No. 764,647. PATENTED JULY 12, 1904.

S. J. WEBB.

HYDRAULIC COMPRESS.

APPLICATION FILED APR. 26, 1898.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

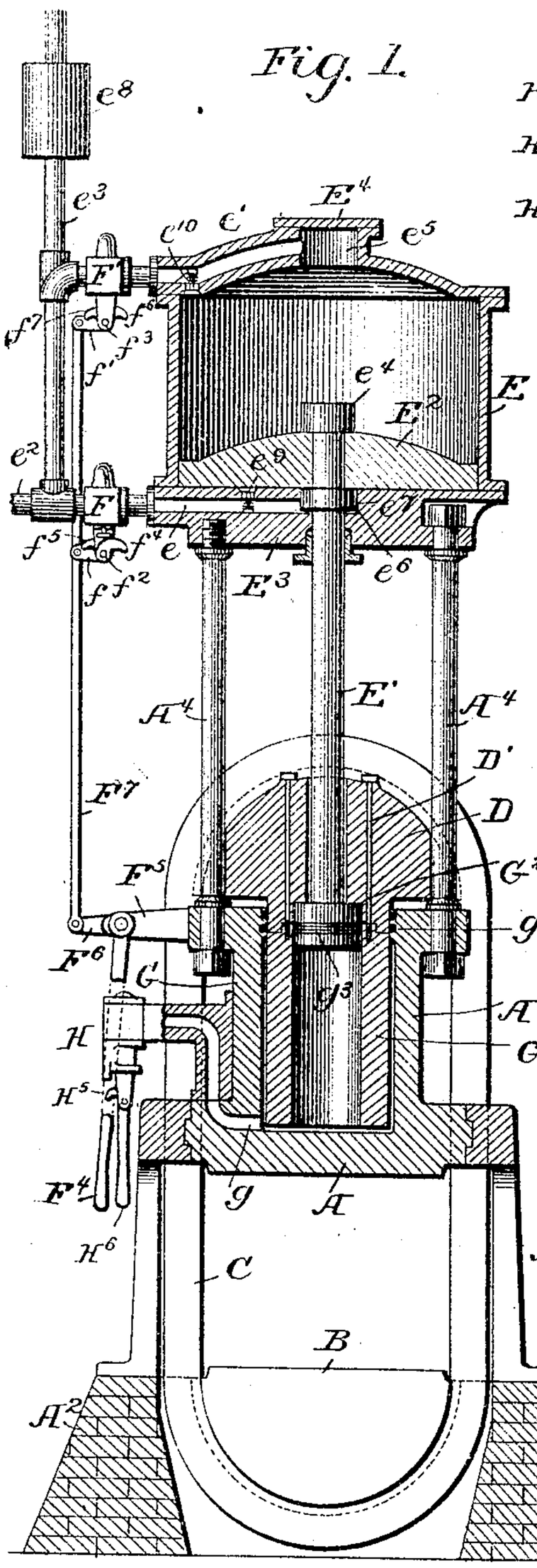


Fig. 3.

