Nov. 14, 1944. C. W. PORTER 2,362,499

IMPACT WRENCH

Filed June 9, 1942 2 Sheets-Sheet 1

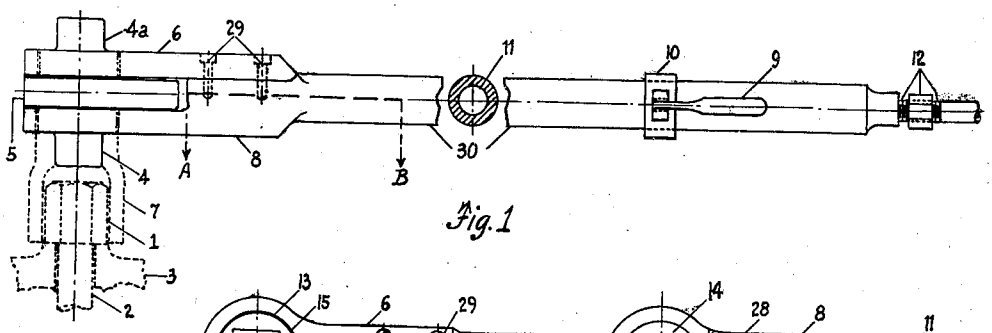


Fig. 1

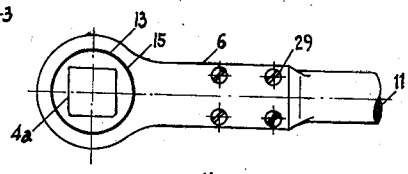
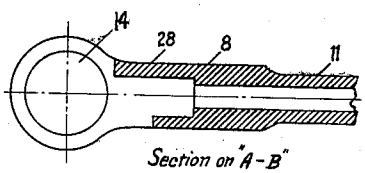


Fig. 2



Section on "A-B"

Fig. 3

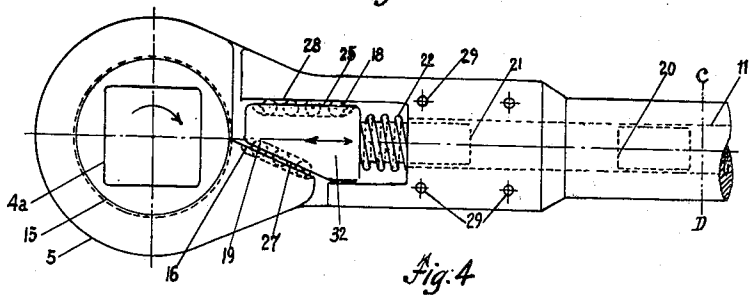


Fig. 4

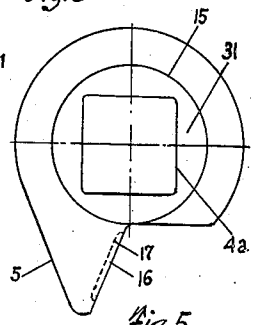


Fig. 5

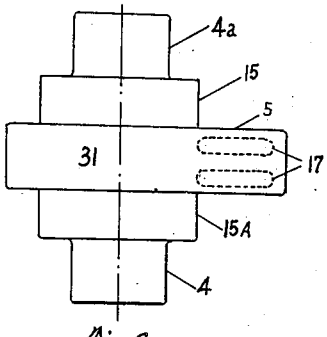


Fig. 6

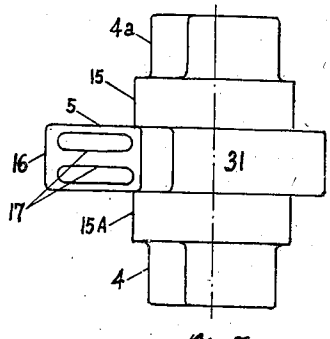


Fig. 7

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Nov. 14, 1944. C. W. PORTER 2,362,499

IMPACT WRENCH

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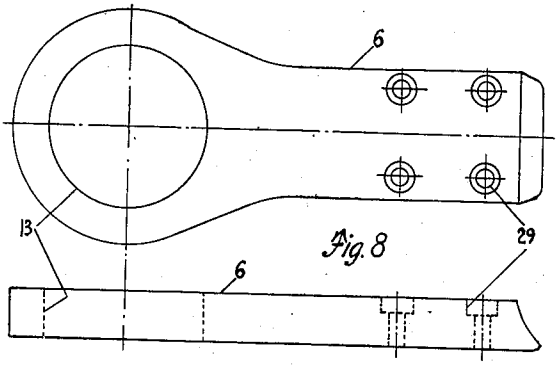


