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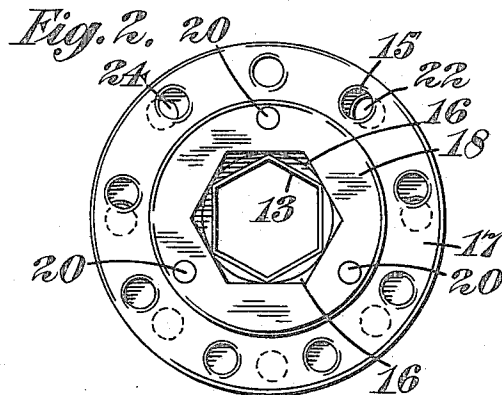
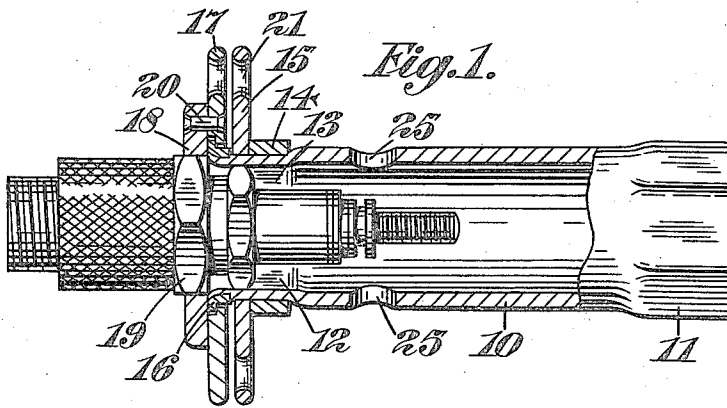
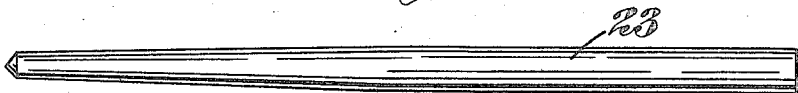


*Fig. 3.*



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## UNITED STATES PATENT OFFICE

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## WRENCH

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## 4 Claims. (Cl. 81—55)

This invention is for improvements in or relating to wrenches of the kind carrying a spanner element to grip one part and a separate spanner element to grip another part which is to be rotated, for example, screwed or unscrewed relatively to the first. Such wrenches are used for rotating a nut-member on a small object whereby the object is gripped and the necessity for a vise or other separate tool is obviated. Wrenches of the kind described are particularly useful for tightening or unscrewing the gland-nut of a sparking plug.

According to the present invention, a wrench of the kind described comprises a series of abutment-surfaces on, or on a part carried by, each of the spanner elements, wherein the two said series of abutment-surfaces are arranged in vernier relationship with one another, whereby a series of relative spacings of co-operating abutment-surfaces is available of which an appropriate spacing can be selected for the application of a tool, such as a lever, to engage both of the said abutment-surfaces. The two said series are preferably formed in discs arranged side-by-side and constituted by a circle of holes in each disc, the holes in one disc being in vernier relationship to the holes in the other. By inserting a suitably shaped lever in the appropriate pair of holes the two discs may be relatively rotated, whereby the nut is tightened or loosened.

In a preferred form of the invention, each disc or a part fixed to it is formed with a hexagonal or other non-circular opening to engage rotatively the part to which it is allocated, for example, to engage the body-nut of a sparking plug and the gland-nut respectively.

According to another feature of the invention, the lever aforesaid is tapered in width so that, as hereinafter explained, a small number of large holes can be used.

A specific embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawing, of which:—

Figure 1 is a side elevation in section, of a wrench according to the invention, showing a sparking plug in position.

Figure 2 is an outside elevation, looking on the left-hand end of Figure 1, while

Figure 3 shows a tapered bar for use with the wrench.

As shown in Figures 1 and 2 the wrench comprises a tube 10 which is pressed into hexagonal shape at each end. The hexagon 11 at the right-hand end of Figure 1 is of a size to engage the

body-nut of the sparking plug while the hexagon 12 at the left-hand end is of a size to engage the gland-nut 13 of the sparking plug as shown. The hexagonal portion 12 is surrounded by a collar 14 which may be welded to it and also by a circular metal disc 15 welded to the tube and to the collar 14.

