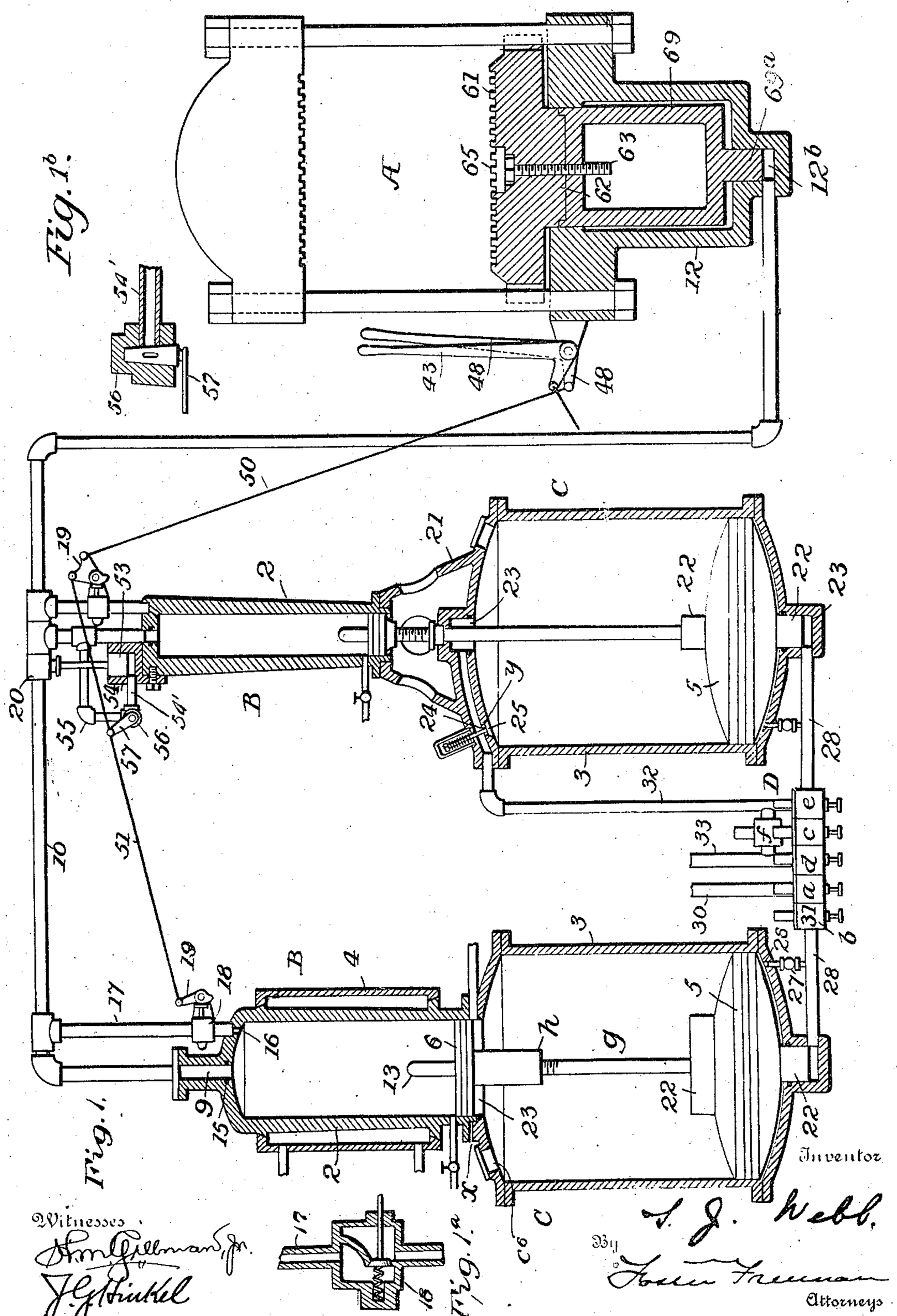
S. J. WEBB.

HYDRAULIC PRESS.

APPLICATION FILED JUNE 12, 1901.

996,693. Patented July 4, 1911.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

Fig 2.

