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SCREW DRIVER AND WRENCH

Original Filed July 11, 1925 2 Sheets-Sheet 1

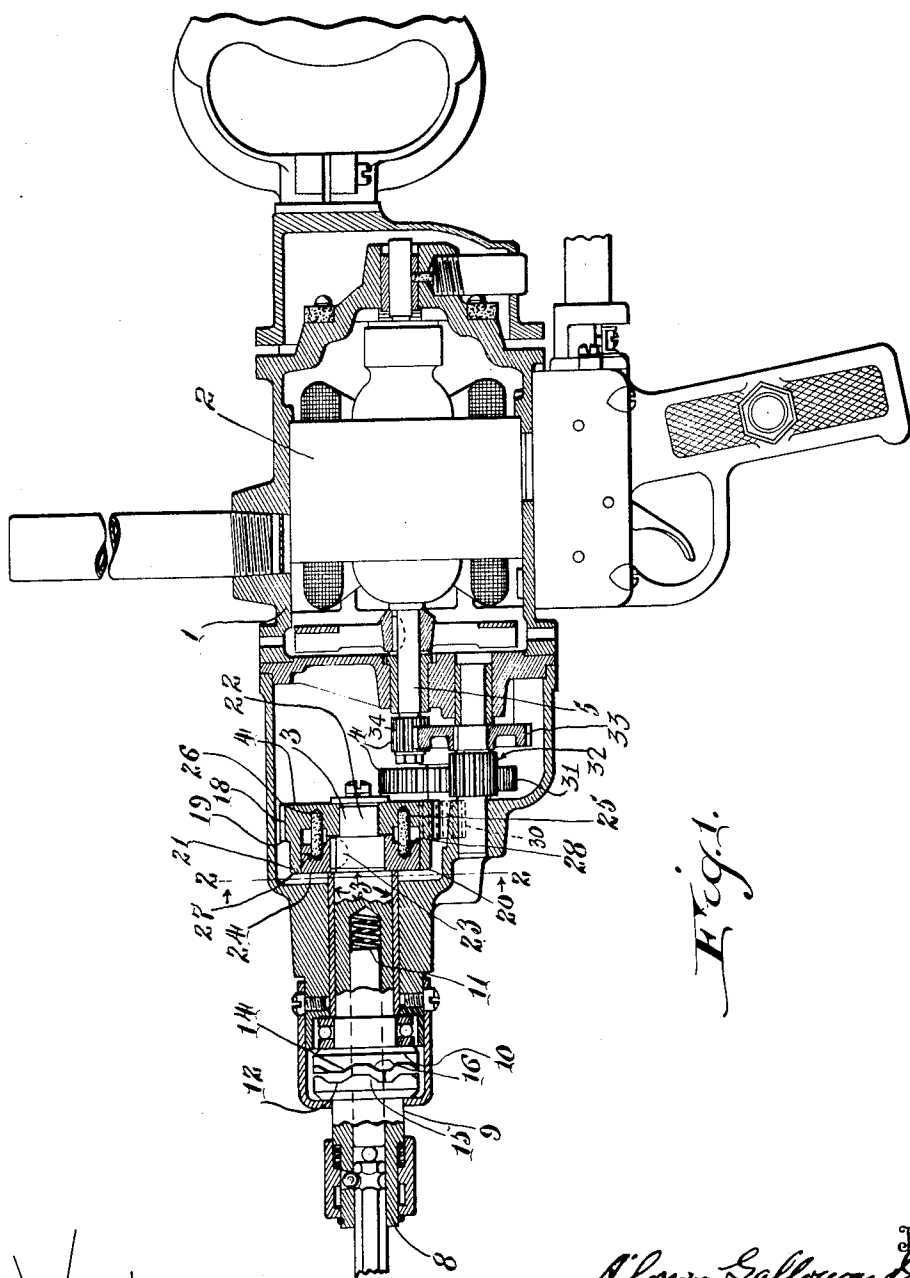


Fig. 1.

WITNESSES
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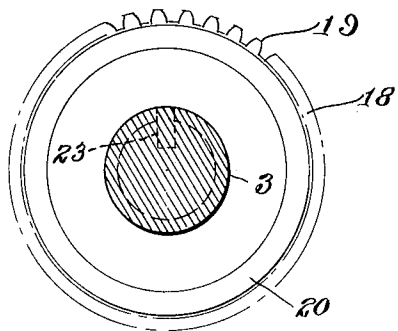


Fig. 3.

