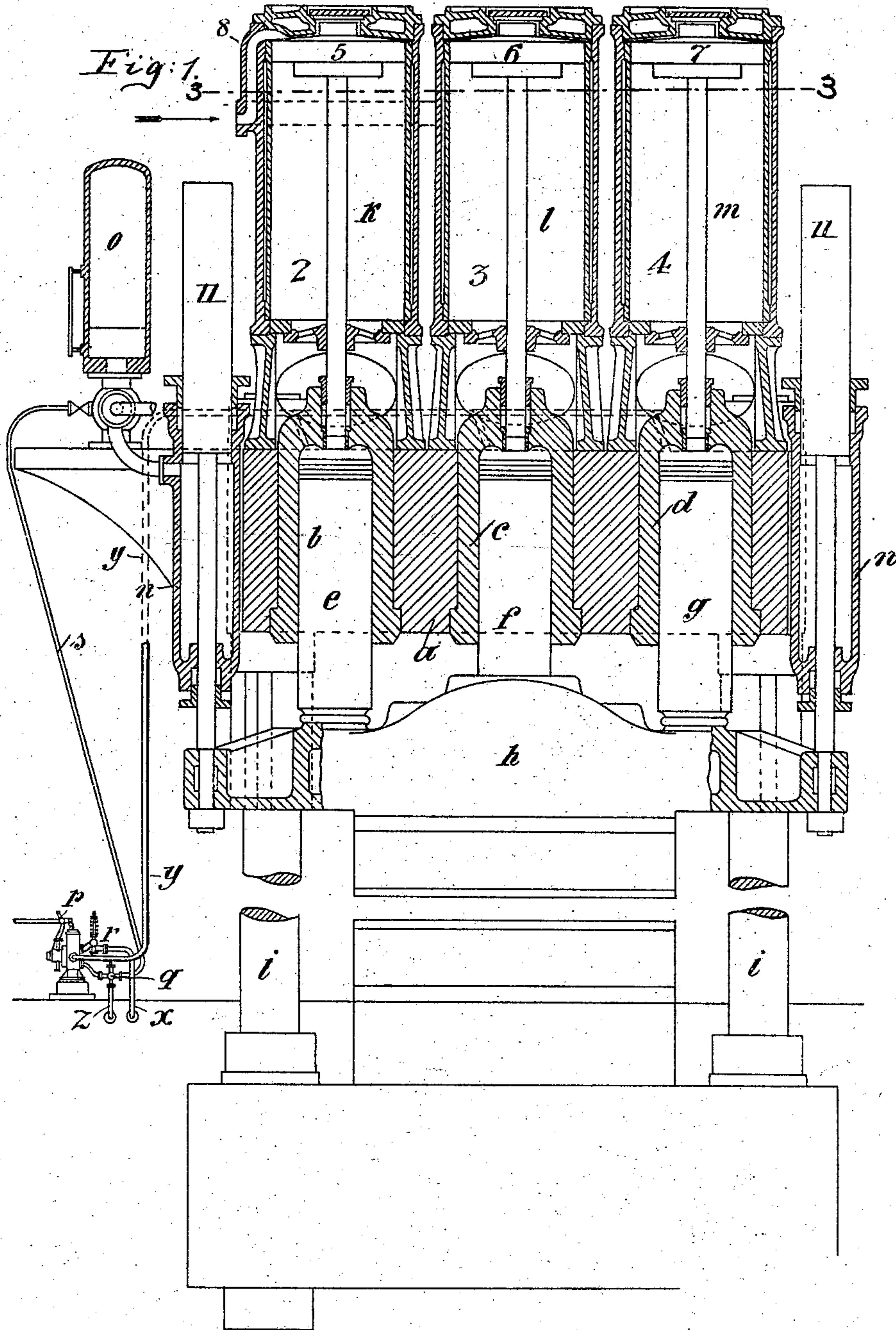


No. 842,949.

PATENTED FEB. 5, 1907.