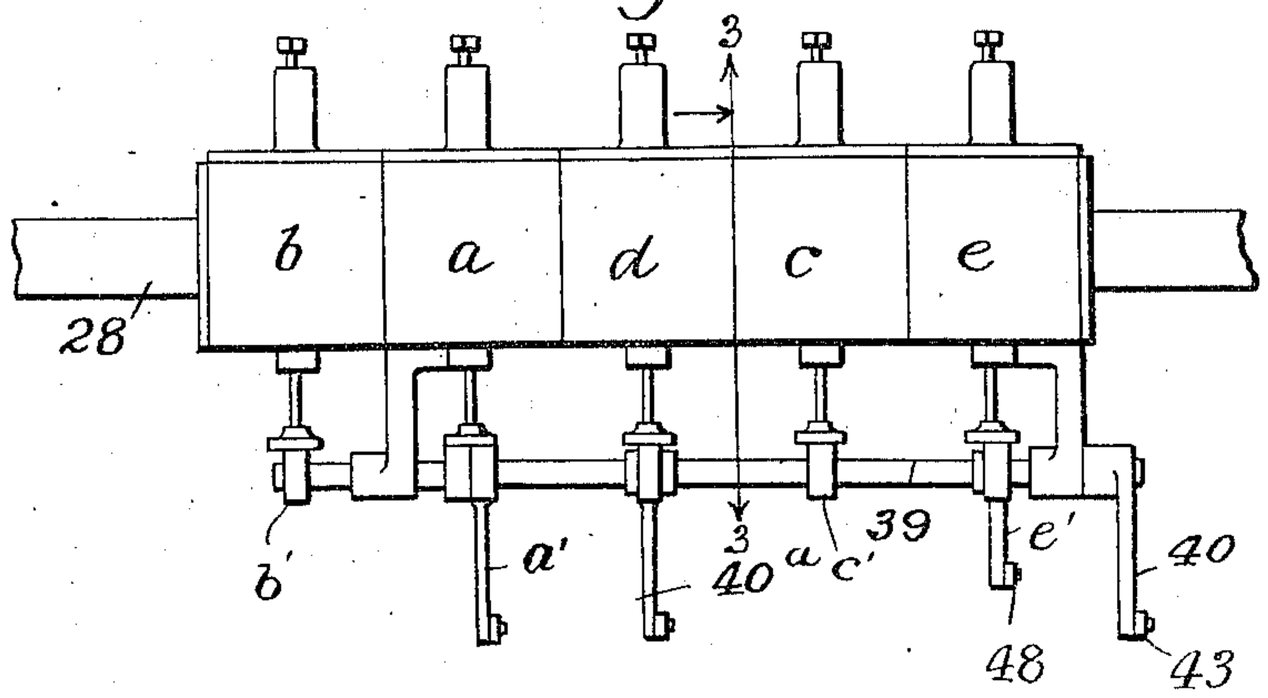


Fig. 3.

