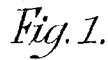


1,005,225.

4 SHEETS--SHEET 1.



Inventor:
Herman A. Jensenius
by his Attorneys:
Howell & Howell

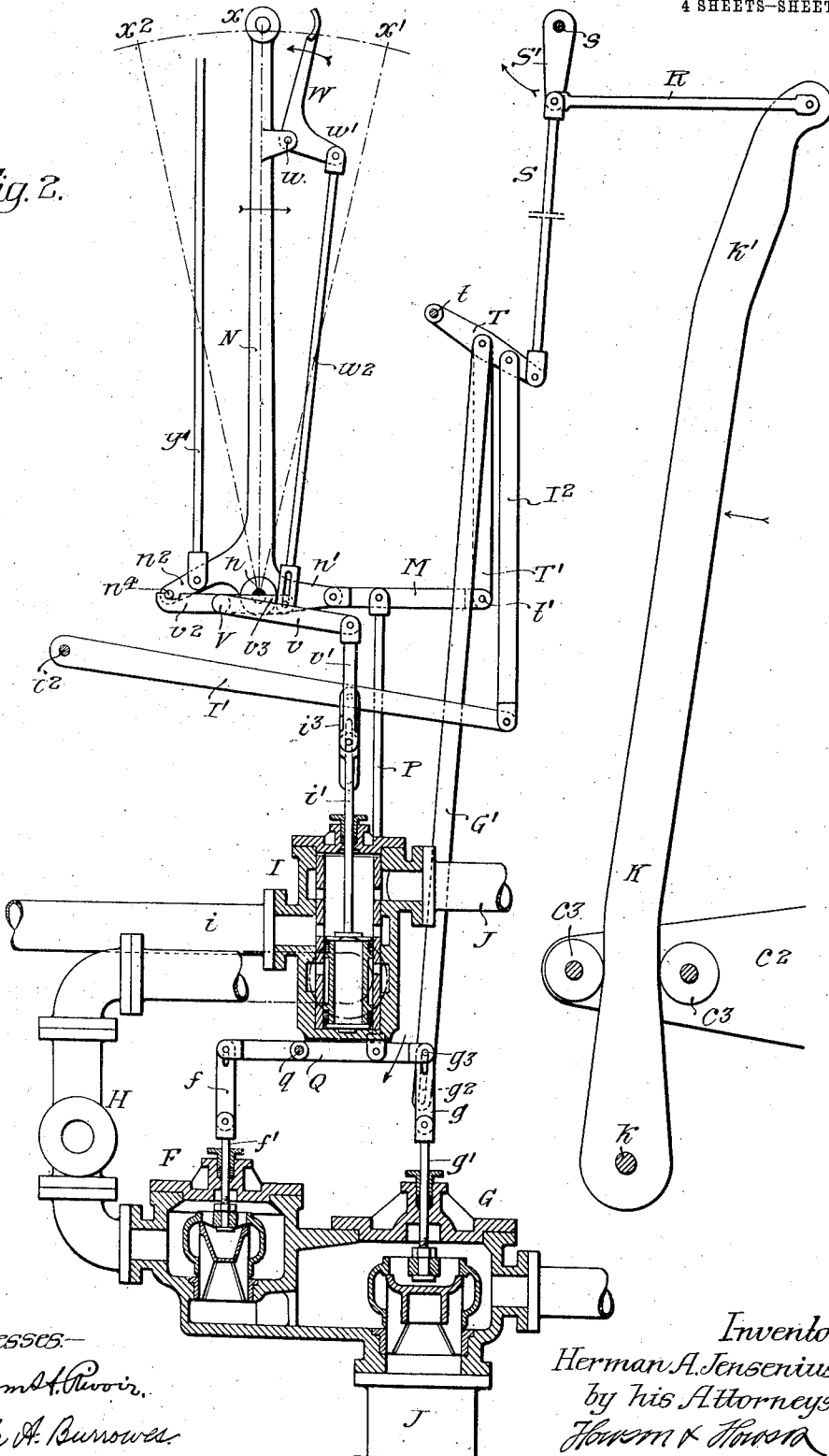
H. A. JENSENIUS.
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4 SHEETS—SHEET 2.

