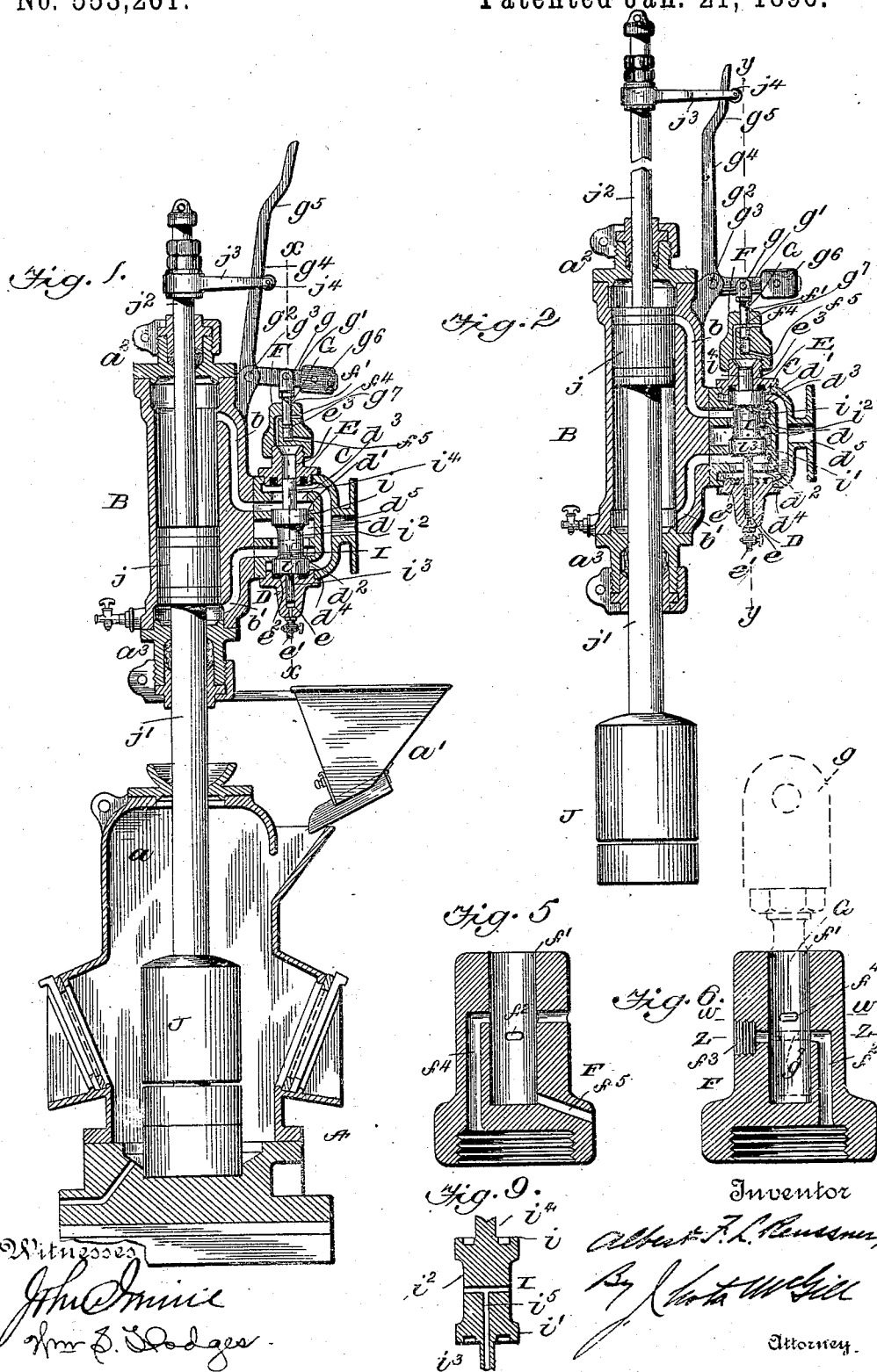


A. F. L. REUSSNER.
STEAM DROP HAMMER.

No. 553,261.