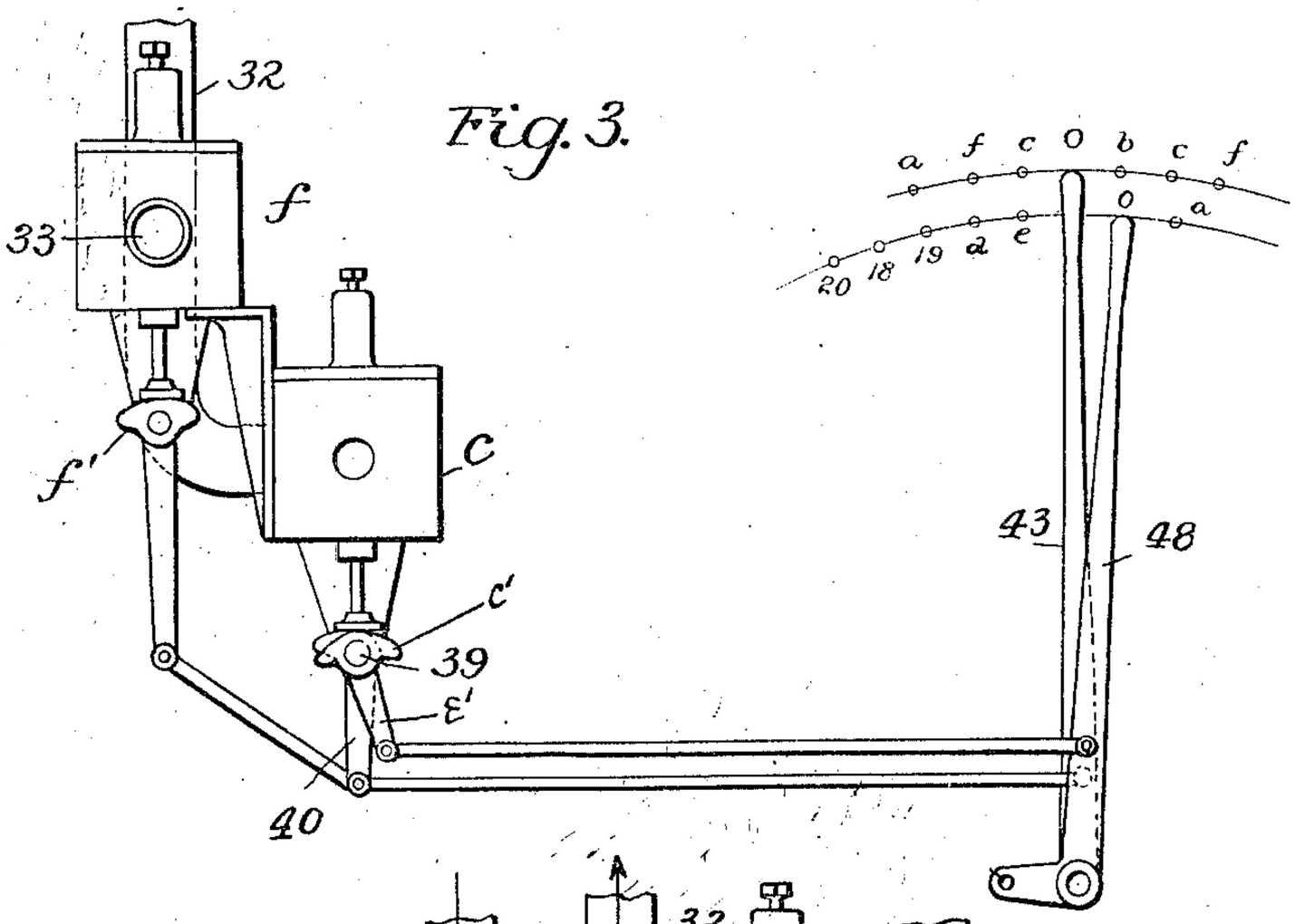
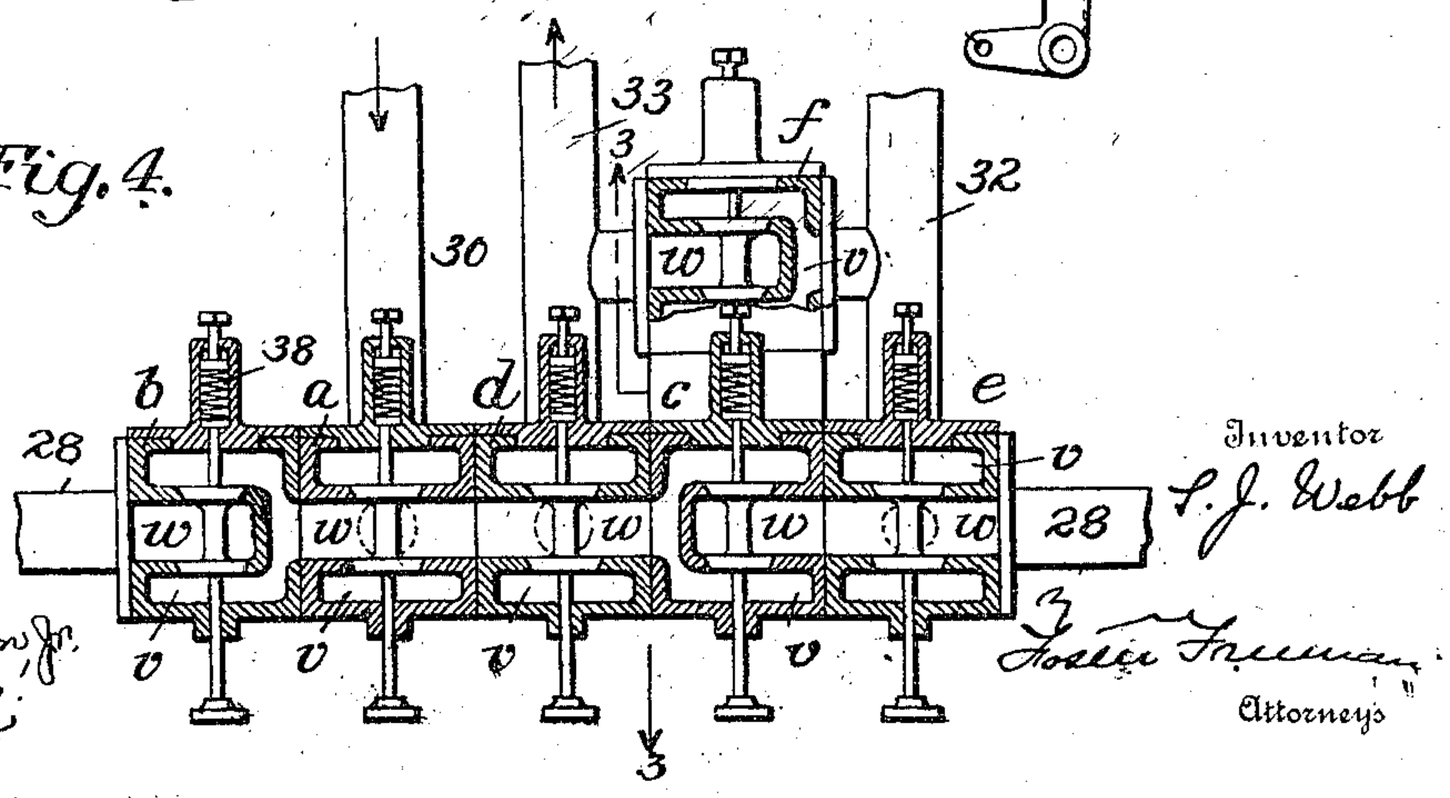


Fig. 4.