B. GERDAU.  
HYDRAULIC PRESS.  
APPLICATION FILED OCT. 11, 1899.

2 SHEETS—SHEET 1.



Witnesses:  
William Miller  
William Schulz

Inventor:  
Berthold Gerdau  
per Roeder & Briesewitz  
Attorneys

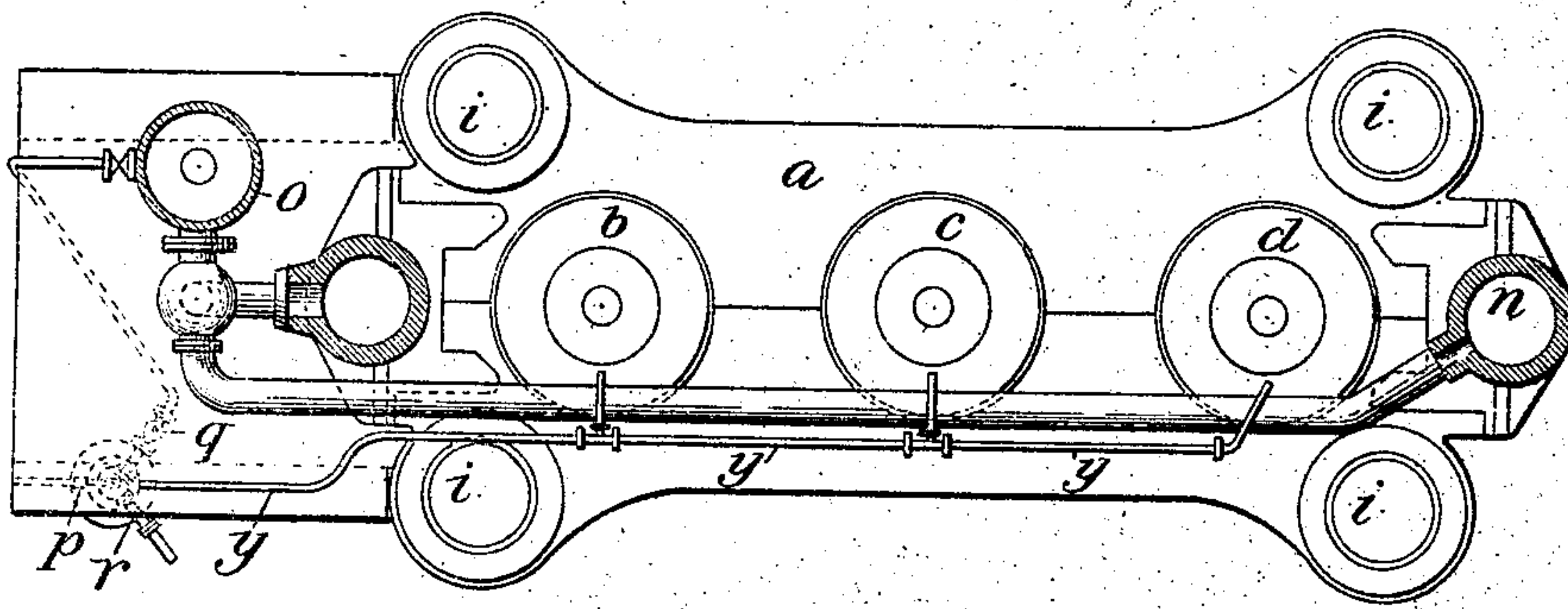
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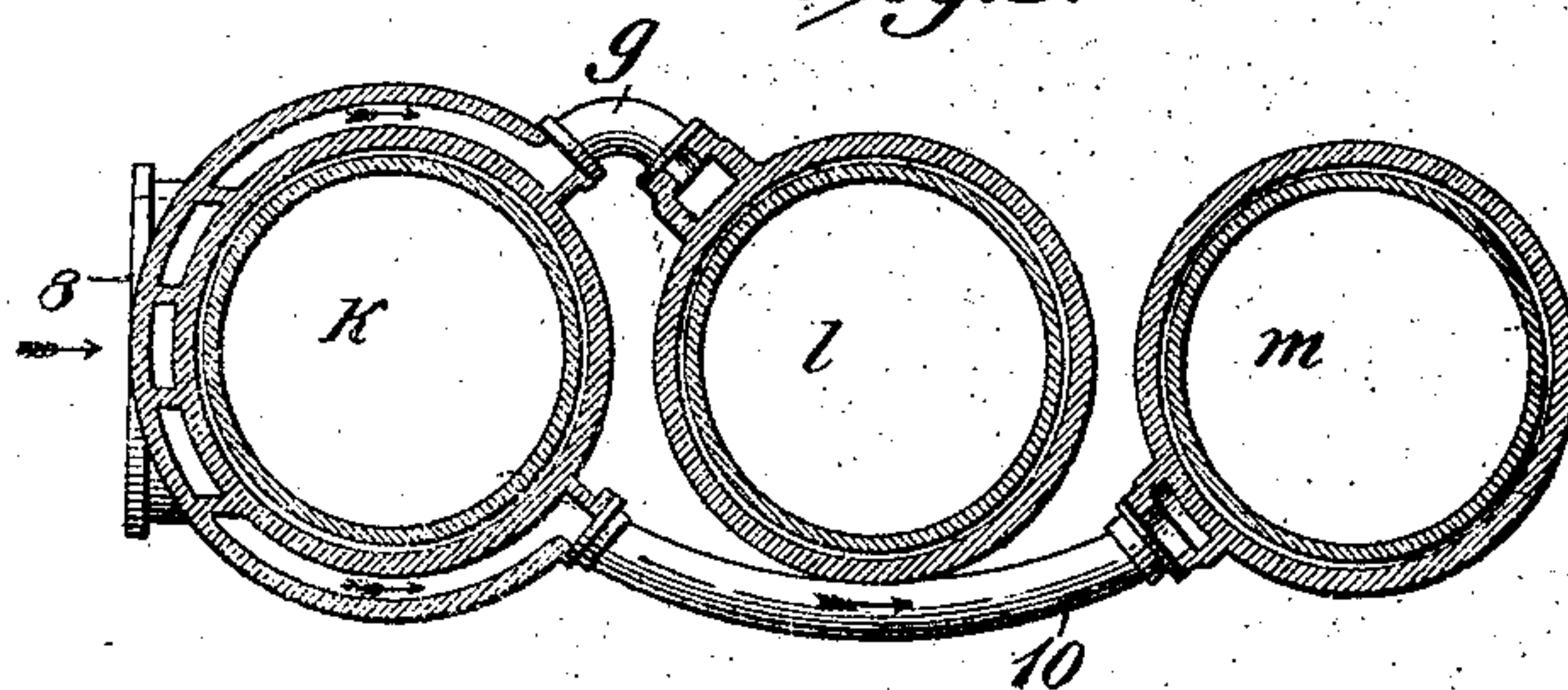
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2 SHEETS—SHEET 2.

