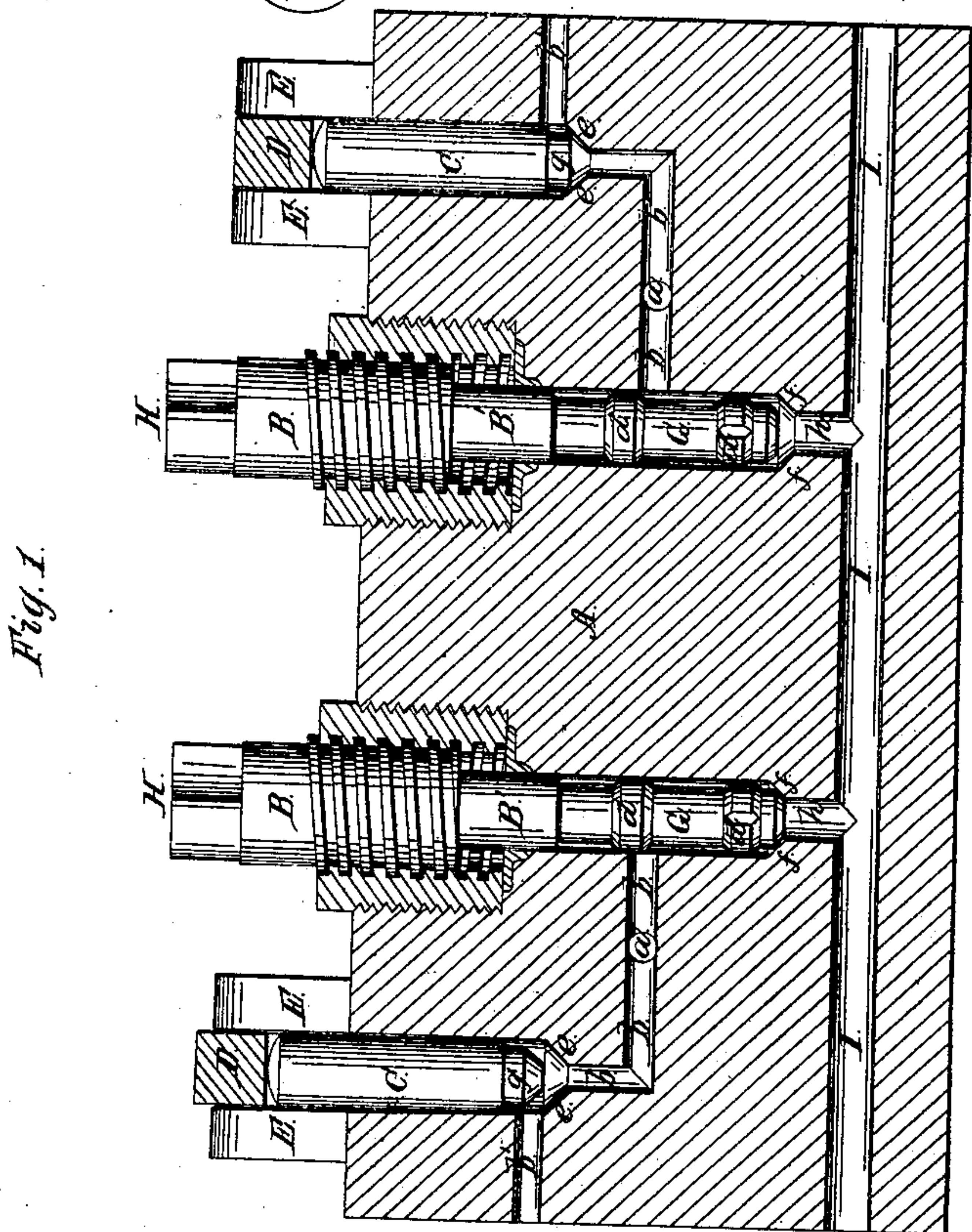
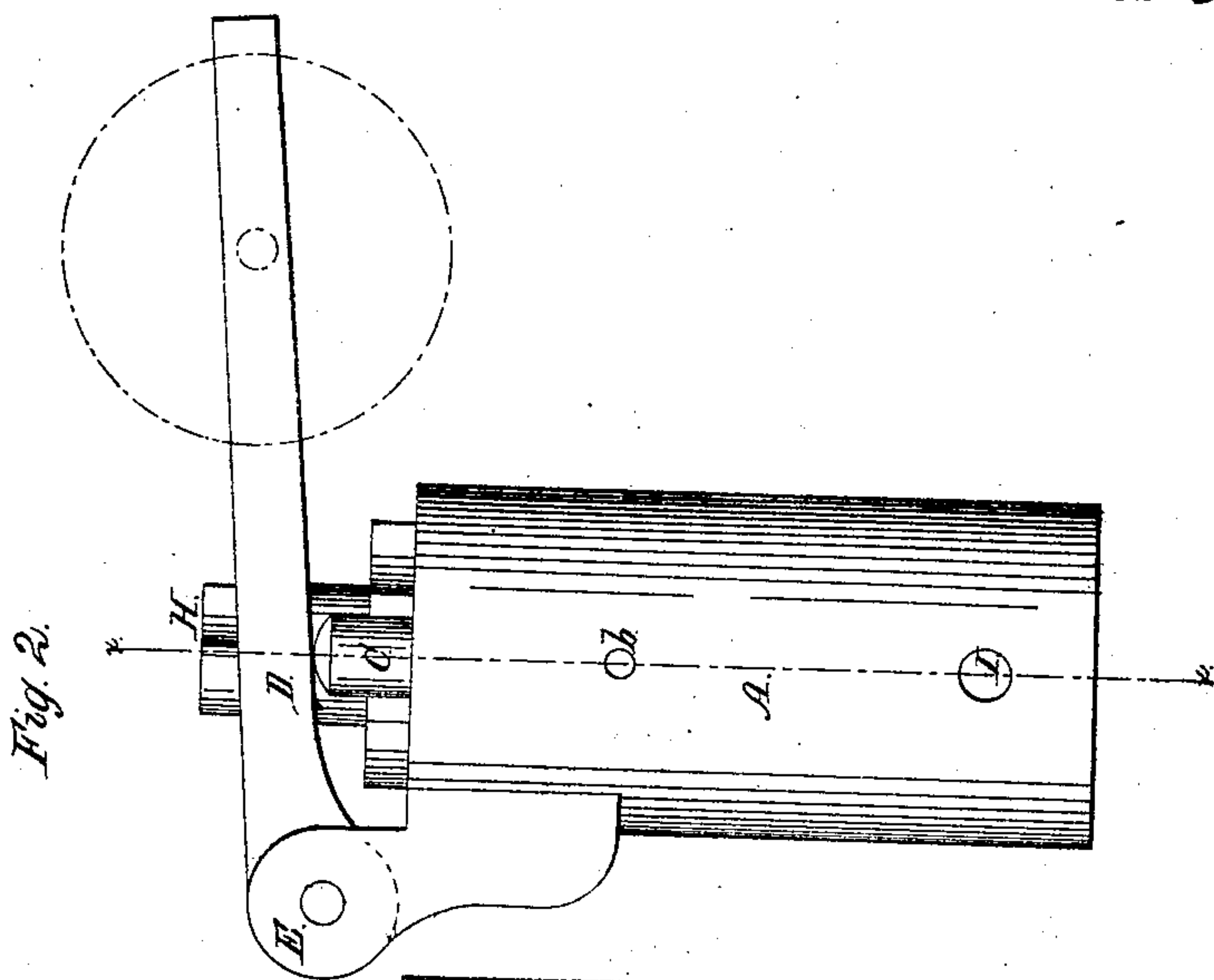