Witnesses

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3 SHEETS—SHEET 3.

Fig. 5.

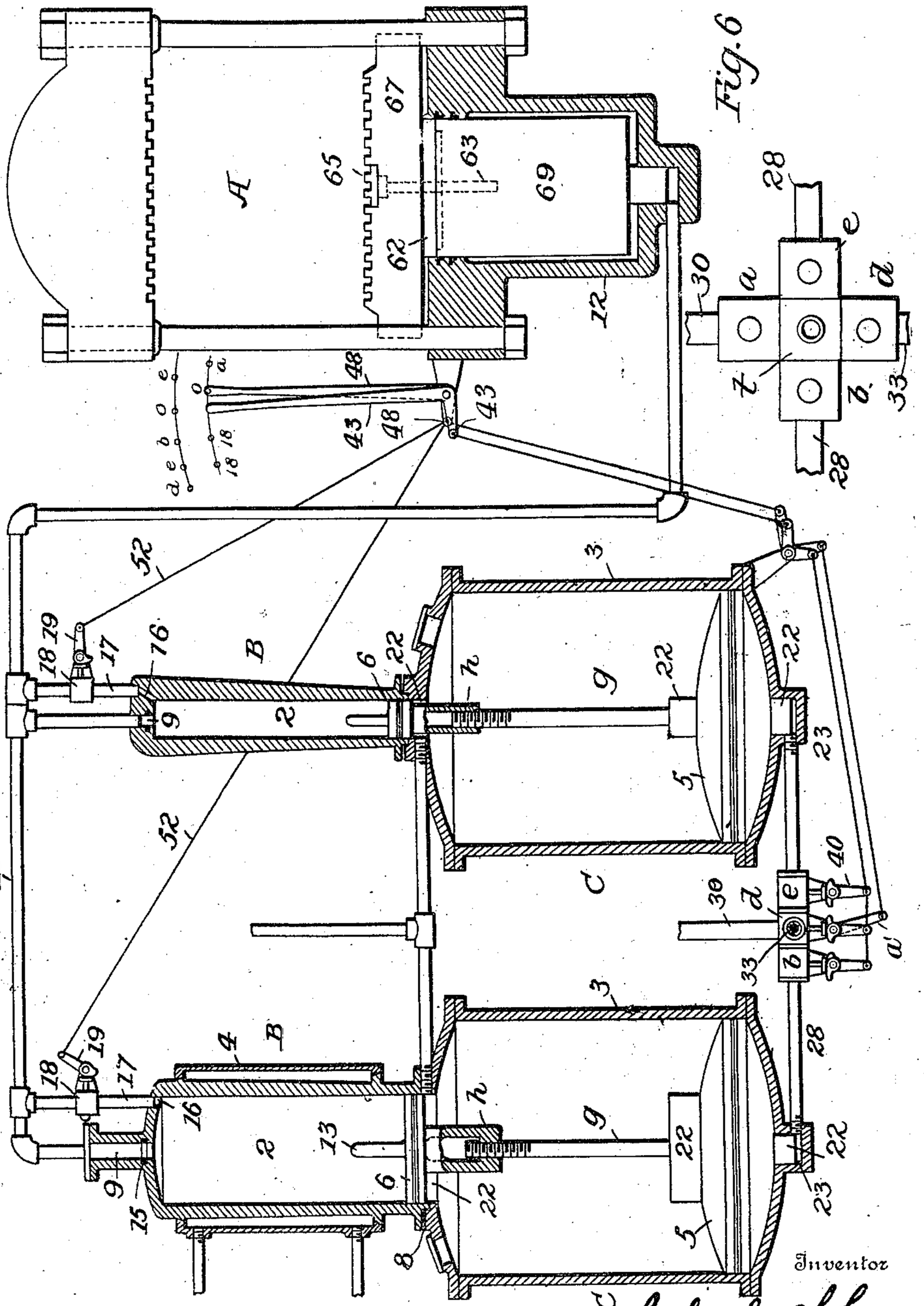

Fig. 6.

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SAMUEL J. WEBB, OF MINDEN, LOUISIANA.

HYDRAULIC PRESS.

996,693. Specification of Letters Patent. Patented July 4, 1911.

Application filed June 12, 1901. Serial No. 64,309.

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 Presses, of which the following is a specification.

