No. 823,480. PATENTED JUNE 12, 1906.

J. P. McLEOD.

DROP HAMMER.

APPLICATION FILED JULY 6, 1905.

2 SHEETS—SHEET 1.

Fig. 1

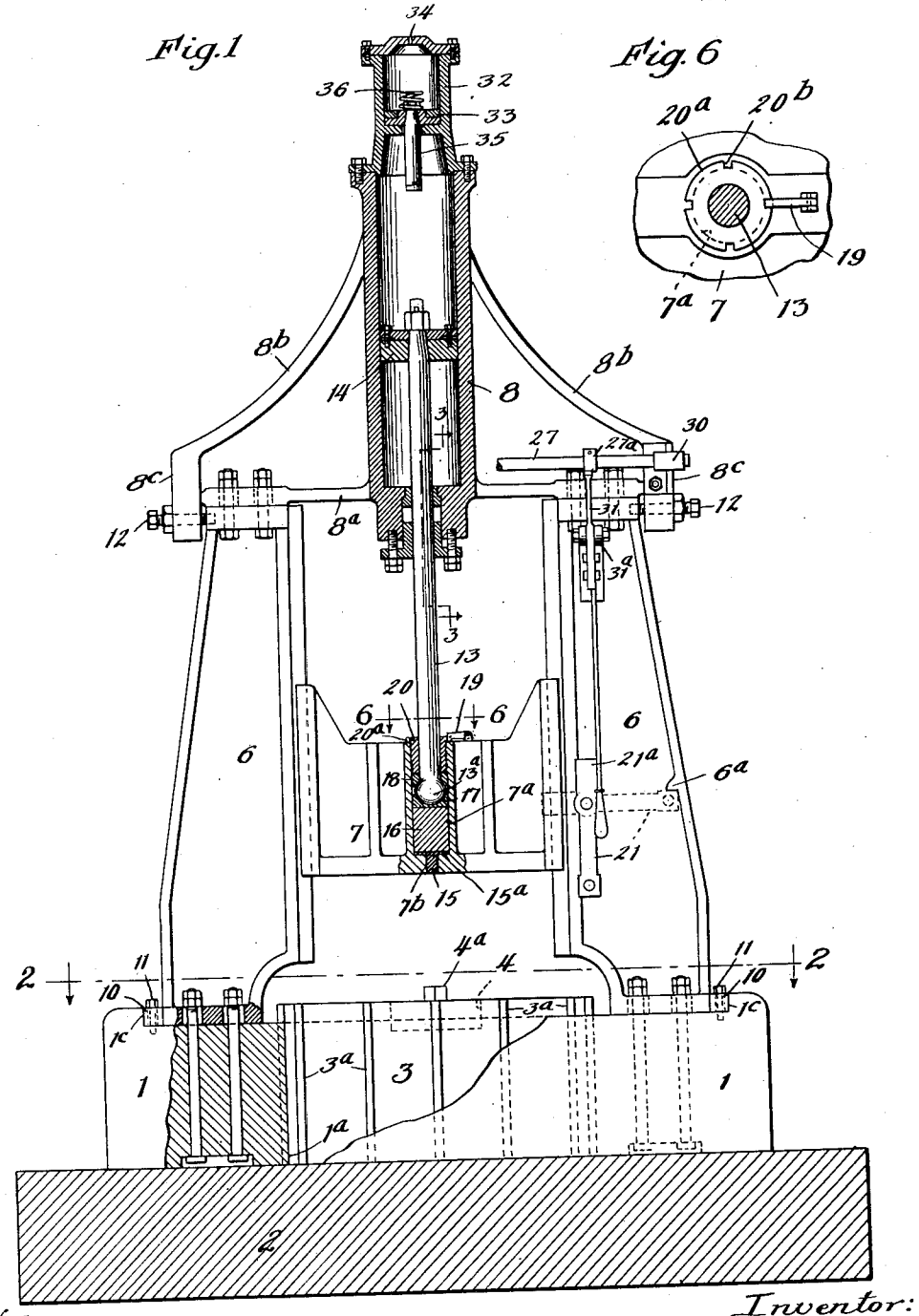

Fig. 6

Witnesses:

Wm. Geiger

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John P. McLeod

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His Attorneys.

