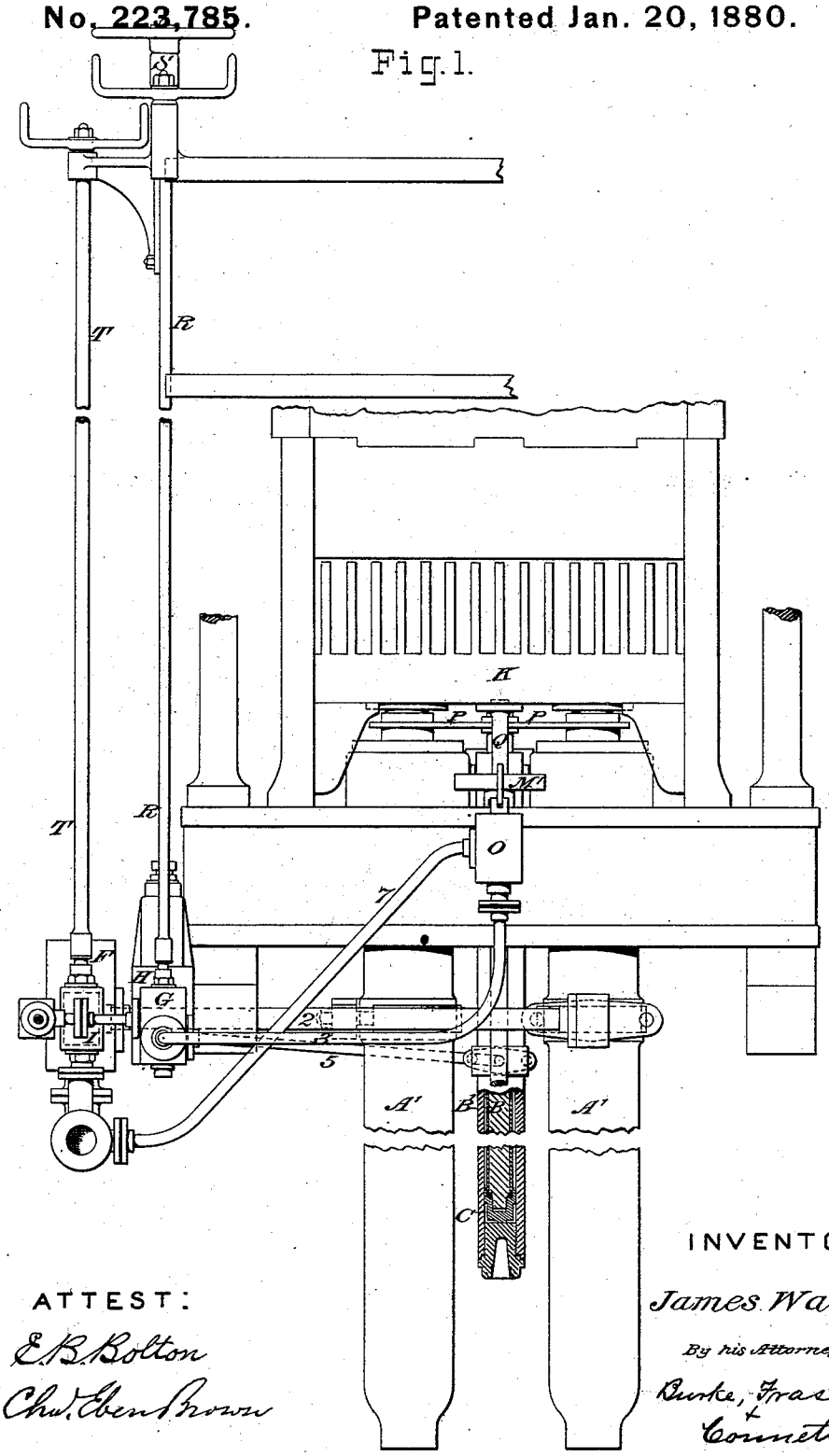
3 Sheets—Sheet 1.

J. WATSON.
Hydraulic-Press.

No. 223,785. Patented Jan. 20, 1880.

Fig. 1.



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By his Attorneys:

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Fig. 2.

