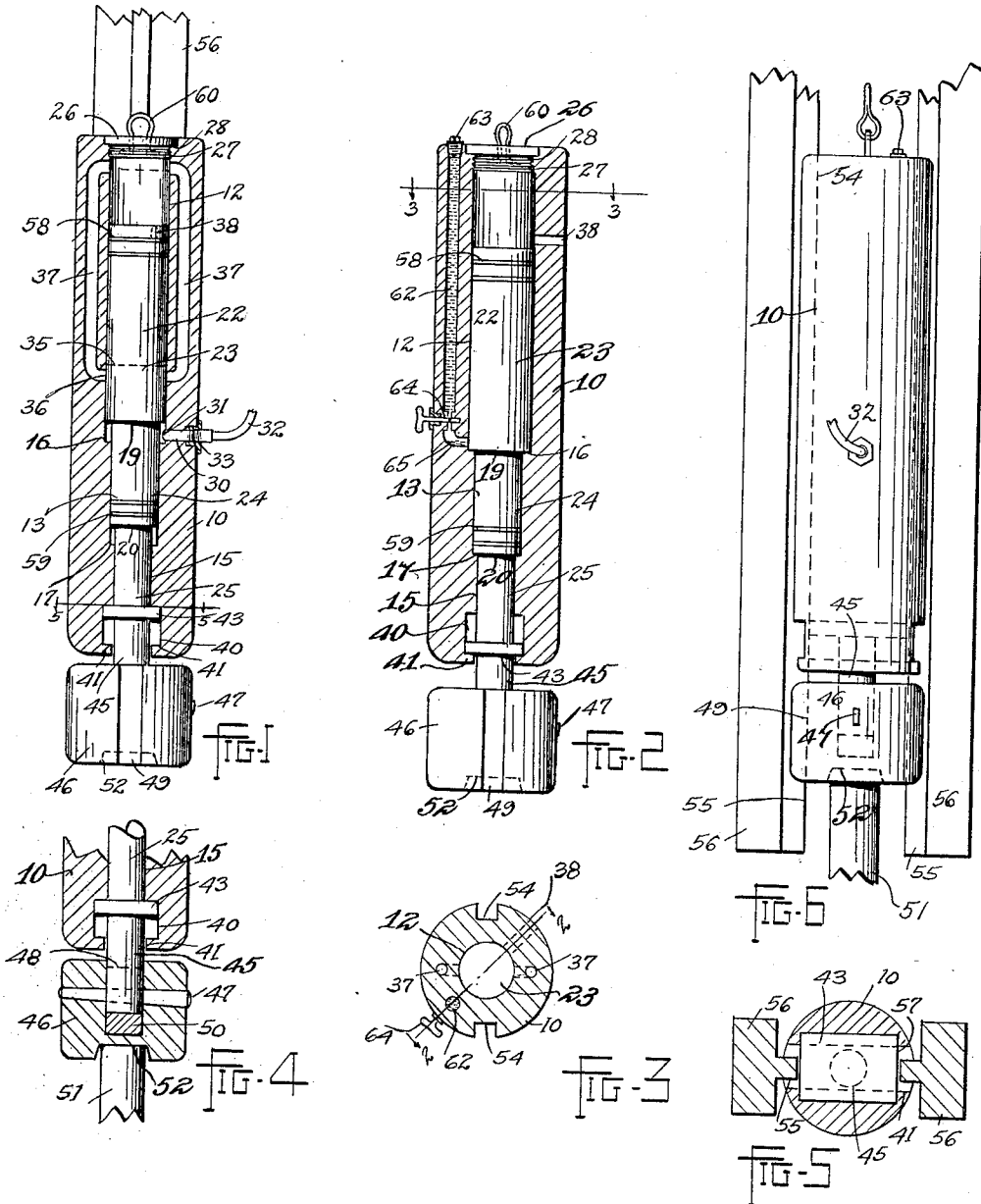


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POWER HAMMER.
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POWER-HAMMER.

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To all whom it may concern:

Be it known that I, JESSE E. WILHELM, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Power-Hammers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

10 This invention relates to hammers adapted to be operated by steam or other pressure fluid.

The principal object is to provide a simple, efficient device for striking blows, and to this end the invention comprises a casing having therein a reciprocating plunger and having simple arrangement of passages, whereby the pressure fluid is caused to reciprocate the plunger without the use of controlling valves, commonly employed in such devices, and without complexity of any sort.

