

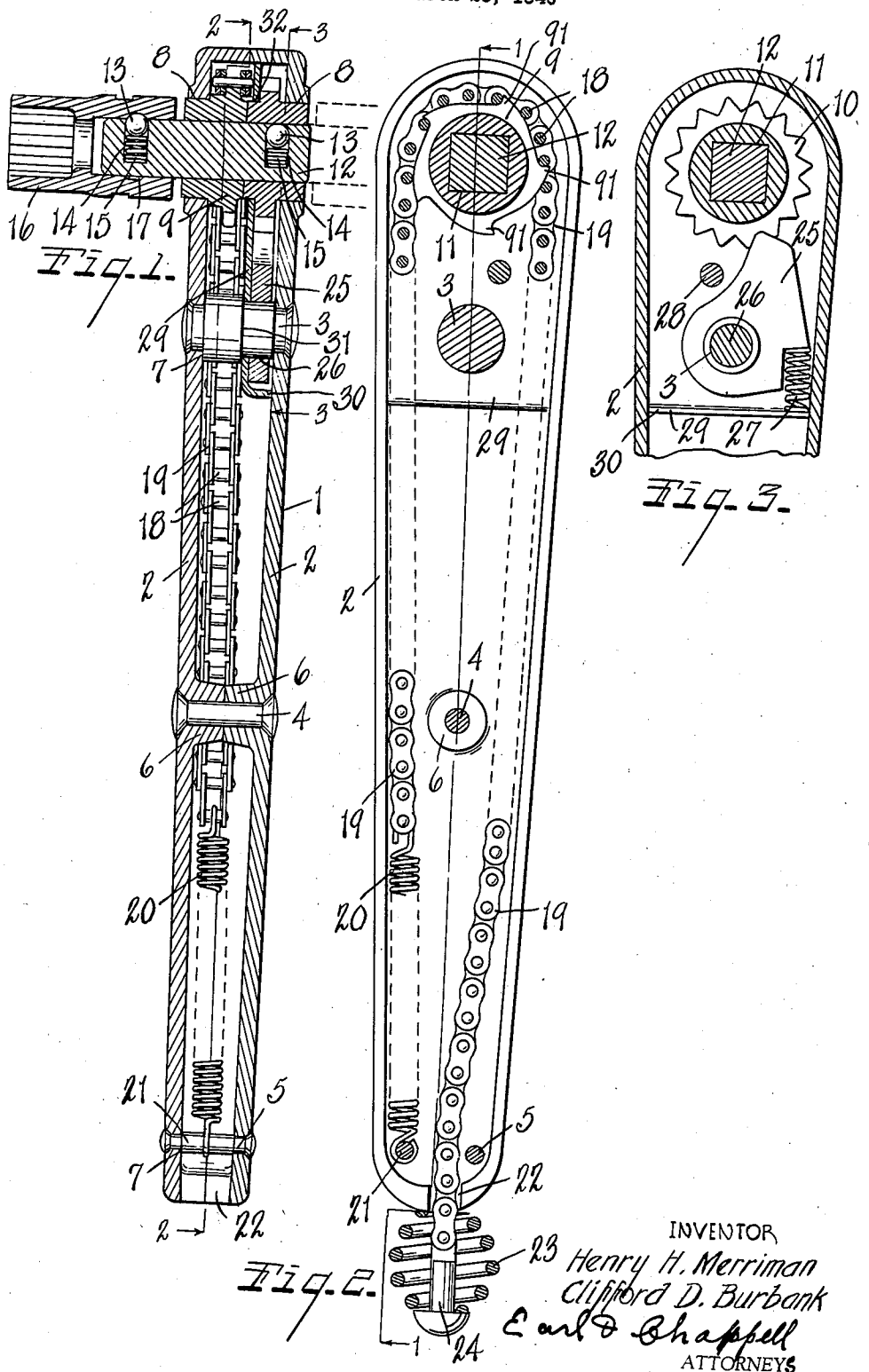
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WRENCH

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WRENCH

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This invention relates to improvements in wrenches.