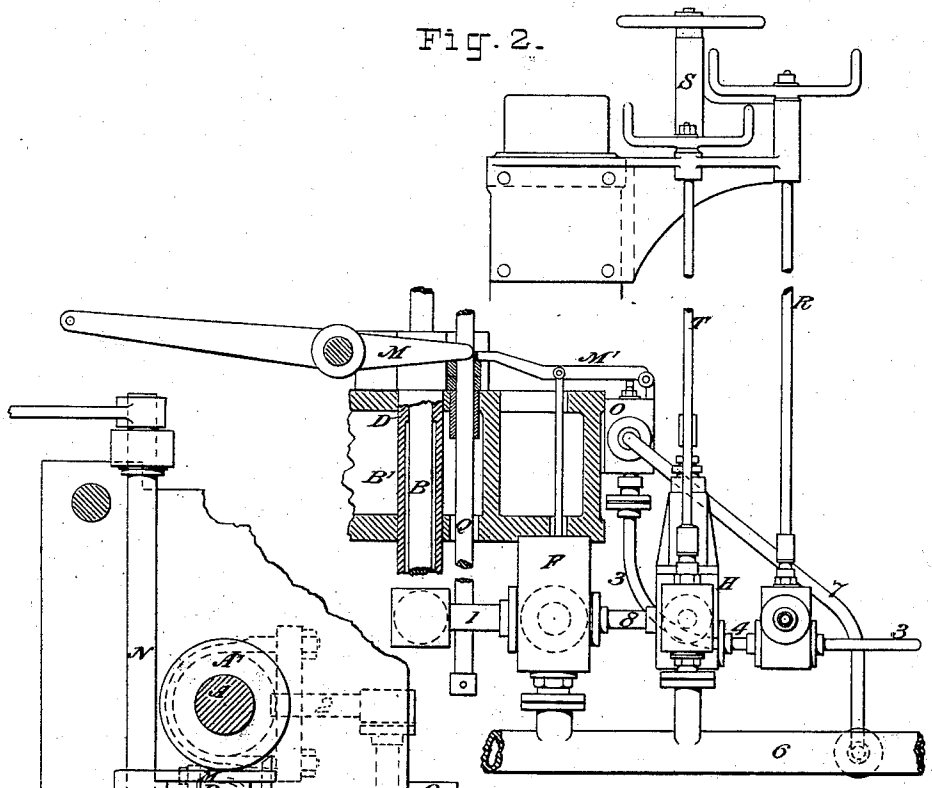
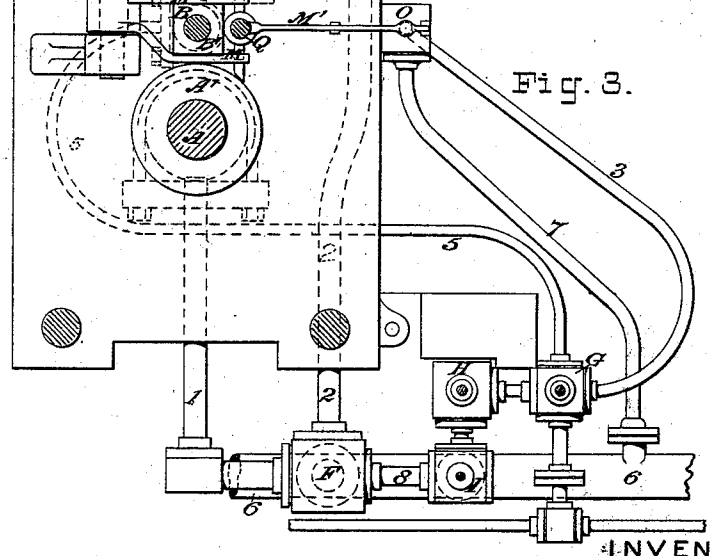


Fig. 3.



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Fig. 7.

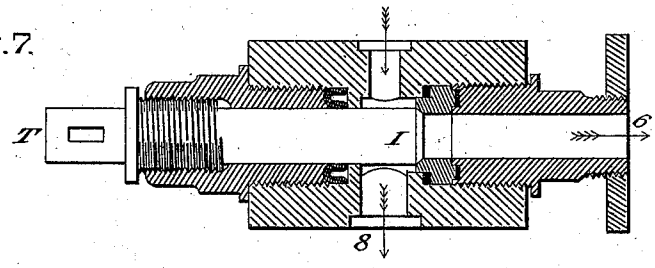


Fig. 6.