Fig. 2.



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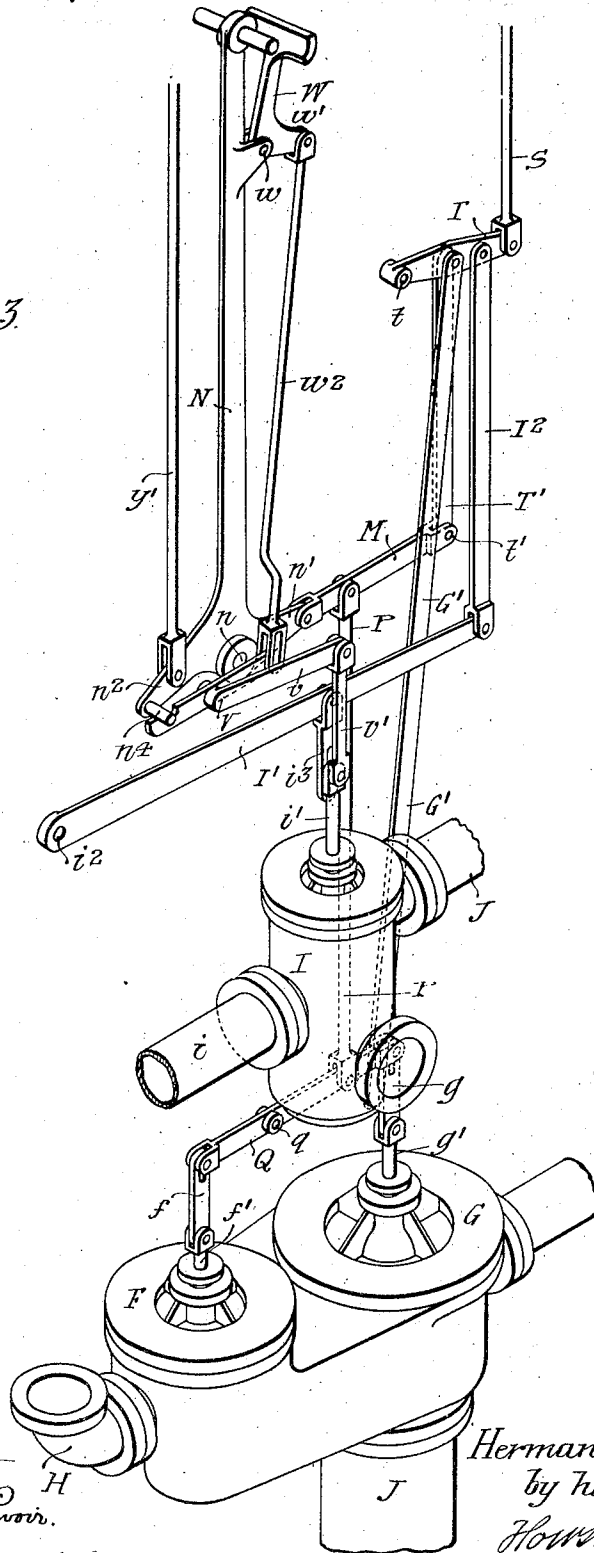
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4 SHEETS—SHEET 3.

Fig. 3.



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APPLICATION FILED DEC. 21, 1910.

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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

HERMAN A. JENSENIUS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO CAMDEN IRON WORKS, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

VALVE MECHANISM FOR STEAM HYDRAULIC PRESSES.

1,005,225.

Specification of Letters Patent.

Patented Oct. 10, 1911.

Application filed December 21, 1910. Serial No. 598,575.

To all whom it may concern:

Be it known that I, HERMAN A. JENSENIUS, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Valve Mechanism for Steam Hydraulic Presses, of which the following is a specification.

