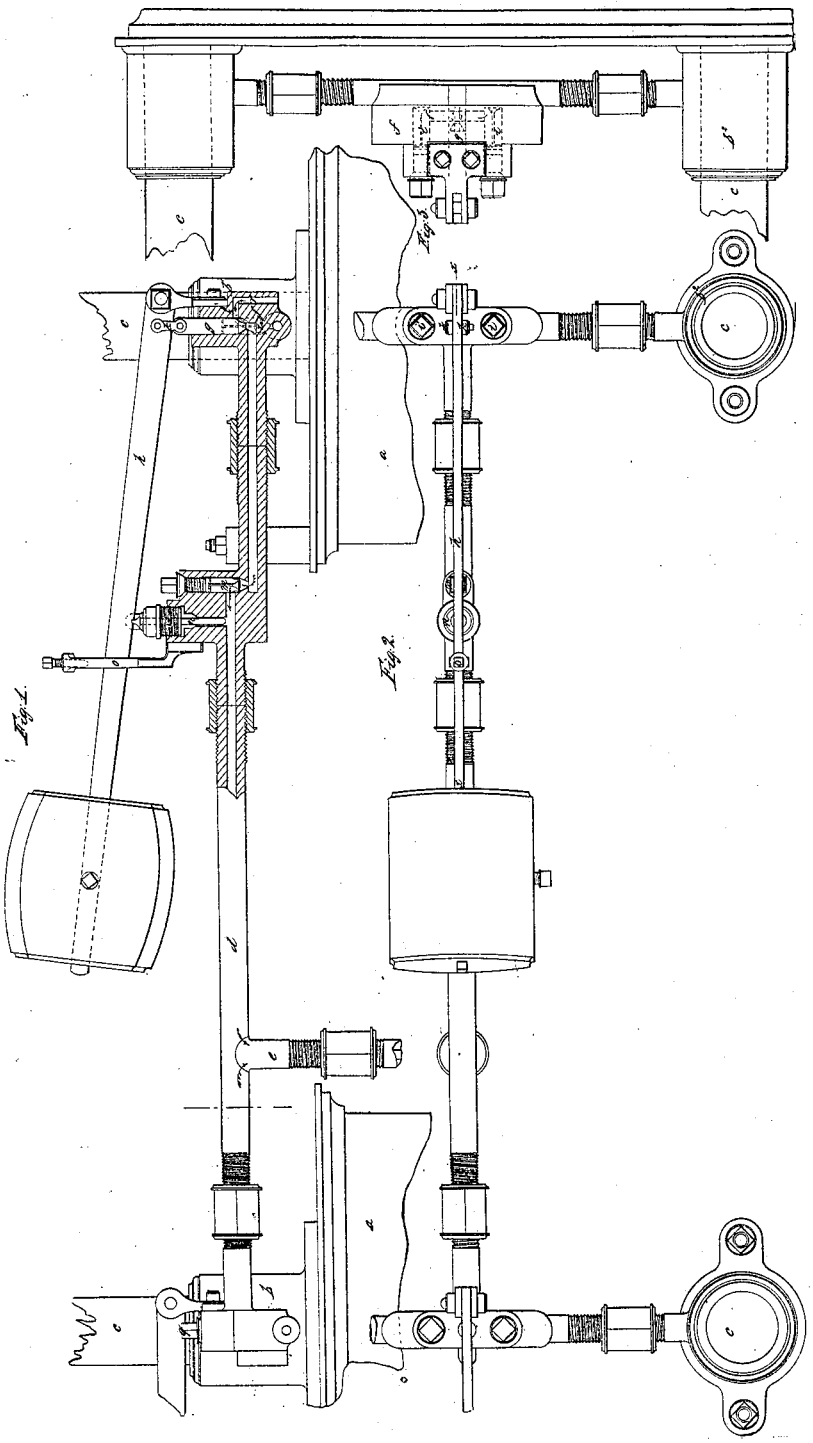
R. Dillon,

Hydraulic Engine,

No. 5,423. Patented Feb. 1, 1848.



UNITED STATES PATENT OFFICE.

ROBERT DILLON, OF NEW YORK, N. Y.

CONNECTING PUMPS WITH HYDRAULIC PRESSES OR RAMS.

Specification of Letters Patent No. 5,423, dated February 1, 1848.

