

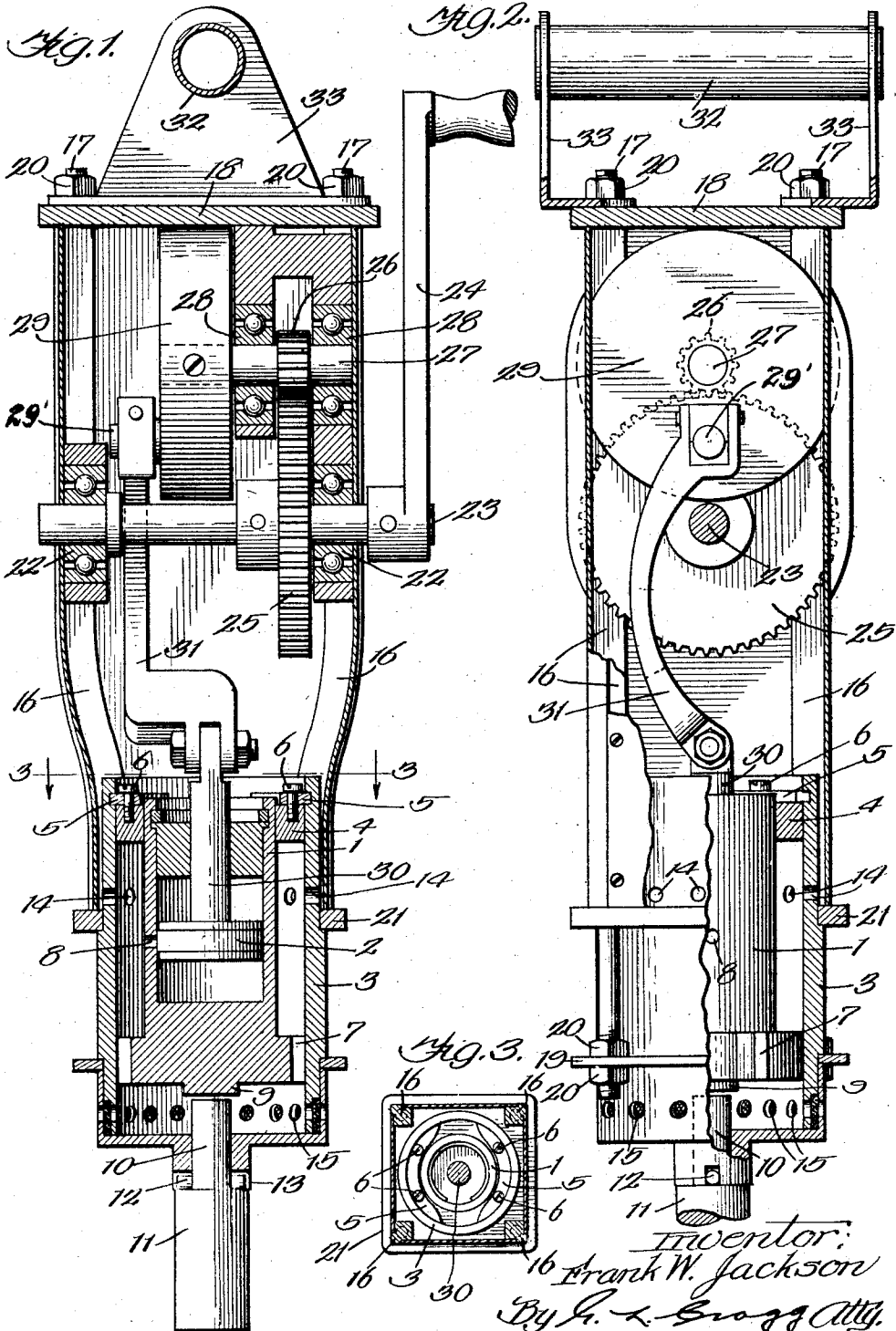
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IMPACTING TOOL

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IMPACTING TOOL.

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My invention relates to impacting tools employing hammer elements to which operating force is applied through the intermediation of air or other cushioning means.

In accordance with my invention the hammer element is of compound formation, being formed of two relatively movable members, one initially receiving the impacting force and the other applying the same to the work, there being a cushion between the two members through which the impacting force is transmitted. The impacting member of the hammer is preferably withdrawn by means of retractile force exerted through another cushion intervening between both members of the hammer.

