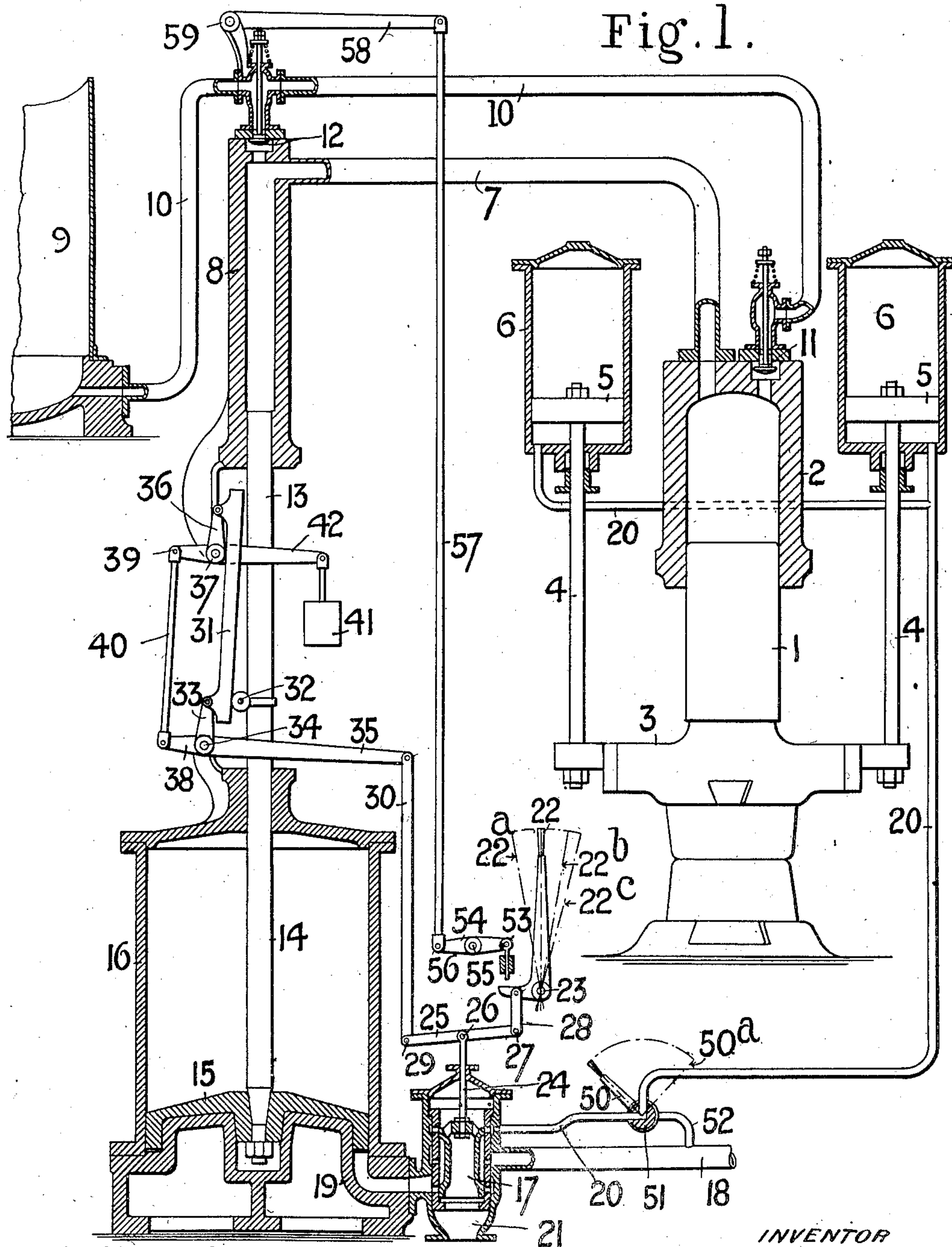
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PATENTED FEB. 20, 1906.

T. E. HOLMES.
STEAM HYDRAULIC INTENSIFIER.
APPLICATION FILED MAR. 8, 1906.

2 SHEETS—SHEET 1.

Fig. 1.



