

No. 678,450.

Patented July 16, 1901.

M. A. YEAKLEY.
PNEUMATIC HAMMER.

(Application filed Oct. 12, 1900.)

(No Model.)

2 Sheets—Sheet 1.

FIG. 1.

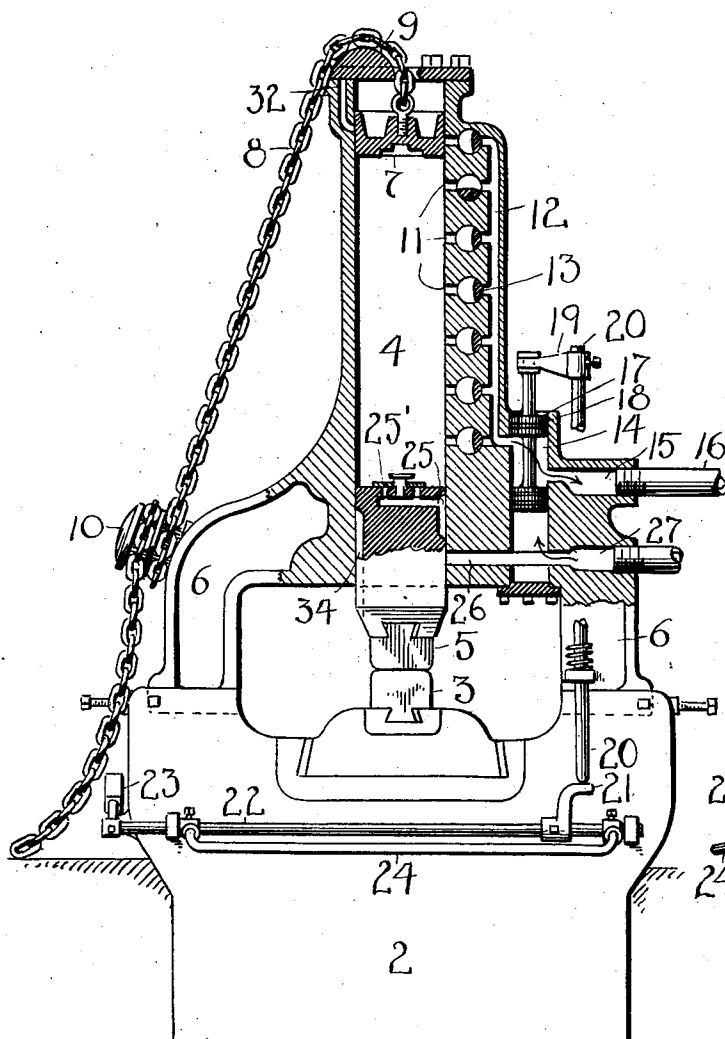
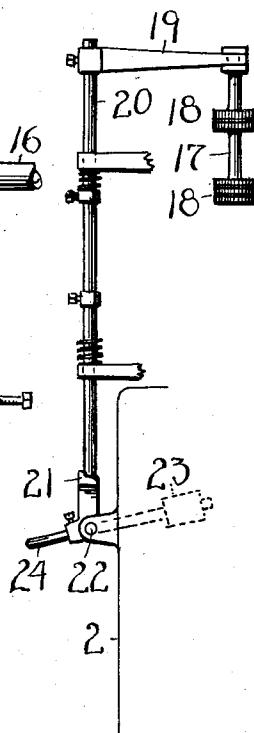


FIG. 5.



ATTEST

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in a Shrub

INVENTOR

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2 Sheets—Sheet 2.

FIG. 2.