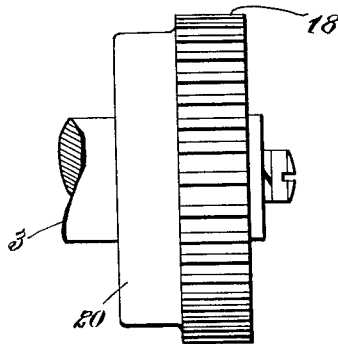


Fig. 4.

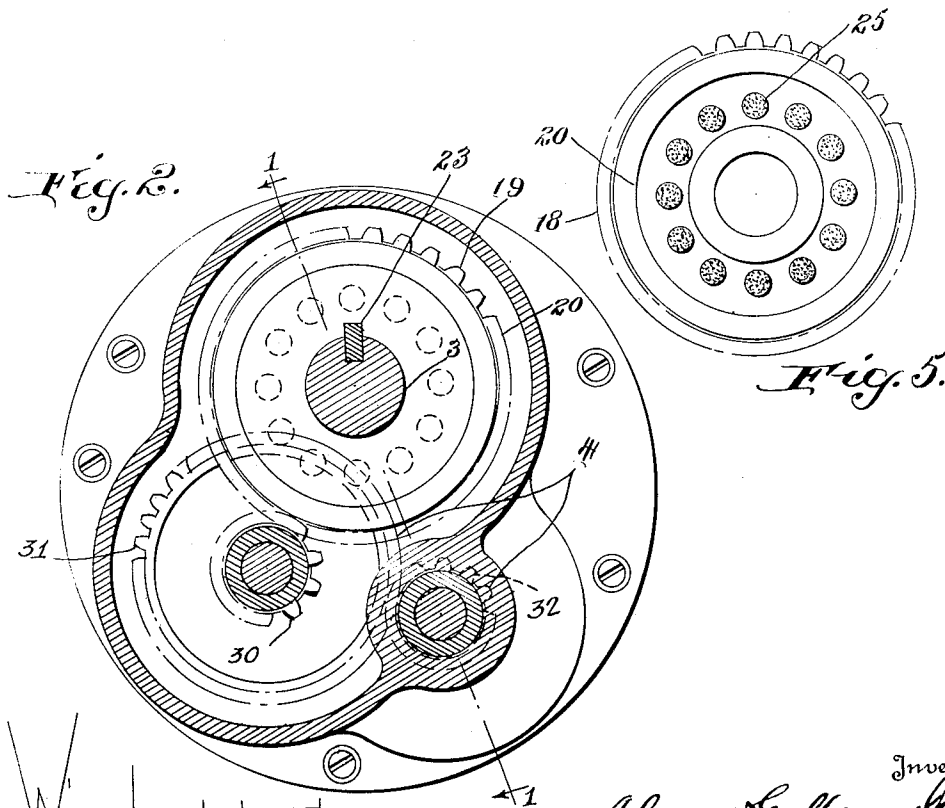


Fig. 2.

Fig. 5.

WITNESSES

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UNITED STATES PATENT OFFICE.

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SCREW DRIVER AND WRENCH.

Application filed July 11, 1925, Serial No. 42,893. Renewed October 6, 1928.

The invention relates to a portable power-driven rotary tool in the form of a wrench or screw-driver, adapted for use in setting nuts and driving bolts and screws whereby the rotary momentum of the parts is utilized in applying to the work a series of tangential hammer blows in the direction of rotation in driving or setting which in ordinary practice is clockwise or righthanded rotation.

The tool described herein is provided with a releasing clutch having inclined engaging surfaces which though they may be positively engaged in driving the screw or setting the nut or bolt, slip and pass on encountering an excessive resistance, releasing the clutch and permitting the jaws to rotate freely relatively to each other until again engaged. The jaws of the clutch are normally disengaged, being engaged by the pressure of the tool against the work. With exactly the right ratio of pressure to resistance on the part of the work, the clutch is, when the screw or nut approaches set or final position, repeatedly released and engaged, permitting the rotary parts of the tool to generate sufficient momentum between each such engagement of the jaws to apply to the chuck and bit or the driven end of the tool when the jaws re-engage in each instance, a hammer blow in a tangential direction tending to set the nut, screw or bolt. The repeated release and engagement of the jaws produces a series of hammer blows delivered in quick succession at substantially regular intervals. The screws, nuts and bolts are thus set from one and a half to three or four turns tighter than in the ordinary operation of the tool.