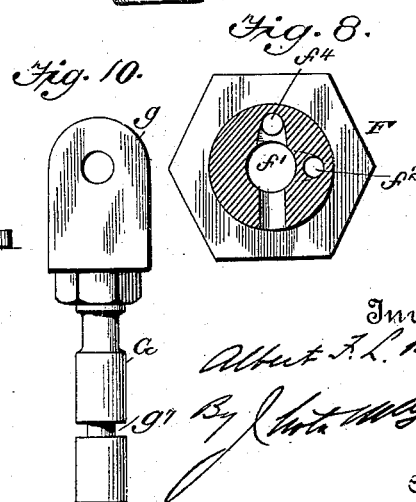
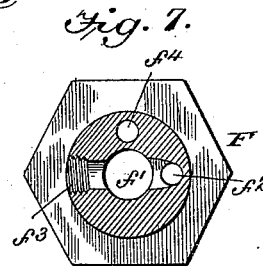
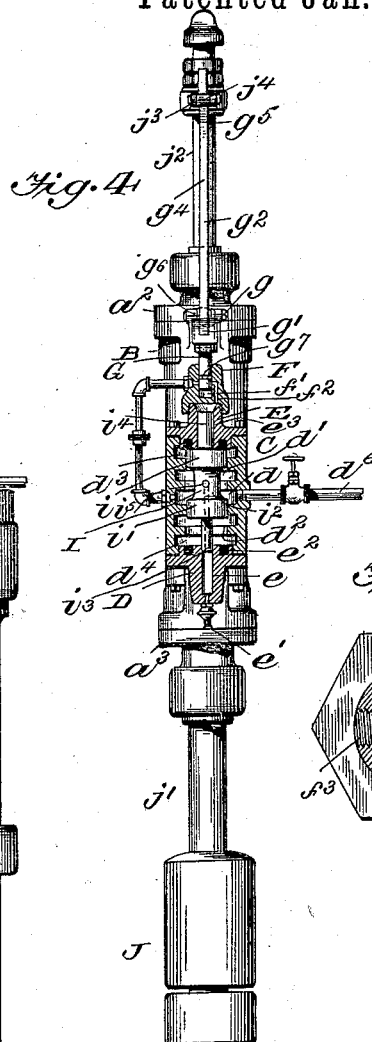
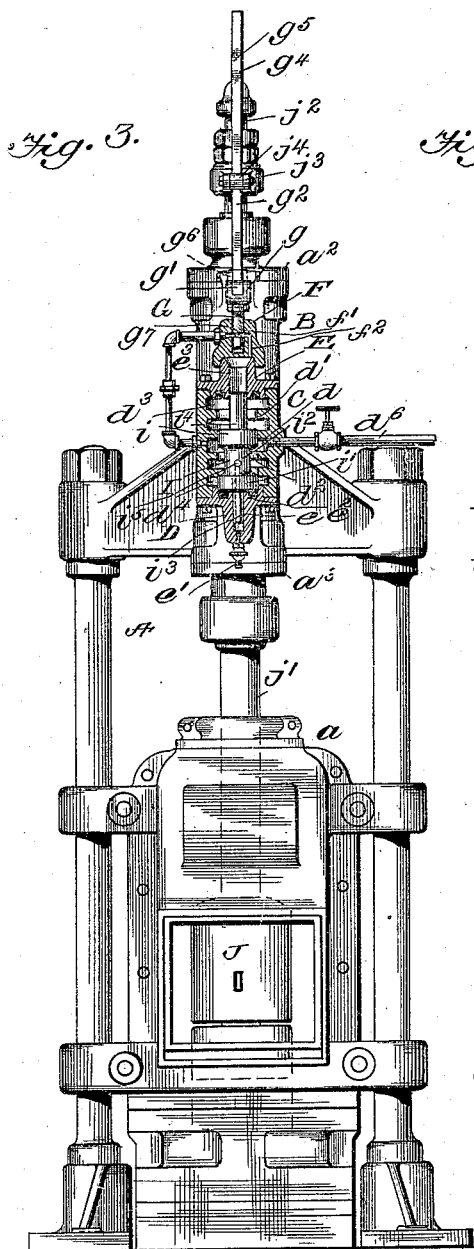
Patented Jan. 21, 1896.



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UNITED STATES PATENT OFFICE.

ALBERT F. L. REUSSNER, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO
GEORGE SMITH, OF SAME PLACE.

STEAM DROP-HAMMER.

SPECIFICATION forming part of Letters Patent No. 553,261, dated January 21, 1896.

Application filed May 28, 1895. Serial No. 550,940. (No model.)