To all whom it may concern:

Be it known that I, ROBERT DILLON, of New York, in the county of New York and State of New York, have invented a new and Improved Method of Governing Hydraulic Pumps; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a longitudinal elevation, a part being in section through the line X—X of Fig. 2. Fig. 2 is a top plan. Fig. 3 is an end elevation.

Similar letters refer to similar parts throughout the figures.

The nature of my invention consists mainly in the combination of two or more valves loaded to minor pressures with the common lever used on hydraulic pumps the same being for the purpose of disconnecting one or more of a set of such pumps to which they are attached from the press, and by this means concentrating the driving power, in a constantly diminishing number of pumps, as there is necessity for it, and finally confining the entire driving power to such pumps as are loaded to the maximum pressure required.

The drawings represent certain parts of modern hydraulic force pumps, sufficient to show and illustrate the several additions and improvements I have made thereto. I deem it therefore unnecessary to go into a minute description of those parts of the said pumps which are well known. The most common way of building the said pumps especially where they are extensively used is to place two in a tank and work their pistons by a lever beam one arm of which shall be elongated and connect, with a crank by a shackle-bar which crank is operated by proper motive power.

Fig. 3 shows an end view of a portion of a pair of force pumps the tops a little elevated above the rim of the tank (a^1) which supplies them with water (b^1 and b^2) being the heads of the pumps and (c c) their pistons. (f) is a case or box containing the top valves (i and i^1) of the pumps and the pipe (d) conveys the water discharged from the pumps into the large hydraulic cylinder, to actuate the ram. Into the box (f) there is likewise the safety valve (g). This valve is commonly kept in its seat by the pressure of the weighted lever (h) resting upon its head as seen at (q) which is a common safety valve, but in the pump with my attachments I permanently connect the lever (h) to the head of the valve by two plates (k) the object of which is to insure the lifting of the valve out of its seat whenever the lever (h) is raised. There is one more opening in the box (f) and that is the channel (r) this leads from the foot of the valve (g) down through the bottom of (f) and terminating so that whatever passes through it will be discharged into the water tank (a^1). Whenever the pumps are in operation if the safety valve (g) should be raised out of its seat all the water thrown by the pumps would be returned to the tanks again by this channel, instead of passing along the pipe (d), as it would choose a passage which offered the least resistance. At (a, b, q) a second pair of pumps are connected with the pipe (e) by which they communicate with the hydraulic cylinder in the same manner as the first. This latter pair of pumps are in every respect the ordinary force pumps. On examining that part of the pipe (d) shown in section in Fig. 1, two valves are seen between the safety valve (g) and pipe (e). One of these valves (m) has its seat immediately in the channel of the pipe (d) and above it is seen a screw bolt which closes the opening by which the valve is introduced and also regulates the height at which the valve may rise out of its seat. This valve permits the water to flow through the pipe only in the direction of the arrows and closes whenever there is superior pressure in that part of the pipe beyond at (d). At (n) I introduce another valve this valve has its seat considerably above the bore of the pipe and is kept in its place by a long stem attached to its bottom which reaches down to the channel in the pipe (d) the stem also passes through a nut which keeps it in its place and terminates in a socket in the underside of the lever (h). Immediately behind this valve a guide piece for the lever (h) is affixed this consists of a metal post secured to the pipe (d) rising up a sufficient height to allow for full play of the lever, in it a vertical slot is cut through which the lever (h) passes and on the top there is a nut and screw the point of which passes down through the top of the slot and is the means of regulating the height at which the lever (h) may be permitted to rise. At

the opposite end of the lever (h) a weight is fixed which can slide along the lever and be placed at any distance for giving the required pressure on the valves. The fulcrum of the lever (h) is at the box (f). Although the above description relates to pumps worked in pairs yet it is equally applicable to those arranged singly.