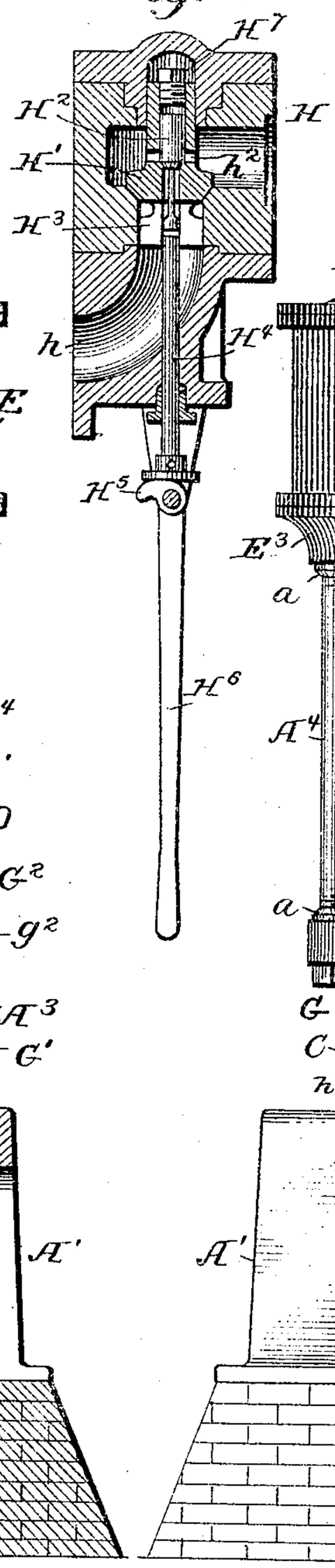
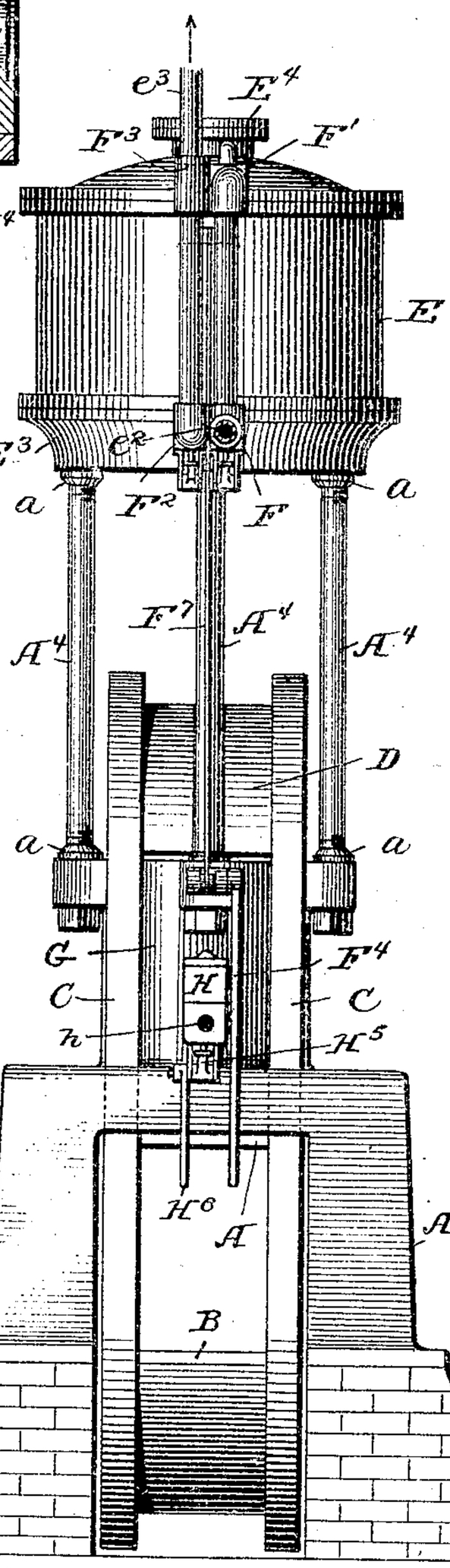


Fig. 2.



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APPLICATION FILED APR. 26, 1898.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 6.