To all whom it may concern:

Be it known that I, ALBERT F. L. REUSSNER, of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Steam Drop-Hammers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention contemplates certain new and useful improvements in steam drop-hammers, and is specially applicable to stamping-mills, although its use is not in any sense restrictive.

The object of the invention is to provide highly-efficient means for quickly and effectively operating the hammer, to simplify the construction and operation of the valve mechanism, and to utilize the inertia of the parts for effecting the blow of the hammer—that is, allowing the full blow to be struck before the piston can be checked by a change in the course of the steam-pressure.

A further object is to provide a main steam-inlet valve, the position of which is controlled entirely by steam-pressure.

These objects I accomplish by providing a steam-inlet valve which is normally held raised by a steam-pressure against its under side and which is lowered by a greater pressure against its upper end, said latter pressure being under the control of a primary valve, the position of which is controlled by the movement of the hammer-carrying piston. The time consumed in effecting the lowering of the steam-inlet valve so as to admit steam against the under side of the main piston is such that the full force of the blow of the hammer is struck before any check is had thereon by the lower steam-pressure.

The invention comprises the novel features of construction and also the combination and arrangement of parts, substantially as herein-after fully set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical sectional view showing my improvements applied to the drop-hammer of a stamp-mill with the hammer lowered. Fig. 2 is a similar view with parts omitted, showing the

hammer raised. Figs. 3 and 4 are sectional views taken on lines xx and yy , Figs. 1 and 2, respectively. Figs. 5 and 6 are vertical sectional views of a valve-casing taken at right angles to each other. Figs. 7 and 8 are, respectively, sectional views on the lines zz and ww , Fig. 6. Fig. 9 is an enlarged sectional view of the main inlet-valve, and Fig. 10 is an enlarged view of primary valve.

Referring to the drawings, A designates the framework, a the inclosing portion of a stamp-mill, and a' the feed-hopper therefor.

B is the piston-cylinder supported by frame A, the upper and lower ends of said cylinder being provided with stuffing-boxes a^2 and a^3 . In one side of this cylinder are two steam-ports b and b' , leading, respectively, from points near the center to the upper and lower ends thereof, into which they open.

C is a valve-casing attached to or formed with cylinder B. It is provided with a central steam-chamber d , upper and lower ports d' and d^2 , which coincide, respectively, with the steam-ports b and b' , while above and below these ports d' and d^2 are exhaust-ports d^3 and d^4 , which open at their outer ends into a single outlet d^5 . Steam is admitted to chamber d by a pipe d^6 . In the walls separating these series of chambers are coincident circular openings.

To the lower end or bottom of casing C is connected an extension D, having a central bore or chamber e , a drip-cock e' , and packing e^2 , forming a buffer. To the top of said casing is attached an extension E having a central bore or chamber e^3 of greater diameter than the chamber e . Upon the upper end of this extension is fitted a casing F of a primary valve. This casing is provided with a lower threaded recess designed to engage a threaded portion of extension E. In this casing is a central perpendicular chamber f' , open at its outer end and extending down into the casing. A steam-inlet port f^2 extends vertically upward parallel with the chamber f' , and about midway of the latter is extended through and horizontally across the same at right angles thereto, terminating in a threaded opening f^3 at one side of the casing, while its inner end opens into the upper open end of the bore or chamber e^3 . An escape-port

f^4 , at right angles to the inlet-port f^2 , leads perpendicularly from bore or chamber e^3 and is extended at right angles horizontally across the chamber f' above the right-angular or horizontal branch of port f^2 , its end opening through the side of the casing. A small exhaust-port f^5 extends from the bottom of chamber f' through the casing to prevent a vacuum being created in said chamber beneath the valve.

G is the primary valve. It is of cylindrical form and designed to fit snug in chamber f' , above which it projects, and is connected by an adjustable keeper-plate g to the short arm g' of a lever g^2 , fulcrumed at g^3 , the long arm g^4 of said lever being extended upward, and near its upper end is provided with an incline or offset g^5 . A weight g^6 is on the end of the short arm g' . In the cylindrical body of valve G is formed a peripheral groove or cut-away portion g^7 , which, when the valve is lowered under the action of the weighted lever, will be in alignment with the horizontal branch of the steam-inlet port, allowing steam to pass into the bore or chamber e^3 ; but when said valve is raised its lower portion will cut off the inlet of steam and the groove or cut-away portion g^7 being in line with the horizontal branch of the outlet-port steam will be permitted to escape from the bore or chamber e^3 . This escape, while steam is being admitted, is prevented by the upper portion of the valve closing the horizontal branch of the outlet-port. A pipe H leading from steam-chamber d opens at its upper end into the steam-inlet port, its end fitting in the threaded opening f^3 .