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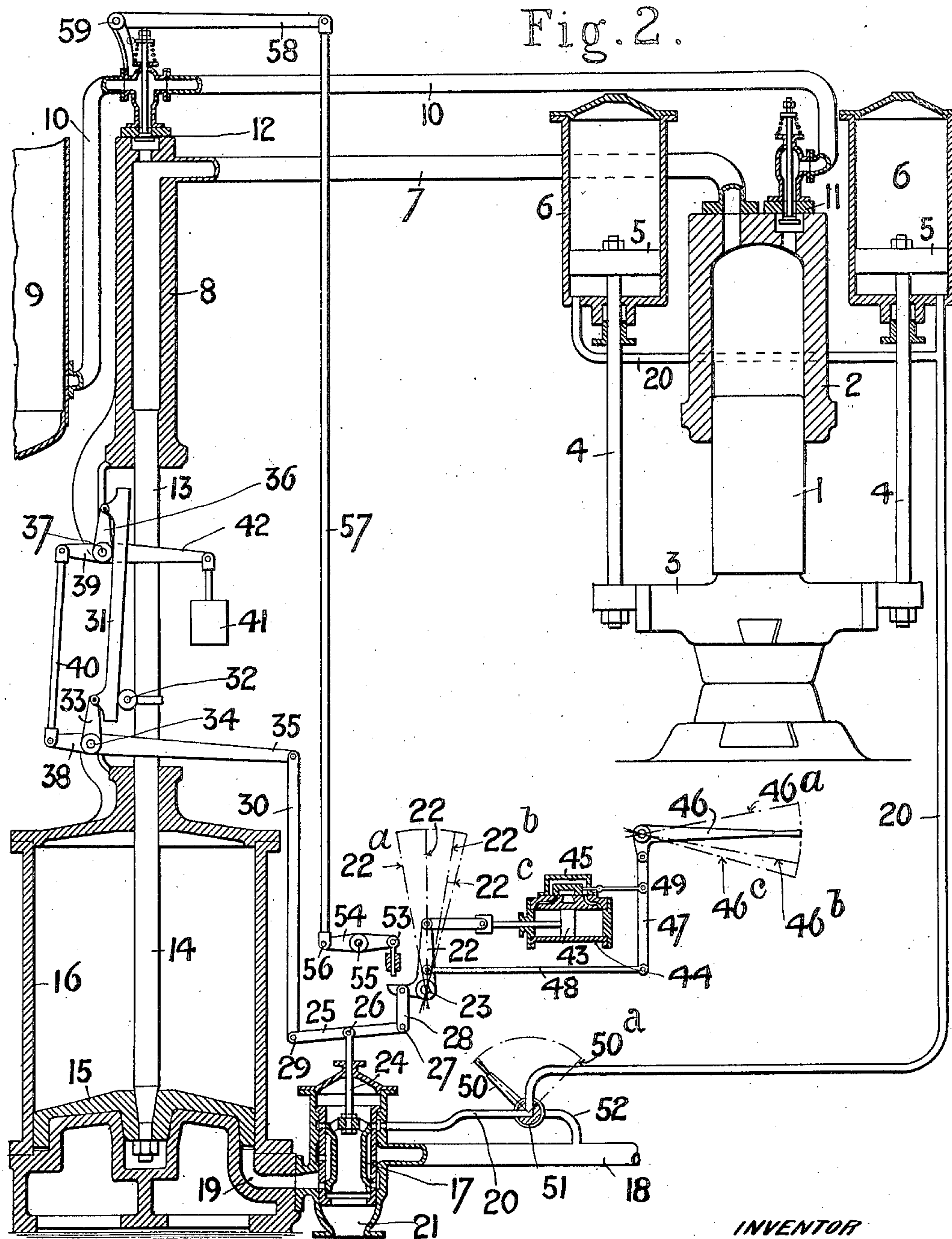
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THOMAS EDMUND HOLMES, OF SHEFFIELD, ENGLAND, ASSIGNOR OF ONE-HALF TO DAVY BROTHERS LIMITED, OF SHEFFIELD, ENGLAND.