One object of my invention is to construct the valve operating mechanism of a steam hydraulic press so that the valves can be manipulated by lever mechanism in order to cut off the pressure at any point indicated by the pointer of a hand lever; the mechanism being so controlled by another hand lever that the press can be used either as a press having a slow movement or as one having a quick movement.

A further object of the invention is to construct the mechanism so that the lever for increasing or diminishing the speed of operation is carried by a main operating lever so that the device is always under the control of the operator, although two distinct lever mechanisms are used.

In the accompanying drawings:—Figure 1, is a view, in elevation of a steam hydraulic press illustrating my invention; the steam cylinder being in section; Fig. 2, is an enlarged view of the valve operating mechanism; Fig. 3, is a perspective view of the valve operating mechanism, and Figs. 4, 5, and 6, are diagram views showing the valve operating mechanism in different positions.

In the drawings, A is the press having an anvil *a* and a head *a'*. A' is the main hydraulic cylinder having a ram *a''*. The head is adapted to suitable guides, which also carry the upper frame A². B—B are the steam cylinders for returning the head to its normal position. Mounted in these cylinders are pistons *b* connected by rods *b'* to the head *a'* so that, when the pressure in the hydraulic cylinder A' is cut off, the pressure under the pistons in the cylinder B will raise the head. This is the ordinary form of a steam hydraulic press.

Located at any convenient point, at one side of the press, is a steam cylinder C, preferably of large area, having a piston *c* connected to a rod C', which extends through a frame C² carrying a hydraulic cylinder D of comparatively small diameter. The end of the rod C' acts as the plunger for this cylinder D. A pipe *d* forms a communication between the upper end of the cylinder

D and the upper end of the main cylinder A' of the press. Also communicating with this pipe *d* is a pipe *e*, leading from an air chamber E, located at any convenient point near the press. In this pipe *e* is an air dome *e'*, and *d'* is a valve controlling the flow of fluid, so as to direct it either from the cylinder D, or to and from the chamber E.

F is the main steam valve.

G is the exhaust valve and I is the pull back valve for controlling the admission of steam to the under side of the piston *b* in the cylinders B.

H is the steam supply pipe and J is the exhaust pipe, which may communicate with both the exhaust valve G and the valve I. The steam supply pipe H communicates with the main steam valve F and with the valve I. The steam from the steam valve passes through the exhaust valve chamber G, and this chamber communicates with the steam passage *c'* in the bottom of the steam cylinder C, and, by operating the valve, steam will be admitted to the cylinder C under the piston *c*, or exhausted from the under side of the piston so as to operate the plunger rod C'. The pull back valve I is connected by a pipe *i* to the lower portion of the cylinders B—B, so that steam will be admitted under the piston *b* into the said cylinders to lift the head *a* when released from the hydraulic pressure in the cylinder.

N is the main operating hand lever, pivoted at *n* to any suitable support, and this lever has two arms *n'*—*n''*. The arm *n'* is pivoted to a floating lever M, and this floating lever is connected some distance from the said pivot by a link P to a lever Q, pivoted at *q* to a fixed bearing. The short arm of this lever is connected to a link *f*, which, in turn, is connected to the valve stem *f'* of the steam supply valve F. The long arm of the lever Q is connected by a link *g* to the valve stem *g'* of the exhaust valve G. On the rod or ram C' is a cross head *c''*, having rollers *c'''* arranged to travel over each edge of the arm K; the cross head and the arm forming an automatic operating gear. The arm is pivoted at *k* to any fixed point, and, in the present instance, it is connected to a bracket on the cylinder C. The upper end of the arm *k* is connected by a link R to two links S—S'; the link S' being pivoted at *s* to a fixed point, and the link S being pivoted to a lever T. The lever is fulcrumed to a fixed

point at t and is connected midway between the pivot and the fulcrum by a link T' to the end of the floating lever M opposite to the point where it is pivoted to the arm n' of the lever N .

By this construction, the valves F and G are operated either by the hand lever, or by the automatic operating gear consisting of the head c^2 and the arm K ; one of these elements moving the valve gear without affecting the other elements, as will be readily understood on referring to the drawings. The floating lever, which is mounted between the two sets of mechanism, allows for the independent operation.