The extreme left-hand end of the tube 10 is recessed to receive an L-sectioned ring 16 and the wall of the tube is pressed outwardly as shown 10 to grip the ring in position. A second circular metal disc 17, which is passed over the end of the tube 10 before the ring 16 is riveted in position has a recess to engage the flanged portion of the ring 16 on which it is rotatable. A metal plate 18 15 having a central hexagonal aperture of a size to engage the body-nut 19 of the sparking plug as shown is secured to the disc 17 by three symmetrically disposed rivets 20.

The fixed disc 15 is formed with eight symmetrically arranged holes 21 near its edge and the rotatable disc 17 is similarly formed with nine such holes (see Figure 2).

When it is required to unscrew or tighten the gland-nut of a sparking plug, the plug is spaced 25 in the wrench, terminal end foremost, as shown in Figure 1, so that the gland-nut 13 engages the hexagon 12 and the body-nut 19 engages the hexagonal hole in the plate 18. To tighten the gland-nut two holes in the discs 14 and 17 are 30 chosen which are somewhat out of register, as for example the holes 22 (see Figure 2). The tapered bar 23 (Figure 3) is then inserted with its narrow end foremost into the elliptical space passing through the holes 22. The bar 23 is then moved 35 so as to rotate the disc 17 in a clockwise direction with respect to the disc 14. Such rotation will have the effect of rotating the body-nut of the plug in a clockwise direction with respect to the gland-nut whereby the gland-nut is tightened. 40 If further rotation is required the tapered bar 23 is transferred to another pair of holes which lie in suitable relationship to one another at a point farther round the discs in a clockwise direction.

To unscrew the gland-nut from the plug two 45 holes in the discs 14 and 17 are chosen which lie slightly out of register with one another but in the reverse sense, such as the holes 24 (Figure 2). The tapered bar is inserted in this position and the disc 17 is rotated in a counter-clockwise direction with respect to the disc 14. If the gland-nut does not move freely, the tapered bar is transferred to a pair of holes farther round the discs in a counter-clockwise direction and lying in suitable relation to each other and the operation is 55

repeated until the gland-nut has been freed.

The tube 10 is formed with two diametrically opposite holes 25 through which the tapered bar may be passed and whereby the hexagon 11 may be used as an ordinary wrench for removing a sparking plug from the cylinder of an internal-combustion engine or for tightening the plug. When the wrench is used in this way, the disc 17 affords a handle by which it may be steadied.

10 The bar 23 is tapered to permit its use in elliptical spaces, between holes in the two discs, of different sizes so that a large relative angular movement between the discs may be obtained by the engagement of the bar with only one pair of holes. Similarly, the number of holes round the discs may be kept small with the result that they can be spaced a considerable distance apart, whereby a robust construction is obtained.

20 Instead of being formed with a circle of holes, each of the discs 14 and 17 may be castellated to form radially projecting lugs. There will be a different number of lugs on each disc so that the two discs, as above described, constitute a vernier. It will be appreciated that any desired number of holes or castellations may be employed provided suitable vernier relationship between the two discs is obtained.

30 Although the invention has been described above as applied to a wrench for unscrewing or tightening the gland-nut of a sparking plug, it will be appreciated that the invention is not limited to this application but may be applied generally to wrenches of the kind having means to grip one part and separate means to grip another part to be relatively rotated.

I claim:—

1. A wrench for tightening or removing the gland-nut of a sparking-plug comprising two superimposed, relatively rotatable circular discs one having a hexagonal aperture to engage the gland-nut and the other having a hexagonal aperture to engage the body-nut of the sparking-plug, wherein one of the said discs has eight circular holes symmetrically disposed around it and the other disc has nine circular holes symmetrically disposed around it whereby the two apertured discs bear a vernier relationship.

2. A wrench comprising two superimposed nut engaging elements which are connected together so as to be capable of relative rotation, the first to grip one part and the second to grip another part which is to be rotated relatively to the first part, a number of abutment surfaces on one of the elements and a different number of abutment surfaces on the other element differently spaced from the abutment surfaces on the first element.

3. A wrench comprising two discs arranged side by side and connected together so as to be capable of relative rotation, the first to grip one part, and the second to grip another part which is to be rotated relatively to the first part, a number of abutment surfaces on one of the discs and a different number of abutment surfaces on the other disc differently spaced from the abutment surfaces on the first element.

4. A wrench comprising two superimposed, relatively rotatable, hexagonal gripping means, a disc associated with each hexagon, a plurality of abutment surfaces on one of the discs and a plurality of abutment surfaces on the other disc differently spaced from the abutment surfaces on the first disc.

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