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2 SHEETS—SHEET 2.

Fig. 2

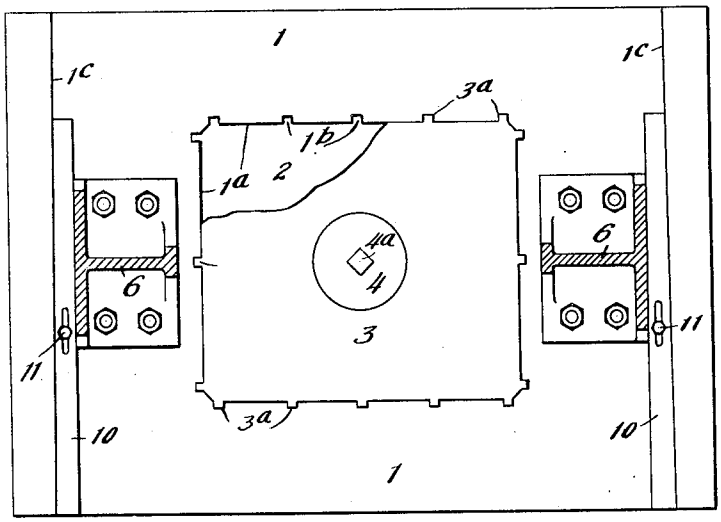


Fig. 3

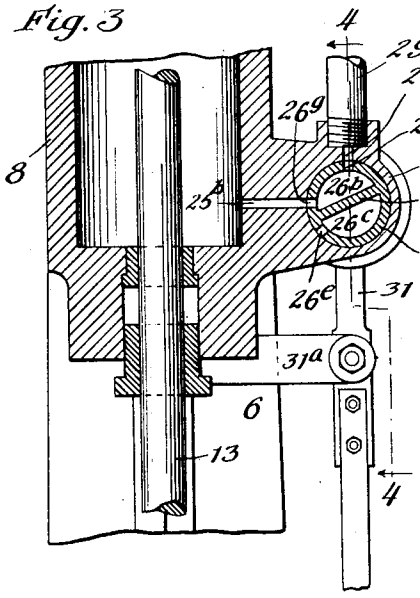


Fig. 4

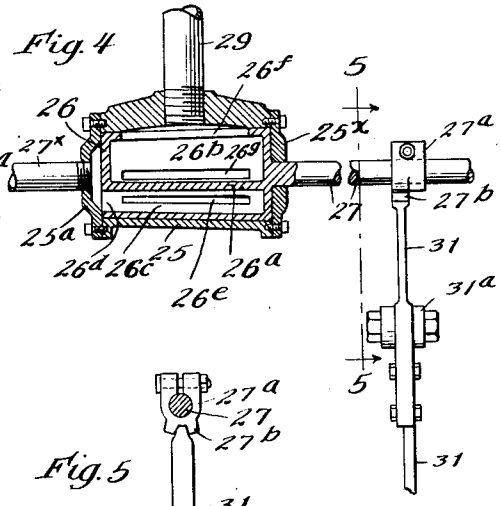
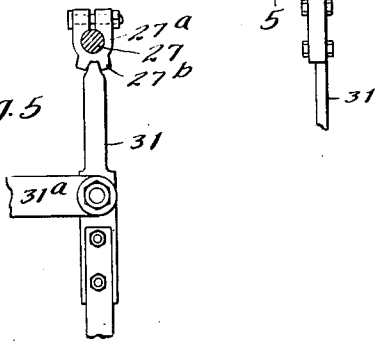


Fig. 5



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UNITED STATES PATENT OFFICE.

JOHN P. McLEOD, OF CHICAGO, ILLINOIS, ASSIGNOR TO FRIEDLY & VOSHARDT, OF CHICAGO, ILLINOIS, A FIRM.

