

J. E. CRISP.
Automatic Reciprocation Regulator.

No. 215,047.

Patented May 6, 1879.

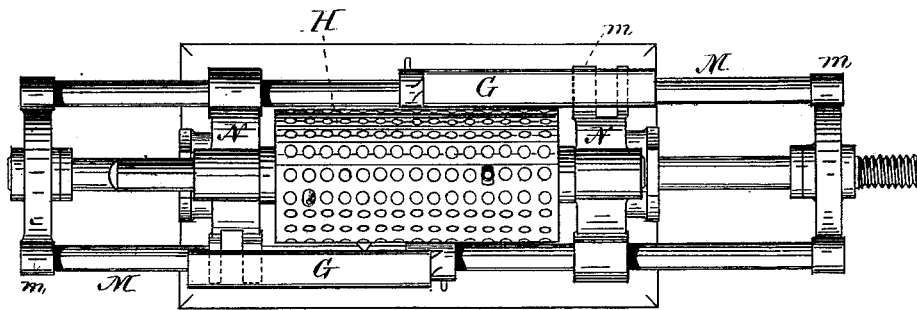


Fig. 1.

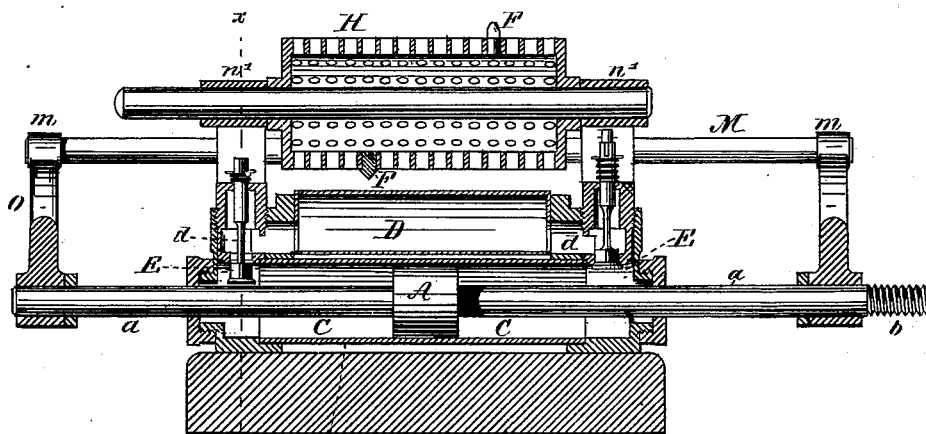


Fig. 2.

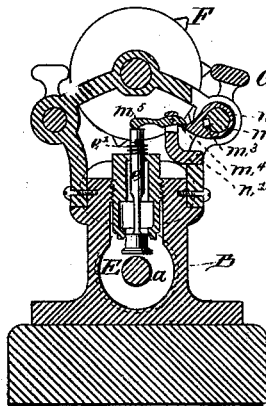


Fig. 3.