In operating hydraulic pumps with my improvements I connect several pairs of pumps to the cylinder containing the hydraulic ram. In the drawings two pairs of pumps are represented as connected by the pipe (e). Of which the pair or set (a, b, q) are the usual force pumps used and (a^1 b^1 &c) are a pair having my improvements adapted to them. I will suppose that the hydraulic ram which is to be operated by these pumps is applied to compress some substance, which offers a constantly increasing resistance to the progress of the ram as the compression goes on, as for instance a bale of cotton; and I further state that it will require a pressure of four tons to reduce the bale to the desired density. I load the valve (q) as in the ordinary manner, with a weight which will keep it in its seat at that pressure; and then pass the weight on the lever (h) along to a point that will load the valve (n) so as to keep its seat at two tons per square inch; water being put into the tank (a and a^1) and all other parts prepared as usual, I put a bale of cotton on the head of the ram in its proper position for being pressed, and start the two pairs of pumps. At the beginning all the valves are in their respective seats as at (g, m, n, q). The water thrown by the pumps flowing into the pipe (e) and thence to the hydraulic cylinder. The valve (m) rising as soon as the water from the first pair of pumps reaches and opens a passage for the water from the pumps in the tank (a^1) to pass to the hydraulic cylinder. The ram now commences rising and with a velocity due to the united action of two pairs of pumps and in its ascent compresses the bale held in the frame, after the usual mode. At that point in which the resistance caused by the compressed bale has attained a pressure of a little over two tons to the square inch, the valve (n) is forced up, (the lever (h) being weighted to keep it closed at two tons pressure per square inch) carrying the lever (h) up with it until it strikes the screw upon the standard (o) and likewise raises the valve (g) out of its seat. This movement connects the channel (r) to the pumps (b^1 b^2) the water flowing instantly through it, back into the tank again, instead of passing on to the hydraulic cylinder through (e) because this affords an unopposed passage for the water which the other by reason of the pressure upon the ram does not. The moment the valve (g) is raised the valve (m) drops into its seat the pressure of the water being removed from its base by reason of the opening of the channel (r) whereby no more water is thrown in that direction by the pumps (b^1 and b^2). Were it not for this valve (m) the whole of the water thrown by the pumps in the tank (a) as well as that contained in the hydraulic cylinder would rush through the channel (r) likewise until the ram had descended to its base, at the bottom of the cylinder, thus destroying all useful effect in working. The valve (m) therefore the moment it drops into its seat as completely disconnects the pumps (b^1 and b^2) from the hydraulic cylinder as if they had never been attached, while the pumps in (a) continue to operate as before. The pumps (b^1 and b^2) however continue to operate, but produce no effect other than discharging the water they lift through the unobstructed orifice (r) back again into the tank, from whence it was taken. Thus by the introduction of the valves (m) and (n) with their appendages I am enabled to govern the action of the pumps to which they are connected so that any desirable number of pumps may be attached to the hydraulic cylinder; the speed of the hydraulic ram being increased in accordance with the number at any time working upon it.

In the present illustration with two pairs of pumps attached, the speed of the ram is doubled to that point in which the bale of cotton is compressed to half its density. If more pumps are to be added to the hydraulic cylinder the weight on their levers (h) must be such as to allow the valves (n) to rise successively one after the other as fast as the increasing resistance upon the ram caused by the compression of the bale, requires the disengagement of the pumps, in order to avoid over-loading the driving power. To illustrate further attach four pairs of pumps to the hydraulic cylinder three pairs having my improvements and the fourth which always finishes the operation to be the ordinary force pumps. The valve (n) in the first pair should be loaded with a pressure of one ton to the square inch, the second with two tons, the third with three tons, and the fourth which is the pair (a, b, q) with four tons. All being started the ram ascends until the pressure within the cylinder is equal to one ton per square inch at which point or a little beyond it, the pair of pumps which has a load of one ton per square inch upon its valve (n) will be raised and thus disengages it from the cylinder and ram; the water still continues to work, discharging through (r) as before described. When the pressure has attained two tons to the square inch, the second set is disengaged in like manner, and at three tons the third set, leaving the

fourth, and usual pair of pumps to complete the operation. The velocity with which the hydraulic ram has ascended has been for the first quarter of the distance four times the velocity due to the action of a single pair of pumps, for the second quarter three times as fast and for the third quarter, twice as fast.

Thus it will be seen that my improvements have for their object, an increase to the speed of the hydraulic ram by the addition of pumps having the arrangements herein set forth for governing their action upon the same; the pumps not needing a speed, so great as to endanger the operation, causing, the rupture of the machinery or producing an action more or less troublesome to govern.

What I claim as my invention and improvement and desire to secure by Letters Patent, are—

The valves (*n*) and (*m*) introduced into and combined with the discharge pipes of hydraulic force pumps, and with the safety valve lever of the same in the manner herein set forth for governing the action of said pumps when operating upon the hydraulic ram, and this without confining myself to the precise position or number of said pumps, or valves, as placed within the discharge pipe, provided the results produced are the same.

ROBERT DILLON.

Witnesses:
JOSEPH P. PIRSSON,
J. L. KINGSLEY.