DROP-HAMMER.

No. 823,480. Specification of Letters Patent. Patented June 12, 1906.

Application filed July 6, 1905. Serial No. 268,409.

To all whom it may concern:

Be it known that I, JOHN P. McLEOD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Drop-Hammers, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved construction of a drop-hammer and its base or bed for the purpose of avoiding deterioration and breakage liable to be caused by the shock to the entire frame structure when the blow of the hammer is directly experienced by such frame and to avoid also the damage to the joint or connection between the drop-hammer and the lifting-rod which is liable to be caused by the momentum of the rod operating with an effect equivalent to that of a blow on the seat, which stops the end thrust of the rod in the hammer when the latter is arrested by its impact upon the work.

Other purposes relate to cushioning the thrust of the piston in the upward movement or retraction of the hammer and latching the hammer at elevated position.

It consists of the features of construction set out in the claims.

In the drawings, Figure 1 is a vertical section axial with respect to the lifting-stem of the hammer through the hammer-frame and foundation embodying my invention. Fig. 2 is a section at the line 2 2 on Fig. 1. Fig. 3 is a detail section at the line 3 3 on Fig. 1. Fig. 4 is a section at the line 4 4 on Fig. 3. Fig. 5 is a section at the line 5 5 on Fig. 4. Fig. 6 is a section at the line 6 6 on Fig. 1.

For my improved drop-hammer frame there is provided a base 1, resting on a suitable concrete or stone foundation 2, said base having a vertical aperture 1^a underneath the hammer and receiving in said aperture a bed 3, which is definitely located within the aperture and engaged with the base by vertical splines 3^a, having vertically-guiding engagement with corresponding vertical grooves 1^b in the sides of the aperture in the base. The bed 3 rests directly upon the foundation 2, so that said foundation directly receives the impact of the blow given by the hammer and no direct force of that blow nor any material part of the vibration which it causes is transmitted to the base 1 nor to any portion of the frame mounted on such base. The base may be made of cast-iron; but the bed 3 is preferably made of semisteel. At the central part of the top of the bed there is let into it a steel block 4, having an upwardly-protruding boss or tenon 4^a for engaging and fixing in location the die, of whatever form, which may be mounted upon the bed and directly upon the steel block, hereinafter named the "die-holder." This die-holder, which next to the die is exposed to the most severe stress of the blow given by the hammer, is thus made removable and can be replaced by a new one, avoiding the necessity for replacing the entire bed, which might otherwise result. The guide-standards 6 6 for the hammer 7 are bolted rigidly to the base and connected at their upper ends by the rigid frame of which the cylinder 8 is preferably an integral part, such frame comprising a cross-bar 8^a and oblique braces 8^b 8^b, the cross-bar 8^a being formed to seat upon the upper ends of the standards 6 6, which are bolted to said cross-bar. The holes for the bolts by which the standards are joined to the base and to the top frame are elongated to permit adjustment to the standards for accurate guidance of the hammer 7. On the base the standards are adjusted by means of tapered keys 10 10, lodged between the outer sides of the standards, respectively, and the shoulders 1^c 1^c, which are sloped divergently at angle corresponding to the taper of the keys, so that the driving of the keys longitudinally crowds the standards toward each other in a manner keeping them at all positions parallel with each other. The keys are longitudinally slotted for the securing-screws 11 11, which may be set down to bind the keys tightly at adjusted position. The upper ends of the standards are adjusted or, more correctly speaking, are secured and checked at positions to which they are brought by the adjustment at the base by the check-bolts 12 12, which are set in through the lugs 8^c 8^c of the top frame and said lugs projecting down from said top frame outside the standards, respectively, so that the check-bolts projecting in through the lugs impinge against the sides of the standards at their upper ends, the latter being preferably provided with sockets in which the bolts engage, at the bottom of which they thus impinge.