Fig. 8

Fig. 9

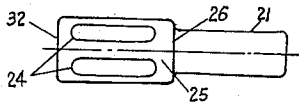


Fig. 10

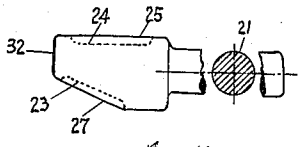


Fig. 11

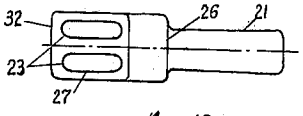


Fig. 12

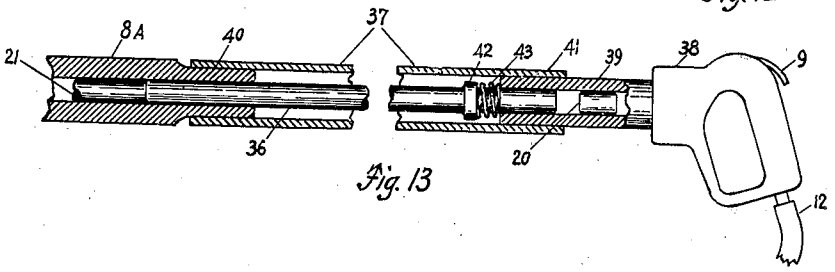


Fig. 13

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Patented Nov. 14, 1944 2,362,499

UNITED STATES PATENT OFFICE

2,362,499

IMPACT WRENCH

Carl W. Porter, Alexandria, Va.

Application June 9, 1942, Serial No. 446,357

11 Claims. (Cl. 81—53)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention herein disclosed is a means for increasing the speed and personal safety and reducing manual fatigue of the operator in driving nuts, bolts or other rotarily wedged parts into place or loosening them therefrom after they have been tightened abnormally or are difficult to budge out of place for some other reason.

The main object of the invention is to adapt the use of power means supplying intermittent impulses so that they may be applied to a wrench in a most practicable manner.

A further object is to increase the speed and reduce the hazards of the present methods of tightening or loosening large size or stubborn bolts, nuts, etc.

A still further object is to ease the work of the operator in pulling up on or freeing bolts, nuts, etc.

In the accompanying drawings illustrating a preferred form of my invention,

Fig. 1 is an elevation of a combination wrench and power hammer of the pneumatic type.

Fig. 2 is a partial plan view thereof,

Fig. 3 is an axial cross-section of the handled head taken at the section line A—B of Fig. 1, the side plate 6 and the torque block 31 being removed,

Fig. 4 is a partial plan view of the handled head 8 with the torque block 31 and plunger 32, but without the side plate 6,

Figs. 5, 6 and 7 are plan, front and rear views respectively, of the torque block 31,

Figs. 8 and 9 are plan and front views respectively of the side plate 6,

Figs. 10, 11 and 12 are rear, plan and front views respectively of the plunger 32, and,

Fig. 13 shows an adapter handle by means of which the impulses from a power tool may be applied to the plunger 32 and the torque block 31.

It is my aim to provide an impact wrench attachable to a source of power (electric or compressed air) and so operable therefrom that this wrench may through its component parts, be used to impart blows or impacts to a nut in such a way as to turn or rotate the nut for tightening or loosening purposes. The wrench is further arranged so as to permit its use manually; that is, without the use of compressed air or electric power and therefore, without imparting impacts to the nut, for simple tightening or loosening purposes, wether the wrench is or is not attached to a source of electric or compressed air power. The wrench is further arranged so that, when it is attached to said source of power, the power can be turned off or on by the operator at will by means of a switch, lever, or cam-operated valve or otherwise, in order that the wrench may be used manually or as a power tool at will.

The advantages of this wrench over other tools for this purpose are its compactness, simplicity, and effectiveness and efficiency with which work may be applied to nuts of any size in turning them for tightening or loosening purposes.

Further advantages are the speed, safety and lack of fatigue with which my wrench can be operated.

A further advantage is the fact that my wrench can be made in sizes large enough to permit practicable application of it to nuts of extremely large size.

A further advantage for my wrench is that one size thereof will handle a greater range of sizes of nuts.

Referring to the accompanying drawings, 1 is the nut, shown for the purposes of illustration, to be tightened or loosened on any bolt or stud 2, 3 being any piece held by the nut and bolt, 4, 4a are projective end posts on the torque block 31, 5 is a flange on the torque block forming a cam or lever-arm with an impact or wedging surface 16. 6 is a removable side-plate fastened in place on the head by means of screws 29 or other fastening means. 7 is a socket type wrench.

8 is the handled head, 9 the trigger or switch handle on the power means, 10 the valve or switch housing, 11 the bore in the handle barrel, 12 the parts of a hose or cable connection, 13 the bore in the side-plate serving as the upper bearing for the torque block, 14 the bore in the handled head portion 8 serving as the lower bearing for the torque block, 15 and 15A the upper and lower cylindrical bearing surfaces on the torque block.