My invention relates to hydraulic presses, and more especially to presses for compressing bales, and to the rams and engines for use in presses, and consists in constructing and connecting the parts for operation, as fully set forth hereinafter and as illustrated in the accompanying drawings, in which—

Figure 1 is a sectional elevation of sufficient of a bale press to illustrate my invention. The press is shown for clearness on the same plane as the cylinders, but it is preferred to locate the valve shafts parallel to the hand lever shaft, as in Fig. 3. Figs. 1^a and 1^b are sections of different valves. Fig. 2 is an enlarged side view of part of the valve device and adjuncts; Fig. 3 is a section on the line 3—3, Fig. 4, showing the connections with the operating levers; Fig. 4 is a longitudinal section through part of the valve device; Fig. 5 is a sectional elevation illustrating a somewhat different arrangement from that shown in Fig. 1; and Fig. 6 is a plan view enlarged of the valve device of Fig. 5.

While some of the features of my invention may be used in connection with a press in which there is a single ram and operating engine, I show the same in connection with a multiple or compound device, two rams and engines being illustrated in connection with a single press A, although the number of rams and operating engines may be increased at will.

The press may be of any desired construction, and each ram B, has a cylinder concentric with the cylinder of the operating engine C, and in some instances the lower end of the cylinder 2, of the ram is open and communicates directly with the upper part of the cylinder 3, of the operating engine. Preferably the cylinder of the ram is surrounded by a water-jacket 4, and as the outer portion of the ram cylinder must support a much heavier pressure than the inner portion the ram cylinder increases in thickness toward the outer end, thereby reducing the amount of metal which otherwise would be in the structure.

The piston 5, of the engine is connected with the piston 6, of the ram by means of an extensible connection, that is, a connection which maintains the two pistons in their proper relation during the working of the apparatus, but which permits the piston 6, to be lowered out of and below the lower end of the cylinder 2, to permit the adjustment of the peripheral packing of the piston or its replacement in case it becomes worn which can be accomplished by access through the man hole C^6 in the upper cylinder head of the steam cylinder C.

It is, of course, desirable to prevent the transmission of heat from the cylinder of the engine to the cylinder of the ram and I, therefore, interpose a non-conductor of heat between the two. This may be an air-space x, as shown in Fig. 1, or the space may be filled by a disk of compressed paper 8, as shown in Fig. 5. A port 9, at the end of the cylinder 2, of the ram communicates with a conducting pipe 10, which leads to the cylinder 12, of the press, so that when either ram piston is lifted the water will be forced therefrom to lift the plunger of the press, and when the latter descends the water will flow back into the cylinder of the ram.

To prevent the too sudden arrest of the movement of the piston of the ram, the said piston is provided with a projection 13, adapted to fit closely the port 9, which preferably is surrounded by a packing 15, which will prevent any leakage after the projection 13, enters the port. This would absolutely prevent any movement of the ram piston after the projection enters the port, and I, therefore, provide a second port 16, connected with a pipe 17, communicating with the pipe 10, the said port 16, being of limited area so that the water can flow through the same but slowly to the pipe 10, and thereby gradually arrest the upper movement of the piston. In the pipe 17, is a check-valve 18, which permits the upward flow of the water but prevents its downward flow so long as the check-valve is closed. An operating lever 19, however, is provided whereby this check-valve may be lifted to permit water to flow to the piston when the latter must descend, as otherwise the pressure upon the end of the projection

13, would not be sufficient to overcome the vacuum that would be created until said projection leaves the port 9.

The ram farthest from the press is of the greatest dimensions; that is, the piston has the greatest area and this ram constituting the low pressure ram is first operated to raise the plunger of the press at the time of least resistance, and after the piston 6, has reached the top of this ram cylinder the other ram is put in operation, and having a cylinder and piston of much less dimensions (while the size of the engine is preferably as great) a much greater pressure is applied to effect the final operation of the press. This latter is the high pressure ram.

It will be evident that as the two rams communicate with the same pipe 10, the pressure in the ram of smaller dimensions would be transferred to the other ram if means were not provided for preventing this, and I, therefore, interpose a check-valve in a casing 20, in line with the pipe 10, which check-valve permits the flow through the pipe toward the press, but prevents the flow back from the ram of smaller dimension and greatest pressure to the other.

It will, of course, be evident that where the projection 13 of the low pressure ram is of very limited dimensions there would not be sufficient back pressure to render the employment of the check-valve 20 essential if pressure be maintained on the piston 5, and, therefore, I have not shown it in Fig. 5, as its use is not always needed, although desirable in some cases. It will further be evident that the employment of the check-valve 18 is only essential when the projection 13 fits tightly within the port 9, as if there was any leakage between the projection and the walls of the port there would be no vacuum and the port 16, and its valve might be dispensed with. It is desirable, however, to have the projection fit tightly in the port 9, as thereby I am enabled by positively controlling the valve 18, to more effectually control the operations of the press.