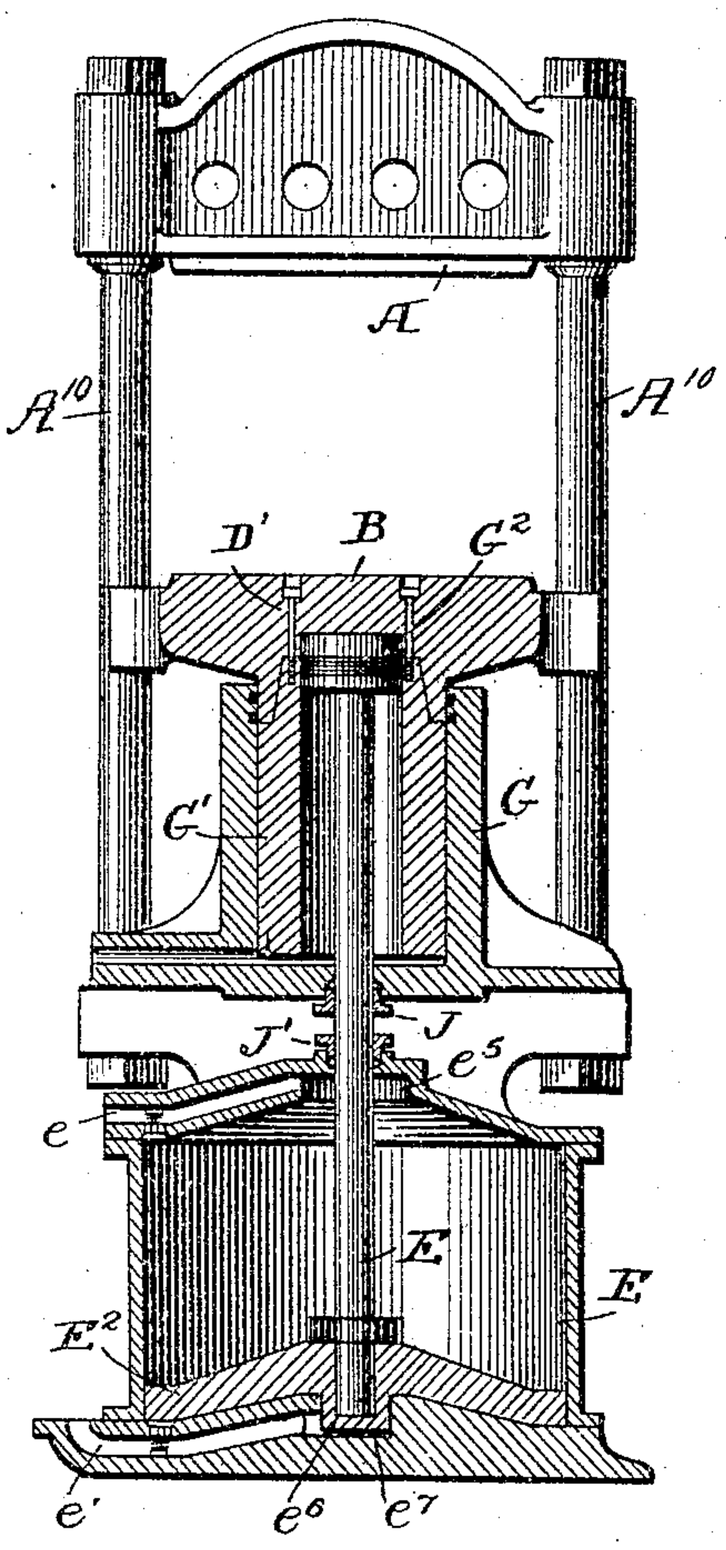


Fig. 4.

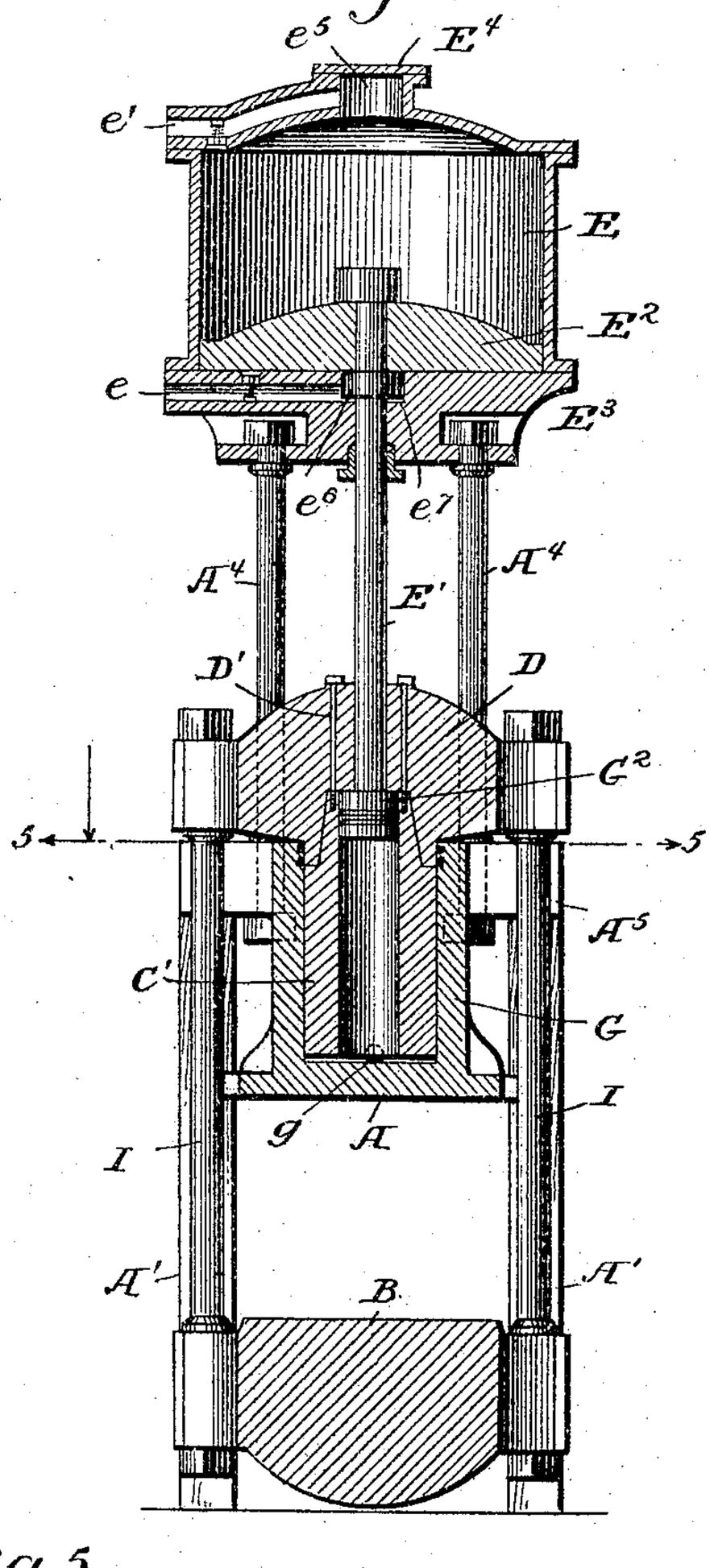
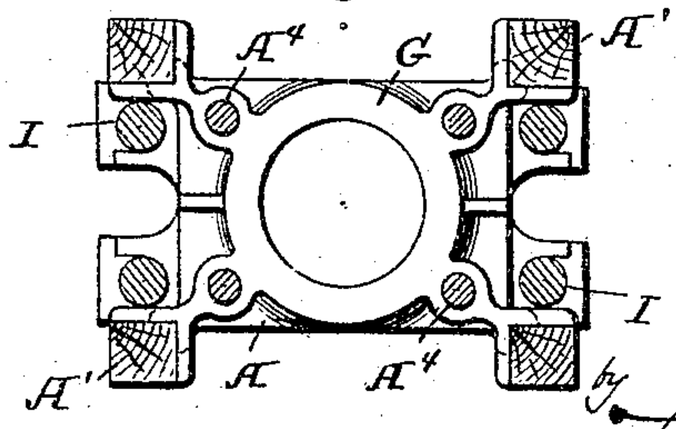