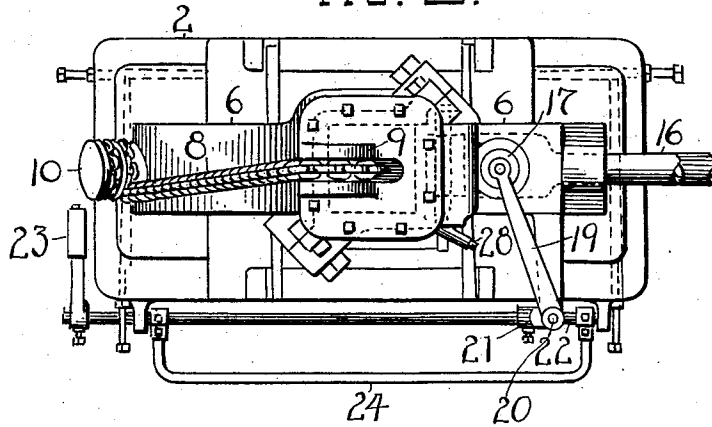


FIG. 3.

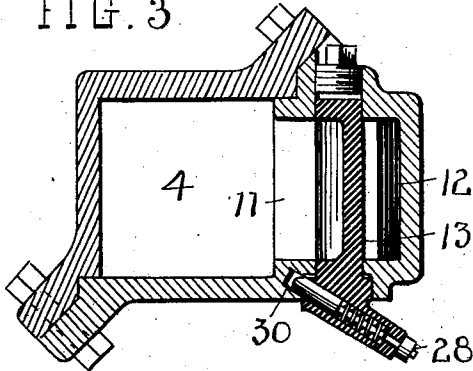


FIG. 6.

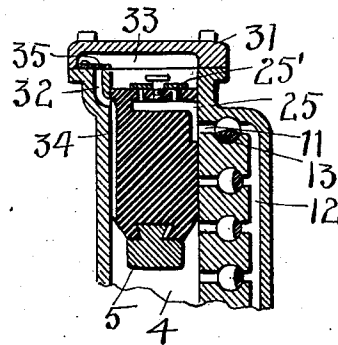
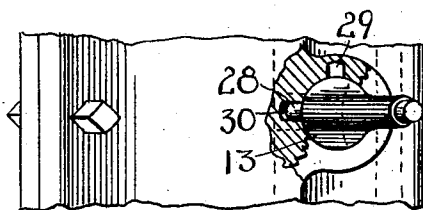


FIG. 4.



ATTEST.

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UNITED STATES PATENT OFFICE.

MELVIN A. YEAKLEY, OF CLEVELAND, OHIO.

PNEUMATIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 678,450, dated July 16, 1901.

Application filed October 12, 1900. Serial No. 32,836. (No model.)

To all whom it may concern:

Be it known that I, MELVIN A. YEAKLEY, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Pneumatic Hammers; and I do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to pneumatic hammers and belongs to that class of hammer wherein the hammer proper is raised by atmospheric pressure on its bottom when the air is exhausted from the hammer-chamber above the hammer and held suspended at a fixed point within the hammer-chamber until released to drop by its own weight, all substantially as herein shown and described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation, partly in section, of my improved hammer; and Fig. 2 is a plan view thereof. Fig. 3 is a cross-section of the vacuum hammer-chamber on a line of one of the valves at the side. Fig. 4 is a front elevation of a portion of the hammer, showing the valve-locking pin and its seats. Fig. 5 is a side elevation of the hammer-chamber with a modified form of head.

The hammer-frame comprises the base 2, having an anvil 3, centrally supported, and the hammer supporting and guiding member mounted on the base and having a hammer-chamber 4 for the hammer 5 in line with the anvil. Legs 6 carry the hammer-guiding member and rest on base 2 at each side and have an open space between them and about said anvil and hammer to permit the handling of the work. The hammer-chamber 4 is preferably square in cross-section and of such length vertically as to permit the hammer to be raised therein to any desired height, this being determined by a sliding adjustable head or piston 7, having a chain 8 attached to keep it in raised position and which passes out at the top of the chamber and over a rounded way 9 and down and around a lug 10 on leg 6, where it is fastened in any suitable manner. At one side of the chamber 4 are a series of passages 11, arranged one above the other, each of which leads to a passage 12