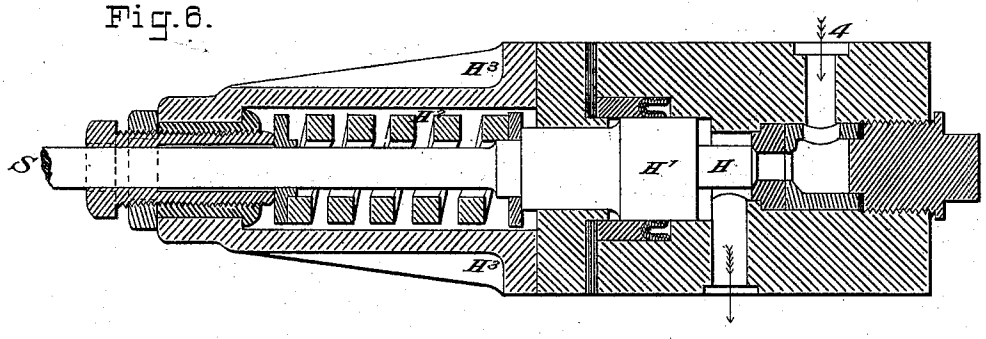


Fig. 5.

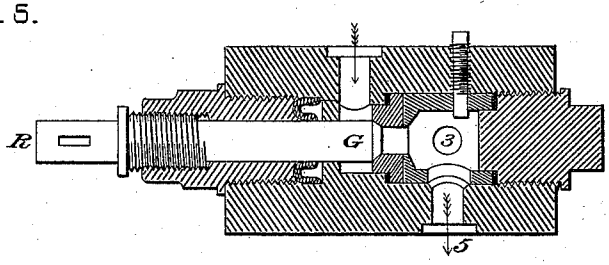
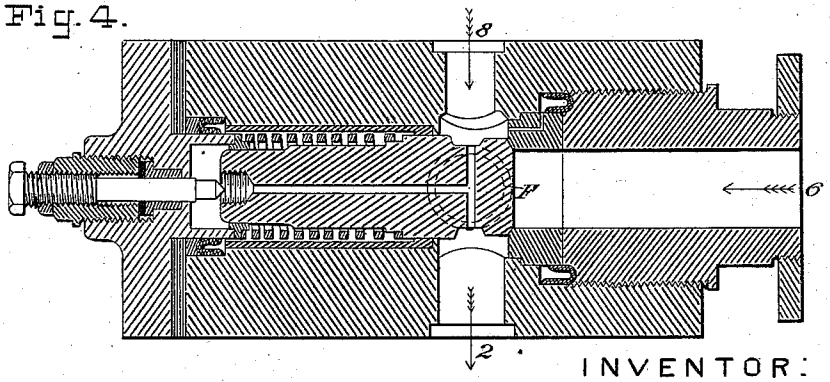


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES WATSON, OF LONDON, ENGLAND.

HYDRAULIC PRESS.

SPECIFICATION forming part of Letters Patent No. 223,785, dated January 20, 1880.

Application filed October 15, 1879. Patented in England, June 8, 1878.

To all whom it may concern:

Be it known that I, JAMES WATSON, of London, England, have invented or discovered certain new and useful Improvements in Hydraulic Presses; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters and figures marked thereon—that is to say:

The object of this invention is to obtain an increase in the working speed of hydraulic presses, and at the same time reduce the number of pumps employed without reducing the power of the presses.

The invention has reference more particularly to presses in which the preliminary pressure upon a bale of cotton or other material is produced by bottom rams, and then, after a grid or blocking apparatus has been inserted below the bale, the final or finishing pressure is given by top rams.

The improvements mainly consist in a particular arrangement of and mode of working presses having three bottom rams, the center ram being much smaller than the two outer rams; also, in a particular construction of self-acting loaded or spring valve, which valve takes off the pressure from the small cylinder when such pressure attains a given limit, and then admits the water to the large cylinders; also, in a particular arrangement for taking the pressure off the small center ram when it reaches a given part of its stroke; also, in the combination with or adaptation to such a press of a self-acting valve to stop the rise of the bottom follower at the exact position for the grid or blocking apparatus to enter.