20 The invention is hereinafter more fully described in connection with the drawings, which show a pile driver, constructed according to the principles involved in my invention. While the invention is particularly well adapted for a pile driver, it is to be understood that I do not wish to be limited to pile drivers, as my invention is applicable to many uses.

30 In the drawings, Figure 1 is a vertical transverse section of the casing, which forms the weight or tup of the pile driver, showing the plunger therein in elevation; Fig. 2 is a vertical transverse section taken on a plane at an angle to the plane of Fig. 1, as indicated by the line 2—2 of Fig. 3; Fig. 3 is a horizontal section through the upper portion of the casing, as indicated by the line 3—3 of Fig. 2; Fig. 4 is a vertical transverse section on the same plane as Fig. 1, showing a form of cap for the pile; Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 1, showing the manner of holding the cap and showing the relative position of leaders or guides of the pile driver frame; Fig. 6 is a side elevation of the casing and the cap in position in the "leaders" of the pile driver frame.

45 10, in the drawings, indicates the casing or cylinder, which corresponds to the tup of the pile driver. The casing has a large central bore 12 opening into a smaller bore 13 opening into a third still smaller bore 15. At the points where one of these bores opens

from another are formed shoulders 16 and 17, against which may rest corresponding shoulders 19 and 20 of the plunger or piston 22, which has three different diameters; a large diameter at 23 fitting the bore 12, a smaller diameter at 24 fitting the bore 13, and a still smaller diameter at 25 fitting the bore 15.

The bore 12 opens upwardly at the top of the casing, providing for the admission of the plunger 22, and is closed at this end by a suitable plug 26 having a reduced threaded portion 27 screwing into corresponding threads in the top of the bore 12. Under a shoulder 28, formed by the reduced portion 27 of the plug, may be conveniently fitted a gasket to prevent the leakage of the pressure fluid. The pressure fluid is hereinafter referred to in this specification as steam, although it is to be understood that the operation of my device is not limited to the use of steam.

Leading to the lower end of the large bore 12, is an inlet passageway 30, which opens into this bore at 31, just above the shoulder 16. To this inlet passage steam is supplied from a suitable boiler, not shown, by a flexible connection 32, which is connected at 33 to the side of the casing. The stroke of the plunger may be of any desired length, being limited only by the relative length of the bores of the casing. With the proportions shown, the plunger may be raised until its top comes nearly to the bottom of the threaded plug 26, in which position the shoulder 19 will be raised to the point indicated in dotted lines at 35, in Fig. 1. Leading from the bore 12 at 36, at points just below the shoulder 19 in its up position, and then longitudinally of the casing, are passages 37 opening into the top of the bore 12 just beneath the threaded portion of the plug 26.

Now, when steam is admitted through the connection 32 to the passage 30, it comes beneath the shoulder 19 and raises the plunger until the steam in the space beneath this shoulder surrounding the reduced portion 24 of the plunger, is allowed to escape through the passages 37 to the space at the top of the plunger, arresting its upward movement and acting to start its return to down position. When the shoulder 19 has moved downward below the ports 36, thus closing them, the steam within the passage

37 and the space within the bore 12, at the top of the plunger, acts expansively to force the plunger the remaining portion of the movement to the lower end of its stroke.

5 When the plunger reaches its down position, the steam in the space above the plunger, having expanded to force it down against the pressure under the shoulder 19, escapes through an exit port 38. This port
10 is closed by the plunger until it comes to the down position, where the port is entirely open, as shown in Fig. 2.

To start the plunger on the upward movement, it is only necessary to raise it so that
15 the shoulder 19 is above the shoulder 16 enough to permit the steam in the passage 30 to come between these shoulders and raise the plunger. The raising movement of the plunger is fast enough so that it is carried
20 upwardly by momentum a distance past the openings 36 of the passages 37, allowing sufficient steam to pass through these passages to the top of the plunger to stop the upward movement of the plunger and force it down-
25 wardly by expansion.

In the lower end of the casing 10 is a transverse slot 40, having a pair of inwardly extending shoulders 41 at its lower edges, adapted to engage a T head 43 of a cylindrical shank 45. On this shank is carried a cap or head 46 constituting in effect a heavy sleeve which is secured thereto by means of a key 47 engaging an elongated slot 48 in the member 45. The head 46 has a central bore
35 fitting over the member 45 and adapted to receive a wooden block, indicated at 50. This block 50 is adapted to cushion the blow of the plunger 22 and thus greatly prolong the life of the parts. When crushed it may be
40 readily replaced by a new block by removing the key 47 and taking the member 46 from the shank 45.