Preferably the jaws are made of specially hard steel to resist this treatment, and the method of driving screws and setting nuts and bolts described, has been widely taught by applicant's salesmen and officers, and has become general practice among applicant's customers. The greatly increased efficiency of operation obtained by this method and apparatus is recognized. The only difficulty encountered is the reduced life of the parts. The shock and vibration due to the operation described is regarded by the motor manufacturers as injurious to the motor, and it has been suggested that there is a tendency to destroy the gears and other con-

nections, correspondingly reducing their period of useful operation.

The object of the present invention is to reduce and overcome the difficulty thus presented. To this end the applicants have produced and devised a new and improved power-driven rotary tool in the form of a wrench and screw-driver particularly adapted for use in setting nuts, bolts and screws by ratcheting in as described, the tool having the improved clutch teeth adapted to resist the wear and shocks to which they are subject in this operation, and having inclined surfaces which pass on encountering a resistance greater than that tending to hold them in engagement, a train of gearing connecting the spindle to the motor and a flexible coupling at any convenient point between the spindle and the motor. This must be distinguished from a friction clutch intended to yield by slipping. It is a bona fide flexible connection so devised that it yields slightly to any and every shock passed through the train of connections. It does not slip or in any way change the gear ratio or introduce any frictional element or any lost motion beyond a slight degree of yield at the instant of each shock, which yielding motion is later taken up. The invention contemplates the use of such yielding coupling in combination with a releasing clutch having teeth of exceedingly tough metal with extremely hard surfaces adapted for use in the ratcheting in operation described and for any power-driven portable rotary tool having a releasing clutch providing for positive or substantially positive intermittent engagement of the motor with the work, the flexible coupling being between the spindle and the motor, and preferably between the spindle on one side and the gearing and motor on the other side, protecting the motor and preferably the motor and gearing from the shock incident to the engagement of the clutch.

In the accompanying drawing I have illustrated a portable rotary power-driven tool with a releasing clutch of what may be termed the positive type in that it does not slip when what may be termed a working pressure is applied to the tool, until the ratio of resistance to pressure applied is increased beyond a certain point determined

by the angle of the teeth, the same being in combination with a flexible coupling between the spindle on one side and the motor and gearing on the other side.

5 In the drawings—

Figure 1 is a vertical central section on the axis of a portable rotary power-driven tool of the type previously defined, the gears, motor, etc. being shown in elevation.

10 The said section is taken on the line 1—1 of Figure 2, but slightly distorted for convenience of illustration.

Figure 2 is a section on the line 2, 2 of Fig. 1.

15 Figure 3 is a bottom plan of the flexible coupling.

Figure 4 is a side view of the same.

Figure 5 is a view of the driving coupling member, the driven member being removed for convenience of illustration.

Referring to the drawings by numerals, each of which is used to indicate the same or similar parts in the different figures; the portable power-driven wrench or screw-driver shown comprises a casing 1 in which is mounted a motor 2, a spindle 3, a train of reducing gearing to be described, connecting the motor shaft 5 to the spindle, a tool-holding chuck 8, chuck shaft 9 and releasing toothed clutch 10. The train of reducing gearing as shown comprises a pinion 34 on the motor shaft, a spur gear 33 driven thereby, a pinion 32 carried by and rotating with the gear 33, a gear 31 meshing with and driven by the pinion 32, a pinion 30 rigidly connected to and rotating with the gear 31, the pinion 30 meshing with and driving the gear 18, which is an element of the flexible coupling to be described. The clutch 10 is normally released by a spring 11 and provided with teeth 12 on the chuck shaft and 14 on the spindle, which are formed of the hardest and toughest metal obtainable and provided with excessively hard inclined engaging surfaces 15, 16, which cause the clutch to release whenever the bit encounters a resistance which is sufficiently great in proportion to the pressure applied to the tool to cause the clutch members to slip one by the other, the said pressure of the tool against the work tending to hold the teeth in engagement, and the resistance to the rotary moment tending to slide the teeth one by the other and release the clutch. The flexible coupling may be placed at any preferred point. As shown the end gear 18 of the train of reducing gears, is formed on the flexible coupling 20, the gear teeth being formed on the outer periphery of the casing 21 of the coupling, which casing also forms one element of the coupling, which element or casing 21 carrying the teeth 19 of the gear 18 rotates freely on the reduced end 22 of the spindle 3. The other element

