(No Model.) 2 Sheets—Sheet 1.

# F. A. PRATT.

## DROP HAMMER.

No. 534,008. Patented Feb. 12, 1895.

*Fig. 1.*

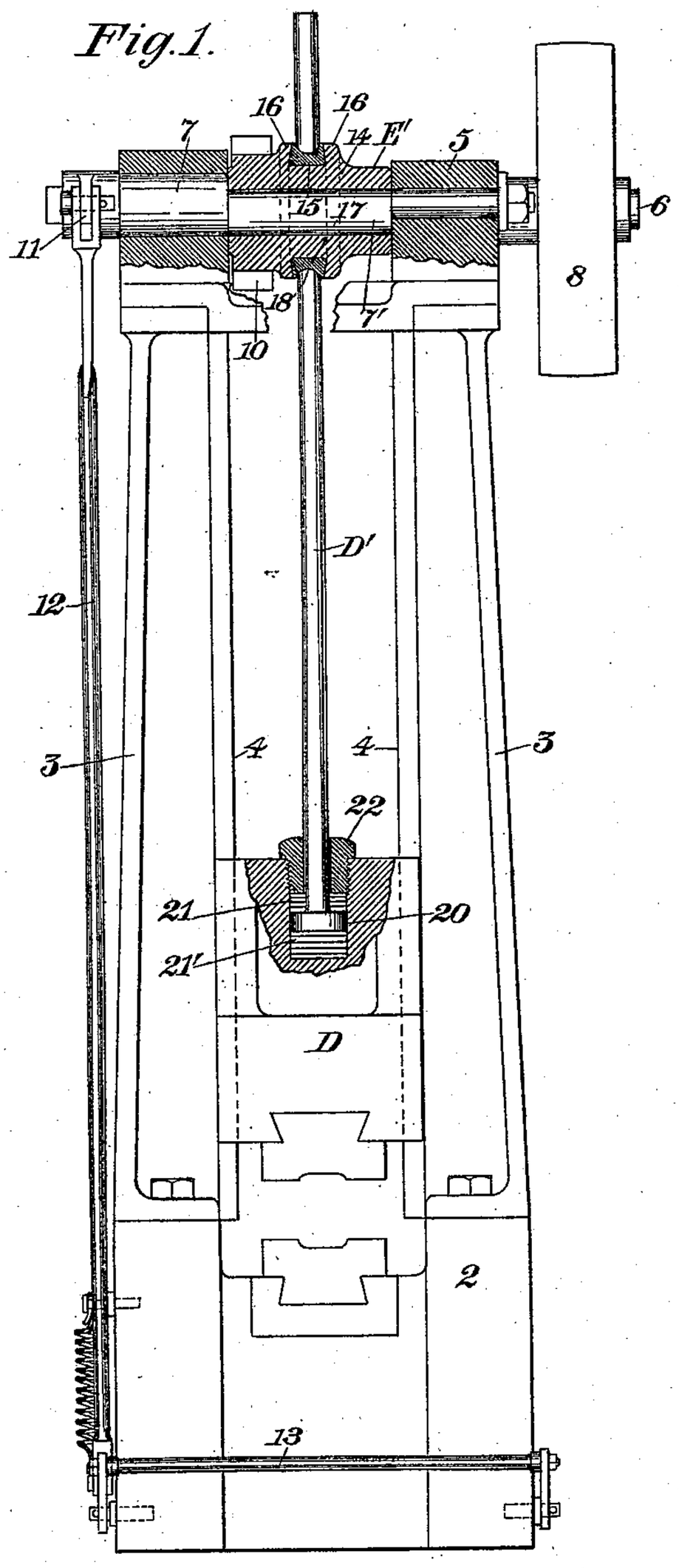
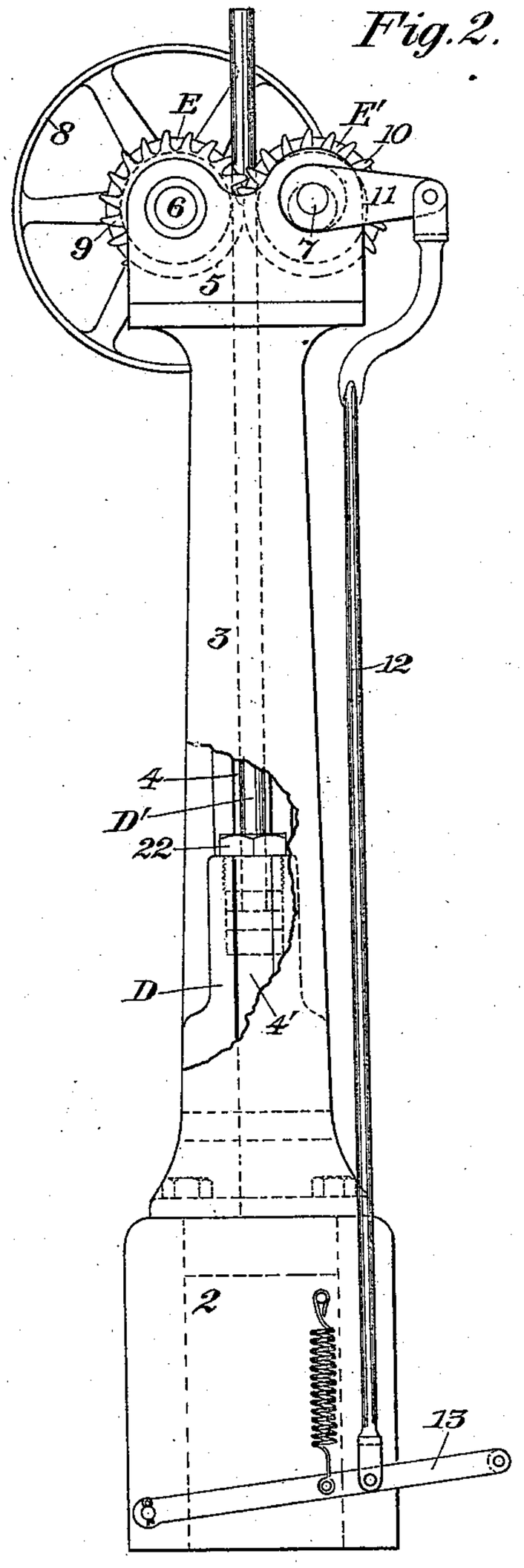