WITNESSES

A. J. Oettinger
Geo. F. Walker

INVENTOR

Joseph E. Crisp
by his attys
Charles & Raymond

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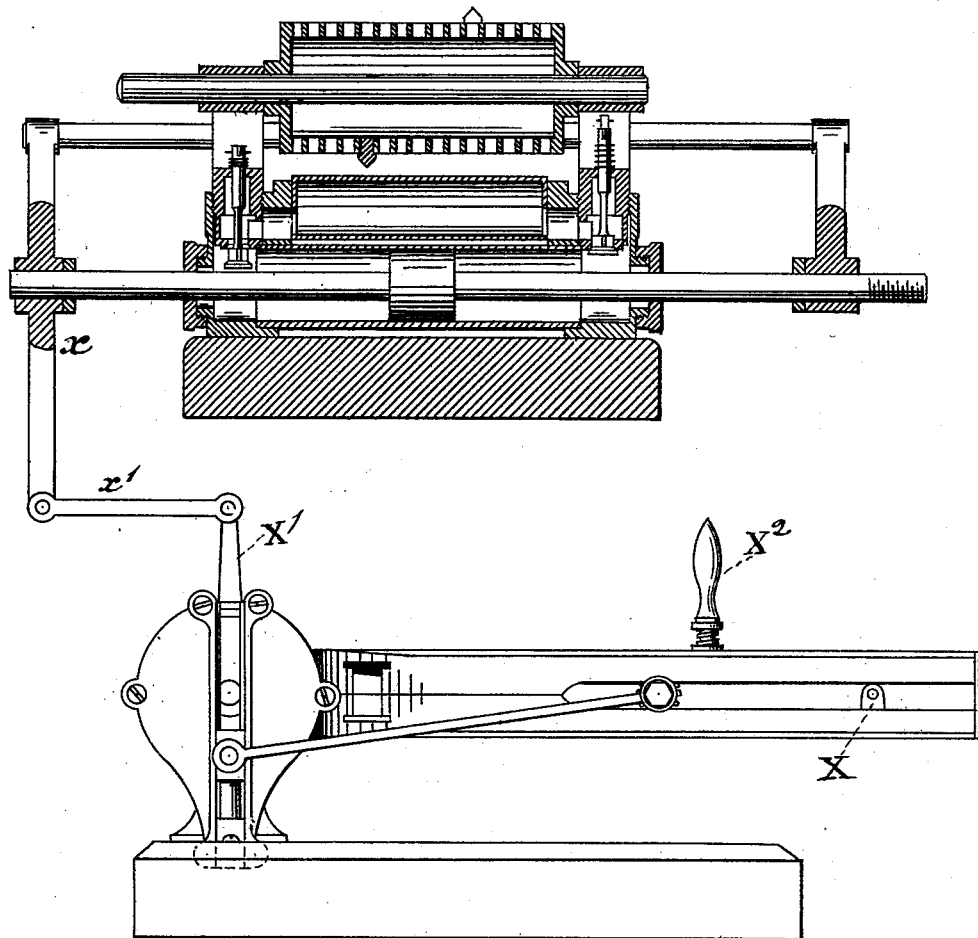


Fig. 4.

WITNESSES.
Geo. F. Walker
A. J. Cettinger.

INVENTOR.
Joseph E. Crisp
by his attys
Clarke & Raymond.

UNITED STATES PATENT OFFICE.

JOSEPH E. CRISP, OF BOSTON, ASSIGNOR TO GEORGE W. COPELAND, OF
MALDEN, MASSACHUSETTS.

IMPROVEMENT IN AUTOMATIC RECIPROCATION-REGULATORS.

Specification forming part of Letters Patent No. **215,047**, dated May 6, 1879; application filed
February 8, 1879.

To all whom it may concern:

Be it known that I, JOSEPH E. CRISP, of Boston, in the county of Suffolk and Commonwealth of Massachusetts, have invented an Improved Automatic Reciprocation-Regulator, of which the following is a specification.

This invention relates to means for automatically registering and then firmly holding in any predetermined position the handle or lever that controls the position or stroke of any reciprocating tool, head, or piston. It embraces—

First, mechanism for controlling the movement of the said lever or handle, consisting of a cylinder and a piston, firmly held in position within the cylinder between two bodies of incompressible liquid; a piston-rod, arranged directly or indirectly to take hold of the handle or lever; a superposed chamber, connected at each end with each end of the cylinder by suitable passages; a valve at each end of the cylinder, at the juncture of the passages, arranged to open downwardly, and to be positively opened at predetermined intervals, whereby, by the opening of one valve, the piston with its attachments is allowed free movement toward the open valve, the piston forcing the liquid before it through said open passage into the chamber above, while it (the piston) draws liquid from said chamber through the valve at the opposite end of the cylinder, which automatically opens to allow the passage thereof into the cylinder as the piston moves from it, but automatically closes to retain and prevent any backward movement of the piston or liquid until it receives another impulse in the desired direction, or until the motion of the piston relative to the registering-pin allows the closing of the positively-opened valve, when the piston and its attachments become stationary and firmly fixed.

Second, a perforated roll or other device presenting registering points or pins, which indicate the limits of the adjustments it is desired to give said handle or lever to connecting mechanism that operate to open and hold open one or the other of the valves in the cylinder so long as the point or pin shall remain

in contact with the said valve-actuating mechanism.

