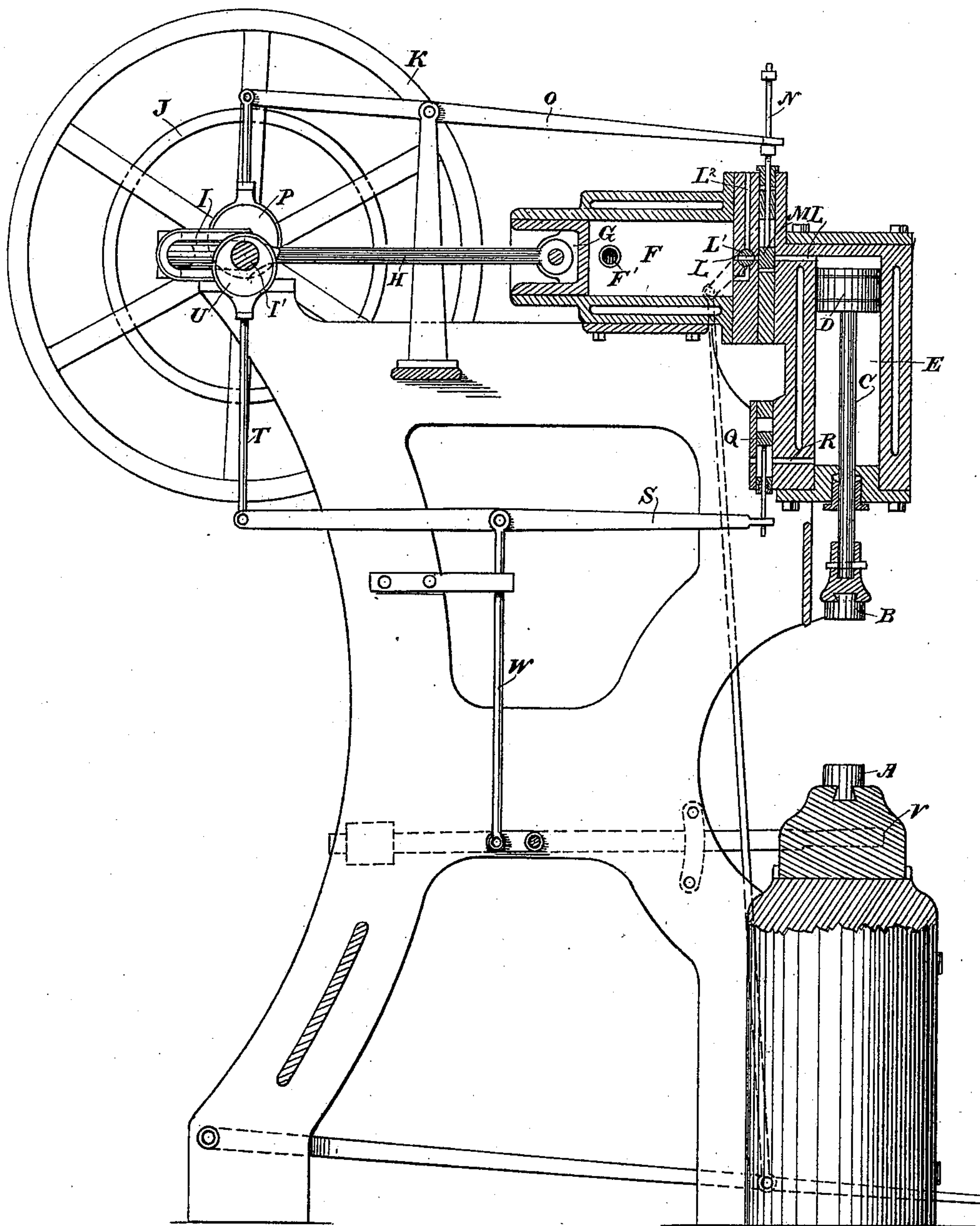


(No. Model.)

J. SCHMIDT.
COMPRESSED AIR HAMMER.

No. 602,198.

Patented Apr. 12, 1898.



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UNITED STATES PATENT OFFICE.

JACOB SCHMIDT, OF RIO VISTA, CALIFORNIA.

COMPRESSED-AIR HAMMER.

SPECIFICATION forming part of Letters Patent No. 602,198, dated April 12, 1898.

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To all whom it may concern:

Be it known that I, JACOB SCHMIDT, a citizen of the United States, residing at Rio Vista, county of Solano, State of California, have invented an Improvement in Compressed-Air Hammers; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to an apparatus for the application of compressed air for the purpose of operating a hammer, drill, or like device.

It consists in details of construction, which will be more fully explained by reference to the accompanying drawing, in which the figure is a sectional side elevation of frame and cylinders.

