To all whom it may concern:

Be it known that I, Alfred R. Linden, a citizen of the United States, and resident of Dorchester, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Combination Ratchet Tools, of which the following is a specification.

This invention relates to ratchet tools and is directed more particularly to a holder or handle member to which wrench sockets, screw drivers and other work engaging tool parts may be detachably secured and operated.

A preferred form of this invention is an improvement on the construction illustrated in the Campbell Patent 1,371,350, issued March 15, 1921, and includes two axially aligned, relatively-rotatable members connected through the medium of a ratchet mechanism. Each of these members may be adapted for the attachment of a screwdriver, wrench socket, twist drill, or other tool or work engaging part which it may be desired to use. The tool may thus be operated by turning one member, and the turning force transmitted directly from the tool to the member attached thereto. As one feature of my invention I make one of the two relatively rotatable members materially longer than the other and of such size that it may conveniently serve as a handle or hand grip portion, and it is also preferably made hollow so that it may serve as a storage chamber or carrier for certain or all of the tool or work engaging parts when the latter are not in use.

As another important feature of my invention, I have provided means for the attachment of a handle bar to either of the relatively rotatable members, for rotating the device. Thus it is not necessary to remove the tool from the device and put it in the opposite end in order to change from a direct or positive drive to an indirect or ratchet drive.

As another feature, I construct the two relatively rotatable members for the attachment of different kinds of tools. Thus, either kind of tool may be positively or ratcheted, and the desired force for either tool may be applied by the use of the handle bar attached to either member.

Another feature of my invention consists in the provision of a novel ratchet mechanism which may be quickly adjusted, at will, to permit relative rotation of parts in one direction, while preventing such rotation in the other direction, and vice versa, and which may also be quickly adjusted to prevent relative rotation of said parts in either direction.

In order that my device may be adapted for use as a socket wrench to fit different sizes of threaded parts, I have provided as another important feature a hexagonal recess at one end of one member, and a series of liners of different sizes to fit into each other and all in said recess. This is particularly convenient in removing or tightening spark plugs. The recess may be made of proper dimensions to fit the largest standard size spark plug. The larger of these liners has an aperture dimensioned to fit the medium size standard spark plug, and the smaller liner is, in turn, designed to fit within the larger, and adapted to engage the small size standard plug.

Other features of my invention will be clearly understood from the detailed description and appended claims which follow.

In the drawing:

Fig. 1 is a longitudinal section of a device in accordance with my invention.

Figs. 2, 3 and 4 are cross-sectional views along the line X--X of Fig. 1, illustrating the operation of the ratchet mechanism.

Fig. 5 is an assembly view in elevation on a smaller scale than the sectional view of Fig. 1, and shows a screw driver tip inserted in one end of the device.

Fig. 6 is another assembly view in elevation showing a socket wrench attachment secured to the end of the device opposite to that in which the screw driver tip is secured in Fig. 5.

Fig. 7 is an end view of Fig. 6, and

Fig. 8 is a sectional view of one end of the device together with two liners, each of which is designed to fit a different size spark plug.

In the form illustrated, the two main members 1 and 2 are in axial alignment and relatively rotatable. Merely as one convenient way of connecting these members the member 1 is provided with a recess 3 in which the member 2 is seated, and the last
ter is held in place by a washer 4 which engages a shoulder thereon. After the member 2 and the washer 4 are put in place, the edge of the wall of the recess is spun over the edge of the washer thereby firmly securing the latter.

My improved means for permitting or preventing relative rotation of the two members includes radially extending ratchet teeth 21 on the inner member 2, adapted to be engaged by the oppositely disposed dogs or paws 5 and 6 which act in radial apertures in the peripheral wall of the recess. A spring 7 encircles said wall, preferably in an annular groove, and engages with the dogs to normally press them inwardly into operative position. The dogs have cam and straight faces so disposed that one may operate to prevent rotation of the member 2 in one direction and the other prevent rotation in the opposite direction. For controlling the action of these dogs I provide a button 8 which may be moved to a position adjacent to either dog to hold that one out of operation. As shown, it is secured to the middle portion of the wire spring 7, which latter is slidable in holes through the dogs. It will be noted that the annular wire spring 7 is held eccentrically to the axis of the members 1 and 2 by the button 8.