In the drawings, Figure 1 represents a plan of my invention; Fig. 2, a vertical section thereof; Fig. 3, a vertical cross-section on the line *x x* of Fig. 2. Fig. 4 is an elevation of my improvement, showing one end of the piston-rod connected with the end of a lever.

The piston A is arranged within the cylinder B, between the bodies of incompressible liquid C. It is fastened to a piston-rod, *a*, which extends through the cylinder and lays hold of the reciprocating lever or handle, or to mechanism connected therewith.

The superposed chamber D is arranged above the cylinder, and connected with each end of it by the passage *d*. A valve, E, is arranged at the juncture of each passage to open downwardly into the cylinder, allowing the escape of liquid from one end, and its entrance at the other end into the cylinder.

The valves are automatically operated by register-pins F, which are presented to the long valve-levers G by the perforated roll H, which is provided by any suitable connecting mechanism from any moving part of the machine with a half-revolution, in order that each of the said valve-levers may have a separate portion of the roll for carrying its valve-actuating pins. Each of the long levers G is fastened to its respective rod M at about the center of its length to project in opposite directions parallel with the rods and with the roll, and they are so arranged in relation to the roll that they contact or almost contact with it, and have a movement by the partial revolution of the rods to and from the same.

The valve-rods M are about three times as long as the cylinder, and are each provided with bearings *m* in the frame N and bifurcated arms O. They are connected at each end by said bifurcated arms with the piston-rod *a*, and with it have a horizontal movement as the piston is moved in the cylinder, thereby effecting the horizontal movement of the valve-levers along the sides of the roll. Each of the valve-rods M is provided with the lever or rocker-arm *m'*, confined between the two parts of one of the bearings *m* in the frame N, and having

a key or feather, m^2 , which fits into the key-way m^3 on the side of the valve-rod, thereby allowing the valve-rod to reciprocate freely therein, while it moves with the rod as it partially revolves to cause the arm m^4 to contact with the lever m^5 , pivoted to the stand n' , and causing it to depress the valve-spindle e against the stress of the spring e' .

The roll is provided with bearings n' in the frame N . The surface of each valve-lever adjacent to the roll is beveled or rounded upon its upper and lower edges, and the pins have heads with sides inclined to a point. This construction allows the pins to move the valve-levers easily and to gradually adjust them against the rolls as the levers move beyond them.

The spring e' , it will be observed, not only serves to automatically close the valve after the valve-lever has passed its operating-pin, but also causes the lever m^5 to hold the valve-levers G constantly against the surface of the roll or register-pin.

The extent of the movement of the piston in the cylinder, when it is allowing an adjustment to take place, depends upon the distance from the registering-pins to the end of the long valve-levers G , that operate the desired valve.

The pins are placed in the roll to indicate the limits of the adjustment which it is determined the tool or other moving part shall have.

In order to show the application of my invention, I have illustrated in Fig. 4 its use in connection with the device shown and described in Letters Patent No. 210,452, granted me December 3, 1878. In that machine the length of stroke of the cross-head X , carrying the tool, is varied as required by the movement of the handle or lever X^1 . The position of the stroke is controlled by the handle X^2 , and if the said lever or handle were not fastened in position by the clamping contrivance described in said patent the lever X^1 would swing to and fro, and the handle X^2 would reciprocate with each movement of the cross-head X .

The device which I have herein described is intended to automatically permit the lever or handle to move a given distance at a certain interval of time, and then to firmly hold it for the purpose of allowing the adjustment of the cross-head to another and predetermined position.

In Fig. 4 the piston-rod is represented as connected at its end x with the lever X^1 by the link x' .

To understand the operation of my device as thus connected, it must be borne in mind that the liquid within the cylinder does not act to move the piston in any sense, but serves simply as a stop in preventing the movement of the piston when the valves are closed. It must also be remembered that the perforated roll carrying the pattern is constantly moving,

and that, at certain intervals, opens one of the two valves, allowing the escape of liquid from the cylinder through the valve thus opened, which is the direction it is desired that the piston shall be moved, and that the lever X^1 , with every reciprocation, is only prevented from moving by the fact that the piston is held between two bodies of incompressible liquid.