If the hand operated lever N is moved in the direction of the arrow, Fig. 2, to the position shown in Fig. 4, the floating lever M turns on the pivot t' , where it is connected to the link T' ; causing the link P to move down and, in turn, causing the lever Q to move in the direction of its arrow; closing the exhaust valve G and opening the steam pressure valve F . This movement will allow steam to enter the cylinder C under the piston c , and, as the piston moves upward, it forces the plunger head C' up into the hydraulic cylinder D ; at the same time the head c^2 travels in contact with the arm K . This arm is normally in an inclined position, as indicated in Fig. 2, and it forces the arm K in the direction of its arrow and the link S' in the direction of its arrow; lifting the link S , lever T , link T' , and the floating lever M , which, in turn, lifts the link P , lever Q ; reversing the previous movement of the lever Q and causing the steam pressure valve F to close; eventually opening the exhaust valve G , thus bringing the mechanism to a standstill.

By this construction, if the hand operated lever N is moved to any point between the normal point x and the extreme pressure point x' , Fig. 2, to open the steam inlet valve and to close the exhaust, the automatic gear will close the inlet and will eventually open the exhaust at a corresponding point in the stroke of the piston c . If, however, the piston c is allowed to move its full stroke, then the automatic gear automatically closes the steam inlet and opens the exhaust, as the upper end k' of the arm K is arranged at such an acute angle that it will immediately reverse the position of the valves, as shown in Fig. 6. If it is desired to open the exhaust by the movement of the hand lever N , then the lever is thrown toward the extreme exhaust point x^2 , Fig. 2; causing the link P to be raised and operating the lever Q so as to open the exhaust valve and close the steam inlet valve.

In order to operate the pull back valve I , I mount a rock shaft V at the point indicated, and connect one arm v by a link v' to the stem i' of the valve I . The short arm

v^2 of the rock shaft extends under a pin n^4 , in the present instance, on the arm n^2 of the hand lever N so that when the hand lever N is moved toward the extreme exhaust position x^2 , the short arm v^2 of the rock shaft V will be depressed. Consequently, the valve stem i of the valve I will be raised; allowing the live steam to pass through the valve to the pipe i and to the under side of the piston b in the cylinder B ; lifting the head a' of the press.

To operate the pull back valve independently of the mechanism, I pivot a second lever W at w to the hand lever N . The arm w' of the lever W is connected by a link w^2 to an arm v^3 of the rock shaft V , so that, when the lever W is moved in the direction of its arrow, irrespective of the position of the lever N , it will immediately lift the valve I ; allowing the steam to enter the cylinders B under the pistons b , as shown in Fig. 5. The object of this construction is to provide means to allow a constant pressure of steam in the cylinders B , under the pistons, so that when the hand lever N is moved to pressure and the steam piston c is raised, the position of the above described mechanism is such as to allow constant steam pressure on the under side of the piston in the cylinders B ; causing the head of the press to be raised without throwing the hand lever to exhaust, and, as soon as the lever W is released, it assumes its normal position, and, in order to cause the steam to enter the cylinder B the lever N must be thrown over to the exhaust position so that its arm n^2 will actuate the lever V and raise the valve I . If the lever N is thrown to exhaust before the head c^2 of the automatic gear actuates the arm K , then the automatic gear does not act to shift the valves; the shifting being done entirely through the medium of the hand lever N .