17, 17 are the ball or roller retaining grooves in wedging or impact surface 16, 19 and 18 the balls or rollers fitting in grooves 23 and 24 on front and rear of plunger wedging or impact surfaces 27 and 25 respectively, 28 the impact surface on the handled head portion, 20 the plunger or hammer of the power tool, 21 the cylindrical end of plunger 32, 22 a coil spring to normally hold the plunger 32 in advanced position, 26 the shoulder or seat for the inner end of spring 22, 29 the screws for fastening side plate 6 on handled head 8, 30 the wrench device as a whole, 31 the torque block, and 32 the wedging or impact plunger.

In Fig. 13 showing the adapter, 36 is the intermediate plunger for transmitting the impulses from the power tool hammer 20 to the cylindrical

end 21 of plunger 32, 37 the handle extension, 38 a chipping, riveting or scaling power tool having a barrel 39, 40 the telescopic connection between the head handle 8—A and handle extension 37, 41 is the telescopic-connection between the barrel 39 and the handle extension 37, 42 a shoulder on the intermediate plunger 36 between which and the end of barrel 39 a coil spring surrounding the intermediate plunger is mounted for biasing the intermediate plunger inwardly, and 8—A is a portion of the handle head 8 cut off at some section C—D as shown in Fig. 4 for the purpose of the adaptation.

The operation of my device is as follows:

Referring to Fig. 1 and assuming 1 is a nut which it is desired to turn on bolt or stud 2, and that the wrench 30 is connected to compressed air or other power by means provided as shown by 12, the socket 7 may be put in place on one of the end posts 4, and the socket 7 engaged with 1, the wrench 30 being placed in position as in Fig. 1. The operator may then pull on the wrench handle, attempting to turn the nut. In this position plunger 32 (Figure 4) will be as far as possible away from the center of the torque block 31, spring 22 will be in compression, balls or rollers 19 will be in contact with impact surfaces 16 and 27, and balls or rollers 18 will be in contact with impact surfaces 25 and 28. At this stage the operator may press the trigger 9 (Fig. 1) and set the hammer or impacter 20 (Fig. 4) into motion. When 20 strikes the end of the cylindrical section 21 of plunger 32 this plunger will be driven forward slightly. Part of the force of impact of 20 with 32 will be transmitted through 32 to 19, and thence to flange or lever arm 5 of torque block 31, thence through 31 to the socket 7, and the nut 1, whereupon 1 will be rotated slightly. While 20 is on its way to the end-point of its travel away from 32 and back again to contact with 32, the force applied to the wrench handle by the operator will cause the wrench 30 to revolve through a small angle equal to the rotation of the nut 1, and 5, 16, 19, 27, 25, 18, 28, 32, and 22 will take their original positions with respect to each other. The above described cycle may be repeated until the turning operation of the nut is completed.

If it is desired to turn nut 1 in the direction opposite to that above described, the operation of the impact wrench would be the same as outlined above, except that the wrench would be turned over and the socket 7 applied to the opposite end post 4, and the operator would apply a force on the wrench handle in the opposite direction.

Whenever the nut 1 is loose enough, the operator may operate the wrench manually.

It is to be understood that the above device is but one form of the invention which includes all other forms and obvious modifications within the scope of the claims appended hereto.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What I claim is:

1. An impact wrench comprising a torque block for attachment to a part to be turned, a handled head in which the torque block is rotatably mounted, the handle portion being bored normal to the axis of rotation on an axis in the same plane therewith to receive a reciprocating impulse element, a reciprocable wedging-element at the inner end of the bore, having wedged surfaces at the end protruding from the bore, said surfaces fitting between impact surfaces less than 90% apart on the torque block and head portion respectively to transmit the impacts to the torque block and through it directly to the part to be turned.

2. An impact wrench consisting of a handled head having bearings therein, a torque block rotatably mounted in said bearings and having a flange therebetween forming an impact surface, said head having another impact surface opposed to and at a slight angle to the first impact surface, the handle of the head having a bore therethrough at right angles to the axis of rotation and on an axis in the same plane therewith for the reception of the impulse delivering element of a power hammer, an impact plunger at the inner end of said bore for receiving the blows from said impulse delivering element and having a wedge portion protruding from said bore adapted to transmit the blows to the torque block by wedging between the impact surfaces and thereby producing momentarily a high degree of torque on the torque block.