24 of the coupling is a smaller disc-like member keyed to the spindle 3 by a key member 23 to rotate therewith. This coupling member or element 24 which is concentric with the spindle and with the gear 18, fits inside the casing 21 and is secured to the gear 18 by means of pins 25 which are parallel to the axis spaced outwardly from the centre and spaced apart from each other by a suitable distance. These pins are of flexible material as raw hide or the like, and each pin is seated in a suitable hole 26, 27 in each of the members connected, and these members, i. e., the disc 22 and the gear 18, are so formed as to provide an annular chamber or space 28 between the members 24 and 18, and including the intermediate portion of each of the pins 25, providing for the lateral flexing of the pins and hence for a slight yielding of the disc 24 relatively to the gear 18, which yield is almost immediately recovered and though it is sufficient to take up the shock on the gearing and motor incident to repeated engagement of the toothed clutch 9, it does not provide any considerable degree of lost motion resulting in friction and loss of power or uncertainty of operation of any sort.

In this way the life of the motor and gearing is indefinitely increased without loss of the positive operation of the tool, without greatly increased expense of construction and without loss of power by slipping and by friction, and without loss of the desired degree of precision.

The operation is obvious from the description and drawing. The drive is from the motor shaft through pinion and gears 34, 33, 32, 31 and 30 to the gear 18, which forms part of the coupling, and by way of flexible pins 25 to the disc 24, which is also part of the flexible coupling which is secured to the spindle and which drives the chuck and bit by way of the ratcheting in clutch 10.

I have thus described specifically and in detail a single embodiment of my invention in order that the nature and operation of the same may be clearly understood; however, the specific terms herein are used descriptively rather than in a limiting sense, the scope of the invention being defined in the claims.

What I claim and desire to secure by Letters Patent is:

1. In a rotary power-driven portable tool, a motor, a spindle with a releasing toothed clutch which is closed by the pressure of the tool upon the work, a coupling composed of two members, one connected to the spindle, the other to the motor, and yielding means connecting said members for limited relative yielding motion.

2. The combination in a portable power-driven rotary tool, serving as a wrench or

screw-driver of a toothed clutch having hardened inclined engaging surfaces adapted for ratcheting in as herein described, and a spindle and tool holder intermittently connected by said clutch, a motor and a coupling composed of two members, one having a positive driving connection to the spindle, the other having a positive connection from the motor and yielding means connecting said coupling members for limited rotation one relatively to the other.

3. The combination in a portable power-driven rotary tool, of a toothed clutch having hardened inclined engaging surfaces adapted for ratcheting in as herein described, and a spindle and tool holder intermittently connected by said clutch, a motor and a coupling composed of two members, one having a positive driving connection to the spindle, the other having a positive connection to the motor and yielding means connecting said coupling members for limited rotation one relatively to the other, the connections from the motor to the coupling including a train of reducing gears, one of which gears is formed on the coupling.

4. The combination in a portable power-driven rotary tool, of a toothed clutch having hardened inclined engaging surfaces adapted for ratcheting in as herein described, and a spindle and tool holder intermittently connected by said clutch, a motor and a coupling composed of two members,

one having a positive driving connection to the spindle, the other having a positive driving connection to the motor and yielding means connecting said coupling members for limited rotation one relatively to the other, the yielding connection comprising a series of flexible pins substantially parallel to the axis, each said pin being seated in its respective ends in each of said coupling members, and the coupling having a chamber enclosing the intermediate portion of the pins providing for a limited yielding of one coupling member relatively to the other.

5. The combination in a portable power-driven rotary tool of a spindle and chuck, a motor and a coupling, composed of two members, one having a positive driving connection to the spindle, the other having a positive connection to the motor and yielding means connecting said coupling members for limited yielding of one relatively to the other.

6. In a rotary, a power-driven, portable tool, a motor, a bit holder, a releasing toothed clutch which is closed by the pressure of the tool upon the work, two members, one connected to the bit holder, the other to the motor, and means yielding to the torque of the tool connecting said members for limited relative yielding motion.

Signed by me at Baltimore, Maryland,
this 8th day of July, 1925.

ALONZO GALLOWAY DECKER.