A depression 52 of a shape suitable to engage the top of the pile is made in the bot-
45 tom of the head to prevent the pile splitting, and also keep it in proper alinement to be driven.

The casing 10 is substantially cylindrical and has vertical ways or grooves 54 in the
50 sides adapted to engage rails 55 of leads 56 of the pile driver. The head 46 is preferably made cylindrical and of the same diameter as the casing. It is also provided with vertical grooves 49 engaging the rails 55, and
55 rests, when in operation, upon the top of the pile, indicated at 51. In operation, the weight of the casing 10 rests upon the head 43, which brings this head to the top of the slot 40, the slot 40 being made much deeper
60 than the thickness of this head, provides for the downward movement of this head caused by each blow.

The head 43 is rectangular and of such length that its two ends 57 ride loosely be-
65 tween two rails 55, as indicated in Fig. 5.

Now, to insert the head 43 into the slot 40, it is only necessary to lower the casing 10, below the leads 56, slide the head into this slot to a substantially central position and then raise the casing again, thus bringing the
70 head 43 between the rails 55.

The plug 26 is provided with a suitable staple 60 which may be cast into the plug and which provides a suitable means for
suspending and raising the casing as well as
75 for removing and replacing the plug. Now, when the plunger 22 is in a down position, it closes the opening of the passage 30, and thus there is no steam under the shoulder 19 and the plunger rests in this position, even
80 though there is steam pressure in the passage 30. To start the plunger when the casing is in proper position over a pile, it is only necessary to lower the casing (by slacking a cable supporting it) so that the head 46 rests
85 on the pile, thus raising the head 43 and the plunger with relation to the casing, so that steam may get under the shoulder 19. The plunger is then raised and lowered, as heretofore described, and the downward move-
90 ment strikes a blow to the pile, moving it downwardly a short distance. The casing then drops by gravity after each blow while the plunger rests upon the pile, thus separating the shoulders 16 and 19 and causing an-
95 other reciprocation of the plunger. The reciprocation may be thus continuous until the casing is raised, bringing the head above the pile or until the steam is shut off from the passage 30.
100

The plunger is provided with packing rings, indicated at 58 and 59, the rings 58 preventing the steam passing the plunger inside the bore 12 in either direction, and
105 rings 59 preventing the leaking of the steam out of the bores 13 and 15, and also providing a cushion for the plunger between the shoulder 17 and the shoulder 20. The air being drawn into a space under the shoulder 20 on the upward movement of the plunger,
110 forms a cushion under the shoulder while being forced out.

Fig. 2 shows a convenient arrangement of oiling, which is as follows: A suitable vertical chamber 62 is provided in the casing,
115 adapted to be closed at the top by a removable plug 63 and having at its lower end a suitable valve 64 which is adapted to regulate the flow of oil from the chamber 62 to a chamber 65 below the valve and opening
120 into the bore 12, just above the shoulder 16. The oil flows into each of the bores and around the plunger throughout its length; accordingly it is only necessary to regulate the valve 64 to provide for the proper sup-
125 ply of oil to the plunger for a considerable length of time.

Having thus described my invention, what I claim is—

1. In a pile driver, the combination of a 130

heavy cylinder, a piston therein, means for admitting fluid to a small area at the lower end of the piston and a large area at the upper end of the piston, where the piston is reciprocated, without the use of controlling valves.

2. The combination of a cylinder, means allowing the cylinder to descend by gravity, a piston in the cylinder, means for admitting fluid to a small area of the piston at the lower end to raise the piston, a passage for the fluid adapted to be opened consequent upon the movement of the piston, whereby the fluid is brought to the upper end of the piston having a larger area to return the piston, and means movably carried by the cylinder against which the piston abuts on the downward movement, said means supporting the weight of the cylinder.

3. The combination of a cylinder, a piston therein having a shoulder, means for admitting fluid against the shoulder and then to the large end of the piston, whereby the piston is reciprocated, a movable head carried by the cylinder, a portion of the piston adapted to abut such head, and means for slidably carrying the cylinder, whereby it may drop by gravity to raise this head and piston with relation to the cylinder after each blow.