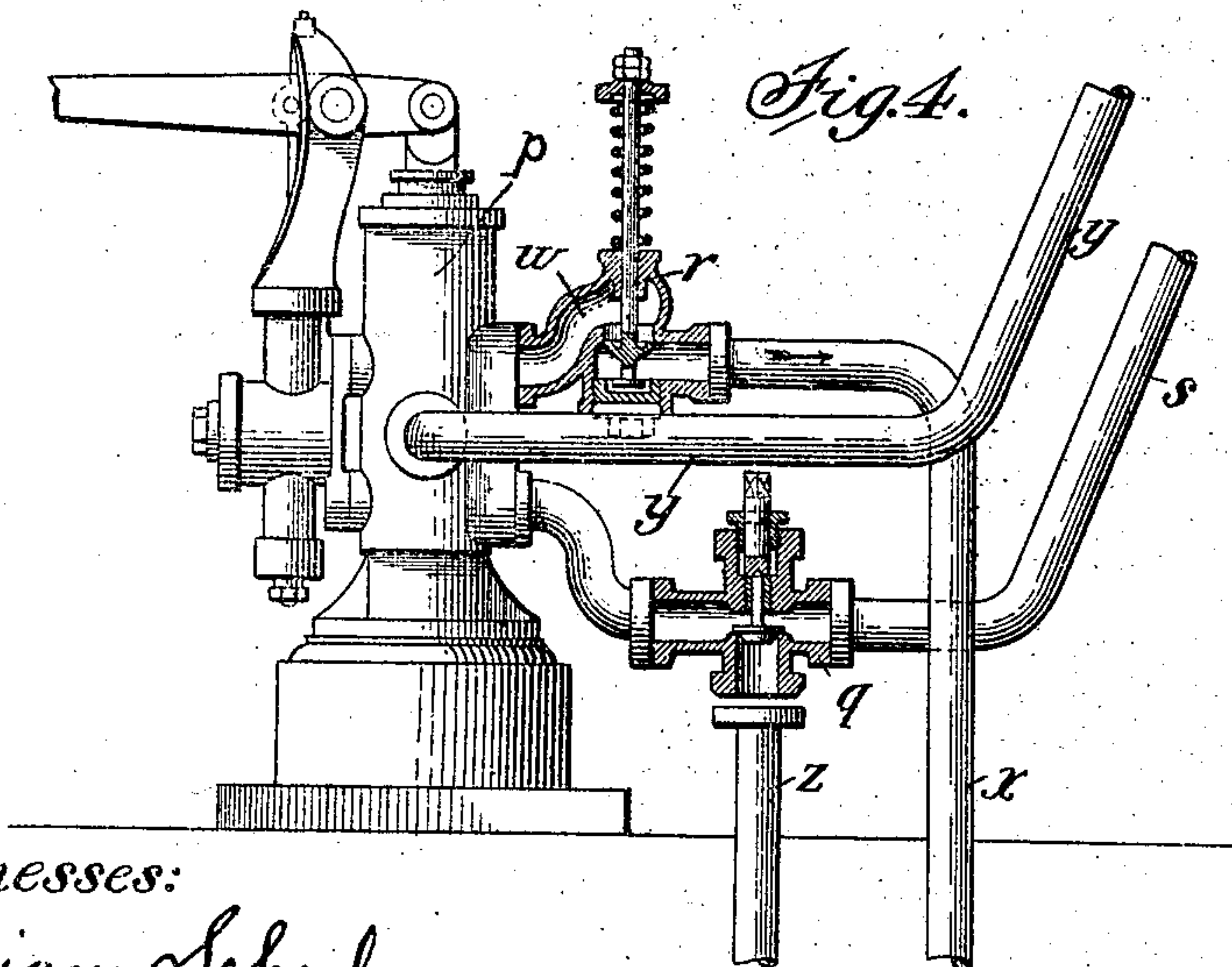
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