In Fig. 2 the button 8 is adjacent to the dog 6 and holds it out of engagement with the ratchet teeth 21, while the dog 5 is held in engagement therewith. The member 2 is then capable of being turned in the direction indicated by the arrow, but not in the opposite direction. In Fig. 3 the button 8 is shown midway between the dogs 5 and 6 so that both are engaged with the ratchet teeth 21. In this position, members 1 and 2 are incapable of relative rotation.

The end of the chamber 15 and the closure are shown as hexagonal in cross section. For facilitating the attachment of a tool or other part to the member 2, the latter is provided at its outward end portion with a non-circular recess 23 into which a tool, such as a screw driver or an extension bar, or a wrench socket or a twist drill socket may be inserted. For permitting the application of greater leverage in the rotation of the tool either directly or through the ratchet, the members 1 and 2 are provided with means for facilitating the attachment of a handle or lever bar thereto. This is shown as a lateral aperture 24 in the member 2 and a similar aperture 13 in the member 1 into either of which the lever bar 12 20 may be inserted for turning the device.

Power may be directly applied to a tool held by member 2 in the recess 23 if the bar 12 be inserted in the aperture 24; or it may be indirectly applied, that is, applied through the ratchet, by inserting the bar in aperture 13. For instance, when putting on a nut, the bar 12 would be first inserted in aperture 13 and the nut turned through the medium of the ratchet until it offered considerable resistance to turning, whereupon the bar would be withdrawn from aperture 13 and inserted in aperture 24, and the final turns would then be given without danger of damaging the ratchet mechanism.

Likewise, when removing a nut the bar could be used first in 24 and then in 13.

With the arrangement described, it will be seen that the tool may be driven either with or without the ratchet as desired, without the necessity of turning the device end for end to effect the change. Furthermore, the operator may firmly grip the member 1 and apply endwise pressure on the tool and rotate the latter by the bar in aperture 24 without rotation of the member 1. With the tool in member 2, it is not ordinarily necessary to use the bar in the aperture 13 as the member 1 may be gripped in the hand and oscillated when the nut turns easily.

The end of bar 12 is shown in Fig. 7 as bent at right angles to the main portion thereof, so that when the tool is not in use the short portion of the bar may be inserted in aperture 24 and the body of the bar swing around to lie parallel to the handle 1.

To permit the handle 1 to be of adequate size to be conveniently gripped in the hand and at the same time to keep the weight down, it is preferably made hollow and the interior chamber 15 utilized as a storage or carrying space for work engaging or accessory parts such as screw driver blades and the like when not in use.

The end of the chamber 15 may serve as a wrench socket and may also receive a plug 16 which serves the double function of a closure and as a connecting piece for a work engaging part. The end of the chamber 15 and the closure are shown as hexagonal in 260
A plurality of wrench sockets 20 of different sizes may be provided to all fit on the extension or connecting bar 18 and means may be provided for directly connecting different sized sockets to the handle 1 without the closure 16 or bar 18. This may be accomplished by a plurality of liners. The base shown in Fig. 8 may be formed of a piece of hexagonal steel tubing. Its outside dimensions are such that it fits within the hexagonal recess in the end of handle 1. A second liner 26 is designed, in turn, to fit inside liner 25. If desired, they may be split lengthwise and normally expanded outwardly to some extent so that, in order to be inserted, the smaller within the larger, and the larger within the recess in handle 1, they must be squeezed together. After having been inserted, the outward spring tension holds them in place. Although wrench sockets so formed by a series of concentric liners are adaptable for all of the purposes of the ordinary wrench socket, I preferably make them of such dimensions that the open end of the chamber 15, the interior of the liner 25, and the interior of the liner 26 will receive and fit the three standard sizes of spark plugs. Thus the handle 1 may be slipped with the spark plug, with or without liners depending on the size of the plug, and the plug turned by the lever bar 18 either directly or through the ratchet, dependent upon which of the members 1 or 2 the lever bar is attached to.

I preferably employ means for frictionally holding the detachable or separable parts together, but permitting their ready separation. For this purpose I have illustrated spring pressed balls partly projecting from drilled holes in certain of the parts. The holes may be reduced in diameter at their outer ends so as to prevent the escape of the balls. I have shown the member 2 provided with such a ball 27 for engagement with the lever bar 12, the closure 16 with a ball 28 for engagement with the inner surface of the chamber 15, the bar 18 with balls 29 adjacent opposite ends for engagement with the recesses in the closure 16 and the wrench sockets 20, and each screw driver blade with a ball 30 for engagement with the wall of the recess 23.