The hammer 7 is connected by a rod 13 to the piston 14 and the lifting-cylinder 8. Said cylinder is provided with connection for steam or compressed air for driving upward the piston to lift the hammer, the valve 26 being constructed as hereinafter more particularly described for venting the motive fluid from the cylinder when the supply thereof is cut off. The arrest of the hammer by the work at the end of its drop causes the rod 13, weighted also by the piston 14, to impose upon its seat in the hammer at the lower end of the rod a stress due to the momentum derived in the fall, which tends rapidly to hammer out the seat and loosen the connection, and when any play has occurred this hammering is increased, and thereby rapidly increases the play, so that in the absence of provision to the contrary constant repair of the joint is necessary. The blow of the rod and piston which the seat receives is also transmitted to the body of the hammer and tends materially to deteriorate the latter. To overcome this defect, I connect the rod to the hammer by the joint illustrated in the drawings. A pocket 7^a is made at the center of the hammer to accommodate the joint, and a small bore 7^b from the center of the pocket is extended entirely through the bottom face of the hammer. This bore is occupied by a steel plug 15, having a flange-head 15^a, whose diameter is substantially that of the pocket 7^a, so that the pocket is thereby floored over. Above this floor there is driven into the pocket a hard-wood plug 16, accurately leveled at the upper end, and on this plug there is seated the lower member 17 of the socket for a ball-and-socket joint which is to be formed between the hammer and the lifting-rod. The other member 18 of this socket is necessarily annular and is passed onto the rod from the upper end before the rod is connected with the piston. The central opening of this annular socket member is in diameter a little greater than the diameter of the rod above the globular head 13^a of the latter. This head, it will be understood, is provided with spherico-segmental seats in the two socket members 17 and 18, and the upper socket member is held in proper close relation to the other member and to the globular head 13^a by a threaded sleeve 20, screwed into the upper end of the pocket 7^a, which is threaded for a suitable distance from the upper end for that purpose. The upper end of the sleeve is provided with a flange 20^a, having peripheral notches 20^b for engagement of a spanner-wrench for screwing it in and out and to also afford engagement for a keeper 19, which is pivotally mounted upon the upper end of the hammer and has its nose adapted to engage the notches 20^b. The hard-wood plug 16 not only cushions the blow of the rod at the arrest of the hammer, but also by its non-metallic texture tends to absorb the vibration and not to transmit it to the body of the hammer. This plug being completely confined in the pocket 7^a with no room for expansion and having only a limited degree of compressibility has great endurance in this position, and not being hard enough to force itself into the surrounding metal the wall of the pocket is in no respect impaired by the hammering which the wooden plug receives, and when the plug becomes deteriorated or compressed to a sufficient extent to make its replacement desirable the plug 15, with its broad head completely flooring the pocket, affords means for driving it out cleanly from below. It will be understood that any play resulting from the compression of the wooden plug which may be caused by the hammering can be compensated as often as necessary by adjusting the sleeve 20.

For the purpose of securely checking the hammer at elevated position when desirable for adjusting the work on the bed there is provided a latch 21, pivoted on one of the standards 6, normally pendent from its pivot out of the path of the hammer, but having an extension 21^a above its fulcrum of sufficient length to reach from the fulcrum horizontally to a point in the path of the hammer when the latch is lifted from pendent to horizontal position, and there is provided on the standard a stop-shoulder 6^a, facing downward, against which the end of the latch which is normally pendent is stopped when it is lifted to such horizontal position, and thereby the latch becomes an adequate support for the hammer at such position.

The compressed-air or steam connection for the cylinder 8 is made through the boss 25, which constitutes a seat for the cylindrical valve or cock 26. The boss is bored from end to end, and the valve is lodged therein between the two caps 25^a and $25^\times$, through the latter of which the valve-stem 27 protrudes and extends across to a bearing 30, provided for it on the frame, and intermediate the valve and said bearing it is engaged by a lever-arm 31, fulcrumed on the bracket 31^a, mounted on the standard 6 for rocking the valve from inlet to exhaust position. For such engagement there is fast on the stem 27 a collar 27^a, having two teeth 27^b, between which the end of the lever enters. The steam or air inlet pipe $27^\times$ is connected into one end of the boss through the cap-plate 25^a, and the exhaust is made from the upper side through the outlet or exhaust pipe 29. The cylindrical valve 26 is hollow and has a longitudinal diaphragm 26^a dividing its cavity into two chambers 26^b and 26^c, being open at one end, as seen at 26^d. The chamber 26^c has also a longitudinal aperture 26^e, and the chamber 26^b has two longitudinal apertures 26^f and 26^g, respectively. The apertures 26^e 26^f, and 26^g are adapted to register with the