I is the main steam-inlet valve. It is in the form of a double piston having upper and lower circular partitions i and i' , each forming a separate valve, and a reduced connecting portion i^2 . This valve is located in the casing C and fits within the coincident openings. From the bottom and top of this valve project short piston-rods i^3 and i^4 , which correspond to and fit snug within the boxes or chambers e and e^3 , the rod i^4 being as much greater in diameter than the rod i^3 as the diameter of said bore or chamber e^3 is greater than that of chamber e . A port i^5 extends through the piston-rod i^3 upwardly into the valve I, and at about the center of the connecting portion of the latter has two lateral branches, which admit of the constant supply of steam from chamber d to the bore or chamber e , the tendency of which, acting on the piston-rod i^3 , is to hold the valve I raised with the upper valve portion i against the upper buffer, closing the upper exhaust-port d^3 and allowing steam to pass from chamber d through ports d' and b to the upper end of cylinder B. When, however, the primary valve G is lowered and steam is admitted to bore or chamber e^3 by reason of the increased area upon which the steam has to act against the end of the piston-rod i^4 , the valve I will be lowered, as against the pressure in bore or

chamber e , and when so lowered the lower valve portion i' will be against the lower buffer, allowing steam to pass from chamber d through ports d^2 and b' to the lower portion of the cylinder B. At the same time the upper valve portion i will open up the exhaust through port d^3 from ports b and d' and cut off the steam-supply from chamber d to said port d' . When the primary valve is again raised, the supply of steam to bore or chamber e^3 is cut off and escape is had through port f^4 , the valve I being again raised by the steam-pressure in the bore or chamber e .

J designates the hammer; j , the main piston movable in cylinder B; j' , a lower piston-rod extending through stuffing-box a^3 and to the lower end of which said hammer is connected. A tail-rod j^2 extends upwardly from the piston through the upper stuffing-box a^2 , and upon its upper end is secured one end of a horizontal arm j^3 , the outer bifurcated end of which has a roller j^4 mounted therein. Through this bifurcated end projects the long arm g^4 of lever g^2 , said arm constantly bearing against the roller j^4 . Hence as the piston j moves upwardly the arm j^3 gradually draws inward the arm g^4 and acting on the incline or offset thereof causes said arm to occupy an upright position, as against the action of the weight on the end of the short arm of the lever. This movement of the lever effects the raising of the primary valve, which in turn cuts off the upper steam-pressure on the main valve, allowing the upward movement thereof under the action of the steam-pressure in the lower bore or chamber e . By the time, however, sufficient steam has been admitted through the lower port b' to permit it to act expansively against the under side of the piston to complete the upward movement thereof, the steam passing into the lower bore or chamber e , raising valve I and cutting off the lower supply of steam, the steam will pass into the upper end of cylinder B above the piston, the exhaust beneath the piston being open. This will result in the almost instantaneous downward movement of the piston j and its hammer, and the full force of the blow will be struck before the position of the valve can be again changed to admit steam into the lower end of the cylinder. The lowering of piston j and its tail-rod will allow the lever g^2 to rock and thereby lower the primary valve, admitting steam into bore or chamber e^3 , effecting the lowering of valve I by the increased pressure thereon, thus cutting off the upper supply of steam and opening up the lower supply through port b' for again raising the main piston and hammer. Thus it will be seen that the constant tendency is to hold the valve I raised, permitting steam to pass to the upper end of cylinder B, and that this tendency is offset and steam admitted to the lower end of said cylinder for raising the piston and hammer by the increased pressure on the upper end of said valve continuing until the said piston

has about reached the upper limit of its movement, when said pressure is released and the valve I again raised by the constant upward pressure. The inertia of the parts is used for the purpose of effecting the blow before steam can be again admitted beneath the piston, the time consumed in the change of the valve movement being such as to prevent any check upon the downward movement.

The advantages of my invention are apparent. It will be seen that I have provided improved valve mechanism which is exceedingly simple in construction and automatic in operation; that the weighted lever holds the primary valve open while the hammer is lowered, allowing steam to pass beneath the piston; that as soon as said piston reaches the upper limit of its movement the increased pressure on the top of the main valve is released, allowing said valve to assume its normal upper position, supplying steam above the piston, and that the inertia of the parts is utilized for effecting the blow, since steam cannot be again admitted beneath the piston before the blow of the hammer has been struck.