The main objects of this invention are:

First, to provide an improved ratchet wrench which is very convenient to use in restricted positions or locations and which may be rapidly manipulated for putting on or taking off nuts.

Second, to provide a wrench having these advantages which is reversible to adapt it to tightening or removing nuts.

Third, to provide a ratchet wrench which is strong and durable and at the same time economical to produce.

Objects pertaining to details and economies of the invention will definitely appear from the description to follow. The invention is defined in the claims.

A structure which embodies the features of this invention is clearly illustrated in the accompanying drawing in which:

Fig. 1 is a view of our improved ratchet wrench mainly in longitudinal section on line 1-1 of Fig. 2.

Fig. 2 is a detail view mainly in longitudinal section on line 2-2 of Fig. 1.

Fig. 3 is a fragmentary section on line 3-3 of Fig. 2.

Our improved wrench comprises a body unit designated generally by the numeral 1 which constitutes a combined housing and handle. This body unit is preferably tapered and comprises a pair of members 2, 2 of channel section disposed in facing relation with their flanges in edge to edge abutting relation and secured in such relation by the rivets 3, 4 and 5. The body members are preferably provided with internal abutting bosses 6 receiving the rivets 4. The rivets 5 are preferably shouldered at 7.

The body members are provided with opposed openings 8 adjacent the head end of the body unit providing bearings for the driving ratchet 9 and the holding ratchet 10. These ratchets have hub-like journal portions journaled in the openings. The members 9 and 10 are disposed in side by side relation and have non-circular spindle receiving openings 11. The non-circular socket spindle 12 is slidably arranged in the ratchet members and is provided with ball detents 13 seated in bores 14 the outer ends of which are upset to retain the ball, and coiled springs 15 acting to urge the ball detents yieldingly outwardly. The spindle is shiftable axially to be projected at either side of the body unit, the detents acting to alternately frictionally or yieldably engage one of the ratchet members or to engage the wrench socket

16 which is preferably provided with an annular internal recess 17 with which the detent engages as shown in Fig. 1.

It will be understood that the spindle may be projected to the opposite side from that shown in Fig. 1 and the socket member having a socket of any suitable size arranged on the spindle. The driving ratchet is provided with ratchet teeth 91 adapted to coact with the cross members 18 of the driving or actuating sprocket chain 19 which is arranged over the driving ratchet to coact with its teeth, the teeth being shaped so that the chain slides freely over them on the retracting movement of the chain but on its actuating movement the driving ratchet is rotated.

The teeth of the driving ratchet and sprocket are so proportioned that a plurality of the chain links engage a plurality of ratchet teeth on the driving actuation of the chain. The chain extends into the handle portion of the body unit and is engaged or connected with the retracting spring 20 which is anchored to one of the rivets 21. The other end of the chain projects through an opening 22 in the end of the handle portion and is provided with a grip 23 preferably in the form of a double helically coiled spring.

A headed coupling member 24 is inserted in the outer end of the grip member 23 and secured to the end link of the chain. This grip member 23 serves the double function of a grip and also as a shock absorbing stop for the actuating chain when it is retracted by the retracting spring 20. The holding ratchet 10 is provided with a holding pawl 25 pivoted at 26 on the rivet 3. A coiled spring 27 is positioned to urge the pawl into co-acting engagement with the holding ratchet. A stop 28 limits the movement of the pawl. A guard plate 29 serves the double function of supporting the spring 27 and preventing engagement of the pawl 25 with the actuating chain. This plate is provided with an inturned flange 30 disposed at its inner end which is shaped to fit within the head end of the body unit. It is supported by the rivet 3 which is shouldered at 31 to limit the sidewise movement of the plate in one direction. The plate has an opening 32 receiving the inner end of the hub of the ratchet pawl.