In order to cause the portion k' of the arm K to actuate the exhaust valve G so as to throw said valve G to exhaust, I connect a link G' to the lever T , which is slotted at the lower end g^2 so as to allow it to have a certain amount of lost motion; the pin g^3 connecting the link G' to the lever Q and passing through the slot g^2 so that while the lever T has a certain amount of movement, as it is raised without causing the link G' to act, as soon as the head c^2 acts on the portion k' of the arm K the link G' acts to raise the valve G to allow steam in the intensifier cylinder C to exhaust and in order to move the valve I so that it will admit pressure to the cylinders B , I connect a lever I' , which is pivoted at i^2 to a fixed point to the lever T through a link I^2 and this lever I' is connected to the valve rod i' through a slotted link i^3 and a pin on the valve, or valve stem, passes through the

slot so that this lever mechanism does not act while the head c^2 is traveling on the main portion of the arm K, but will act only when the head is traveling on the extreme upper portion k' , when it will partly lift the valve I so as to bring it to steam position; admitting steam to the cylinders B. Thus the mechanism is automatically brought to a standstill.

10 The valve d' , in the pipe d , leading from the hydraulic cylinder D to the hydraulic cylinder A', is so constructed that it will open when the plunger head C' is moved down in the cylinder D so as to exhaust the pressure in the cylinder A'. When steam is admitted to the under side of the piston b in the cylinder B to raise the head a' , and when the lever is thrown full to exhaust, then the valve d' is raised so as to allow the fluid to pass from the cylinder A' through the pipe d into the pipe e to the chamber E, where it remains under pressure to be used when the pull back valve is shifted so as to exhaust the steam from the under side of the piston b . Then the pressure in the chamber E overcomes the pressure in the cylinders B and the head a' is forced down by fluid entering the cylinder A' and when the piston c , in the main steam cylinder C, is raised, the pressure in the cylinder A' of the press is materially increased, while the valve in the chamber D' acts as a check to cut off the flow of fluid in the chamber E; allowing the fluid to pass entirely under extreme pressure to the cylinder A' of the press. This valve d' is opened through the medium of the lever y , rod y' , and mechanism connected to the hand lever N, and is only opened mechanically when the said lever is near the extreme exhaust point, otherwise it acts as an ordinary check valve.

Thus, by the above described mechanism, it will be seen that the press can be operated solely by operating the single lever N. The movement of the lever toward the extreme pressure point will govern the downward motion of the head carrying the upper die of the press, as the automatic gear will automatically stop the movement of the piston of the steam cylinder or intensifier, and, consequently, the pressure at a point corresponding to the point to which the operating lever is moved, and, on operating the lever N, the piston will return to its normal position, but, on moving the hand lever to the reverse position, or exhaust, the parts will be returned to their normal position, so that, in pressing, the speed of the movement of the press will be dependent upon the movement of the hand lever from a central position to pressure and exhaust, but, if a quick movement of the head-carrying die, or hammer, is required, then the lever W is actuated so as to raise the pull back valve to allow steam to constantly enter the cylinders

B, so that when the lever N is moved to pressure position, while the lever W is held so as to open the valve I, it will place constant pressure on the piston b of the cylinders B and the die or hammer will be reciprocated rapidly.

By pivoting the arm of the automatic gear, as shown, the first part of the stroke will move the arm a greater distance than the latter part of the movement of the head, and, to compensate for this, I connect the upper end of the arm by a link to a pivoted lever S'; connecting the link, also at the same point, with a link S, which is coupled to a lever, in turn coupled to the floating lever, which controls the valve so that during the first part of the stroke of the head, while the arm of the automatic gear is moved a given distance, the lever S' swings in the arc of a circle; moving a greater distance laterally than vertically so that the link S is raised only a limited distance, considering the length of the movement of its pivot, and, as the automatic gear head nears the free end of the automatic gear arm, the lever S' reaches a point where its vertical motion increases and the movement of the floating lever is practically equivalent to the movement of the head of the automatic gear.

I claim:

1. The combination in a steam hydraulic forging press, of a head carrying the die or hammer; a fluid pressure cylinder; a plunger within the cylinder carried by the head; a steam cylinder having a piston connected to the head, an intensified cylinder; a piston therein; a fluid pressure cylinder having a plunger connected to the piston; said fluid pressure cylinder communicating with the fluid pressure cylinder of the press; a steam supply valve and an exhaust valve communicating with the intensifier cylinder; a hand lever and cross head for actuating the said valves; a system of levers connecting the said hand lever and the arm with the valves, whereby the hand lever and the arm can operate the valves independently of each other; a pull back valve communicating with the pull back cylinders; levers connecting the pull back valve with the main hand lever; and a supplemental hand lever for lifting the valve to admit steam to the under side of the pistons in the pull back cylinders.