and has separate controlling-valves 13 therein. The passage 12 is open to communication with the valve-chamber 14, a passage or duct 15 leading therefrom to a line of pipe 16, which is connected to a vacuum-pump. (Not shown.) Ordinarily only one of the valves 13 and its passage 11 are open to passage 12, and this open passage and the position of the head or piston 7 in relation thereto determine and limit the distance of travel upward of the hammer 5 when vacuum is created in hammer-chamber 4 from the line. In order to control the flow of the fluid to the hammer, a sliding valve 17, having separated piston-heads 18, connected by a central stem, is caused to reciprocate in valve-chamber 14. Normally the position of this valve is up, as shown in Fig. 1, with the passages 12 and 15 in open communication between the valve-pistons, and the valve is held in this position by means of an arm 19, connected to the upper end of the stem of the valve and to a vertical rod 20, supported to slide in arms on the hammer-frame and base. The lower end of this rod 20 normally rests on an arm 21, fastened to shaft 22, which is supported to rotate in bearings on the base, and a counterweighted arm 23 keeps arm 21 in raised position to hold rod 20 and valve 17 suspended. An extending loop or foot bearing rod 24, fastened to shaft 22 and extending to the front, serves to provide means for tripping rod 20 to allow valve 17 to drop and cut off the exhaust-passage 15 from passage 12 and open passage 12 to the atmosphere through the open end of valve-chamber 14. The hammer-chamber 4 is then open to the atmosphere through passages 11 and 12. Collars on rod 20 and spiral springs between said collars and arms on the frame cushion the movement of the valves at the end of each stroke. Whenever the hammer 5 is down in position, as seen in Fig. 1, and the valve 17 is up and one of the valves 13 and its passage 11 are opened the air begins to exhaust out of hammer-chamber 4 and the atmospheric pressure on bottom of hammer raises it to the passage 11 then open and closes it so no more air can be withdrawn. The hammer then stops and remains in this raised position as long as the vacuum is connected. To release the hammer and cause it to drop by its own

weight, the trip mechanism is operated by the operator and valve 17 is caused to drop down until the upper head or piston of the valve is below the passage 12, where it opens into valve-chamber 14. This cuts off the vacuum and allows the air from the outside to enter chamber 4 through the open end of valve-chamber 14 and passages 12 and 11, and the hammer then drops. When the hammer is raised, the top of the hammer usually passes by the port 11, which is open to passage 12 and is held there, and in order to allow the air from the outside to break the vacuum above the hammer and below the piston 7 a groove or channel 25 and flap-valve openings 25' are made in the side and top of the hammer, the channel 25 in the side communicating with the open port 11 when the hammer is in its extreme raised position. A pressure-supply passage 27 opens into the lower end of valve-chamber 14 beneath valve 17 and connects with a pressure-supply or air pump. (Not shown.) A separate passage 26 also connects the lower end of valve-chamber 14 with the lower end of hammer-chamber 4, and when the hammer 5 is down, as seen in Fig. 1, passage 26 is closed by the hammer itself, and the air-pressure having no outlet is compressed within the lower end of valve-chamber 14, which forces the lower piston of valve 17 up and raises it to its highest limit, where it is then held by rod 20 and trip-arm 21. The instant valve 17 is raised the vacuum is opened to hammer-chamber 4, as hereinbefore described, and the hammer rises. After the hammer passes passage 26 in going up the pressure escapes to the lower end of the hammer-chamber beneath hammer 5 and into the open atmosphere, which relieves the pressure on the lower piston of valve 17 and permits said valve to drop whenever the trip mechanism is again actuated to release rod 20. Each valve 13 has a spring-pressed bolt 28, inclosed in an arm extension on the said valve, and this bolt enters sockets 29 or 30 in the frame to lock the valve in open or closed position.