Fig. 5.



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No. 764,647. Patented July 12, 1904.

UNITED STATES PATENT OFFICE.

SAMUEL J. WEBB, OF MINDEN, LOUISIANA.

HYDRAULIC COMPRESS.

SPECIFICATION forming part of Letters Patent No. 764,647, dated July 12, 1904.

Application filed April 26, 1898. Serial No. 678,899. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL J. WEBB, a citizen of the United States, residing at Minden, in the parish of Webster and State of Louisiana, have invented certain new and useful Improvements in Hydraulic Compresses, of which the following is a specification.

My invention relates to presses, and while it may be adapted to presses of different kinds and for different purposes it is more especially intended for use in cotton-compresses and the like, and I have so shown it embodied in the present application.

The object of the invention is to improve and simplify the construction of such presses and to provide for the use of a double-acting piston in connection with such presses.

A further object is to combine with such a double-acting piston a hydraulic press, while the double-acting piston may be operated by steam, water, or other motor fluid.

With these and other objects in view my invention consists in a press embodying the various features of construction and arrangement of parts having the general mode of operation substantially as hereinafter more particularly set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of a press embodying my invention. Fig. 2 is a side view of the same. Fig. 3 is an enlarged vertical section of the valve which is preferably used in connection with the press. Fig. 4 is a vertical longitudinal section of a modification of the press. Fig. 5 is a horizontal transverse section on the line 5 5, Fig. 4; and Fig. 6 is a vertical longitudinal section of a press, showing the cylinder at the bottom.

Heretofore in constructing presses, for this general purpose it has been common to use a cylinder and piston operated by a motor fluid, such as steam or water, in one direction only, and through the medium of levers or other connecting devices the movable platen has been operated to compress the cotton-bale or other object to be operated on and the piston has returned to its normal position by gravity. This involves a certain loss of time in exhausting the steam from the cylinder to permit gravity to cause the piston to return to its normal position. Moreover, when the motor fluid acts in one direction only it necessitates a more or less complicated construction involving a relatively large amount of material in comparison with the amount of work done. In my present invention one of the main objects is to provide a structure wherein the piston may be acted upon by the motor fluid in both directions, constituting what is properly termed a "double-acting" piston, and in this way the objections above indicated, as well as others, are overcome, and a relatively simple and inexpensive press, compared to the amount of work done, is provided. Furthermore, in connection with a double-acting piston I provide a hydraulic press by means of which the power of the motor fluid may be multiplied and the final compression to the bale or other article be effected when power exerted is more important than amount of work of the platen.

With these general statements I will now proceed to describe in detail the embodiments thereof shown in the drawings, it being understood that the general principles can be applied in various ways and in various constructions by those skilled in the art without departing from the spirit of the invention.