*Fig. 2.*




*Witnesses:*

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*Fred. J. Dole*

*Inventor:*

*Francis A. Pratt,*

*By his Attorney,*

*F. H. Richards*

(No Model.) 2 Sheets—Sheet 2.

# F. A. PRATT.

## DROP HAMMER.

No. 534,008. Patented Feb. 12, 1895.

*Fig. 3.*

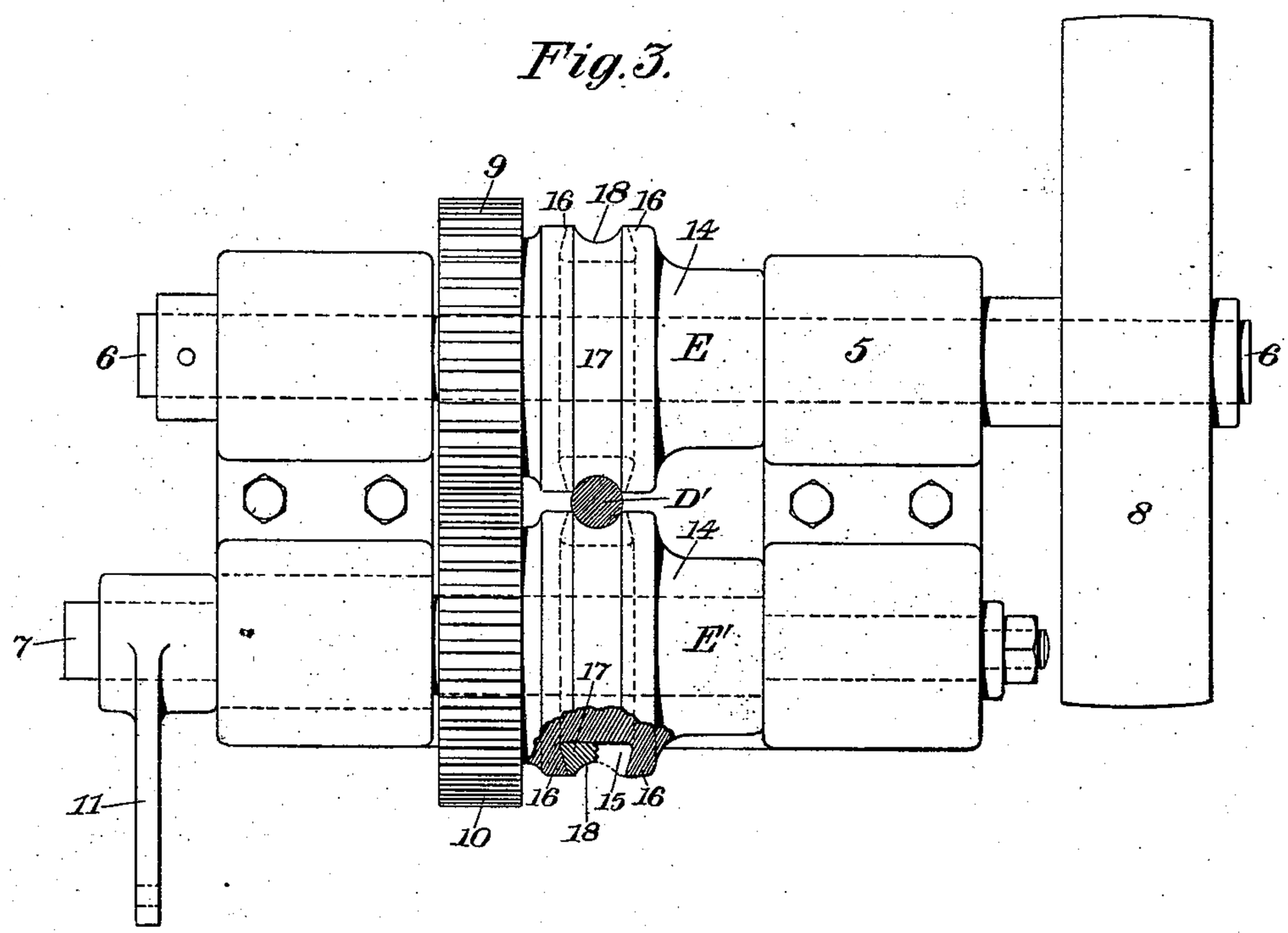



*Fig. 4.*

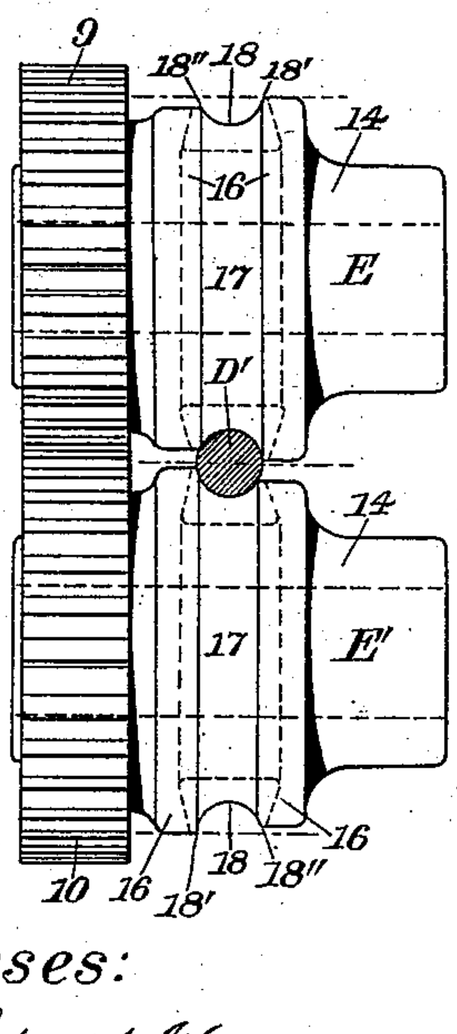
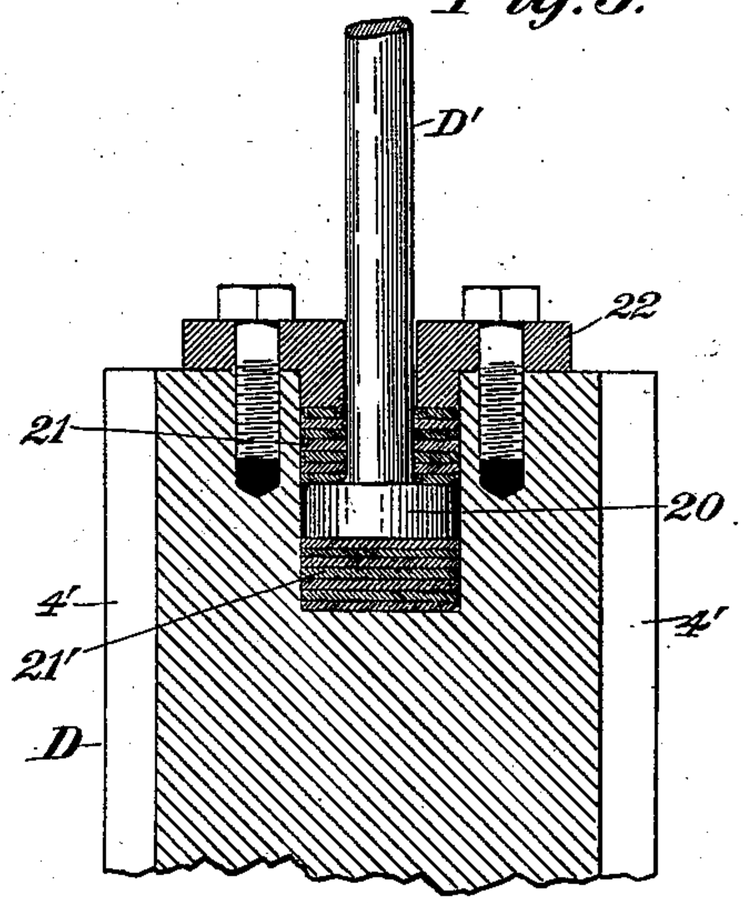