Fig. 6 shows a modified form of head 31 for the hammer-chamber 4, which is used when the sliding head or piston 7 is entirely removed in order to utilize the full length of the hammer-chamber to raise the hammer to the highest position possible within the same. To prevent the hammer in its upward movement from knocking this cover loose and to cushion the hammer at the end of its upstroke, air is allowed to enter into the hammer-chamber above the hammer and beneath said cover. To this end a passage 32 in the side of the hammer-frame opens into the hammer-chamber 4 near the top and also opens into a passage 33, which communicates with the extreme top of chamber 4. When the hammer 5, which has a groove 34 in its side running to the bottom, where it opens to the atmosphere, reaches the highest point in its upward movement and closes the highest pas-

sage 11, the groove 34 opens to passage 32 and lets in air above the hammer within chamber 4. This breaks the exhaust above the hammer, and the velocity of the hammer still carries it up; but before the hammer reaches the cover the flap-valve 35 over passage 32 prevents the air just admitted from escaping from hammer-chamber 4, and the air thus confined cushions the hammer. When the upward movement of the hammer meets this reverse, it lowers slightly and closes passage 32, and exhaustion again occurs in hammer-chamber 4, which holds the hammer suspended until again released, as heretofore described.

The hammer can be controlled fully to rise and fall at any point in its range of stroke or at will of operator without the aid of the pressure fluid upon valve 17 by simply disconnecting arm 21 and connecting rod 20 to treadle 24 by a link or other positive connection, whereby the treadle can be moved up or down mechanically to raise and lower valve 17 by means of rod 20 and arm 19. A handle lever can also be connected to treadle-shaft 22 to operate and control the hammer, if desired.

The hammer will work nearly as well when head 7 is removed and the closed cover 31 is substituted therefor, the different elevations to which the hammer is raised being determined and controlled by the passage 11 that has been previously selected and opened; but there will be a loss of power, especially when working with one of the lower passages 11 open, on account of the space above the passage 11 being so much larger, which requires more air to be withdrawn from this space each time the hammer 5 is to be raised than otherwise would be if piston 7 was in, as heretofore described.

The hammer serves as a piston as well as a hammer and is fitted closely to the hammer-chamber 4, so that no air leakage is had into hammer-chamber 4 to affect the efficiency of working the hammer by the atmospheric pressure from below.

A rotary or slide valve in connection with a piston in a cylinder open to passage 26 would work the same in principle as the piston-valve 17 herein shown.

I have specifically described the mechanism shown in the drawings; but obviously this mechanism might be very considerably varied in form and serve the same purpose, so that my claims are to be understood as covering all equivalent mechanism.

What I claim is—

1. In a drop-hammer substantially as described, the hammer and the chamber therefor, a series of passages connecting said chamber at different elevations with a fluid-passage for the hammer-operating medium, and valves to open and close said passages and fluid-passage, substantially as described.

2. The hammer frame and chamber and the sliding hammer therein, a series of passages open to said chamber at different ele-

5 vations, valves for said passages, a single passage for the fluid operating media leading to said passages, and a separate valve for said single passage, substantially as described.

10 3. In a drop-hammer, the sliding hammer and the chamber therefor, means to raise the hammer by exhausting the air within said chamber above the hammer, and an adjustable head within said chamber to limit the upward movement of said hammer, substantially as described.

15 4. The hammer-frame and the chamber therein, a sliding hammer within said chamber, a series of passages at different elevations opening into said chamber, valves for said passages, and an adjustable head above said hammer and within said chamber, having means to adjust said head in relation to said passages, substantially as described.

20 5. In a drop-hammer substantially as described, the hammer-chamber having passages at different elevations, in combination with a hammer having a valved passage in line and open to one of said passages when the hammer is in raised position, substantially as described.

25 6. A drop-hammer having a hammer-chamber and an adjustable head in said chamber above the hammer, a series of passages open to said chamber at different elevations, separate valves for each passage, a separate valve-chamber open to said valved passages and having a double piston-valve therein, and 30 a mechanism to actuate said valve to open and close the opening to said valved passages, substantially as described.

35 7. The hammer and hammer-chamber, in combination with a valve-chamber having passages leading to said hammer-chamber, the vacuum and pressure supply passages leading to said valve-chamber, and a reciprocating valve within said valve-chamber operated by the pressure to open the vacuum-passages to the hammer-chamber, substantially 40 as described.