Referring more particularly to Figs. 1 and 2, A represents a stationary bed or platen of the press, which is supported in any desired way, it being shown as mounted upon standards A', which in turn are mounted upon a suitable base A^2. The movable platen B in the present instance is mounted in links C, which are adapted to be moved up and down to cause the movable platen B to approach or recede from the fixed platen A. In the upper portion of the links C is arranged a crosshead D, and this is connected to the piston-rod E', which in turn is connected to the piston E^2 of the cylinder E of the engine. This cylinder E is suitably mounted in relation to the fixed bed or platen A, and in this instance I have shown the platen as having an upward projection A^3, to which the cylinder is connected by the standards A^4, and while these may be variously constructed and connected to the cylinder and the bed I have shown them as detachably connected to the bottom

E^3 of the cylinder, it being understood that there may be four, more or less, of these standards. The piston E^2 is a double-acting piston, and the cylinder E is provided with two ports $e\,e'$, suitably connected to a pipe e^2, leading to the source of supply of the motor fluid (preferably steam) and with an exhaust-pipe e^3, and while I have shown in the present instance two ports, both acting alternately as inlet and outlet ports, it is obvious that there may be more ports arranged to accomplish the same general end. The piston E^2 reciprocates in the cylinder E under the direct action of the steam, (and when I say "steam" I mean any suitable motor fluid,) and means are provided for cushioning the piston as it approaches the extreme of its movement in either direction. While various forms of cushioning devices may be used, I have shown an exceedingly-simple arrangement which I have found practical, comprising the head or nut e^4 of the piston-rod, which is adapted to enter a recess e^5 in one head of the cylinder E, and a collar e^6, arranged on the other side of the piston E^2, adapted to enter a recess e^7 in the base or bottom of the cylinder E. Instead of using the nut or head e^4 and the collar e^6 on the piston-rod it is evident that these projections can be formed on the piston itself. It will be understood that whenever the piston approaches the end of its movement in either direction the nut or head e^4 or the collar e^6 enters the recess e^5 or e^7, cutting off the exhaust of the steam from the cylinder through the port e or e', as the case may be, so that the steam remaining in the cylinder at this moment acts as a cushion for the piston to take up its momentum and prevent its striking the cylinder-heads. In order to operate the double-acting piston, suitable inlet-valves F and F′ and exhaust-valves F^2 and F^3 (the latter being practically hidden) are provided in connection with the ports of the engine, and while these may be variously constructed I have shown an arrangement whereby they are all operated by a single valve-lever F^4. In this particular arrangement it is manifest that there are four of these valves, two acting as inlet-valves and two as exhaust-valves. The valve-lever F^4 is pivotally mounted on a bracket F^5 and is connected to an arm F^6, which in turn is connected to a rod F^7, and to this rod are connected arms $f\,f'$, which in turn are connected to rocking shafts $f^2\,f^3$, each carrying two cams $f^4\,f^5$ and $f^6\,f^7$, each cam being arranged to lift a valve from its seat, which is normally under the stress of a spring or weight tending to seat the valve. These valves may be of any well-known construction—such, for instance, as is shown in Fig. 4 of my Patent No. 550,358, granted November 26, 1895—and it is not deemed necessary to show them in detail. It will be seen from this construction that when the valve-lever F^4 is moved in one direction—toward the press, for instance—the valve-rod F^7 is drawn down, rocking the shafts $f^2\,f^3$, causing the cams $f^4\,f^6$ to lift their respective valves, thereby allowing the steam to enter the port e and to be exhausted through the port e'. When the valve-lever F^4 is moved back to its normal position, the valves will seat themselves, closing the ports. When, however, the valve-lever F^4 is moved outward from its normal position, the valve-rod F^7 moves upward, rocking the shafts $f^2\,f^3$ in the opposite direction, causing the cams $f^5\,f^7$ to raise their respective valves, which are arranged so that steam will be admitted through the pipe e^2 to the port e' and exhausted through the port e to the exhaust-pipe e^3. In this way it will be seen that the piston E^2 is moved in both directions under the direct action of the steam, and while the arrangement of valves shown is very simple and practicable it will be understood that other arrangements of valves accomplishing the same general purpose can be used. The exhaust-pipe e^3 may be connected to a suitable heater (indicated at e^8) to utilize the exhaust-steam for heating the feed-water of the boiler. Combined to operate with the double-acting cylinder E is a hydraulic cylinder, the piston of which is connected to be operated by the piston of the steam-cylinder E, and in this present arrangement I have shown the projection or extension A^3 of the stationary bed or platen A as arranged to form the exterior cylinder G of the hydraulic press. Moving in this cylinder is an annular plunger G′, which is connected to the cross-head D and moves therewith. Mounted on the piston-rod E′ of the steam-cylinder E is a plunger G^2, fitting the annular plunger G′. The hydraulic cylinder G is provided with a port g, controlled by a suitable valve to permit the flow of the water to and from the cylinder, and while various forms of valves may be used I have shown an improved valve which is well adapted for the purpose and which is illustrated on an enlarged scale in Fig. 3. This valve device H comprises a casing and passage h therethrough, and controlling this passage is a check-valve H′. Mounted in this check-valve is a secondary or pilot valve H^2, and the lower end of this pilot-valve is guided in the wings H^3 of the check-valve. In order to operate the valve, there is a valve-rod H^4, arranged to be operated by any suitable means, as a cam H^5 and lever H^6, and in the construction shown in Fig. 1 this lever is arranged adjacent to the lever F^4, so that both can be operated conveniently. The valve is shown in its closed position in Fig. 3, and when the valve-lever H^6 is operated the cam H^5 raises the valve-rod H^4, which impinges upon the lower end of the pilot-valve H^2, opening a comparatively small passage h^2 and permitting the escape of the water from the cylinder G, thus relieving the pressure from the water in the cylinder on the check-valve H′ and permitting that valve