Where it is desired to carry steam to the upper part of the cylinder of the operating engine the cylinder of the ram should not, of course, connect therewith, and in such case, as in the engine at the right Fig. 1, the end of the cylinder 3, is closed except the steam inlet port *y*, and a distance casing 21, is interposed between the head of the cylinder 3, and the inner end of the cylinder 2, of the ram.

In each head of each steam cylinder is a chamber or socket 23, surrounded by a suitable packing and to which is adapted a projection 22, on the opposite face of the piston 5, thereby securing a cushioning effect as the piston approaches either head. Steam is admitted to each socket after the projection has moved out to a slight extent, as the inlet pipe or channel communicates with the socket, but to prevent a vacuum between the piston and head of the cylinder in starting (except when the low pressure engine cylinder communicates with the ram cylinder) inlet ports are provided communicating with the supply pipe or channel, as the port *y*, closed by a spring-seated valve 25, at the top of the high pressure engine cylinder and ports 26, communicating with tubes extending to the pipe 28, and provided with check valves at the bottoms of the engine cylinders. The pipe 28, in Fig. 1, forms a communication between the engine cylinders and there is provided a valve device D, having a plurality of valves suitably arranged so that steam from the supply pipe 30, may be directed to either cylinder at will, or so that the exhaust from either cylinder, after its piston has been raised to the top, may be passed to the bottom of the other cylinder, thereby compounding the apparatus in either direction, and the valve device D, is also constructed so that the steam from one side of the high pressure ram cylinder may be circulated to the other side thereof and then exhausted into the other cylinder. Thus, it is possible to obtain a multiple of different pressures, either by direct action of the steam or by compounding the engines.

In the construction shown in Figs. 1 to 4 the valve device has six valve casings and valves *a*, *b*, *c*, *d*, *e*, *f*, each casing with partitions having ports and valve-seats dividing it into a central chamber *w* and outside chamber *v*, and the valve-stems extend vertically through stuffing-boxes of the casings.

The chamber *v*, of the casing *a*, communicates with the steam supply pipe 30, and the chamber *v*, of the casing *d*, communicates with the exhaust pipe 33. The chamber *v*, of the casing *e*, communicates with a circulating pipe 32, extending to the top of the cylinder of the high pressure ram engine and with the pipe 32, also communicates the chamber *v*, of the casing *f*, the chamber *w*, of the latter communicating with the exhaust pipe 33.

The chambers *w*, of the terminal casings *b*, *e*, communicate through pipes 28, with the cylinders of the adjacent engines. The casings *c*, has a valve which serves to open and cut off cummunication between the casing *e*, and the other casings, and by lifting the valve of the casing *c*, and that of the casing *b*, communication is established between the two engine cylinders 3, 3 to exhaust from below the elevated piston of either into the cylinder of the other, and then by closing either of the said valves and opening the valve of the casing *a*, the steam is directed from the supply pipe to one of the engines according to which valve

is left open, and then by closing the supply valve and opening the valve of the casing *d*, the steam is exhausted from said engine to the exhaust pipe.

By opening the valves of the casings *b c f*, steam may be exhausted from the low pressure to the bottom of the high pressure engine cylinder, and from the top of the latter through the pipe 32, to the exhaust pipe 33. By opening the valves of casings *b d*, the steam may be exhausted from the low pressure engine cylinder to the exhaust pipe 33. By opening the valve of the casing *e*, the steam may circulate through the pipe 32, from the top to the bottom of the cylinder of the high pressure engine or from the bottom to the top.

Each valve-stem is depressed to close the valve by means of a spring 38, and is raised by a suitable cam or otherwise. In the construction shown in Figs 1 to 4, all the cams of the valves *a* to *e* are secured to or rock upon a single shaft 39, and the valve *f* is raised by cam *f'*, and all the cams are so constructed and connected with operating devices as to lift the valves in proper manner on the rocking of the cams. For instance the cams for operating valves *a*, *b* and *c* are fixed to the shaft 39 rocked by the arm 40 connected to the lever 43. These cams extend on one or the other side of the shaft 39, as shown in Fig. 3, so as to move the respective valves when the shaft is rocked in one direction or the other. The cam for operating the valve *e* is mounted to rock loosely on the shaft 39 and is operated by the lever 48 through its connecting rod. The arm 40^a swings loosely on shaft 39 and moves the cam operating valve *d* and is connected to lever 48. In the construction shown in Fig. 5, there are but four casings, diagonally arranged and the cams are upon different rock shafts, provided with arms 40. In either case the parts are so constructed and arranged that the valves may be raised or lowered in proper manner to secure the results described.

The levers 43 and 48 which control the valves of the valve device D, may also control the valves 18 and 20. As shown in Fig. 1, a rod 50, connects the lever 48, with one of the arms 19, the two arms 19 being connected together by a rod 51 so as to operate in unison. In the construction shown in Fig. 5 a rod 52, leads from each arm 19 to an operating lever.