The body unit members 2 are preferably formed as drop forgings which provides the desired strength and rigidity and resists the rough handling to which wrenches are commonly subjected when used industrially as on large scale assembly in the automobile industry. The wrench is also

compact in proportion to its strength and capacity.

In operation the socket spindle is projected to the desired side for putting on a nut, for example, and a suitable socket is engaged therewith. The nut is started on the bolt and pull on the actuating chain quickly brings the nut to approximate seating position. The chain may be pulled more than once if necessary. It ratchets freely over the ratchet teeth of the driving ratchet but in any event the spindle is held by the holding ratchet. The handle is then rocked or swung as may be necessary to properly tighten or seat the nut. In removing the nut the handle is oscillated to loosen the nut and then the chain pulled or actuated to remove the loosened nut.

It will be noted by reference to Fig. 2 that the driving ratchet teeth 91 are of relatively low pitch and are relatively elongated and curved on their periphery so that a plurality of the links 18 of the sprocket chain rest on the said periphery or land of a given tooth while an adjacent link is in driving engagement with the next adjacent tooth. This is in addition to the fact that a plurality of the chain links engage a plurality of ratchet teeth on the driving actuation of the chain, and the features noted enable a very positive and effective transmission of force from the chain to the ratchet while at the same time permitting the chain to slide back freely over the ratchet teeth in reverse direction. Thus, the retractile spring 20 need not be excessively large in order to perform its function.

Our improved wrench is economical in its parts, the parts may be economically assembled, and at the same time the structure is rigid and durable.

We have illustrated our invention in an embodiment which has been found very satisfactory. We have not attempted to illustrate or describe other embodiments which we contemplate as it is believed this disclosure will enable those skilled in the art to embody or adapt the invention as may be desired.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. In a reversible ratchet wrench, the combination of a tapered body unit constituting a combined housing and handle, said body unit comprising a pair of members of channel section disposed in facing relation with their flanges in edge to edge abutting relation, said members being riveted together and having aligned bearing openings adjacent the head end thereof, a driving ratchet provided with sprocket chain engaging teeth and having a hub portion in fixed relation thereto journaled in one of said bearing openings, a holding ratchet having a hub portion journaled in the other bearing opening, said ratchets having aligned non-circular spindle openings therein, a non-circular spindle slidably mounted in said spindle openings of said ratchets to be projected at either side of the body unit and having spring pressed detents which alternately act to frictionally engage one of the ratchets for shiftably holding the spindle in its adjusted position or constituting a wrench socket engaging means, said ratchet teeth being of relatively small radial dimension and being relatively elongated circumferentially, with one or more of the links of the sprocket chain resting on the peripheral surface of one of the teeth while another link is in driving engagement with the adjacent tooth, a

sprocket chain disposed around said driving ratchet to cooperate with the ratchet teeth thereof and extending into the handle portion of said body unit, one end of said chain being disposed through an opening in the end of the handle portion of said body unit and the other being anchored within the body unit by means of a coiled extension spring, the teeth of said driving ratchet and the links of said chain being so proportioned that a plurality of ratchet teeth and a plurality of links are simultaneously engaged, a helically coiled spring mounted on the projecting end of said chain and constituting a grip and a yielding stop member limiting the retracting movement of the chain by said anchoring spring and yieldably held against the end of the handle portion thereby, and a spring actuated pawl co-acting with said holding ratchet.