The member of the hammer which initially receives the impacting force is desirably in the form of a piston and the complementary member is in the form of a cylinder in which the piston may reciprocate. The cylinder is preferably substantially air tight except at the mid zone thereof where it is provided with air ports or passages. The air trapped between the piston and both ends of the cylinder forms cushions upon both sides of the piston through one of which the impacting force is transmitted when the piston is moved in a hammer striking direction and through the other of which the retractile force is exerted when the piston is moved in a hammer withdrawing direction. The final portion of the movement of the striking member of the hammer is desirably effected by the momentum thereof, the striking member of the hammer then moving far enough beyond the piston to unseal the cylinder to permit the momentum of the striking hammer member to be fully effective.

I will explain my invention more fully by reference to the accompanying drawing in which Fig. 1 is a view in elevation of a tool constructed in accordance with the preferred embodiment of the invention, parts being shown in section; Fig. 2 is another view in elevation, taken at right angles to the direction in which Fig. 1 is taken, with parts shown in section and parts broken away; and Fig. 3 is a sectional view on line 3-3 of Fig. 1 but on a smaller scale.

Like parts are indicated by similar characters of reference throughout the different figures.

The hammer illustrated comprises a cylinder 1 and a piston 2 reciprocable within or

with reference to the cylinder. The impacting force is initially applied to one of the hammer members, preferably the piston 2 the other member striking the blow. Both of the hammer members 1 and 2 are movable with respect to each other and also with respect to the cylindrical casing or cage 3 which encloses them. The casing carries a ring 4 within its interior, this ring being assembled with the casing by means of keys that are received within arcuate notches formed upon the interior of the casing and through which assembling screws 6 are passed into the ring. One end of the cylinder 1 has sliding fit within the ring 4 that serves as a guide that takes part in limiting the cylinder to rectilinear movement. The other end of the cylinder is formed with ribs 7 that directly engage the inner surface of the casing 3 whereby the casing and the ring 4 therein co-operate to limit the cylinder to rectilinear movement along the cylinder axis. The cylinder 1 is preferably substantially air tight except at its mid zone where ports 8 are provided which are intermittently sealed by the piston, being unsealed in the final movement of the cylinder 1 in a striking direction and a withdrawing direction successively occurring during the reciprocations of the piston that may be effected in any suitable way but preferably by the mechanism illustrated and presently to be fully described.

The impacting end of the cylinder may be formed with a striking head 9 aligned with the axial opening in the outer end of the cage 3, this opening receiving the shank 10 of the tool 11 which is to be operated upon and is of a character selected to be suitable to the work to be performed thereby. This tool may be confined in rectilinear movement by means of the key 12 carried by its stem and received in the notches 13 in the adjacent end of the cylinder 3. Vents 14, 15 establish communication between the interior and exterior of the cylinder 3 to avoid trapping of the air between the reciprocating cylinder 1 and the outer guide cylinder 3 that would render the movement of the cylinder sluggish.

The casing 3 desirably has an enlarged continuation 16. Tie rods 17 are passed through the end wall 18 of the casing extension 16 and through the flange 19 slipped upon the smaller and outer end of the cyl-

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inder 3 into engagement with the shoulder as illustrated in Fig. 1. Nuts 20 upon the tie rods serve to clamp the casing sections together, the casing extension 16 being thereby clamped against the flange 21 slipped upon the smaller and inner end of the cylinder 3 into engagement with the shoulder as illustrated in Fig. 1. Thus, the various parts of the casing of the implement are readily assembled and may be readily taken apart.

The casing extension 16 carries two aligned roller bearings 22 within the casing and which receive the main driving shaft 23, illustrated herein as a crank shaft, there being a crank handle 24 by which this shaft may be turned to render the implement manually operable although the invention is not to be thus limited. The crank shaft 23 carries a spur gear 25 in mesh with a spur pinion 26 mounted on a countershaft 27 which is carried by aligned roller bearings 28 that are also carried upon and within the casing extension 16. A heavy crank disc 29 is mounted upon the countershaft 27 to serve as a fly wheel in addition to its function of effecting the reciprocation of the piston 2, for which latter purpose the crank disc is coupled with the piston stem 30 by means of a pitman or connecting rod 31. The upper end of this connecting rod is pivoted to a crank pin 29' projecting from the side of the crank disc or fly wheel 29, and the lower end is suitably pivoted to the upper end of the piston stem 30. It will be observed from Fig. 2 that intermediate these points of pivotal connection the connecting rod is bowed outwardly to operate around the main shaft 23. Rotary motion imparted to the shaft 23 by means of the crank handle 24 is multiplied by the gears 25 and 26 to effect rapid reciprocation of the piston 2. This piston forces movement of the cylinder therewith through the intermediation of the cushion, the trapped air, that is between the piston and the impacting end of the cylinder. The cylinder 1 is massive to enable the movement imparted to it by the piston to be continued by momentum and by the compressed body of air when the piston reaches the end of its stroke, the piston then uncovering the ports 8 to permit the momentum of the cylinder to have full effect. Similarly, the cylinder is retracted in the reverse movement of the piston. The handle 32 may also be assembled with the casing extension 16 by means of brackets 33 clamped in position by the nuts 20 at the casing end wall 18.