In order to operate the valve 20, positively I prefer to make use of a motor consisting of a piston 53, and a cylinder 54, to which water is admitted by a pipe 55, from the pipe leading from the ram cylinder to the pipe 10, and the passage of water through the pipe 55, is controlled by a valve 56, provided with an arm 57, which is connected with the rod 51, so that the valve 56. will be opened at the same time as the valve 18, to thereby admit water below the piston 53, and open the valve 20.

In Figs. 1, 2, 3 and 4 the operation is as follows: Both pistons of the steam cylinders being down when the press starts to press a bale, and the top of the right hand cylinder being filled with steam from the previous operation, steam is admitted into the low pressure, or left hand cylinder, by a forward movement of the lever 43 opening the valves *b* and *c* (the valve *e* being open from the previous operation), which allows the steam to flow from the top of the high pressure cylinder to the bottom of the low pressure cylinder, forcing its piston up. The lever 43 is then drawn back closing the valve *c*, and the lever 48 is pushed forward closing *e* and opening valve *a* and admitting live steam under the said piston which completes its stroke and makes the initial pressure on the bale. Then the lever 48 is drawn back which closes the valve *a*, and the lever 43 is pushed forward opening *c* and *f*, *b* being already open, and steam is allowed to flow from the under side of the low pressure piston to the under side of the high pressure piston thus forcing it up and applying additional pressure to the bale; then the lever 43 is drawn back thus closing the valve *b*, leaving *c* and *f* open by the action of the double cams under them and opening the valve *a*, thus admitting live steam under the high pressure piston, which drives it up and applies the final pressure to the bale. The exhaust from above the high pressure piston passes out through pipe 32, valve *f* and pipe 33, lever 43 being then stopped to leave all valves closed. To lower the press, the valve *e* is opened by the lever 48, allowing the steam to pass from the under side of the high pressure piston to the upper side of the same, retaining the steam for use to drive up the low pressure piston on the next stroke, and the weight of this piston and rod will cause it to descend, thus leaving all the steam in the upper end of the high pressure piston ready to start to press another bale. The lever 48 is then drawn back opening valves *d*, 19, 18 and 20 in this order, thus allowing the steam to pass from the bottom of the low pressure cylinder out through the pipe 33 and allowing the water to pass all of the hydraulic valves into the hydraulic cylinders 2, completing the operation and leaving all the parts as at the beginning of the operation, and as shown in Fig. 1.

Shaft 39 is rigidly connected through arm 40 and its connecting rod to lever 43 (Figs. 2 and 3) and carries cams to operate valves *c*, *a*, *b*, cam *c'* being a double cam. The double cam under valve *f* is also connected to lever 43. The double cams lift the valves by either forward or backward motion of

the hand lever. There is a cam under each of the valves *a*, *d* and *e* which swing loosely on shaft 39 and are all connected to and operated by lever 48 by means of connecting rods. Valve *a* is also operated by lever 48, as one of the cams under it swings loosely on shaft 39 and is connected to lever 48 by means of a connecting rod. The other cam under *a* is operated by the lever 43. Valve *b* is opened and closed by lever 43.

In Figs. 1, 2, 3 and 4, lever 43 opens valves *b*, *c* and *f* by its forward movement, and *c*, *f* and *a* by its backward movement. Lever 48 opens valve *a* by its forward movement, and *e*, *d*, 19, 18 and 20 by its backward movement, and when each lever is at point O, all of the valves are closed, as shown by the arcs at the top of the levers in Fig. 3, which is correctly lettered to show the opening of each valve in their regular orders. Point O is the vertical or central position of each of the hand levers. The forward movement of levers 43 and 48 is toward the press or to the right in each figure.

It will be evident that any other suitable arrangement of valves or any suitable number of operating levers may be employed so that any valve or valves may be lifted when it is necessary to effect the desired results, that is, to admit the steam to the cylinder of either operating engine or to exhaust it from either operating engine, either to the exhaust or to the cylinder of the other engine, or to circulate it from end to end of one of the cylinders.

I have referred to the fact that the pistons of the rams and cylinders are extensibly connected. Any suitable means may be employed for this purpose, but preferably the connecting rod is in two sections *g*, *h*, one provided with threads extending into the other section, as in Fig. 5, or where the ram cylinder is separated from the engine cylinder, as in the high pressure ram in Fig. 1, the threaded end of the piston-rod may extend through a threaded socket in the piston of the ram. By turning the piston of the ram in either case the distance between the said piston and that of the operating engine may be increased or diminished as desired.

In the construction shown in Figs. 5 and 6 the casings of the valves are arranged diagonally to each other, about a central casing *t*, which communicates with each valve casing. The valve casing *a*, communicates with the steam pipe 30, and the opposite valve casing *d*, communicates with the exhaust pipe 33, and the valve casings *b* and *e* with the opposite engines respectively, and by properly operating the valves either engine may be put into communication with either the supply pipe or the exhaust or with each other.

