July 16, 1946. P. M. BIRK 2,404,029

TORQUE WRENCH

Filed May 6, 1944

FIG. 1

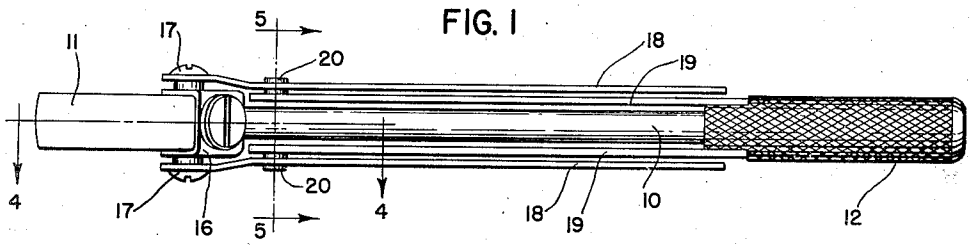


FIG. 2

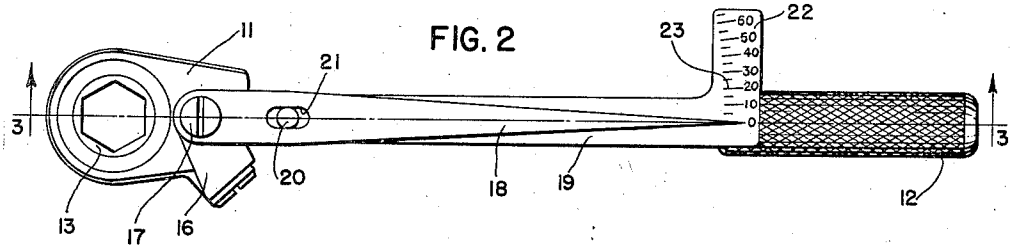


FIG. 3

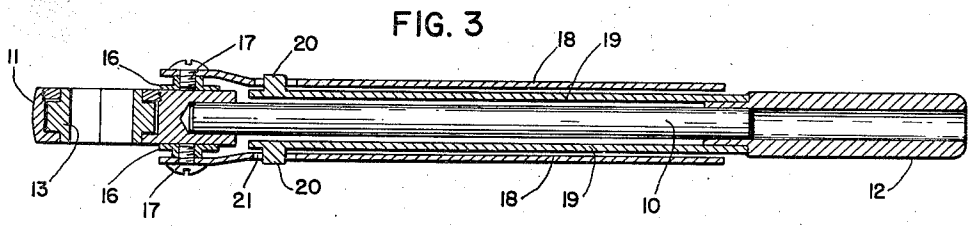
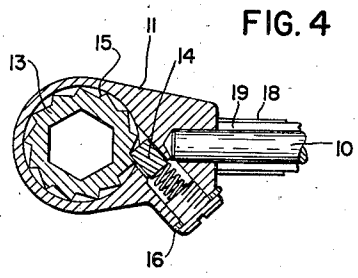


FIG. 4



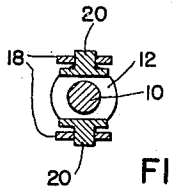


FIG. 5

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TORQUE WRENCH

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Application May 6, 1944, Serial No. 534,476

6 Claims. (Cl. 73—139)

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This invention relates to improvements in torque measuring and indicating wrenches, and more particularly the invention is concerned with a wrench of the type characterized by a resilient beam by which the torsional forces are transmitted to the part to be turned, the deflection of the said beam varying directly as the magnitude of such forces and hence being readily translatable into appropriate force units. Although not necessarily limited to such use, the wrench may be employed to particular advantage for winding the spring actuators which are associated with the shell feeding mechanisms of aircraft cannon and for indicating when such actuators have been wound to the proper degree.

One object of the invention is to provide a wrench which is compact and of light-weight construction and which may be manipulated in confined areas and stored in a minimum of space.

A further object is a wrench wherein provision is made for amplifying the deflection of the beam in such a manner that, although a short, relatively stiff beam may be employed, the magnitude of the forces acting upon the part being turned will be clearly and accurately indicated.

A still further object is to provide a wrench which may be availed of to apply turning forces to a part either in a clockwise or a counterclockwise direction and which will measure and indicate the magnitude of such forces in either direction.

The invention is illustrated in the accompanying drawing in which:

Figure 1 is a top plan view of a wrench embodying the features of the invention.

Figure 2 is a side elevational view of the wrench.

Figure 3 is a longitudinal section taken along line 3—3 of Figure 2.

Figure 4 is a detail sectional view taken along line 4—4 of Figure 1.

Figure 5 is a transverse section taken along line 5—5 of Figure 1.

The wrench, as illustrated, includes a resilient beam 10, one end of which carries a head 11 and the other end of which carries a handle 12. The wrench being of the ratchet type, the head 11 carries a socket 13 in which a terminal portion of the part to be turned is adapted to be accommodated. A spring-loaded pawl 14 (Figure 4) is engageable with teeth 15 on the socket in such a manner that a movement of the beam 10 with respect to the socket is permitted in one direction but prevented in the other.