2. The combination in a steam hydraulic press, of a press; an intensifier cylinder; a fluid pressure cylinder; a plunger in the said cylinder actuated by steam in the intensified cylinder; steam and exhaust valves communicating with the intensifier cylinder; a pull back valve communicating with the pull back cylinders of the press; lever mechanism for actuating the said valves; a hand lever; a head on the piston rod of the intensifier cylinder; an arm pivoted to a fixed

point and engaged by the said head so that it will be positively moved in both directions by the said head; said arm being connected with the lever mechanism for operating all

5 three valves.

3. The combination in a steam hydraulic press having a fluid pressure cylinder, a pull back cylinder, and a steam intensifier cylinder, of a piston mounted in the intensifier cylinder; a piston rod; a fluid pressure cylinder, of less diameter than the cylinder of the press; a pipe connecting said cylinders; the plunger of said pressure cylinder being connected to the piston rod of the intensifier; steam and exhaust valves; a pull back valve; said pull back valve being connected to the pull back cylinders of the press; lever mechanism for actuating the several valves; a head on the piston rod of the intensifier; an arm pivoted to a fixed point and engaged by the said head; the upper end of the rod being shaped to form a cam so that, when the head reaches the upper end of the rod, it will close the steam

25 valve and open the exhaust communicating with the steam intensifier cylinder.

4. The combination in a steam hydraulic press having a fluid pressure cylinder and a steam pull back cylinder, of an intensifier cylinder having a piston and a rod; a fluid pressure cylinder less in diameter than the cylinder of the press; a pipe communicating with the two cylinders; the pressure cylinder having a plunger connected to the rod of the intensifier cylinder; steam and exhaust valves communicating with the intensifier under the piston; a pull back valve communicating with the pull back cylinders of the press, a hand lever and a head on the piston rod of the intensifier cylinder; an arm located to be actuated by the head; lever connections between the arm, the hand lever and the valve mechanism; a floating lever being one of the elements of the said lever mechanism; lever mechanism connecting the hand lever with the pull back valve so that it will operate when the hand lever is moved to the exhaust position; with a supplemental hand lever pivoted to the first

50 mentioned hand lever and connected to the pull back valve so that when said lever is

operated the pull back valve will be moved to a position to allow steam to enter the pull back cylinder continuously when the main hand lever is moved to pressure so that the hammer will strike a series of quick successive blows.

5. The combination in an intensifier, of a head on the intensifier; a pivoted arm engaged by said head as it travels on the movement of the piston of the intensifier; a floating lever; a valve connected to the floating lever; a swinging link, and a link connecting the said swinging link with the upper end of the pivoted arm; and a link connecting the said swinging link with the floating lever so that, as the pivoted arm is moved by the head on the piston rod, the valve will be operated and the differential movement of the pivoted arm will be compensated for by the swinging arm and its connections.

6. The combination in a steam hydraulic forging press, of a head carrying a die or hammer; a fluid pressure cylinder; a plunger within the cylinder carried by the head; an intensifier cylinder; a piston therein; a fluid pressure cylinder having a plunger connected to the piston and communicating with the fluid pressure cylinder of the press; a steam supply valve; an exhaust valve communicating with the intensifier cylinder; a pull back cylinder; a piston therein; a pull back valve for regulating the flow of steam to and from the pull back cylinder; operating mechanism consisting of a pivoted arm and a traveling cross head connected to the piston of the intensifier cylinder; hand operated mechanism; with lever and link mechanism in which is a floating lever; the parts being so constructed that when the cross head is raised it will open the exhaust and will cut off the steam valve leading to the intensifier cylinder, opening the pull back valve to steam.

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

HERMAN A. JENSENIUS.

Witnesses:

WM. E. SHUPE,
WM. A. BARR.