There are many possible modifications of the device illustrated, all of which would come within the spirit of my invention and the scope of the appended claims. Many illustrated details are comparatively unimportant.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A tool comprising two coaxial members, and means operable to permit relative rotation of said members in one direction, and to prevent relative rotation of said members in the other direction, each of said members being provided with an aperture for the reception of a lever bar.

2. A tool comprising two coaxial members, each being adapted for the attachment thereto of a lever bar and each being adapted for the attachment of a work engaging part thereto, and a ratchet mechanism operable to permit relative rotation of said members in one direction and to prevent relative rotation of said members in the other direction.

3. In combination, two members, each adapted for the attachment of a work engaging part, and each adapted for the attachment of a lever handle and ratchet connections between the members whereby a work engaging part attached to either member may be operated by the lever handle on that member or through the ratchet from the lever handle on the other member.

4. A tool comprising two concentric members and means operable to permit relative rotation of said members in one direction and to prevent relative rotation of said members in the opposite direction, each of said members being provided with an aperture substantially at right angles to the axis of rotation for the reception of a turning bar, one of said members being adapted for the attachment of a work engaging part.

5. A tool comprising two concentric members, and means operable to permit relative rotation of said members in one direction and to prevent relative rotation of said members in the opposite direction, each of said members being provided with an aperture substantially at right angles to the axis of rotation for the reception of a turning bar, each of said members being adapted for the attachment of a work engaging part.

6. A tool including a hollow handle, a closure member for one end, and a member having ratchet connections with the handle at the opposite end, each of said members having means for the attachment of a work engaging part thereto.

7. A tool including a hollow handle, a
closure member for one end, and a member having ratchet connections with the handle at the opposite end, each of said members having a noncircular recess for the attachment of a work-engaging part thereto.

8. In combination, an elongated handle member presenting a recess in one end, and a member having a ratchet wheel at one end, and means for connecting a work engaging part at the other end, and means intermediate the ends for the attachment of a lever bar, said ratchet wheel being disposed in said recess and held from relative rotation in one direction.

9. A tool including an elongated handle for applying endwise pressure to a work engaging part, and a one piece member having a recess in one end for slip connection of the work engaging part, and a transverse aperture intermediate of the ends for a lever handle and means engaging a surface at the other end thereof and adapted to hold said member against rotation in one direction in respect to said handle but permitting rotation in the opposite direction.

10. A tool comprising two concentric members, a ratcheting member of said members a pair of dogs carried by and disposed on the opposite sides of the outer end of said members and radially movable through the wall thereof, one of said dogs being adapted to engage said ratchet and prevent relative rotation of said members in one direction, and the other of said dogs being adapted to engage said ratchet and prevent relative rotation of said members in the other direction, a spring extending around the outer surface of the outer member and engaging both of said dogs to serve as the sole means for holding them in place and as means for resiliently pressing them toward the ratchet, and a button on the outer surface of the outer member engaging said spring and movable to a point adjacent either dog for holding that dog inoperative.

11. A tool including a hollow handle presenting a non-circular opening at one end adapted for use as a wrench socket, a plug closure for said opening and having a non-circular recess and a member adapted to engage said recess for attaching a work-engaging part to said closure.

12. A tool including a tubular handle having a chamber therein adapted to carry work-engaging parts and having an opening at one end of the full size of the interior of the chamber and adapted to serve as a wrench socket, and a non-circular plug closure for said opening and provided with a non-circular portion of smaller size for attachment of work-engaging parts thereto.

13. A tool including a tubular handle adapted to carry work engaging parts therein and a non-circular plug closure having a slip friction fit in one end of said handle for retaining said parts therein, and provided with a non-circular recess for the attachment of work engaging parts thereto.

14. An elongated hollow handle member adapted for the storage of work engaging parts therein and having means at each end thereof for the attachment of a work engaging part in alignment therewith and ratchet connections between said member and one only of said means, the other of said means being removable and constituting a closure for the chamber within the handle.

Signed at Boston Mass. this 28th day of July A.D. 1921.

ALFRED R. LINDEN.