While I have herein shown and particularly described the preferred embodiment of my invention I do not wish to be limited to the precise details of construction shown as changes may readily be made without departing from the spirit of my invention;

but having thus described my invention I claim as new and desire to secure by Letters Patent the following:—

1. In a portable, hand-driven hammer for drilling concrete and performing like operations, the combination of a casing, a main shaft journaled in the upper end of said casing, a hand-operated crank on the outer end of said main shaft, a countershaft journaled in said casing above said main shaft, a large spur gear on said main shaft driving a spur pinion on said countershaft at an increased rate of speed, a fly wheel mounted on said countershaft within said casing, a crank element rotating with said fly wheel, guide surfaces in the lower end of said casing, a pair of pneumatic members comprising an outer cylinder member reciprocally supported by said guide surfaces and comprising an inner piston member reciprocable in said cylinder member, a connecting rod pivotally connected at its upper end to said crank element and at its lower end to one of said pneumatic members, said connecting rod comprising a bowed portion intermediate its ends for operating around the transversely extending main shaft, and means on the lower end of said casing adapted to support an impact member for receiving the impact blows from one of the aforesaid pneumatic members.

2. In a portable, hand-driven reciprocating hammer, the combination of a casing, a main shaft journaled in the upper part of said casing, a hand-operating crank mounted on the outer end of said main shaft, a countershaft journaled in said casing, a large spur gear on said main shaft driving a spur pinion on said countershaft, a fly wheel mounted on said countershaft within said casing, a crank element rotating with said fly wheel, guide surfaces in the lower end of said casing, a pair of pneumatic members comprising an outer cylinder member reciprocally supported by said guide surfaces and comprising an inner piston member reciprocable in said cylinder member, a connecting rod pivotally connected at its upper end to said crank element and at its lower end to one of said pneumatic members, and an impact member supported at the lower end of said casing adapted to receive impact blows from one of the aforesaid pneumatic members.

3. In a portable, hand-driven reciprocating hammer for drilling concrete and the like, the combination of a casing, a main shaft journaled in the upper part of said casing, a hand-operating crank mounted on the outer end of said main shaft, a countershaft journaled in said casing above said main shaft, a large spur gear on said main shaft driving a spur pinion on said countershaft at an increased rate of speed, a fly wheel mounted on said countershaft within

said casing, a crank element rotating with said fly wheel, guide surfaces in the lower end of said casing, a pair of pneumatic members comprising an outer cylinder member reciprocally supported by said guide surfaces and comprising an inner piston member reciprocable in said cylinder member, a connecting rod pivotally connected at its upper end to said crank element and at its lower end to one of said pneumatic members, said connecting rod comprising a bowed portion intermediate its ends for operating around the transversely extending main shaft, an impact member reciprocally supported in the lower end of said casing and adapted to receive blows from the impact end of one of said pneumatic members, and an air port in said cylinder member admitting air thereto, the impulse of the crank-reciprocated member being transmitted to the other pneumatic member by air pressure therebetween, said crank-reciprocated pneumatic member having a shorter operating stroke than said impacting pneumatic member whereby when said crank-driven pneumatic member reaches the end of its operating stroke the impacting pneumatic member continues to move under the impulse of the compressed air before striking the impact member supported in the end of the casing.

4. In a portable, hand-driven reciprocating

hammer for drilling concrete and the like, the combination of a casing, a main shaft journaled in the upper part of said casing, a hand-operating crank mounted on the outer end of said main shaft, a countershaft journaled in said casing above said main shaft, a large spur gear on said main shaft driving a spur pinion on said countershaft at an increased rate of speed, a fly wheel mounted on said countershaft within said casing, a crank element rotating with said fly wheel, a guide sleeve constructed as a unit and removably supported at the lower end of said casing, a pair of pneumatic members reciprocally supported in said guide sleeve and comprising a cylinder member and a piston member therein, a connecting rod pivotally connected at its upper end to said crank element and at its lower end to said piston member, said connecting rod comprising a bowed portion intermediate its ends for operating around the transversely extending main shaft, an impacting element adapted to receive blows from said cylinder member, and pin and socket means cooperating with said impacting element to permit its axial reciprocation, but to prevent its rotation relative to said casing.

In witness whereof, I hereunto subscribe my name this 6th day of December A. D., 1922.

FRANK W. JACKSON.