2. In a reversible ratchet wrench, the combination of a tapered body unit constituting a combined housing and handle, said body unit comprising a pair of members of channel section disposed in facing relation with their flanges in edge to edge abutting relation, said members being riveted together and having aligned bearing openings adjacent the head end thereof, a driving ratchet provided with sprocket chain engaging teeth and having a hub portion in fixed relation thereto journaled in one of said bearing openings, a holding ratchet having a hub portion journaled in the other bearing opening, said ratchets having aligned non-circular spindle openings therein, a non-circular spindle slidably mounted in said spindle openings of said ratchets to be projected at either side of the body unit and having spring pressed detents which alternately act to frictionally engage one of the ratchets for shiftably holding the spindle in its adjusted position or constituting a wrench socket engaging means, a sprocket chain disposed around said driving ratchet to cooperate with the ratchet teeth thereof and extending into the handle portion of said body unit, one end of said chain being disposed through an opening in the end of the handle portion of said body unit and the other being anchored within the body unit by means of a coiled extension spring, the teeth of said driving ratchet and the links of said chain being so proportioned that a plurality of ratchet teeth and a plurality of links are simultaneously engaged, said ratchet teeth being of relatively small radial dimension and being relatively elongated circumferentially, with one or more of the links of the sprocket chain resting on the peripheral surface of one of the teeth while another link is in driving engagement with the adjacent tooth, a grip on the projecting end of said chain, and a spring actuated pawl co-acting with said holding ratchet.

3. In a reversible ratchet wrench, the combination of a tapered body unit constituting a combined housing and handle, said body unit comprising a pair of members of channel section disposed in facing relation with their flanges in edge to edge abutting relation, said members being riveted together and having aligned bearing openings adjacent the head end thereof, a driving ratchet provided with sprocket chain engaging teeth and having a hub portion in fixed relation thereto journaled in one of said bearing openings, a holding ratchet having a hub portion journaled in the other bearing opening, said ratchets having aligned non-circular spindle openings therein, a non-circular spindle slidably mounted in said spindle openings of said ratchets

to be projected at either side of the body unit and having spring pressed detents which alternately act to frictionally engage one of the ratchets for shiftably holding the spindle in its adjusted position or constituting a wrench socket engaging means, a sprocket chain disposed around said driving ratchet to cooperate with the ratchet teeth thereof and extending into the handle portion of said body unit, one end of said chain being disposed through an opening in the end of the handle portion of said body unit and the other being anchored within the body unit by means of a coiled extension spring, the teeth of said driving ratchet and the links of said chain being so proportioned that a plurality of ratchet teeth and a plurality of links are simultaneously engaged, a grip on the projecting end of said chain, a spring actuated pawl coacting with said holding ratchet, and a partition plate disposed within said body unit between said holding ratchet and its pawl and said driving ratchet and its coacting chain and having an opening therein receiving the inner end of the hub of said holding ratchet and in supporting relation thereto, said plate fitting within the walls of said body unit and having a laterally turned flange at its inner end constituting a seat for the spring of said holding pawl, said plate being supported by one of the connecting rivets for said body unit members.

4. In a reversible ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a driving ratchet provided with sprocket chain engaging teeth in fixed relation thereto, a holding ratchet, said ratchets being journaled in said body member in side by side relation and having alined non-circular spindle openings therein, a non-circular spindle slidably mounted in said spindle openings of said ratchets to be projected at either side of the body unit, a sprocket chain disposed around said driving ratchet to cooperate with the ratchet teeth thereof and extending into the handle portion of said body unit, there being a plurality of the links of said chain in driving engagement with the teeth of the ratchet, one end of said chain being disposed through an opening in the end of the handle portion of said body unit and the other being anchored within the body unit by means of an extension spring, a double helically coiled spring mounted on the projecting end of said chain and constituting a grip and a yielding stop member limiting the retracting movement of the chain by said anchoring spring and yieldably held against the end of the handle portion thereby, and a spring actuated pawl coacting with said holding ratchet.

5. In a reversible ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a driving ratchet provided with sprocket chain engaging teeth in fixed relation thereto, a holding ratchet, said ratchets being journaled in said body member in side by side relation and having alined non-circular spindle openings therein, a non-circular spindle slidably mounted in said spindle openings of said ratchets to be projected at either side of the body unit, a sprocket chain disposed around said driving ratchet to cooperate with the ratchet teeth thereof and extending into the handle portion of said body unit, there being a plurality of the links of said chain in driving engagement with the teeth of the ratchet, one end of said chain being disposed through an opening in the end of the handle portion of said body

unit and the other being anchored within the body unit by means of an extension spring, a grip mounted on the projecting end of said chain, and a spring actuated pawl coacting with said holding ratchet, said teeth being of relatively small radial dimension and being relatively elongated circumferentially, whereby a plurality of said chain links rest on the peripheral surface of one tooth while an additional link is in driving engagement with the adjacent tooth.