T. Harbottle,
Hydraulic Press.

No. 89650.

Patented May 4. 1869.



Witnesses.
A. Denman and
Spencer Morgan

Inventor.
T. Harbottle.
per *Mumma & Co.*
Attorneys.

United States Patent Office.

THOMAS HARBOTTLE, OF BROOKLYN, NEW YORK.

Letters Patent No. 89,656, dated May 4, 1869.

IMPROVEMENT IN HYDRAULIC PRESSES.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, THOMAS HARBOTTLE, of Brooklyn, in the county of Kings, and State of New York, have invented a new and useful Improvement in Valve-Gear for Hydraulic Presses; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal vertical section through the block, which contains the valves and passages leading to and from the same, the section being taken through the line *x x*, fig. 2.

Figure 2 is an end view of the block, showing a side view of one of the relief-valve levers.

Similar letters of reference indicate like parts.

The object of this invention is to obtain a simple and effective automatic valve-gear for hydraulic presses, whereby the check-valves will close instantly and automatically at the end of each stroke of the pump, and each of the relief-valves will duly perform its respective functions without affecting the operation of the other check-valves or relief-valves connected with the same pump, but different presses.

In the valve-gear of hydraulic presses generally, the great pressure required necessitates the use of a solid metal block, which is bored out to receive solid valves and to afford seats for the same, and is also bored out to obtain passages of small calibre for the oil or fluid used to pass through to the valves, and to the pipes leading to the pumps and presses.