In the particular arrangement and mode of working a press with three bottom rams, as above mentioned, the small ram, which is of long stroke, does the first portion of the stroke, this ram being effective only during such portion of the stroke as is safe for such a small ram to work; and when the pressure on the small ram reaches the limit to which it is calculated it can safely work it is relieved.

In the annexed drawings, Figure 1 is an elevation, partly in section, of a hydraulic press constructed according to my invention. Fig. 2 is an elevation, taken at right angles to Fig. 1, of the valves and pipes. Fig. 3 is a plan of the press. Figs. 4 to 7 are sectional views, on a larger scale, of valves employed in connection with the press, and are hereinafter referred to.

The press has three bottom rams, A A B, of which the center one, B, is, say, a three-inch ram, while the two outer, A A, are, say, seven-inch rams. Each of these seven-inch rams is capable of making a stroke of, say, sixteen feet six inches.

The small ram B has a collar, C, at its lower end, and there is a bush or inner projection, D, at the top (or it may be at any other convenient part) of the small cylinder B′, against which the said collar C comes, as hereinafter explained. The small ram B is not connected to the follower K, and is therefore not carried up with the follower in the last portion of the stroke of the press—that is to say, of the large rams—and is kept central during the rising of these rams by means of a sort of cross-head, P, through which the large rams slide after the center ram has stopped.

F is a self-acting valve, (shown separately in Fig. 4,) in communication, by a pipe, 6, with an elevated tank, to allow water to flow into and from the large cylinders A′ A′ at the proper times by the pipes 1 2.

G is the valve (shown separately in Fig. 5) for admitting the water from the pumps to the small cylinder B′ by the pipe 5, also to a self-acting or loaded or spring valve, H, by the pipe 4, and also to a stop or relief valve, O, by the pipe 3.

The self-acting valve H, which is shown separately in Fig. 6, is loaded to the maximum pressure which is to be attained on the center ram, B, so as to open at such pressure and relieve the center ram, and allow the water to flow through such valve into the large cylinders A′ A′; and in order to prevent this valve closing, owing to the decrease in pressure which takes place when the water has entered the large cylinders, the valve has a larger area at a part, H′, above its seat, for the purpose hereinafter explained.

I is a valve (shown separately in Fig. 7) for allowing the return-water from the cylinders to return into the pipe 6, leading to the elevated tank. 7 is a return-pipe from the stop-valve O. Q is a tappet-rod, moving with the

large rams A A, and which, when these rams reach the top of their stroke, acts both upon levers M M, which open the lock of the main door of the press by means of the rod N, and also upon a lever, M′, which opens the relief-valve O. R, S, and T are rods connected, respectively, with the valves G, H, and I, and fitted with handles at the top.

Such being the construction and arrangement of the parts of the press, I proceed to describe its action.

Supposing the follower K to be at the bottom of its stroke, the press-box filled, and all the valves shut, the man at the top of the press opens the inlet-valve G by means of the rod R, so as to admit water from the pumps to the small cylinder B′ by the pipe 5, and to the under side of the loaded valve H by the pipe 4, and also to the stop-valve O by the pipe 3. The small ram B is thus forced up, together with the follower K, which carries the large rams A A with it. While these rams are rising their cylinders are being filled with water from the elevated tank, the pressure due to the height of this tank being sufficient to open the valve F and allow the water to run into the large cylinders. When the pressure in the small cylinder B′ has got up to, say, fifteen hundred-weight to the square inch, (according to the load on the valve H,) which will probably be at about thirteen to fourteen feet of the stroke, the pressure raises the loaded valve H, thereby allowing the water to pass over the valve I, and by the pipe 8 to the valve F, which it will shut, and thence, by the pipes 1 2, to the large cylinders, so as to raise the large rams and complete the stroke. The small ram B, being loose from the follower, does not participate in this portion of the stroke, and is retained in its cylinder by means of the collar C on its lower end coming against the bush D in the cylinder B′. When the pressure in the small cylinder has been sufficient to lift the valve H, as before described, and water has begun to flow through it to the large cylinders, the pressure, owing to the larger area of the two large rams, will drop from fifteen hundred-weight to, say, two hundred-weight to the square inch, and therefore the load on this valve would close it again; but the water, by acting on the larger area H′, which this valve has at a point above its seat, as before explained, overcomes the load on the valve, and therefore keeps the valve open. The increased pressure upon this valve is borne not entirely by its spring H^2, but by a cover, H^3, bolted down and regulating the lift of the valve.