To permit access to the packings of the press cylinder the lower section of the plunger 69, is less in length than the distance of the lower part of the packing from the bottom of the cylinder, and this lower section is separable from the movable platen 67, in any suitable manner, so that when the said platen is lifted with the upper section of the plunger (which may be connected either permanently or detachably with the platen) the packings will be exposed for repair or replacement.

As shown, the upper section 62, of the plunger is a part of or connected permanently with the platen 67, and one or more bolts 63, pass through the platen into the lower section of the plunger and connect the same detachably with the platen.

To permit the manipulation of the bolt or bolts 63, which necessitates access to the heads thereof, the latter occupy positions in the platen 67 below the level of the ribs between the grooves in the platen plate, and a section 65, of the latter having ribs thereon is removable to permit access to the sockets and the heads of the bolts therein.

The lower end of the plunger 69 is provided with a projection 69^a adapted to fit in a recess 12^b in the lower end of the cylinder 12. The pipe 10 communicates with the recess and the latter forms the inlet and exhaust port of the cylinder, and when the plunger is at its lowest position the projection 69^a will enter and close such port and form a cushion for the plunger.

In Fig. 5, the operation is as follows: lever 43 is pulled back opening the valve *b*; lever 48 is then pushed forward opening the valve *a*, thus admitting live steam to the underside of the piston and driving it up and making the first pressure on the bale. The valve *a* is closed by dropping the lever back to O, then lever 43 is drawn farther back, opening the valve *e* and allowing steam to pass from the low pressure to the high pressure cylinder, thus applying additional pressure to the bale. Then lever 43 is pushed forward, closing the valve *b* and opening the valve *e* by the action of the double cam under the valve *e* and lever 48 is pushed forward, opening the valve *a*, admitting live steam to the underside of the high pressure piston, thus completing its stroke and giving the final high pressure to the bale. Lever 48 is then drawn back to O and lever 43 is also drawn back, opening the valves *b*, *c* and *d*, which allows the steam to exhaust from both cylinders through the exhaust pipe 33, and lever 48 is drawn back opening both the valves 18, allowing the water to pass around the projections on the hydraulic pistons and causing them to descend to their normal position, thus completing the operation.

Without limiting myself to the precise

construction and arrangement of parts shown and described, I claim:

1. The combination with the communicating cylinders of an engine and ram, the engine cylinder having a man hole, of a piston in each of the cylinders, and an extensible connection between the two pistons whereby one can be withdrawn from its cylinder without detaching it from the other piston, substantially as set forth.

2. The combination with the communicating cylinders of an engine and ram, the engine cylinder having a man hole, of a piston in each cylinder provided with peripheral packings, and an extensible connection between the two pistons whereby one can be withdrawn from its cylinder to replace or adjust the packing without detaching it from the other piston, substantially as set forth.

3. The combination with the hydraulic press, rams and operating engines therefor and connecting pipes, of a valve structure comprising a plurality of contiguous and communicating casings, each casing having a valve, and operating means for the valves, said structure and operating means being constructed and arranged to admit steam first to the low pressure ram engine and then exhaust from same to the high pressure ram engine and then admit steam directly to the latter engine and from the latter to the former, substantially as set forth.

4. The combination with the cylinder and piston of a hydraulic ram, of two outlet ports at the end of the cylinder, a projection on the piston adapted to enter and close one of said ports, and a check valve for preventing return flow through the other port, substantially as set forth.

5. The combination with the cylinder and piston of a hydraulic ram, of two outlet ports at the end of the cylinder, a projection on the piston adapted to enter and close one of said ports, and a valve and means for positively opening the same and controlling the flow through the other port, substantially as set forth.

6. The combination with a hydraulic press, of a hydraulic ram and actuating engine, said ram having a cylinder, piston, and two terminal ports, a projection on the piston adapted to close one of said ports, a pipe communicating with said port and the press, and a second pipe extending between the first and the other port and provided with a check valve, substantially as set forth.

7. The combination with a hydraulic press, of a hydraulic ram and actuating engine, said ram having a cylinder, piston, and two terminal ports, a projection on the piston adapted to close one of said ports, a pipe communicating with said port and the press, a second pipe extending between the first and the other port, and provided with a check valve, and means for positively opening said valve, substantially as set forth.

8. In a valve device a series of connected valve casings each having a central chamber *w* and a chamber *v* surrounding it with ports between them and valves adapted to said ports, and a plurality of the chambers *w* being in open communication with each other and with the chamber *v* of other casings, whereby steam may pass from one casing to another without operating its valve, and supply and exhaust pipes communicating with said casings, 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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W. CLARENCE DUVALL.