And my invention consists in the relative arrangement of such valves and passages, and also in the employment of independent or automatic check-valves, moving freely within chambers in the said block, and also in the employment of relief or safety-valves, arranged within the said block, in such relation to the check-valves and passages communicating therewith, as to operate in the manner hereinafter set forth; and the present invention may be considered as an improvement on the valve-gear of hydraulic presses generally, as the principal advantages obtained thereby are—

First, the maintenance of pressure in the rams of one or more of a series of presses connected with the same pump or set of pumps.

Second, the simple and expeditious character of the manipulation required at the hand of the attendant in changing the connection of the pump from one press to the next.

And, finally, the absence of that vigilant attention on the part of the operator, which, with some of the presses hitherto provided, is required to prevent injury and breakage, and with others to obtain the most economical working of the presses.

I am thereby enabled to operate a number of presses by the same pump or pair of pumps, without loss of time in waiting for any one of the rams to discharge before another is filled, or without requiring more than one attendant for the pump and valves of a number of the presses.

My invention will be more clearly understood by reference to the drawings, in which—

A is a metallic block, having a horizontal transverse passage, I, which communicates with the pump or pumps, forcing fluid to the rams of the presses.

In the drawings, the valves and passages are provided for two presses only, which number is, however, sufficient to illustrate the invention; but it will be observed that the chief value of the same lies in the fact that a number of presses may be easily and economically worked from one and the same pump or set of pumps.

G G are two independent check-valves, having a slight lift in their respective chambers, which latter are bored out of the block, as shown.

The reduced ends of these valves are formed to fit against conical seats, *f f*, surrounding the short passages *h*, leading from the main pump-passage I, and these valves, when seated, shut off the flow of fluid to or from the passage *a*, leading to the rams of the presses.

The construction, arrangement, and function being the same for each pair of valves and their respective passages, one pair only will be described in detail.

The check-valve G is a solid cylindrical mass of metal, and is formed with fillets *d d*, which serve as guides to keep the valve in the axis of its chamber and seat, as the body of the valve is of less diameter than the bore or chamber in which it works, in order to afford a space for the passage of fluid through the chamber into the passage *b*, which communicates with the passage *a*, leading to the ram-chamber of the press.

In practice, a small copper pipe, leading to the ram-chamber of the press, is connected with the external orifice of this passage *a*, while, in a similar manner, a pipe leads from the passage I to the pump or pumps, and also a pipe leads from the external orifice of the passage *b*, which latter is a continuation of the passage *b* from above the seat of the relief-valve C to the tank from whence the pump draws the fluid, which it delivers into the passage I.

The passage *a* opens into the passage *b*, between the check-valve G and the relief-valve C, which latter is a solid metal cylinder, formed with a reduced lower end, *g*, around which the fluid flows to the external passage *b'*, leading from the bore in which the relief-valve works.

The said reduced end, *g*, is formed with a conical base, which fits lightly against the seat *e e*, surrounding the vertical part of the passage *b*.

In order to limit the play of the check-valve G, and also to close its bore or chamber, the latter is fitted with a plug or stop, B, which is formed with a reduced part, B', which projects into the bore or chamber of the check-valve, and is made tight therein by leather cup-packing.

This plug must be adjustable up or down, so that the part B' may be brought to bear forcibly against the check-valve, in order to hold it immovably to its seat when the fluid is to be shut off from the press, or to remove the said part B' a short distance from the

check-valve, in order to allow the valve to lift and seat with each stroke of the pump.

The simplest and best method of operating the stop-plug B' is by means of a screw-thread cut on the said plug, and working in a hollow thread cut directly in the block, or in a nut tapped into the block, as shown, which latter method is preferable, for the purpose of packing the part B'.

In practice, the part bearing the thread should be enlarged, in order to afford a thread of suitable strength and pitch.

In the drawing, the block, valves, and passages are shown in the full or actual size as employed in practice, and square-threaded screws, of small pitch, as therein shown, are also of the requisite relative dimensions.

These plugs are formed with square heads, H, affording attachment for lever-handles, by means of which the attendant operates the stop-plugs.

D are the weighted levers, pivoted to lugs E, and resting on the ends of the relief-valves, which project from their bores, above the upper face of the block A, as shown.

These levers are weighted, to obtain the desired pressure per square inch in the pipes, passages, and ram-chamber; and when the pressure in the ram-chamber exceeds this predetermined pressure, the relief-valves will be raised, thus permitting a slight escape of the fluid, through the passage B', until the valve again seats.

In the operation of this valve-gear, the water or oil (the latter being generally used) is forced by the pump into the passage I.

The check-valves being free to work, consequently all the presses of the series will be operated simultaneously.

When all the presses are up, that is to say, when the matter in them is compressed to the utmost degree required, the presses are to be lowered.

The attendant now screws down the stop-plug of one of the check-valves; for example, the first of the series, which seats the valves firmly, thus preventing any oil from passing either to or from the passage I, through that valve.