port 25^b, which opens through the boss 25 into the cavity of the cylinder 8. The two apertures 26^e and 26^g are at a very short distance apart about the circumference of the valve at opposite sides of the diaphragm 26^a, so that a small angular movement of the valve in its seat changes the communication of the port 25^b from one to the other of said apertures. The aperture 26^f registers with the port 25^c, leading into the exhaust-pipe 29, when the aperture 26^g registers with the port 25^b, so that when the valve stands in position with these two apertures registering with said two ports, respectively, the cylinder is exhausted, and by rocking the valve in its seat to a sufficient angle to bring the aperture 26^e in registration with the port 25^b the exhaust is first closed, and then the port 25^b coming into registration with the aperture 26^e the cylinder is connected with the inlet. This construction of the valve, it will be seen, making it require such slight angular movement to change from inlet to exhaust renders the hammer susceptible to rapid operation.

At the upper end of the cylinder 8 there is mounted a supplemental cylinder 32, provided with a piston 33 and having a small vent-aperture 34 at the upper end, the stem 35 of the piston 33 being arranged to protrude down into the cylinder 8 in position to be encountered by the piston 14 or any protruding part at the upper side thereof upon the lifting movement of said piston 14, whereby the piston 33 is forced up into its cylinder, driving the air before it more rapidly than the same can escape through the vent 34, thus producing an air-cushion for the said upstroke of the piston 14. The air will escape slowly through the vent 34, so that the cushion will be relieved; but said vent is sufficiently small to make the cushion practically as effective as if the chamber were closed. A spring 36 may be provided at the upper side of the piston 33 to yieldingly check the upstroke of said piston and to cause it to return with reasonable promptness notwithstanding the smallness of the vent 34.

I claim—

1. In a drop-hammer structure, a drop-hammer and its lifting-rod, the rod having a ball-and-socket-joint connection with the hammer, the ball being formed on the end of the rod and the socket comprising a bottom seat and an annular cap, the hammer having a pocket in which the two socket elements are lodged; a wooden plug in the bottom of such pocket under the seat, and means for adjusting the cap to close up the socket.

2. In a drop-hammer structure, in combination with the hammer and its lifting-rod, elements forming a ball-and-socket joint between the lifting-rod and the hammer, comprising a bottom or seating element for the ball and an annular cap, the hammer having a vertical upwardly-open pocket; a wooden plug at the lower part of such pocket, the two-part socket being lodged above the wooden plug, and a threaded sleeve above the annular cap for closing up the socket and retaining it in the pocket.

3. In a drop-hammer structure, a hammer having a central bore from the top downward, and a central aperture from the bottom of the bore leading through the lower face of the bore; a wooden plug lodged in the bore resting on the head of the plug, the lifting-rod having a ball-terminal, and elements forming a socket for such ball lodged in the bore above the plug, and a sleeve screwed into the bore at the upper end for closing up the socket.

4. In a drop-hammer structure, in combination with the hammer, a lifting-rod for the same; a seat or box with which the lifting-rod makes a joint at the lower end, the hammer having a pocket in which the seat or box is lodged; a wooden plug in the pocket; means for retaining the seat or box in the pocket, the bottom of the pocket being apertured, and a false bottom or disk lodged in the bottom of the pocket which is accessible through the aperture by which the wooden plug may be driven out of the pocket.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 12th day of June, 1905.

JOHN P. McLEOD.

In presence of—

CHAS. S. BURTON,

J. S. ABBOTT