With these facts in mind it will readily be seen that upon the opening of the valve the lever X^1 will move the piston and cause it to force the water from the cylinder as it advances through the open valve, and that, as the piston advances toward the open valve, it is prevented from moving backward by the filling of the portion of the cylinder behind it with water, which is caused to enter by the suction produced by said forward movement.

The valves, it will be observed, are so arranged that they open automatically by suction from within or weight from without, but close instantaneously when the weight from without is removed and by the pressure of the liquid in the cylinder against them. This movement of the piston toward the open valve continues by successive steps until the lever X^1 has moved the requisite distance to establish its new position, and the interval which is required for such a movement is determined by the rapidity of its reciprocation; but it continues as long as the valve-pin, by contact with the valve-lever, holds a valve open. Of course this reciprocation-regulator can be used in connection with any arm, lever, or handle having a reciprocating movement for the purpose indicated.

In operation, the revolution of the roll presents a pin to one of the valve-levers. Its contact therewith moves the lever from the roll, partially revolves its rod, thereby opening, by connecting mechanism, a valve. The piston and piston-rod are then allowed motion in the cylinder toward the valve until the valve-lever, which is moved by the piston, passes horizontally beyond the pin with which it is in contact, when it is automatically returned to the roll, and with the piston and piston-rod becomes stationary, to again move upon the contacting of the next succeeding pin therewith in a like manner.

As the piston is moved by a lever handle or head which has a reciprocating movement, it does not always move continuously in the cylinder toward the open valve, this depending upon the length of stroke that the machine is making and the amount of adjustment desired, but moves by successive steps coincident with like movements of the lever, tool, or head. Therefore it is necessary at the end of said movement or stop to catch or retain the piston until the next step or movement in the proper direction, and this is effected by causing the cylinder to fill with liquid as the piston moves, and by preventing the discharge of said liquid by the auto-

matic closing of the valve through which it enters the cylinder while the piston is stationary and awaiting the next stroke in the direction of the open valve.

It will be observed that only one valve is directly operated upon at any time by the valve-controlling mechanism, and that the piston always moves in the direction of the valve thus operated; that it forces the liquid before it through said open valve into a chamber; that it draws from a chamber as it advances enough liquid to keep full the cylinder behind it; that the valve from which the cylinder is moving opens automatically to allow said liquid to enter, and closes automatically to prevent its escape until it is desirable to change the direction of movement of the piston, when it is directly operated upon and held open to permit the exit of the liquid, while the valve which has before been directly operated upon becomes automatic, allows the entrance of the liquid into the cylinder, and automatically closes to prevent its escape.

It will further be seen that when both valves are closed the liquid acts as a stop, and the piston is stationary.

It will further be seen that one of the valve-levers controls all movements of the piston in one direction, and that the other valve-lever controls all movements in an opposite direction.

It will be noticed that the distance upon a valve-lever from the point where the pin first contacts with it to its end indicates the extent of the movement of the piston in the cylinder for the desired interval.

Of course I do not confine myself to the use of a roll revolved or partially rotated in presenting the registering-pins to the valve-levers, as by increasing the length of the roll so that it shall be twice the length of each valve-lever it may be constantly revolved in presenting the pins, or in lieu of a roll a reciprocating perforated plate may be reciprocated between the valve-levers and carry the registering-pins, or a perforated card may be drawn by each lever, and thus carry the registering-pins in presenting them to the valve-levers.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. As a means for providing automatic adjustments to a reciprocating handle, lever, head, or any reciprocating part of a machine, the combination of the following elements: a piston arranged to be moved in a cylinder by the movement of a reciprocating part of a machine, means for controlling the movement of said piston, and automatic means for determining and actuating said controlling mechanism at predetermined intervals, all substantially as described.

2. As a means for effecting the automatic adjustment of a reciprocating part of a machine, a piston connected with said moving part by any suitable mechanism, and arranged to be operated thereby with automatic means,

substantially as described, for controlling the movement of said piston within a cylinder, as and for the purposes described.