In accordance with the invention the magnitude of the deflection of the beam 10 during a working stroke of the wrench is utilized to measure and indicate the magnitude of the forces acting upon the part to which such forces are transmitted. To this end a U-shaped element 16 is carried by the head 11. The terminal portions of the legs of the said element carry screws 17 which provide pivots for indicators 18, the latter being located at opposite sides of the beam 10. The indicators overlie similar arms 19 which are fixed to opposite sides of the handle 12. The said arms are supported by the handle preferably in spaced relation with respect to the beam and the respective indicators and terminate at their inner ends in the vicinity of the head 11. Oppositely extending studs 20, which are carried at the inner ends of the arms 19, occupy elongated slots 21 which are formed in the indicators 18, the outer ends of the arms 19 carrying lateral extensions 22. The latter bear suitably graduated scales 23 with which the indicators cooperate.

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It will be apparent that in the use of the wrench the beam 10 will be deflected more or less depending upon the force being applied to the handle 12 and that such deflection will be accompanied by a corresponding deflection of the free ends of the arms 19 in an opposite direction. As such movement of the outer ends of the arms 19 is transmitted to the indicators 18 by the studs 20, the indicators will traverse the scales 23 to indicate the value of the torsional forces acting upon the part being turned and thereby indicate whether and to what extent such turning should be continued.

It will be noted that the magnitude of the deflection of the indicators with respect to the deflection of the beam depends not only upon the resiliency of the beam but also upon the length of the arms 19 and the points at which the arms are connected to the indicators. The construction described, therefore, has the advantage that the deflection of the beam may, within limits, be amplified to any desired degree. Hence, a relatively stiff beam may be employed, when for any reason this is desired, it being only necessary in such case to increase the amplification of the beam deflection to obtain the desired accuracy of measurement and indication. The use of dual indicators in the manner described has the advantage that the wrench may be availed of to equal advantage in turning parts either in a clockwise or counterclockwise direction. This is effected by merely reversing the position of the wrench, so that one of the indicators 22 lies uppermost for clockwise turning and the oppo-

site indicator 22 lies uppermost for counterclockwise turning.

It is to be understood that any reference to the use of the wrench in connection with the winding of the spring actuators of shell feeding mechanisms is intended by way of example only, being noted particularly because of the special adaptability of the wrench for uses wherein the space in which the wrench must be manipulated is limited or the small size and light weight of the wrench may be of importance. Obviously the wrench may be employed to equal advantage for other purposes wherein the factors of size and weight may not be so important.

I claim as my invention:

1. In a torque measuring wrench, the combination of a head which is engageable with a part to be turned, a resilient beam connected to said head and which is deflected by the force applied to it in turning said part, a handle at the outer end of said beam, an indicator, a pivot for said indicator carried by said head, an actuating arm fixed at its outer end to said handle, and a slot and pin connection between said indicator and the inner end of said arm in the vicinity of said pivot.

2. In a torque measuring wrench, the combination of a head which is engageable with a part to be turned, a resilient beam connected to said head and which is deflected by the force applied to it in turning said part, a handle at the outer end of said beam, a U-shaped element fixed to said head and carrying pivots at the opposite sides of the latter, indicators connected to said head by said pivots, slots formed in said indicators in the vicinity of said pivots, arms which said indicators overlie, which at their outer ends are fixed to said handle and which at such ends are formed with graduated lateral extensions which said indicators may traverse, and studs carried at the inner ends of said arms and accommodated in said slots.

3. In a torque measuring wrench, the combination of a head which is engageable with a part to be turned, a resilient beam pivotally connected to said head and which is deflected by the force applied to it in turning said part, a ratchet and pawl connection between said beam and said head arranged to permit free pivotal movement of said beam with respect to said head in one direction and to prevent pivotal movement of said beam with respect to said head in the opposite direction, a handle at the outer end of said beam, a pair of indicators, a pair of pivots carried by said head, each said pivot carrying one of said indicators, a pair of actuating arms fixed to said handle at one end, and a pair of slot and pin actuating connections between the inner ends of said actuating arms and said indicators in the vicinity of said pivots.

4. In a torque measuring wrench, the combination of a head which is engageable with a part to be turned, a resilient beam connected to said head and which is deflected by the force applied to it in turning said part, a handle at the outer end of said beam, an indicator, an actuating connection between said indicator and said head, an actuating arm fixed at its outer end to said handle, and an actuating connection between said indicator and the inner end of said arm in the vicinity of the first mentioned actuating connection, one of said actuating connections being a pivot connection and the other a pin and slot connection.

5. In a torque measuring wrench, the combination of a head which is engageable with a part to be turned, a resilient beam connected to said head and which is deflected by the force applied to it in turning said part, a handle at the outer end of said beam, a pair of indicators, a pivot connection between each indicator and the head, an actuating arm for each indicator fixed at its outer end to said handle and having a graduated lateral extension which the indicator may traverse, and an actuating connection between the inner end of each arm and its indicator in the vicinity of said pivot.

6. In a torque measuring wrench, the combination of a head which is engageable with a part to be turned, a resilient beam connected to said head and which is deflected by the force applied to it in turning said part, a handle at the outer end of said beam, a pair of indicators, a pivot connection between each indicator and the head, an actuating arm for each indicator fixed at its outer end to said handle and having a graduated lateral extension which the indicator may traverse, and a pin and slot connection between the inner end of each arm and its indicator in the vicinity of said pivot.

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