One of the main features of my invention lies in the fact that the effectiveness of the blow will not be impaired by the height of the material in a stamp-mill beneath the hammer. The lever g^4 is independent of the tail-rod after the arm j^3 ceases to engage the incline or offset g^5 . The force of the blow will, of course, be in proportion to the distance the hammer-piston travels, be less as the height of the material increases and greater as the latter diminishes or is disposed of by the stamping process; but whatever the extent of the blow it is never checked by the steam before its entire force is spent.

A steam-hammer provided with my improvements is effective and rapid in operation, and the parts being extremely simple are not liable to readily get out of order or be deranged.

While I have shown my improvements in connection with the drop-hammer of a stamp-mill, yet it will be understood that it is not restricted in its use in any sense. Likewise changes may be made in the details of construction without departing from the scope of my invention.

I claim as my invention—

1. A steam-operated drop-hammer, comprising a cylinder having two ports, a piston movable in said cylinder having a tail-rod, the hammer being carried by said piston, the valve casing having a steam-chamber and ports corresponding to said former ports, a steam-inlet valve movable in said casing and normally held raised by lower steam-pressure, a primary-valve for admitting steam against the upper end of said steam-inlet valve for lowering the latter, and means for operating said primary-valve operatively connected to said tail-rod, substantially as set forth.

2. A steam-operated drop-hammer, com-

prising a cylinder having two ports, a piston movable in said cylinder having a tail-rod, the hammer being connected to said piston, a piston-like steam-inlet valve designed to move vertically, said valve being raised and lowered by steam pressure and controlling the admission of steam through said ports, and allowing alternate exhaust therethrough, whereby the inertia of the parts is utilized for effecting the blow of the hammer, and means operatively connected to said tail-rod for controlling the upper steam-pressure on said valve, as set forth.

3. The combination with the piston-cylinder having two ports, of the valve-casing having a steam-chamber and ports corresponding to said former ports, a steam-inlet valve movable in said casing for alternately admitting steam to, and exhausting steam from, said ports of said cylinder, and communications between said steam-chamber and said casing above and below said valve, whereby the latter is raised and lowered by steam-pressure, substantially as set forth.

4. The combination with the piston-cylinder having two ports, of the valve casing having a steam-chamber and ports corresponding to said former ports, a steam-inlet valve movable in said casing for alternately admitting steam to, and exhausting steam from, said ports of said cylinder, communications between said steam-chamber and said casing above and below said valve, and a primary-valve for controlling the admission of steam above said steam-inlet valve, substantially as set forth.

5. The combination with the piston-cylinder having two ports, of the valve-casing having a steam-chamber and ports corresponding to said former ports, a steam-inlet valve movable in said casing for alternately admitting steam to, and exhausting steam from, said ports of said cylinder, said valve having upper and lower piston-rods fitted in corresponding chambers, communications between said steam-chamber and said casing above and below said piston-rods, and a primary valve for controlling the admission of steam against said upper piston-rod, substantially as set forth.

6. The combination with the piston-cylinder having two ports and the piston movable therein having a tail-rod, of the valve-casing having a steam-chamber and ports corresponding to said former ports, a steam-inlet valve movable in said casing and normally held raised by the steam pressure therein, connections between said steam-chamber and the upper end of said casing above said valve, a primary-valve for controlling the admission of steam against the upper end of said steam-inlet valve and means for operating said primary-valve connected to said tail-rod, substantially as set forth.

7. The combination with the piston-cylinder having two ports, of the valve-casing having a steam-chamber and ports correspond-

ing to said former ports, a steam-inlet valve movable in said casing having a port therein forming communication between said steam-chamber and said casing beneath said valve, whereby the latter is normally held raised by steam-pressure, and means for lowering said valve as against said lower steam-pressure, substantially as set forth.

8. The combination with the piston-cylinder having two ports, of the valve-casing having upper and lower bores or chambers, a central steam-chamber, and ports corresponding to said former ports, said upper bore or chamber being of greater diameter than the lower, the piston-like valve movable in said casing having upper and lower piston-rods corresponding to and movable in said bores or chambers and also having a port extending through said lower piston-rod and opening at its upper end into said steam-chamber, a pipe connecting said steam-chamber to said upper bore or chamber, a primary-valve for admitting steam into said upper bore or chamber, and means for operating said primary-valve, substantially as set forth.