*Fig. 5.*




Witnesses:
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Fred J. Dole.

Inventor:
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By his Attorney,
F. H. Richards.

# UNITED STATES PATENT OFFICE.

FRANCIS A. PRATT, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE PRATT & WHITNEY COMPANY, OF SAME PLACE.

## DROP-HAMMER.

SPECIFICATION forming part of Letters Patent No. 534,008, dated February 12, 1895.

Application filed March 17, 1894. Serial No. 504,025. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS A. PRATT, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Drop-Hammers, of which the following is a specification.

This invention relates to drop-hammers, the object of the invention being to produce a simple and effective drop-hammer of such construction and organization that the hammer-rod may be quickly and positively engaged and the hammer or drop elevated without subjecting the hammer-rod to undue wear, and to do this by means of rolls having rod-grasping portions of relatively yielding or ductile material which may be removed and replaced or repaired in case of wear.

Another object of the invention is to provide means whereby longitudinal impact upon the hammer-rod is greatly reduced, and also to provide means whereby said hammer-rod will be gradually rotated during successive operations to uniformly distribute any wear due to frictional engagement between the lifting-rolls.

In the drawings accompanying and forming a part of this specification, Figure 1 is a front elevation, partially in section, of a drop-hammer embodying my invention. Fig. 2 is a side elevation of the same. Fig. 3 is an enlarged plan view, partially in section, showing the rolls and driving-mechanism therefor. Fig. 4 is an enlarged plan view of two lifting rolls embodying a modification of my invention. Fig. 5 is an enlarged cross-sectional view of the hammer or drop and the hammer-rod showing a modified form of connection therefor.

Similar characters designate like parts in all the figures.

The framework of my improved drop-hammer may be of any usual or suitable construction, it being herein shown as consisting of the anvil, or base-portion, 2, having the two uprights, 3, separately bolted thereto, and each having a guide, 4, adapted for guiding the hammer, or drop, D, in its movements, and a top frame or head, 5, for carrying the lifting-rolls bolted to the upper end of the uprights 3, as clearly shown in Figs. 1 and 2 of the drawings.

In the form thereof herein shown, the lifting-rolls which are designated in a general way by E and E′, are carried by the shafts 6 and 7, respectively, journaled in bearings in the top frame, as clearly shown in Figs. 1 and 2 of the drawings. One of these rolls E is fixed to the shaft 6, which shaft is provided with a pulley, 8, at one end thereof for revolving the same, while the other lifting-roll E′ is mounted for free rotary movement upon the eccentric portion 7′ of the shaft 7, and is driven from the first lifting-roll E by means of a gear, 9, upon the first roll E, meshing with a gear, 10, upon the second roll E′, which gears will preferably be an integral part of said rolls. The shaft 7 of the roll E′ has at one end thereof a rocker-arm, or lever, 11, which is connected by means of a rod, 12, with the usual treadle, 13, whereby the eccentric shaft may be turned for closing the lifting-rolls upon the rod or lifting-bar D′ of the hammer or drop D of the machine.