The object of my invention is to provide an apparatus whereby the air can be first compressed to a high degree and then delivered suddenly into the cylinder, by which the hammer or other impelled plunger is actuated.

In the present drawing I have shown the apparatus as applied for the operation of a hammer-head B, which is adapted to fall upon an anvil A. The hammer-head is shown as connected in any suitable manner with a piston-rod C, the upper end of said rod being connected with a piston D, which is fitted and movable within a vertical cylinder E, so that when air is admitted above the piston D it acts to force the latter and with it the hammer down with greater or less power and velocity. At right angles or in other suitable relation with the cylinder E is a second cylinder F, having within it a piston G, which is actuated by a rod or pitman H. This rod or pitman is connected with a crank I upon the driving-shaft I', and power is applied to rotate this shaft through a pulley J, and one or more balance-wheels K serve to store the power and keep up momentum when the air begins to be compressed to a high degree within the cylinder F.

L is a port opening from the cylinder F to the cylinder E at a point above the piston D of the latter cylinder. This port is controlled by a slidable valve M, so that by the movement of this valve the air may be admitted or cut off at will. The object of this valve is to close the passage or port L until such time as the return stroke of the plunger or piston G has compressed the air in the cylinder F

to a high degree. When this valve is opened, the air thus compressed is delivered suddenly and with great force above the piston D, thus forcing it, with the piston-rod and head actuated thereby, downward with great velocity and power.

The valve M has a stem N, which is engaged by a lever-arm O, this lever-arm being actuated by a crank or eccentric P on the main power-shaft, and it may be adjustable, so as to regulate the point at which the valve is opened and the air admitted from one cylinder to the other. Thus a pressure as great as may be desired can be accumulated in the cylinder F at each stroke of its piston and then suddenly discharged into the cylinder E to actuate the piston and rod and the attachment which is to be impelled by it. No independent storage-receptacle is required.

In order to regulate the force of the blow of the hammer B, there is a passage R opening out of the lower part of the cylinder E, and a valve Q is slidable, so as to control this port. When the port is opened, air below the pistons escapes freely from the cylinder E, and when the piston is forced down by the pressure from above the hammer is allowed to strike with its full force.

If it is desired to vary or regulate the force of the blow, the valve Q is moved so as to partially intersect the port or passage R and proportionately cut off the escape of air there-through. This will form a more or less perfect cushion in the lower part of the cylinder and will thus check the velocity and power with which the piston D descends. This valve Q is operated by a lever S, connected with it. This lever may be connected by means of a rod T with an eccentric U on the main power-shaft, and by any suitable or desired adjustment the operation of the eccentric will move the valve Q, so as to intercept the port or passage R to the desired degree whenever the piston is forced downward. Any suitable adjustment, such as a screw, may be employed to regulate the position of this valve Q and through it the power of the stroke.

If it is desired to obtain a full stroke of the hammer, the valve Q is raised so high that it will not intercept the port or passage R at all. This may be done by means of a hand-lever V within easy reach of the workman, this le-

ver being connected by a rod W with the lever S, so that by raising or lowering the hand-lever V the lever S will be correspondingly moved, and as the point of connection between W and S is really the fulcrum about which the lever S moves when actuated by the eccentric U it will be seen that when the lever V is raised to a sufficient height the oscillations of the lever S will not bring the valve Q down far enough to intercept the discharge-port R, and by means of any suitable rack or holding device this lever may be set so that the fulcrum will be depressed to a point where the valve Q will intercept the passage R to any desired extent.

The passage L, which connects the cylinder F with the cylinder E, passes through a rotary plug-valve L', which is interposed between the cylinder F and the valve M. Another passage L² leads from the cylinder F out of line with the passage L, and this passage L² is bent, so as to cross the passage L at right angles.

When the valve or cock L' is turned so that the passage L directly through is opened, air is permitted to pass from the cylinder F to the cylinder E and its passage is controlled by the valve N; but if it is desired to stop the apparatus without stopping the rotation of the shaft this is done by turning the cock L' until the passage through it is at right angles with the passage L, thus closing the latter, and the passage through the cock L' is in line with the passage L². This allows the air to escape freely from the cylinder F.

Any suitable means for admitting air to the cylinder F may be adopted, either by valves or by an opening F', which is exposed by the retraction of the plunger G, so that air is allowed to rush into the cylinder, and the compression commences as soon as the plunger has passed this opening and closed the connection between it and the interior of the cylinder.

The retraction of the piston G produces a vacuum in both cylinders, which continues until after the piston has passed the air-opening F, which allows air to enter and fill the cylinder preparatory to compression. The vacuum produced, as just stated, will raise the hammer-piston from its lowered or depressed position ready for another stroke.