9. The combination with the cylinder having two ports, of the valve-casing having a steam-chamber, and ports corresponding to said former ports, the steam-inlet valve movable in said casing and normally held raised by steam-pressure, the primary valve-casing having steam-inlet and exhaust ports opening into said former casing above said steam-inlet valve, a pipe connecting said steam-inlet port to said steam-chamber, the primary-valve movable in said casing, and means for automatically operating the same, substantially as set forth.

10. The combination with the piston-cylinder having two ports, and the piston movable therein having a tail-rod, of the valve-casing having a steam-chamber and ports corresponding to said former ports, the steam-inlet valve, the primary-valve for admitting steam against said former valve, the weighted lever to which said primary-valve is connected, and the arm carried by said tail-rod engaging said lever, whereby said primary-valve is operated, substantially as set forth.

11. The combination with the piston-cylinder having two ports, and the piston movable therein having a tail-rod, of the valve-casing having a steam chamber and ports corresponding to said former ports, the steam-inlet valve, the primary-valve for admitting steam against said former valve, the lever having a short arm to which said primary-valve is connected, its long arm having an incline or offset at or near its upper end, the weight on said short arm, and the arm carried by said tail-rod and engaging said long arm of said lever, substantially as set forth.

12. The combination with the piston-cylinder having two ports, and the piston movable therein to which the hammer is connected having a tail-rod, of the valve-casing having upper and lower bores or chambers, the for-

mer being of greater diameter than the latter, a central steam chamber and ports corresponding to said former ports, the piston-like valve having upper and lower piston-rods fitted in said bores or chambers, said lower piston-rod having a port therein leading from said steam-chamber to said lower bore or chamber, the upper valve-casing secured to said former valve-casing having steam-inlet and escape ports opening into said upper bore or chamber, the steam-supply pipe opening into said steam-inlet port, the primary-valve designed to alternately open and close said inlet and exhaust ports, the lever to which said primary-valve is connected, and the arm carried by said tail-rod engaging said lever, substantially as set forth.

13. The combination with the piston-cylinder having two ports, and the piston movable therein to which the hammer is connected having a tail-rod, of the valve-casing having upper and lower bores or chambers, the former being of greater diameter than the latter, a central steam-chamber and ports corresponding to said former ports, the piston-like valve having upper and lower piston-rods fitted in said bores or chambers, said lower piston-rod having a port therein leading from said steam-chamber to said lower bore or chamber, the upper valve-casing secured to said former valve-casing having a central chamber, steam-inlet and outlet ports opening at their inner ends into said upper bore or chamber and having angular portions extending across said central chamber at different altitudes, the steam-supply pipe leading from said steam-chamber of said valve-casing to the steam-inlet port of said primary valve-casing, the primary-valve movable in said chamber having a peripheral groove forming a port and designed to alternately coincide with the branches of said inlet and exhaust ports, the lever to which said primary-valve is connected, and the arm carried by said tail-rod engaging said lever, substantially as set forth.

14. The combination with the piston-cylinder having two ports, and the piston movable therein to which the hammer is connected having a tail-rod, of the valve-casing having upper and lower bores or chambers, the former being of greater diameter than the latter, a central steam chamber and ports corresponding to said former ports, the piston-like valve having upper and lower piston-rods fitted in said bores or chambers, said lower piston-rod having a port therein leading from said steam-chamber to said lower bore or chamber, the upper valve-casing secured to said former valve-casing having a central chamber, steam-inlet and outlet ports opening at their inner ends into said upper bore or chamber and having angular portions extending across said central chamber at different altitudes, the steam-supply pipes leading from said steam-chamber of said valve-casing to the steam-inlet port of said primary-

valve-casing, the primary-valve movable in
said chamber having a peripheral groove
forming a port and designed to alternately
coincide with the branches of said inlet and
5 exhaust ports, the lever having a weight on
its short arm to which latter said primary
valve is connected, the long arm of said lever
having an incline or off-set at its upper end,
and the arm carried by said tail-rod having
10 a bifurcated end and roller mounted therein

engaging said long arm of said lever, substantially as set forth.

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

ALBERT F. L. REUSSNER.

Witnesses:

W. H. MITCHELL,
P. J. VREELAND.