In the preferred form thereof herein shown, the lifting-rolls each consists of a suitable body, 14, peripherally grooved, as shown at 15, to form friction-ring-retaining flanges, 16, between which flanges is secured the friction-ring, 17. This friction ring 17 will, in practice, preferably be formed of relatively yielding or ductile cast metal so as to not have a capacity for welding cold under friction or pressure with the lifting-rod D′, which will ordinarily be made of steel. In practice the periperal groove 15 in both lifting-rolls will be undercut or dovetailed as most clearly shown in Fig. 1 so as to form, practically, dovetailed flanges for more readily holding the friction-rings 17 in place, and for preventing material expansion of said friction-rings when subjected to compression by the impingement of the lifting-rod D′ between said rings. For said friction-ring or lifting-ring I prefer to employ a high grade of Babbitt metal, an article well known to the trade and which soft metal I find has the requisite quality for securing the best practical results. Metal alloys of other composition, however, also other suitable relatively yielding material may be used, especially some kind of bronze. The friction-rings are peripherally grooved, as shown at 18, to coincide with the form of lifting rod D′ employed. This construction of friction-ring

will permit the same to be readily repaired in case of wear, or, if desired, it may be removed and replaced.

By providing the rolls E and E′ with friction-rings of relatively ductile material, the entire compression, due to the impingement of the lifting-rod between the rolls will be sustained by said friction-rings without any distortional effect upon the rolls proper, which is a matter of great desideratum, as it obviates the necessity of truing-up the rolls as in machines of this class of ordinary construction; it being simply necessary in case of distortion or wear of one or both of the friction-rings, to fill-in or true-up said ring or rings.

According to my present improvement the lifting-rod D′ is circular in cross-section, as shown, for instance, in Figs. 3, 4 and 5, and is engaged between the circular grooves 18 of the lifting-rings 17 of the lifting-rolls E and E′, respectively. At its lower end, the lifting-bar is shown as having a flexible and revoluble connection with the hammer-head D, said rod having a peripheral flange, or head, 20, which rests within a chamber, or bore, in the upper end of the hammer or drop D between two sets of flexible washers or cushion-devices, 21 and 21′, respectively, the lower ones 21′ of which form the end bearing for the lifting-rod head, and the upper ones 21 of which are in the nature of rings fitting the rod D′ and resting upon the upper face of the head 20 thereof, said cushion-devices and lifting-rod being held in place preferably by a cap, 22, flanged at its lower face to fit the recess in the hammer or drop, and secured to said hammer in any suitable manner. In Fig. 1 said cap is shown as externally screw-threaded and screwed into the recess in the hammer, whereas in Fig. 5, said cap is shown as secured to said hammer by means of screw-bolts. In either case the cap will be of such construction and be so secured to the hammer as to firmly press the washers 21 against the head of the lifting-rod but with not sufficient stress as to tightly impinge said head between the two sets of washers or packing-rings 21 and 21′ and prevent rotation thereof. This will be understood by reference to Figs. 1 and 5 of the drawings.

The lifting-bar, being cylindrical and being so connected with the hammer-head as to be capable of rotary movement, will in practice, during continued reciprocations thereof, owing to the torsional lifting action of the friction-rings 18 upon it, be gradually rotated so as to cause an even distribution of the wear around the entire surface of said bar and thereby keep the same symmetrical and in proper working condition. The lifting-bar being engaged in the groove 18 of the friction-rings 17, the rings have a peculiar grinding action upon the rod, whereby when the rod is pinched between said rings, it is grasped after the manner of frictional-gearing so that the rolls will take effect instantly when they close upon the rod, thereby rendering the machine very quick and positive in its action. In this respect, my present improvements are found, in practice, to have important advantages over plain and flat lifting-boards now generally used for raising the hammers of drop-hammers. In practice, the gears 9 and 10 of the rolls E and E′, respectively, will constantly be in intermeshing engagement, the teeth thereof being of such construction as to permit more or less lateral movement of one gear with relation to the other. The lateral movement of the roll E′ with relation to the roll E would necessarily be very slight, it simply being necessary to shift the same sufficiently to firmly grasp the rod D′ and to take up any slight wear in the rod and friction lifting-rings which may have accrued from constant usage.