Witnesses:

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*Roeder & Friesen*



# UNITED STATES PATENT OFFICE.

BERTHOLD GERDAU, OF DÜSSELDORF, GERMANY.

## HYDRAULIC PRESS.

No. 842,949.

Specification of Letters Patent.

Patented Feb. 5, 1907.

Application filed October 11, 1899. Serial No. 733,241.

*To all whom it may concern:*

Be it known that I, BERTHOLD GERDAU, a subject of the King of Prussia, residing at Düsseldorf, in the Kingdom of Prussia, Germany, have invented certain new and useful Improvements in Hydraulic Presses, of which the following is a specification.

This invention has reference to hydraulic presses, and applies in particular to those wherein the pressure of the working piston may be increased by an auxiliary plunger acting upon said working piston and intensifying the pressure produced thereby; and it further comprises improvements in the means of delivering and distributing the water, whereby a great economy is realized and the highest degree of efficiency secured.

In the accompanying drawings, Figure 1 is a front elevation, partly in section, of my improved press; Fig. 2, a plan thereof, partly in section; Fig. 3, a horizontal section on line 3-3, Fig. 1; and Fig. 4, a detail of the valve.

The press is composed of a suitable number of pistons *e f g*, working, respectively, in the cylinders *b c d*, secured within the frame *a* of the press, which is filled with pressure-water from the pipe *y*. The pressure-ram is attached to the cross-head *h*, to which is rigidly connected the middle piston *f*, while the lateral pistons *e* and *g* are separate from the said cross-head *h* and rest upon it by a ball-and-socket connection, which affords greater security against lateral oscillation of the whole system. The cross-head *h* slides up and down on four guide-rods *i*, penetrating through suitable openings of the cross-head.

*k l m* are pressure-intensifiers, consisting of plungers of a cross-section smaller than that of the pistons *e f g* and sliding within the secondary cylinders 2 3 4, arranged above cylinders *b c d*, respectively. The lower extremities of the plungers enter directly the cylinders *b c d*, respectively, which are filled with pressure-water or some other liquid under pressure from the pipe *y*, as above indicated.

This pressure-water constitutes an incompressible medium for transmitting multiplied pressure from the plungers *k l m* to the top of the pistons *e f g*, respectively. Pistons 5 6 7 are attached to the upper extremities of the plungers, upon which live steam may be made to impinge, the steam being admitted to the top of the cylinders by the ports 8, 9, and 10. Suitable valves (not shown in the drawings) are provided which allow the steam to be admitted to only some or all of

these cylinders at a time in the well-known manner. Corresponding regulating-valves (not shown) are inserted into the water-delivering pipes to admit water to either one or all of the press-pistons *e f g*. Additional pistons 11, which I will call "withdrawal" or "return" pistons, are secured upon the sides of the cross-head or follower *h* and working in the cylinders *n*, arranged on each side of the press, operate to withdraw the press-pistons at the completion of their strokes.