to be easily raised on the further movement of the valve-lever H^6. In order to regulate this, the stem of the check-valve H′ is provided with an adjustable screw H^7, against which the upper end of the pilot-valve H^2 impinges after the small opening or passage h^2 is opened. It will be understood that water is drawn through the passage-way g in the act of raising the annular plunger G′, the check-valve rising under the force of the water. In order that the cylinder G and the plunger G^2 may be easily and properly packed, I arrange the annular plunger G′ so that it can be detached from the cross-head D, and in the present instance I have shown bolts or rods D′ passing through the cross-head D and secured to the plunger G′. Moreover, the form of the plunger is such that when it is in the position shown in Fig. 1 and the cross-head D lifted away therefrom the packing-rings g^2 are exposed so that they can be readily adjusted or replaced, as the case may be. It will also be seen that the plunger-head G^2 on the piston-rod E′ is so arranged with relation to the cross-head D that when the head is separated from the annular plunger G′ the packing-rings g^3 on the plunger-head are also exposed and can be adjusted or replaced. It will be understood that when the bolts or rods D′ are removed the piston E^2 is raised, carrying with it the piston-rod E′ and the cross-head D, and it can be held up in position by the motor fluid under the piston or by suitable blocks, or otherwise, while the packing-rings are being arranged, and it is further observed that the cross-head D may be guided by the standards A^4. If perchance it is desirable to remove the link C, or for any other reason, the outer standards A^4 in Fig. 2 may be removed bodily, they being shown as provided with movable collars a. In some cases it is desirable to provide means to permit the steam to enter the steam-cylinder E independent of the ordinary openings closed by the cushioning devices above described, and while ordinarily steam will pass under the cushioning devices and move the piston I have found it desirable in some instances to provide the ports e e' with check-valves e^9 e^{10}, which control passages from the ports directly into the cylinder, permitting the steam to flow freely therethrough at the beginning of the movement of the piston E^2, and it will be observed that as soon as the piston moves sufficiently from the end of the cylinder to withdraw the collar or nut from the cushioning-recess the steam will flow through this opening, and the check-valves will be closed by the steam-pressure or other suitable means.