3. An impact wrench consisting of a handled head having a pair of bearings therein, a torque block rotatably mounted in said bearings and having a flange therebetween forming an impact surface, said head having another impact surface opposed to and at a slight angle to the first impact surface, the handle of the head having a bore therethrough at right angles to the axis of rotation on an axis in the same plane therewith for the reception of a power driven reciprocating element, an impact plunger at the inner end of said bore for receiving the blows from said reciprocating element and having a wedge portion protruding from said bore adapted to transmit the blows to the torque block by wedging between the impact surfaces and thereby producing momentarily a high degree of torque on the torque block.

4. In an impact wrench, mounting means for attachment to a part to be turned and having one of a pair of opposed impact surfaces, handle means for rotatably holding said mounting means and having the other impact surface inclined at less than 90° to said first impact surface, reciprocable wedging means biased inwardly between said surfaces to normally wedge them apart and retractible upon manual application of turning force to the handle means so as to bring the surfaces closer together, said wedging means being adapted to be driven inwardly by intermittent impulses from a power tool while applying said manual force so as to produce a series of high torque impacts on the mounting means as long as a turning force is manually applied to the handle means.

5. An impact wrench comprising a handled head having a torque block rotatably mounted therein, said torque block having an impact surface extending in substantial radial alignment therewith, said head having another impact surface also extending in substantial radial alignment of the torque block but angularly displaced from said other surface, reciprocable wedging means between said surfaces, power hammer means for delivering blows to said wedging means.

6. In a power wrench, a rotatable torque block having an impact surface, a handle having another impact surface, a wedge between said surfaces having resilient means for urging it in-

wardly arranged to be retracted by manual pressure on the handle in the direction of wrench operation, said pressure biasing the impact surface of the handle toward the impact surface of the torque block and moving the wedge upwardly against said resilient means, a power operated reciprocating member for directing blows inwardly against said wedge to drive the surfaces apart and thereby deliver intermittent impulses of high torque to the torque block.

7. In a power wrench, a rotatable torque block having an impact surface, a handle having another impact surface, a wedge between said surfaces having resilient means for urging it inwardly arranged to be retracted by manual pressure on the handle in the direction of wrench operation, said pressure biasing the impact surface of the handle toward the impact surface of the torque block and moving the wedge upwardly against said resilient means, a power operated member reciprocating in said handle for directing blows inwardly against said wedge to drive the surfaces apart and thereby deliver intermittent impulses of torque to the torque block.

8. In an impact tool, a handled head, a partially rotatable torque block in said head having an impact surface extending in substantial radial alignment therewith, said head having an opposed impact surface at an angle of less than 90° to said first impact surface, a wedge between said surfaces having a stem portion mounted to reciprocate in the end of a bore through the handle, an adaptor extension on the handle for connection to a power tool, a plunger in said extension for transmitting power impulses from said power tool to said wedge.

9. In an impact wrench, having a head and a handle, a torque block mounted for partial rotation in said head, and having a flange with an impact surface substantially radially thereof, said handle being bored and having an impact surface at the inner end of the bore opposed to and at a slight angle to the impact surface on the torque block, a wedge adapted upon inward motion to push against said surfaces and partially turn said torque block in said head, a guide stem on said wedge slidably mounted in the end of said bore, a shoulder between the wedge and stem, a coil spring mounted around said stem between said shoulder and the end of the bore, to urge said wedge inwardly, anti-friction means between said wedge and the impact surfaces, said wedge angle and coil spring being so proportioned as to cause the wedge to be pushed outwardly against the force of the spring when pressure is manually applied to the handle, and power means adapted to deliver intermittent impulses to the wedge stem through said bore.

10. In an impact wrench, having a head and a handle, a torque block mounted for partial rotation in said head, and having a flange with an impact surface substantially radially thereof, said handle being bored and having an impact surface at the inner end of the bore opposed to and at a slight angle to the impact surface on the torque block, a wedge adapted upon inward motion to push against said surfaces and partially turn said torque block in said head, a guide stem on said wedge slidably mounted in the end of said bore, a shoulder between the wedge and stem, a coil-spring mounted around said stem between said shoulder and the end of the bore, to urge said wedge inwardly, ball or roller bearings between said wedge and the impact surfaces, said wedge angle and coil spring being so proportioned as to cause the wedge to be pushed outwardly against the force of the spring when pressure is manually applied to the handle, and power means adapted to deliver intermittent impulses to the wedge stem through said bore.

11. In an impact wrench, a handle, a head, a rotatable part therein having its axis of rotation normal to the handle and in the same plane therewith adaptable for attachment to the piece to be turned, said rotatable part having an impact surface extending in substantial radial alignment thereof, reciprocable wedging means at the inner end of the handle, said head having another impact surface also extending in substantial radial alignment thereof but angularly displaced from said other surface, power-operated reciprocating means for delivering intermittent blows to the wedging means for transfer to said rotatable part through wedging action of said wedging means against the impact surface of said rotatable part.

CARL W. PORTER.