*o* is an air-vessel or a vessel filled with some other elastic fluid inserted into the pressure-water conduit *s*, which leads to the return-cylinders *n*. A check-valve *q*, inserted into conduit *s*, serves to prevent return of water from pipe *s* to pipe *z* whenever pressure in pipe *s* in the operation of the press becomes greater than accumulator or tank pressure.

The valve *p* is connected with inlet pipe or conduit *y*, which serves for delivering the pressure liquid on top of the pistons *e f g*. The valve *p* is constructed in the manner of the ordinary hydraulic valves, comprising a series of collars or sleeves on the valve-stem which by suitable annular channels and passages establish communication with and between the pipes *s y x*. The exhaust-water is discharged through pipe *x*, communicating with the regulating-valve *p* by the conduit *w*, between which and pipe *x* I insert a spring-pressed throttling-valve *r*, which operates to maintain a certain pressure of water in the system, which will hold the plungers *k l m* and the steam-pistons 5 6 7 in a raised position. This valve is depressed by the water displaced upon the ascent of the press-pistons, which is then delivered into the discharge-pipe *x*. Pressure-water for refilling is admitted through the pipe *z*.

The operation is as follows: In order to fill the pressure-cylinders with water, the pipe *z*, coming from a suitable pressure-tank, is connected to pipe *y* by moving valve *p* in the proper direction. After bar *h* has been brought down upon the work-piece valve *p* is closed and steam is admitted above the pistons 5 6 7. Upon the descent of the press-plungers and of the pistons 5 6 7 a high tension is produced in the pressure-storer *o*, which is filled with compressed-air by the water displaced in the withdrawal-cylinders *n*, this tension operating on the release of the press to withdraw the press-pistons *e f g*. The water displaced in the withdrawal-cylinders during the preliminary lowering of pis-



tons *e f g* flows through the pipe *s* and the valve *p*, which is opened during this time, into the pipe *y*, which delivers it into any or all of the pressure-cylinders on the top of the pistons *e f g*. After the press has performed its work and the pistons *e f g* are to be returned pipe *y* is connected to the exhaust-pipe *w* by proper movement of valve *p*, whereupon the air-pressure within the pressure-storer *o* starts to operate the withdrawal-cylinders *n*. According to the expansion of the fluid within the chamber *o* the pressure therein will decrease until the pressure within pipe *z* will lift valve *q* and permit pressure-water from the tank to enter pipe *s*, so as to fully operate the withdrawal-cylinders, Fig. 2. The water which has been displaced in the pressure-cylinders upon the upward stroke of the pistons is delivered through the open valve *p* into the exhaust-pipe *w*, where it depresses the valve *r* and is discharged through pipe *x*. It is obvious that inasmuch as I may have the steam act upon any or all of the piston-heads 5 6 7 and also fill any or all of the cylinder-heads *b c d* with pressure-water I am enabled to obtain any variation of pressure without interfering in the least with the uniformity of the strokes or with the uniformity of the forward motion of the ram *h*, those cylinders and pistons on which a pressure does not act being nevertheless carried along and acting as guides for

those cylinders and pistons which operate under pressure in the manner above described.

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What I claim is—

1. In a hydraulic press, the combination of a series of working cylinders with inclosed pistons, a press-bar operated thereby, steam-influenced plungers adapted to directly enter the cylinders, a liquid-inlet pipe communicating with the cylinders, a valve controlling said pipe, an exhaust-pipe, and an outwardly-opening spring-resisted check-valve in the exhaust-pipe and outside of the controlling- valve, substantially as specified.

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2. In a hydraulic press, working pistons in connection with a press-bar and steam-actuated plungers to operate said working pistons, means to distribute the steam upon said plungers, return-pistons and pipe connections with a controlling-valve, a throttling-valve upon said pipe connections to regulate the pressure in the working cylinders, and a compressed-air vessel in connection with the return-cylinders, substantially as specified.

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In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

BERTHOLD GERDAU.

Witnesses:

WILLIAM ESSENWEIN,  
GEO. P. PETTIT.