Having thus described in detail the construction and arrangement of parts shown in Figs. 1 and 2, the operation will be largely understood from what has been said and is as follows: Supposing the parts to be in the position shown in Figs. 1 and 2, the cotton or other material to be compressed is placed upon the movable platen B. The valve-lever F^4 is operated to simultaneously open the valve F to permit steam to enter the port e and to open valve F^3 to permit the exhaust of the steam from the cylinder through the port e'. The steam entering the cylinder E below the piston E^2 causes the same to rise, carrying with it the link C, supporting the movable platen B, and compressing the material between the latter and the stationary bed or platen A, and the annular plunger G′ also moves with the link C, causing water to flow through the valve H to the port g into the cylinder G. As this movement continues the bale or other material is compressed until the piston E^2 approaches the upper end of the cylinder E, when the nut e^4, entering the recess e^5, cuts off the flow of the exhaust-steam, confining a portion in the cylinder, which acts as a cushion to the piston. When this is done, the bale has received a direct pressure, reducing it to a comparatively small space, and, as is well understood, the resistance to further compression enormously increases. To complete the compression, the hydraulic press is now brought into operation, and the valve-lever F^4 is operated so as to open valve F′ to steam, permitting it to enter the port e' above the piston E^2 and opening valve F^2 to permit the steam to exhaust from below the piston E^2. The lowermost portion of the plunger G′ at this time is in the upper portion of the hydraulic cylinder G, and the water has filled the cylinder G and the space beneath the plunger G^2. As the piston E^2 now moves downward the plunger G^2 displaces the water in the annular plunger G′, forcing the latter upward to its extreme limit and further compressing the bale. It will be seen that owing to the relative sizes of the piston E^2, the plunger G^2, and the annular plunger G′ the steam-power is multiplied in accordance with the relations of these parts, so that a greatly-increased pressure is brought to bear upon the bale until it is finally compressed to the desired amount. When this is done, the valve-lever F^4 is moved to close all the ports of the cylinder E and the valve-lever H^6 is moved to operate the pilot-valve H^2 to permit the escape of a small portion of the water from the cylinder G until the pressure thereof is relieved to a certain extent, when a further movement of the valve-lever H^6 raises the check-valve H′, permitting the water to flow freely through the passage h and allowing the annular plunger G′ and the cross-head D and link C, connected thereto, to assume their normal positions, the platen B descending from the platen A, and the compressed bale can be removed, ready for another operation. It will thus be seen that by the use of a double-acting piston in the steam-cylinder I am enabled to compress the bale to its fullest extent, first by the di-

rect action of the steam on the piston E^2 and then to multiply the pressure of the steam on the piston E^2 through the medium of the hydraulic press, so as to give the final and full amount of compression to the bale. It will further be seen that the construction and arrangement of parts is simple and compact; that the parts are arranged to be easily adjusted and to be made exceedingly strong with a comparatively small amount of metal; that the operative parts are all under the control of the operator through the medium of the valve-levers F^4 and H^6, which are arranged adjacent to each other, so that the operations can be quickly carried into effect. Another advantage of the double-acting piston, which is a very material one on account of time, as well as for other reasons, is found in the fact that when the bale is finally compressed the piston E^2 is in its normal position ready to commence the operation again, and it is not necessary to wait for the steam to exhaust from the cylinder, which is the case with a single-acting piston. Another result of the double-acting piston is in the matter of safety, for when the bale is placed in position on the movable platen and steam is admitted beneath the piston E^2 if perchance (as sometimes happens) the bale slips from the platen the pressure of steam might cause the piston E^2 to move too rapidly or too far, so as to break or injure the cylinder E; but with my arrangement, utilizing the steam to positively drive the piston in both directions, the valves being closed at the end of the operation, there is sufficient steam above the piston E^2 to prevent an accident of this character.

It may be observed that the cylinder E is provided with a cap E^4, which may be removed, and the recess e^5 forms a manhole to permit the entrance of a workman to adjust the packing of the piston E^2 or for other purposes.

In Fig. 4 I have illustrated a modification of my invention embodying the same general principles, wherein like parts are similarly lettered, and in this instance instead of the link C the platen B and cross head D are connected together by rods I, and the hydraulic cylinder G extends below the supporting-lugs A^5 of the bed A. In this case the standards A′ are shown as being of wood, and Fig. 5 is a transverse cross-section showing the general arrangement and relation of the parts.

In Fig. 6 I have shown another embodiment of my invention, wherein the steam-cylinder E forms the base of the press, the hydraulic cylinder G being above the steam-cylinder and the stationary platen A being above the hydraulic cylinder and connected to the steam-cylinder by rods A^{10}, the parts being substantially the same in their construction and mode of operation except in their relation to each other. This arrangement forms a very compact press, which is useful where it is convenient to place the steam-cylinder below the platform or level of the movable platen. Another advantage arising from this arrangement is that the glands or piston-packings J J′ in the hydraulic cylinder and steam-cylinder are in the space between the two, where they are accessible for adjustment.

From the above it will be seen that by the use of the double-acting piston I am enabled to save considerable time in the operations of the press, to make the press compact and strong and at the same time light, and by the use of the hydraulic press in connection with the double-acting piston I can multiply the power of the steam or other motor fluid to secure the final compression in a most advantageous way. It will be noted that during the first part of the compression of the bale the piston of the steam-cylinder moves in one direction, while during the latter part of the compression the piston moves in the opposite direction. At the same time the pressure on the bale is always in the same direction. This enables the cylinder to be made shorter than where the movement of the piston is in one direction throughout the operation.