45 8. In a pneumatic drop-hammer, a hammer-chamber and a hammer therein having the hammer-chamber closed above said hammer, and a passage and valve therefor leading from the atmosphere to said hammer-chamber for dropping the hammer, in combination with a valved vacuum-passage from said hammer-chamber, substantially as described.

50 9. In a pneumatic hammer, the hammer-chamber and hammer therein, a valve-chamber adapted to be opened to the atmosphere and a valve therein, a combined air-supply and vacuum-passage connecting said hammer-chamber and valve-chamber, and an exclusive vacuum-passage open to said valve-chamber and means to control the movement of said valve to open and close said passage and thereby actuate and control the hammer, 55 substantially as described.

10. In pneumatic hammers, a hammer-

chamber and hammer, a piston-chamber and piston-valve therein to control the movement of said hammer and an air-passage connecting said hammer-chamber and piston-chamber and open to both chambers and adapted 70 to be closed by said hammer and cause the atmospheric pressure to act directly upon said piston and raise the same, substantially as described.

75 11. In pneumatic hammers, the sliding hammer and the chamber therefor having a closed top and open bottom, and a valved passage open to the inside near the top and leading to the extreme top inside of said chamber, 80 said passage being located to open under hammer to the atmosphere under hammer when the hammer is raised too near the limit of its upward movement to let in air in the top of said chamber to cushion said hammer, substantially as described. 85

12. In pneumatic hammers, the sliding hammer and chamber therefor closed at its top, a valved passage open to the inside of said chamber near the top thereof and leading to the extreme top of the inside of said chamber 90 at its outlet, said passage being opened to the atmosphere by the upward movement of the hammer near the end of its upstroke for cushioning the hammer, substantially as described. 95

13. In pneumatic hammers, the sliding hammer and chamber therefor closed at its top and open at its bottom, an air-passage from the closed end of said chamber, and an opening from said passage to the outside atmosphere, a valve in said passage adapted to be 100 operated to close the atmosphere from said chamber and open the vacuum to said chamber, for raising the hammer and to close the vacuum from said chamber and open the atmosphere to the same for dropping the hammer, substantially as described. 105

14. In pneumatic hammers, the sliding hammer and chamber therefor closed at the top and open at its bottom, an air-passage from 110 near the top of said chamber and an opening to said passage to the outside atmosphere, a valve in said passage to control the vacuum and outside atmosphere to and from said hammer-chamber to actuate the hammer, in combination with a valve-operating air-passage leading to the lower end of said hammer-chamber and open to said valve, whereby 115 when the said hammer is dropped it covers said valve-operating passage and causes a pressure to accommodate and move the valve upward, substantially as described. 120

15. In drop-hammers, the hammer-chamber closed at its top and open at its bottom and a combined hammer and valve in said chamber, 125 a joint vacuum and air-supply passage leading into said chamber over the hammer and a valve at the entrance to said passage arranged to determine whether vacuum or air-supply shall be open to the said chamber, 130 substantially as described.

16. In a drop-hammer, a hammer and a ham-

mer-chamber, a passage opening into said chamber having a vacuum-outlet and a fresh-air inlet open thereto, and a valve mechanism located at the junction of said outlet and inlet and adapted to close one and open the other alternately, substantially as described.

17. In drop-hammers, the hammer-chamber and the hammer therein, an adjustable head in the top of said chamber and means to raise and lower said head, substantially as described.

18. The hammer-chamber and hammer therein, and an air-passage leading to said chamber, in combination with a valve mechanism controlling said passage and a pneumatic-pressure passage open to said valve mechanism, whereby the said mechanism is raised and the position of the valves changed

by direct pneumatic pressure, substantially as described.

19. The hammer and hammer-chamber and an air-passage thereto, in combination with a valve-chamber having a pressure-passage, a vacuum-passage and an open-air passage entering the same, and valve mechanism in said chamber exposed to the pressure-passage for actuation and adapted to control the vacuum and open-air passages, substantially as described.

Witness my hand to the foregoing specification this 26th day of September, 1900.

MELVIN A. YEAKLEY.

Witnesses:

R. B. MOSER,

H. T. FISHER.