The driving-pulley may be connected with a guiding-shaft by a clutch or other connection, and the clutch serves to connect or disconnect it with the shaft in any usual, suitable, or well-known manner, which is not therefore herein shown.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A hammer fixed to a vertically-reciprocating piston-rod having a piston fixed to its opposite end and movable within a containing-cylinder, a second cylinder disposed at right angles to the first-named cylinder, a plunger movable in the second cylinder and

connected with a mechanism whereby air is compressed in said second cylinder, a passage between the two cylinders, a valve whereby said passage is closed until the air in the compressing-cylinder has reached any desired tension, and a mechanism connecting said valve with a crank or eccentric upon the main driving-shaft whereby the valve is opened, and the air in the first cylinder is admitted to propel the piston of the second, and a valve and connections for regulating or varying the force of the hammer's blow.

2. In a compressed-air hammer, cylinders disposed with relation to each other, one of said cylinders having a piston movable therein with a piston-rod and a hammer-head connected with the outer end of the piston-rod and adapted to be propelled thereby, a plunger in the other cylinder, a crank-shaft, a connecting-pitman by which the plunger is movable whereby air is compressed in said cylinder by each inward reciprocation of the plunger, a passage connecting said cylinder with the first-named cylinder above its piston whereby the compressed air is admitted in successive charges to impel said piston downward, and a valve actuated by the rotation of the crank-shaft whereby the passage controlled by the valve is retained in closed condition until the air is compressed to the desired tension, and afterward opened to admit it under full pressure of the second cylinder, and a valve and connections for regulating or varying the force of the hammer's blow.

3. In a compressed-air hammer, a cylinder having a piston movable therein, a piston-rod, the lower end of which carries a hammer, a second cylinder arranged with relation to and connecting through an open passage with the upper end of the first-named cylinder, a plunger and mechanism by which it is reciprocated in said second cylinder and to compress air therein, a valve movable so as to retain the connecting-passage closed until the air in the second cylinder has been compressed to the desired tension, connection between said valve and the crank-shaft through which the compressing-piston is actuated, whereby the valve is reciprocated to alternately close and open the passage, a discharge-passage from the lower end of the hammer-cylinder, a valve adjustable to intercept said passage to any desired degree whereby a back pressure is created in the lower part of the cylinder and the force of the blow delivered by the piston and connected parts is regulated.

4. In a compressed-air hammer, a vertical cylinder having a piston reciprocating therein, a piston-rod extending through the lower head of the cylinder and carrying a hammer at its lower end, a compressing-cylinder with a passage connecting it with the upper end of the hammer-cylinder, a crank-shaft and crank whereby the plunger of the compressing-cylinder is actuated, a valve adapted to intercept the passage between the two cylin-

ders until the desired amount of compression is obtained in the compression-cylinder, and mechanism connecting with the crank-shaft to automatically open the valve and allow the air to pass into the hammer-cylinder, a passage opening out of the lower part of the hammer-cylinder, a valve whereby said passage may be intercepted or cut off to any desired degree, a fulcrumed lever, one end of which connects with the said valve and the other with an eccentric upon the crank-shaft by which the valve is actuated to partially intercept the escape of air from the lower part of the hammer-cylinder and to correspondingly reduce the force of the blow.

5. In a compressed-air hammer, a vertical cylinder having a piston reciprocating therein, means for admitting air under pressure above said piston, a passage from the lower part of the cylinder through which the air escapes as the piston moves downwardly, a valve movable to intercept said passage to any desired degree and thus cushion the piston at the lower end of its stroke, a lever-arm one end of which is connected with the valve-stem, the other with an eccentric upon the shaft through which the air is compressed, a fulcrumed bar to which the intermediate part of said lever is fulcrumed, a second lever to which the lower end of said fulcrumed bar is connected, said lever being movable up or down so that the valve may be reciprocated by the eccentric without intercepting the air-

discharge passage when a full blow is required or it may be moved downwardly to partially intercept the passage for a lighter blow.

6. In a compressed-air hammer, a main cylinder with a piston movable therein, a piston-rod extending through the lower head carrying the hammer with its lower end, a second cylinder having a passage connecting it with the first-named cylinder above its piston and plunger movable in the second cylinder, a crank-shaft and a pitman connecting it with the plunger whereby the latter is reciprocated to compress air on each inward stroke of the plunger, a valve actuated in unison with the movements of the plunger whereby said valve is opened when the desired pressure has been attained within the compression-cylinder and the air under such pressure is admitted into the hammer-actuating cylinder, and a second passage crossing the first passage having a cock through which this first-named passage passes when the apparatus is in operation, and a foot-lever connection whereby said cock may be turned to close the direct connection between the cylinders and allow the air to escape from the compression-cylinder without acting in the lower cylinder.

In witness whereof I have hereunto set my hand.

JACOB SCHMIDT.

Witnesses:

M. CHRISTENSEN,
PERRY ANDERSON.