STEAM HYDRAULIC INTENSIFIER.

No. 813,209.

Specification of Letters Patent.

Patented Feb. 20, 1906.

Application filed March 8, 1905. Serial No. 248,954.

To all whom it may concern:

Be it known that I, THOMAS EDMUND HOLMES, engineer and chief draftsman, a subject of the King of Great Britain, residing at 63 Sheldon road, Nether Edge, Sheffield, England, have invented certain new and useful Improvements in Steam Hydraulic Intensifiers, of which the following is a specification.

In hydraulic presses, hammers, shears, and the like constructed on the "steam-intensifier" system the main controlling-valve (whereby steam is distributed to the main or pressure-producing cylinder and the retracting cylinders, respectively) has heretofore usually been operated by means of a hand-lever, which being connected directly to the valve-stem has (more particularly in the cases of heavy plants) of necessity been movable through an arc of such length as to render its manipulation laborious when working the press at maximum speed. Moreover, the device for preventing excessive travel of the main steam-piston has heretofore been arranged to operate directly on the stem of the main controlling-valve so that when, for example, the resistance of the pressure of the main ram has happened to be suddenly or accidentally withdrawn the hand-lever has received so violent a shock as to be apt to escape from the control of the operator, while the momentum maintained by the main steam-piston up to the end of its active stroke has even been liable to cause said piston to strike against and break the cylinder-cover.

The present invention is designed to obviate these defects without in any way interfering with the ordinary mode of working the press; and to this end the invention consists, essentially, in providing (for the purpose of effecting the automatic cut off of the steam-supply) mechanism in the nature of a "hunting-gear," which, on the one hand, is connected to the main controlling-valve and its actuating-lever and, on the other hand, is adapted to be controlled automatically by the main steam-piston, the said actuating-lever being controlled either directly by hand or by a steam or other power relay, which in turn is manually controlled through the medium of hunting-gear.

In the accompanying drawings, Figure 1 is an elevation, partly in section, showing in an elementary or diagrammatic manner the ap-

plication of the invention to a hydraulic press of the type referred to; and Fig. 2 is a partial view of the same, showing the application of a power-relay for actuating the controlling-lever of the main steam-valve.

The same numerals of reference denote like parts in both figures.

1 is the main ram of the press, fitted to work in the cylinder 2, the press-head 3 being coupled by the rods 4 to the lifting or retracting pistons 5, which are fitted to work in steam-cylinders 6. The main cylinder 2 of the press is connected by the high-pressure pipe 7 with the intensifier-cylinder 8 and also with the air vessel 9 through the low-pressure pipe 10, which communicates with the cylinders 2 and 8 through the valves 11 and 12, respectively, the arrangement being as usual.

The intensifier-ram 13 is integral with the piston-rod 14 of the piston 15, which is fitted to work in the main steam-cylinder 16.

17 is the main controlling-valve, (consisting of a balanced piston-valve, as usual,) whereby motive fluid may be admitted from the main steam-pipe 18 either to the main steam-cylinder 16 through the pipe 19 or to the lifting-cylinders 6 through the pipe 20 alternatively or may be discharged from either of said cylinders to the exhaust 21, as usual. In both figures the valve 17 is shown closed, the press being understood to be at rest.

Referring to Fig. 1, it will be seen that the hand-lever 22, which works on a fixed fulcrum 23, actuates the stem 24 of the main valve 17 not directly, as usual, but through the medium of a "floating" lever 25, which is pivoted at a point 26 about midway in its length to the valve-stem 24 and is coupled by one of its ends 27 to the hand-lever 22 through a link 28, the opposite end 29 of the floating lever being likewise coupled by a link 30 to the automatic controlling-gear. This gear (in its preferred form, as shown on the drawings) comprises a movable bar 31, extending preferably alongside of the intensifier-ram 13 between the cylinders 8 and 16 and at a slight angle to their common axis, so as to be adapted to be acted upon by a cam stud and roller 32, (or equivalent device,) carried by the ram 13 or reciprocated thereby in any convenient manner. The inner or lower end of the bar 31 is supported by being pivoted to

one arm 33 of a three-armed bell-crank lever, which is fulcrumed at a fixed point 34, another arm 35 of this lever being coupled, through the link 30, to the floating lever 25.