6. In a reversible ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a driving ratchet provided with sprocket chain engaging teeth in fixed relation thereto, a holding ratchet, said ratchets being journaled in said body member in side by side relation and having alined non-circular spindle openings therein, a non-circular spindle slidably mounted in said spindle openings of said ratchets to be projected at either side of the body unit, a sprocket chain disposed around said driving ratchet to cooperate with the ratchet teeth thereof and extending into the handle portion of said body unit, there being a plurality of the links of said chain in driving engagement with the teeth of the ratchet, said ratchet teeth being of relatively small radial dimensions and being relatively elongated circumferentially, with one or more of the links of the chain resting on the peripheral surface of one of the teeth while another link is in driving engagement with the adjacent tooth, one end of said chain being disposed through an opening in the end of the handle portion of said body unit and the other being anchored within the body unit by means of an extension spring, a grip mounted on the projecting end of said chain, a spring actuated pawl coacting with said holding ratchet, and a partition plate disposed within said body unit between said holding ratchet and its pawl and said driving ratchet and its coacting chain.

7. In a reversible ratchet wrench, the combination of a chambered body unit, a driving ratchet provided with ratchet teeth in fixed relation thereto, a holding ratchet provided with a coacting pawl, said ratchets being journaled in said body member in side by side relation and having alined socket spindle openings therein, a socket spindle slidably mounted in said ratchets to be projected at either side of the body unit and having rotary driving connection to said ratchets, an actuating chain disposed around said driving ratchet to cooperate with the teeth thereof, said ratchet teeth being of relatively small radial dimension and being relatively elongated circumferentially with one or more of the links of the chain resting on and out of driving engagement with one thereof while another link is in driving engagement with the adjacent tooth, one end of said chain being connected to a retracting spring and the other being provided with a grip on the exterior of said body unit.

8. In a ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a spindle, a driving ratchet operatively associated therewith and having chain engaging teeth journaled in said housing, a holding ratchet means operatively associated with said spindle, an actuating chain disposed around said driving ratchet for ratcheting coaction therewith, said ratchet teeth being of relatively small radial dimension and being relatively elongated circumferentially with one or more of the links of the chain resting on and out of driving engagement with one thereof while

another link is in driving engagement with the adjacent tooth, one end of the chain being disposed through an opening in the body unit and the other being connected to an extension spring within said body unit, a helically coiled spring mounted on the projecting end of said chain and constituting a grip and a stop member limiting the retracting movement of said chain by said retracting spring.

9. In a ratchet wrench, the combination of a chambered body unit constituting a combined housing and handle, a spindle, a driving ratchet operatively associated therewith and having chain engaging teeth in fixed relation thereto journaled in said housing, a holding ratchet means operatively associated with said spindle, and an actuating chain disposed around said driving ratchet for ratcheting coaction therewith, said ratchet teeth being of relatively small radial dimension and being relatively elongated circumferentially with one or more of the links of the chain resting on and out of driving engagement with one thereof while another link is in driving

engagement with the adjacent tooth, one end of the chain being disposed through an opening in the body unit and the other being connected to an extension spring within said body unit.

10. In a ratchet wrench, the combination of a chambered body unit, a spindle, a driving ratchet provided with ratchet teeth in fixed relation thereto, a holding ratchet provided with a co-acting pawl, and an actuating chain disposed around said driving ratchet to drivingly cooperate with the teeth thereof, said ratchet teeth being of relatively small radial dimension and being relatively elongated circumferentially with one or more of the links of the chain resting on and out of driving engagement with one thereof while another link is in driving engagement with the adjacent tooth, one end of said chain being connected to a retracting spring and the other being provided with a grip on the exterior of said body unit.

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