Having thus described the general principles of my invention and set forth an embodiment thereof, so that those skilled in the art can make and use the same, without limiting myself to the precise construction and arrangement of parts, what I claim is—

1. The combination with the stationary and movable platens, of a double-acting piston connected to the movable platen to move the latter in the direction the piston moves on one stroke, and a hydraulic press operatively connected to the movable platen and actuated by the return stroke of said piston to continue the movement of the platen in the same direction it was moved by the piston, substantially as set forth.

2. The combination with the stationary and movable platens, of a double-acting piston having a sliding connection with the movable platen and operating to positively move the latter in the direction the piston moves on one stroke, and a hydraulic press operatively connected to the movable platen and actuated by the return stroke of the piston to continue the movement of the platen in the same direction it was moved by the piston, substantially as set forth.

3. The combination with the stationary and movable platens, of a double-acting steam-piston, connections partly hydraulic and partly structural between the piston and movable platen constructed and arranged substantially as described, whereby when the piston moves in one direction the platen is moved by the structural connections and when the piston moves in the other direction the

platen is moved in the same direction as before and with increased power by both connections, substantially as set forth.

4. The combination with the stationary and movable platens, of a double-acting piston connected to the movable platen to move the latter in the direction the piston moves on one stroke, a hydraulic cylinder connected to the stationary platen, an annular plunger within said cylinder connected to the movable platen, and a plunger within said annular plunger connected to and movable with said piston and operating on the return stroke of the piston to continue the movement of the movable platen in the same direction it was moved by the piston and with increased power, substantially as set forth.

5. The combination of the stationary and movable platens, of a hydraulic cylinder connected to the stationary platen, a cross-head connected to the movable platen, an annular plunger coöperating with the hydraulic cylinder and connected with the cross-head, a plunger within the annular plunger, and means to positively move the latter in both directions, substantially as described.

6. The combination with the stationary and movable platens, of a hydraulic cylinder forming a part of the stationary platen, a cross-head connected to the movable platen, an annular plunger connected to the cross-head and coöperating with the hydraulic cylinder, and a piston adapted to work in the annular plunger, substantially as described.

7. The combination with the stationary and movable platens, of a hydraulic cylinder forming a part of the stationary platen, a cross-head connected to the movable platen, an annular plunger connected to the cross-head and coöperating with the hydraulic cylinder, a steam-cylinder connected to the stationary platen, a piston therefor, and a piston-rod carrying a plunger working in the annular plunger, substantially as described.

8. The combination with the stationary and movable platens, of a hydraulic cylinder connected to the stationary platen, a cross-head connected to the movable platen, an annular plunger connected to and moving with the cross-head, a steam-cylinder connected to the stationary platen, a piston in said cylinder, and a piston-rod connected to the cross-head to directly move the latter in the direction the piston moves on one stroke, and a plunger on the piston-rod working in the annular plunger and acting to move the cross-head on the return stroke of the piston in the same direction it was moved directly by the piston, substantially as set forth.

9. The combination with the stationary and movable platens, of a hydraulic cylinder connected to the stationary platen, a cross-head connected to the movable platen, an annular plunger connected to and moving with the cross-head, a cylinder connected to the stationary platen, a double-acting piston therein, a piston-rod connected to the piston and to the cross-head to raise the same, and a plunger attached to the piston-rod working in the annular plunger and arranged to move in a direction opposite to that of the annular plunger to complete the compression, substantially as described.

10. The combination with the stationary and movable platens, of a cylinder, a double-acting piston therein, and connections partly hydraulic and partly structural between the piston and movable platen whereby when the piston moves in one direction the platen is moved by the direct action of the piston through the structural connections and when the piston moves in the other direction the platen is moved in the same direction as before by both connections and with increased power, substantially as described.

11. The combination with the stationary and movable platens, of a cylinder connected to the stationary platen and arranged below the movable platen, a double-acting piston in said cylinder, and connections partly hydraulic and partly structural between the piston and movable platen whereby the platen is first moved by the direct action of the piston through the structural connections, and its movement is completed through both connections when the piston moves in the other direction, substantially as described.

12. The combination with stationary and movable platens, of a hydraulic cylinder connected to the stationary platen, a check-valve controlling the flow of fluid from the cylinder, a pilot-valve movably mounted in said check-valve to control an opening through the latter, a longitudinally-movable rod engaging with one end the pilot-valve, an adjustable stop on the check-valve to limit the opening movement of the pilot-valve, a pivoted lever provided with a cam engaging the other end of the said rod, whereby when the lever is rocked the rod will move to first lift the pilot-valve from its seat into engagement with the adjustable stop and then lift both valves together, substantially as set forth.

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

SAMUEL J. WEBB.

Witnesses:
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