5 The outer or upper end of the bar 31 is pivotally attached to one arm 36 of a second three-armed bell-crank lever, which is fulcrumed at a fixed point 37, the lever-arms 33 and 36 normally extending in the same direction and

10 approximately parallel to the bar 31. The two bell-crank levers are caused to act in unison by arms 38 and 39 on the lower and upper levers, respectively, being coupled together by means of a rod 40, while the upper

15 lever (by the pressure of a spring or of a weight 41, suspended from its third arm 42, as shown) is constantly forced in a direction to cause the bar 31 to bear against the roller 32.

20 The action of the automatic controlling-gear is as follows: Assuming the main ram 1 and press-head 3 to have been raised in the ordinary course of operations and that it is required to bring the press-head down upon

25 the work, then on moving the hand-lever 22 to the dotted position 22^a the floating lever 25 (owing to the resistance exerted by the weight 41 through lever-arms 42 39, rod 40, lever-arms 38 35, and link 30) will turn about

30 the point 29 as a fulcrum, and consequently the valve-stem 24 will be depressed, so as to cause the valve 17 to admit motive fluid to the main steam-cylinder 16 and to exhaust it from the lifting-cylinders 6. The piston 15

35 will therefore be raised and by forcing water from cylinder 8 into cylinder 2 will cause the main ram 1 to descend in the usual manner. As the piston 15 rises the roller 32 will likewise ascend, and in so doing will force the up-

40 per end of the bar 31 toward the left in opposition to the weight 41. Consequently the gear will be caused to move so as to gradually raise the arm 35 of the lower bell-crank lever, and with it the end 29 of the floating

45 lever 25, which will now (owing to the resistance offered by the hand of the operator on the hand-lever 22) turn about the point 27 as a fulcrum, and thus the valve-stem 24 will be raised, so as to return the valve 17 to

50 a position wherein steam is cut off from the cylinder 16. By this means steam will be cut off from cylinder 16 gradually and automatically at a point in the stroke of piston 15 corresponding to the position to which lever

55 22 had been moved, the cut off in any case occurring so far before the piston 15 reaches the upper or outer end of its active stroke (the exact point of ultimate cut off being determined by the preliminary adjustment of

60 the controlling-gear) that any possibility of excessive travel of the piston will be eliminated. At the same time the hand-lever 22 will not necessarily be moved back until after the valve 17 has been returned to the closed

65 position and will in any case be returned to

normal position without shock, and therefore without liability of escaping from the control of the operator. When the ram 1 and press-head 3 are to be raised, the hand-lever 22 is moved in the opposite direction to

70 that mentioned before—i. e., to the position 22^b—thus causing the floating lever 25 to turn about the point 29 as a fixed fulcrum, so as to raise the valve-spindle 24 and bring the valve 17 to a position wherein it admits motive fluid from the main steam-pipe 18 to the

75 lifting-cylinders 6 by way of the pipe 20. During the lifting movement of the press the automatic controlling-gear is not required to come into action, since the main steam-piston remains at the bottom of its travel, while

80 the point 29, forming the fulcrum of lever 25, is held stationary by the weight 41.

In cases—such, for example, as those of installations of heavy plant—where the direct

85 manual actuation of the lever 22 might be laborious this lever may be worked by a steam or other power relay under the control of an easily-moved valve actuated directly by hand

90 under the automatic control of a second hunting-gear. Such an arrangement is illustrated in Fig. 2, wherein the lever 22 is coupled to a piston 43, fitted to reciprocate in a steam or

95 other cylinder 44 under the control of a slide-valve 45, adapted to be initially set by a movement in either direction, as required, by means of a hand-lever 46, so as to admit motive fluid on the one and exhaust it from the

100 other side of the piston 43. The lever 46 is connected to one end of a floating lever 47, whereof the opposite end is coupled by a link 48 to the lever 22, the slide-valve 45 being

105 connected to an intermediate point, as at 49, in the length of the floating lever, so that the valve 45 will always be automatically returned to normal position when or before the

110 piston 43 reaches the end of its stroke. In either case means are provided whereby when it is required to work the press rapidly with short strokes a permanent cushion of live steam may be maintained beneath the lift-

115 ing-pistons 5, said means consisting, as usual, of a cock 51, (controlled by a lever 50,) on a by-pass 52 from the main steam-pipe 18 to the pipe 20 and lifting-cylinders 6, the arrangement being such that when the lever 50

120 is shifted to the position 50^a steam is admitted to the lifting-cylinders 6 independently of the valve 17.