3. As a means for effecting adjustments of a reciprocating part of a machine, a cylinder provided with an exterior passage extending from one end to the other, suitable controlling-valves for regulating the escape of liquid from the cylinder, to operate substantially as described, a piston connected with said reciprocating part, and arranged to be moved thereby, and an incompressible liquid filling said cylinder.

4. The combination of a cylinder, a chamber or channel connecting one end of said cylinder with the other, a liquid filling said cylinder, a piston arranged to be moved in said cylinder by the reciprocation of any part of the machine to which it is desired to give adjustment, a valve at each end of said cylinder, and means, substantially as described, for automatically opening said valves at stated intervals, whereby a change in the position of the piston within the cylinder is effected.

5. The combination of a piston connected with a reciprocating part of a machine by a piston-rod and suitable connecting mechanism, a cylinder filled with a practically-incompressible liquid, and means for varying the quantity of liquid upon each side of said piston without diminishing the quantity in the cylinder, substantially as and for the purposes described.

6. The combination of a cylinder provided with a passage extending from each end into a separate chamber, a piston connected with a reciprocating part of a machine, and arranged to be moved thereby, an incompressible liquid filling said cylinder, passages, and chamber, a valve at each end of the cylinder opening downwardly, a revolving perforated roll provided with pins set to the adjustments required, and suitable connecting mechanism for operating said valves automatically by said pins in effecting a change in the position of the piston in the cylinder, substantially as and for the purposes described.

7. In a device for allowing the automatic adjustment of a reciprocating part of a machine, the combination of operating pins or points, carried by a revolving perforated roll, with suitable valve-connecting mechanism and the valves E, whereby a valve is opened and the liquid is allowed to escape from the cylinder at predetermined intervals, in the manner described, for the purposes set forth.

8. In an automatic reciprocation-regulator for effecting adjustments, the combination of a perforated revolving cylinder, H, removable pins, valve-levers, valves, and suitable connecting mechanism, whereby one lever controls the forward movement of the piston, and the other lever the backward movement thereof, all substantially as described.

9. In an automatic reciprocation-regulator for effecting adjustments, the combination of a roll, pins, valve-levers, valves, and suitable

connecting mechanism, whereby the valves are opened by the movement of the levers from the roll upon the contact of a pin therewith, and whereby the levers are automatically closed against such roll, substantially as and for the purposes described.

10. The combination of a revolving perforated cylinder, H, pins F, levers G, rods M, the piston-rod *a*, the arms O, the cylinder D, its chamber and its connecting passages, a piston, and valves, all arranged to operate substantially as described.

11. The combination of a piston adjusted within a cylinder between two bodies of incompressible liquid, and arranged to be connected by a piston-rod extending through and beyond both ends of the cylinder, with a reciprocating lever or other reciprocating part of a machine, means for varying the contents of each body of liquid upon either side of the piston simultaneously without diminishing the volume of liquid in said cylinder, levers provided with the same motion as the piston, a revolving pattern-roll for controlling said levers, and suitable connecting mechanism, whereby the movement of the levers by the pins opens the valves and allows the said variations in the two bodies of liquid to occur, and a consequent movement of the piston within the cylinder, and a corresponding movement of the said levers along the side of the pattern-roll, all substantially as described.

12. In an automatic reciprocation-regulator for effecting the adjustment of a reciprocating lever, the combination of a piston adjusted in a cylinder between two bodies of incompressible liquid, and arranged to be connected with said lever by a piston rod extended through both ends of the cylinder, with said incompressible liquid filling said cylinder upon each side of the piston, and means for varying the contents of each body of liquid simultaneously without diminishing the volume of liquid in said cylinder.

13. In an automatic reciprocation-regulator for effecting the adjustments of a reciprocating part of a machine, the combination of a piston within the cylinder between two bodies of incompressible liquid, and arranged to be connected by a piston-rod with said moving tool, lever, or other moving part of a machine, means for varying the contents of each body of liquid upon either side of the piston without diminishing the volume of liquid in said cylinder, and a pattern for automatically operating the valves at predetermined intervals, substantially as and for the purposes described.

JOSEPH E. CRISP.

Witnesses:

GEO. F. WALKER,
F. F. RAYMOND, 2d.