As has been already mentioned, when the large rams reach the top of their stroke the tappet-rod Q opens the lock of the main door of the press by means of the levers M M and rod N, and it also opens the valve O by means of the lever M′, so that the water from the pumps passes through this valve, and by the pipe 7 to the pipe 6, leading to the elevated tank, and thereby stops the follower at the exact position for the grid to enter it.

When a grid or blocking apparatus is employed, it must now be run in to enable the final or finishing pressure to be given by the top rams, and the three rams A A B are then lowered. The wheel on the rod S is run down in order to keep the valve H open, and thereby form an outlet for the water in the center cylinder. To effect the lowering of these rams the inlet-valve G is shut and the outlet-valve I is opened; the water from the three cylinders A′ A′ B′ will then be forced back by the weight of the rams and follower into the elevated tank through the pipe 6. As soon as the follower is down the man shuts the valve I and turns the hand-wheel of the loaded valve H, so as to allow this valve to be shut by its spring H^2. The valves are now all shut and the press is ready for the next operation.

Although I have described the small ram B as being disconnected from the follower, it may be connected thereto, in which case, when the large rams begin to rise, both the small ram and its cylinder B′ will rise also, the small ram, of course, being inactive.

The press stop-valve O, before described, is like an ordinary valve, and is loaded sufficiently to prevent its being opened by the pressure of water from the pumps.

I am aware that hydraulic presses have been constructed in which two rams of different diameters have been employed, the smaller arranged under the larger, and adapted to do the primary or lighter part of the work; but I am not aware of two large rams and one small one having been employed, arranged as herein shown, and for the purpose above stated.

What I claim, and desire to secure by Letters Patent, is—

1. In a hydraulic press employing three bottom rams, two large and one small, the arrangement of the three abreast, as shown, the smaller between the two larger, and the former arranged to perform the primary or lighter part of the work, as shown and specified.

2. A hydraulic press having a ram, B, of small diameter, not connected with the follower K, and provided with means, substantially as shown, whereby it is automatically relieved from pressure at a predetermined point in its stroke, and two large rams, A A, provided with an automatic valve, H, whereby they are permitted to be supplied with water from the pumps only when the pressure in the smaller cylinder B′ has reached a predetermined point, substantially as and for the purposes set forth.

3. The combination, in a hydraulic press, of the smaller ram B, arranged to do the primary and lighter portion of the work, and the larger rams A A, the latter arranged to open a relief-valve when they have reached the termination of their stroke, and thus automatically stop their ascent, substantially as shown, and for the purposes set forth.

4. The combination of the larger rams A A, the smaller ram B, the relief-valve O, arranged to be opened by the larger rams at the termination of their stroke, and the loaded valve H, arranged to admit water from the pumps to the larger rams when the pressure in the smaller ram reaches a predetermined limit, substantially as set forth.

5. The combination, with the rams A A B, of the relief-valve O, tappet-rod Q, and valve-lever M′, all arranged to operate, in connection with the inlet and outlet pipes 3 and 7, substantially as set forth.

6. The valve H, provided with an enlarged area, H′, a spring, H^2, a cover, H^3, and a suitable box or casing, substantially as shown in Fig. 6, and as described.

7. The combination, in a hydraulic press, of the two larger rams A A, the smaller ram B, the follower K, cross-head or yoke P, relief-valve O, valves F, G, H, and I, pipes 1, 2, 3, 4, 5, 6, 7, and 8, valve-lever M′, and rod Q, all arranged to operate substantially as set forth.

In witness whereof I, the said JAMES WATSON, have hereunto set my hand this 30th day of June, 1879.

JAMES WATSON.

Witnesses:
I. C. MEWBURN,
GEO. C. BACON.