In order to enable water to be withdrawn

125 from the system, means are provided whereby on the lever 22 being moved beyond the normal distance in the direction to admit motive fluid to the lifting-cylinders 6 the valve

130 12 will be positively opened against the spring-pressure by which it is normally held closed, so that water may then be passed out of the high-pressure system, as usual. For

135 this purpose the lever 22 when moved beyond the position 22^b to 22^c is arranged to encoun-

ter and raise the free end 53 of a sway-bar 54, pivoted at a fixed point 55, the other end 56 of said bar being connected to the rod 57, whose upper end is attached to a lever 58, fulcrumed at 59, so as to bear upon the stem of the valve 12 in the direction to cause said valve to open. By this means on the lever 22 being moved to the position 22^c the lever 58 will be depressed and the valve 12 caused to open against its spring.

Where a power-relay is employed to operate lever 22, as in Fig. 2, the movement of the hand-lever 46 to the positions 46^a, 46^b, and 46^c will obviously produce the same results as the movement of lever 22 to the positions 22^a, 22^b, and 22^c directly by hand, as already explained with reference to Fig. 1.

It is to be understood that instead of steam any other suitable motive fluid—such, for example, as compressed air—may be employed in the cylinders 6 and 16.

I claim—

1. In a hydraulic press working on the steam-intensifier system, the combination with the steam-piston of the intensifier, the valve for controlling the supply of steam to said piston, and a hand-lever whereby said valve is initially set, of mechanism including a movable bar, a reciprocatory device in contact therewith, and an intermediate resistance connected to said valve and hand-lever and controlled automatically by the steam-piston in such manner that the movement of said piston in performing its working stroke will cause the supply of steam to be cut off in accordance with the position to which the hand-lever has been set.

2. In a hydraulic press working on the steam-intensifier system, the combination with the steam-piston of the intensifier, the valve for controlling the supply of steam to said piston, and a hand-lever whereby said valve is initially set, of mechanism including a movable bar, a reciprocatory device in contact therewith, and an intermediate weight connected to said valve and hand-lever and controlled automatically by the steam-piston

in such manner that the movement of said piston in performing its working stroke will cause the supply of steam to be cut off in accordance with the position to which the hand-lever has been set.

3. In a hydraulic press, working on a steam-intensifier system, the combination with the steam-piston of the intensifier, of a valve for controlling the supply of steam to the piston, a hand-lever, a floating lever pivoted to the stem of the main valve and coupled by one end to the hand-lever, a movable bar connected to the other end of the floating lever, and means whereby the steam-piston may actuate the movable bar during its working stroke to close the steam-valve, substantially as described.

4. In a hydraulic press, the combination with the steam-piston of the intensifier of a so-called floating lever pivoted to the stem of the main steam-valve, and another lever to which one end of the floating lever is coupled, a movable bar connected to the other end of the floating lever, adapted to be acted upon by the steam-piston during its working stroke, to cause the main steam-valve to be closed in correspondence with the position to which the second-mentioned lever has been set, a double-acting piston coupled to said second-mentioned lever, a reciprocatory piston within the cylinder, a slide-valve adapted to admit fluid to the one side and exhaust it from the other side of said piston, alternately, a hand-lever, a coupling-rod attached to the said second-mentioned lever, and another so-called floating lever pivotally attached at its ends to the second-mentioned lever and said coupling-rod coupled at an intermediate point to the said slide-valve, to cause the piston to be arrested at that point in its travel, corresponding to the position to which the said hand-lever has been set.

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Witnesses:

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WILFRED H. SLATER.