The relief valve belonging to the press is then raised by the attendant, and the oil discharged from the ram-chamber of the first press back through the passage B' to the pump tank.

The stop-plug is then raised again, and the press operated as before, while the attendant proceeds to perform the same operation successively on the valves of each press of the series, and returning again to the first press, which by that time had been brought up and remained in that condition, compressing the matter placed therein.

Should the pressure exceed the degree required, the same will be equalized throughout the series of presses (except the one being discharged) by the action of any one of the relief-valves; and here another advantage obtains incidentally, for it frequently occurs in the practice that safety-valves at the pump-gear of hydraulic presses, as heretofore made, from some cause not well understood, (generally considered to be the collection of air under the safety-valve,) refuse to lift at the presses for which they are weighted, thereby producing breakage of some part of the mechanism.

By my invention, however, if only one of the relief-valves operates at the proper pressure, the excess of pressure in the passage I will find vent by the way of the check-valve and relief-valve of that particular pressure, thereby equalizing the pressure at all the valves and passages of the presses which are up.

Another advantageous feature resulting from my invention is due to the arrangement of the relief-valves in the passages b b', which latter communicate with each other, and with the press-passage a, and

the check-valve chamber, above the seat of the latter valve, whereby the relief-valve serves also as a safety-valve, but is free from the violent jumping action heretofore experienced in such valves, from their intimate connection with the pumps; but in the present arrangement, the pulsation or shock of the oil is first felt and softened by the check-valve, and after passing it does not act upon the relief-valve suddenly and harshly, having the continuous medium of oil extending to the ram-chamber to receive and diffuse the shock up to the very instant when the relief-valve lifts automatically from excessive pressure.

In the most approved combination of valves for hydraulic presses hitherto employed was that of myself and another, wherein two screw-valves geared tightly, so as to seat and lift reversely.

They were operated by hand, one valve closing the passage from the press to the tank, and the other closing the passage from the pump to the press, a cock in the pump-passage being employed to shut off the communication with the pump, while the geared valves were being shifted.

Where a series of these were used, the attendant was compelled to charge them rapidly and correctly, to avoid loss of pressure or breakage; but with the present invention, it is hardly possible for breakage or loss of pressure to occur through neglect on the part of the attendant.

When any hydraulic presses are employed in expressing liquid resident in matter, (as in expressing linseed-oil and the like,) which requires great pressure, the most effective or productive moment of pressure is the terminal pressure, that is to say, the highest degree of pressure which is obtained and maintained on the matter when the presses are up to their full extent, whereby the throbbing action of the pump-fluid is made to act on the matter with its full effect.

Now, this highest degree of pressure will be lost in charging the valves, unless the same are check-valves, which retain the pressure in manner described, and at the same time permit the pumps to continue working without breakage.

By the employment of check-valves, the pressure may be retained in any one or all of the ram-chambers, without danger or detriment, for any desired time, and the attendant is not required to be constantly present and vigilant in order to insure the proper working of the presses.

It will be observed that one of the important features of my invention is the stop-plug B' B, and, as shown in the drawing, is a screw-plug, to be operated by a hand-lever or wrench; but I desire to be understood as not limiting my invention to a screw-stop plug, or even a screw-stop, for this feature is subject to two legitimate modifications, of which the first is to dispense with the screw-threads, and form the part B cylindrical, and fit it air-tight (or pack it) into the bore, allowing the end to project above the block, as do the relief-valves C, a lever and weight being employed, as in the latter valves.

This modification would be desirable when the presses were remote from the pumps; or the part B, projecting upward as before, might be acted upon by means of a set-screw working in a nut formed in a yoke or plate of metal affixed to the upper surface of the block A, and arching over the projecting end of such closely-fitting stop-plug, or an analogous projection from and continuous with the check-valve itself.

In both of these modifications, the adjustability of the check-valve would be permitted.

In the case of the weighted lever, the same would be raised by a rope and pulley, leading to the attendant's locality.

In practice, a cup-packing of leather is used, which surrounds the part B', and is held in place by the nuts of the screw-stops, as shown.

I am aware of the existence of the patent, number 79,949, July 14, 1868, to W. P. Callahan, and I claim nothing that is therein embraced; but having thus described my invention,

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

The arrangement of the passage I, passages *h*, check-valves G, adjustable stops B B', passages *b b' a*, and the relief-valves C, as herein described, whereby each press is relieved independently, the pulsation of

the liquid upon the relief-valves reduced, and one block provided for a number of presses, for the purpose specified.

The above specification of my invention, signed by me, this 29th day of October, 1868.

THOS. HARBOTTLE.

Witnesses:

F. BLOCKLEY,
E. G. COLLINS.