In Fig. 4, I have shown a slight modification of the lifting-rolls, in which the circular grooves 18 are slightly higher upon one side, as shown at 18′, than upon the other side, as shown at 18″ when measured from the axis of the roll as will be fully understood by reference to said figure,—which is to say, the adjacent edges of each groove are in different transverse planes and of different diameters. The grooves of the two rolls are conversely disposed so as to bring the edge of greatest diameter of one roll-groove adjacent to the edge of smallest diameter of the adjacent roll-groove. By this construction of roll, the action of said roll upon the lifting-rod is slightly modified so as to tend more surely to revolve the rod and thereby distribute the wear over the entire surface of said rod.

The hammer-head, or drop, may be of any usual general construction, it having slideways 4′ formed in opposite sides thereof to engage the guides 4 upon the uprights 3 of the machine after the ordinary manner of constructing hammer heads.

Having thus described my invention, I claim—

1. In a drop-hammer, the combination with the frame-work and with the reciprocatory hammer-head, of a cylindrical lifting-rod rotatively connected at one end with the hammer-head and in position and adapted to be gradually rotated by the impinging action of the grooved lifting-rolls whereby the wear is evenly distributed around the entire surface of said rod, a pair of lifting-rolls having segmentally-circular peripheral grooves conforming to the outline of the lifting-rod and in position and adapted for engaging and lifting and gradually rotating said lifting-rod, means for shifting one of said rolls toward and from the other, and means for simultaneously rotating said rolls, substantially as described.

2. In a drop-hammer, the combination with the frame-work and with the reciprocatory hammer-head, of a cylindrical lifting-rod rotatively connected at one end with the hammer-head and in position and adapted to be gradually rotated by the impinging action of

the lifting-rolls whereby the wear is evenly distributed around the entire surface of said rod, a pair of rotatable peripherally-grooved lifting-rolls supported for lateral movement one of them toward the other, rod-grasping soft-metal rings secured in said grooves and having segmentally circular peripheral grooves conforming to the outline of the lifting-rod, means for shifting one of the rolls laterally of the other to grasp said lifting-rod between said rings, and means for simultaneously rotating said rolls, substantially as described.

3. In a drop-hammer, the combination with the frame-work and with the reciprocatory hammer-head, of a cylindrical lifting-rod having a longitudinally-yielding and rotatable connection at one end with the hammer-head and in position and adapted to be gradually rotated by the impinging action of the lifting-rolls whereby the wear is evenly distributed around the entire surface of said rod, a pair of rotatable peripherally-grooved lifting-rolls supported for lateral movement one of them toward the other, rod-grasping soft-metal rings secured in said grooves and having segmentally-circular peripheral grooves conforming to the outline of the lifting-rod, means for shifting one of the rolls laterally of the other to grasp said lifting-rod between said rings, and means for simultaneously rotating said rolls, substantially as described.

4. In a drop-hammer, a pair of non-flexible lifting-rolls each having a dove-tailed peripheral groove, in combination with a pair of dove-tailed soft-metal rings secured in said grooves and having segmentally-circular peripheral grooves conforming to the outline of the lifting-rod, a cylindrical lifting-rod adapted to be grasped between the said rings, means for shifting one roll laterally of the other, and means for rotating said rolls, substantially as described.

5. In a drop-hammer, the combination with the frame-work and with a hammer-head or drop, of a cylindrical lifting-rod revolubly connected at one end with the hammer-head, a pair of lifting-rolls each of which has a segmentally-circular peripheral groove whose side-edges lie in different transverse planes and which are adapted for engaging, lifting and imparting a gradual rotary movement to the lifting-rod, means for shifting the rolls one of them laterally of the other, and means for rotating said rolls, substantially as described and for the purpose set forth.

6. In a drop-hammer, the combination with the frame-work and with the reciprocatory hammer-head or drop, of a cylindrical lifting-rod having a head at one end rotatively supported in a recess in the hammer-head, packing-rings in said recess at each side of said head and adapted to form a cushion for said head, means for maintaining said packing and head in longitudinal position, a pair of rotatable peripherally-grooved lifting-rolls supported for lateral movement one of them toward the other, rod-grasping soft-metal rings secured in said grooves and having segmentally-circular peripheral grooves conforming to the outline of the lifting-rod, means for shifting one of the rolls laterally of the other to grasp said lifting-rod between said rings, and means for simultaneously rotating said rolls, substantially as described.

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