4. The combination of a casing having large and small bores, a shoulder formed between them, a piston within the casing having large and small diameters adapted to fit said bores respectively, a passage leading to the large bore adjacent said shoulder, a passage leading from an intermediate point to the opposite end of the large bore, a vertically movable head carried by the lower end of the casing and abutting a portion of the piston, means for slidably carrying the casing so that it may drop by gravity, bringing the piston under this head to separate the shoulders of the piston and of the casing.

5. The combination of a casing having a large bore and a small bore forming shoulders between them, said large bore opening upwardly, removable means for closing said bore, a piston having a large and a small diameter each adapted to fit said bores respectively, a shoulder between said diameters of the piston, a vertical movable head carried by the lower end of the casing, a portion of the piston adapted to abut said head and vertical ways in the sides of the casing adapted to fit suitable guides, whereby the casing may slide downwardly on the piston after each blow to separate the shoulders.

6. The combination of a cylinder and a piston, means for slidably carrying the cylinder, a transverse T slot in one end of the cylinder, a T head engaging such slot, a

shank on said head, a sleeve slidable on said shank having a closed end, and a cushion interposed between the end of the shank and the closed end of the sleeve.

7. The combination of a casing, a piston therein, means for admitting fluid to a small area at one end of the piston, and a large area at the other end of the piston, whereby it is reciprocated, a T slot at the lower end of the casing, a T head vertically movable in such slot and having a cylindrical shank, a hollow member adapted to fit said shank and be slidably keyed thereto, and means whereby the piston may deliver a blow to said T head.

8. The combination of a cylinder and a piston therein, means for admitting fluid to a small area at one end of the piston, a large area on the other end of the piston, whereby it is reciprocated, vertical ways in the sides of said cylinder, guides in said ways, a transverse T slot in one end of the cylinder, a corresponding T head vertically movable in said slot, a shank on said head and a sleeve slidable on said shank having a closed end, a depression in the closed end of the sleeve, and a cushion interposed between the end of the shank and the closed end of the sleeve.

9. In a device of the character described, a cylindrical casing having vertical longitudinal grooves whereby it may be vertically slidable, a piston therein, means for admitting fluid to a small area at one end of the piston and to a large area at the other end of the piston, whereby it is reciprocated, a T slot in the lower end of the casing, a head vertically movable in said slot and having a shank, a sleeve slidably mounted on said shank, an elongated key slot in the shank, a key in the sleeve engaging said slot, a closed end in the sleeve having a depression, and a cushion within the sleeve between the end of the shank and the closed end of the sleeve.

10. In a pile driver, the combination of a heavy casing having a bore, a piston therein, a passage for fluid leading to the bore at one end of the piston and a passage for fluid leading from the bore at an intermediate point to the other end of the bore.

11. In a pile driver, the combination of a heavy casing having a bore, a piston in the bore, and a port admitting fluid to one end of the bore and ports admitting fluid to the other end of the bore, said ports adapted to be opened and closed by the piston.

12. In a pile driver, the combination of a heavy cylinder, a piston therein, a passage for admitting fluid to a small area at the lower end of the piston and a passage for admitting fluid to a larger area at the upper end of the piston, said second named passage being covered by a portion of the piston

and opened when the piston is moved upwardly to admit fluid to the upper end of the piston.

13. In a pile driver, the combination of a cylinder having a large and small bore, a piston having two diameters each adapted to fit one of said bores, and an intermediate shoulder between said diameters, a passage for admitting fluid to said shoulder within the large bore, and a passage leading from an intermediate point of the large bore to the opposite end from the first mentioned passage, said passage adapted to convey fluid to the upper end of the piston when it is opened on the upward movement thereof.

14. In a pile driver, the combination of a heavy cylinder having a bore, a piston in said bore, a port admitting fluid to one end of said bore and a port adapted to be covered by a portion of the piston, a passage

leading from said port to the opposite end of the piston from the first named port whereby pressure fluid may be admitted first to one end of the piston and then to the other end consequent upon the movement thereof.

15. In a pile driver, the combination of a heavy cylinder having a bore, a piston in said bore, a port for admitting fluid to one end of the piston, a port intermediate of the ends of said bore, and a passage leading from said port to the end of the bore opposite the first mentioned port, said passage being made in the wall of the cylinder.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

JESSE E. WILHELM.

Witnesses:

ALBERT H. BATES,
J. B. HULL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."