May 20, 1941. S. MANDL 2,242,613

TORQUE WRENCH

Filed Aug. 15, 1938

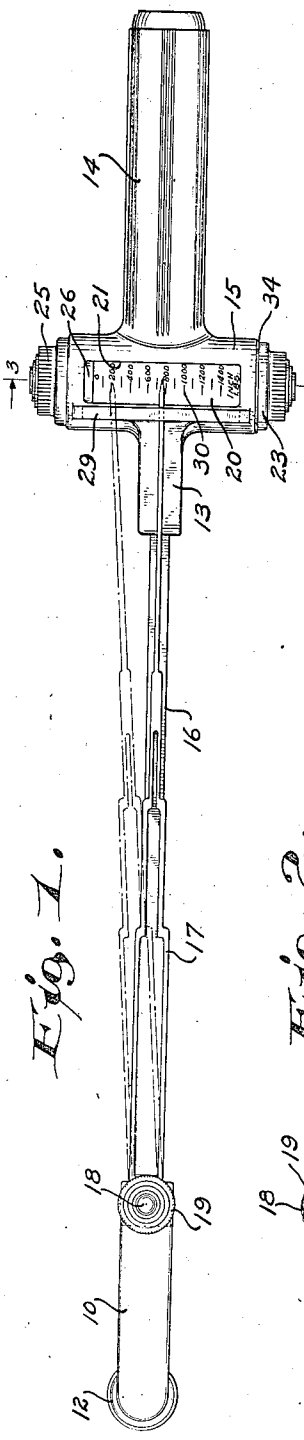


Fig. 1.

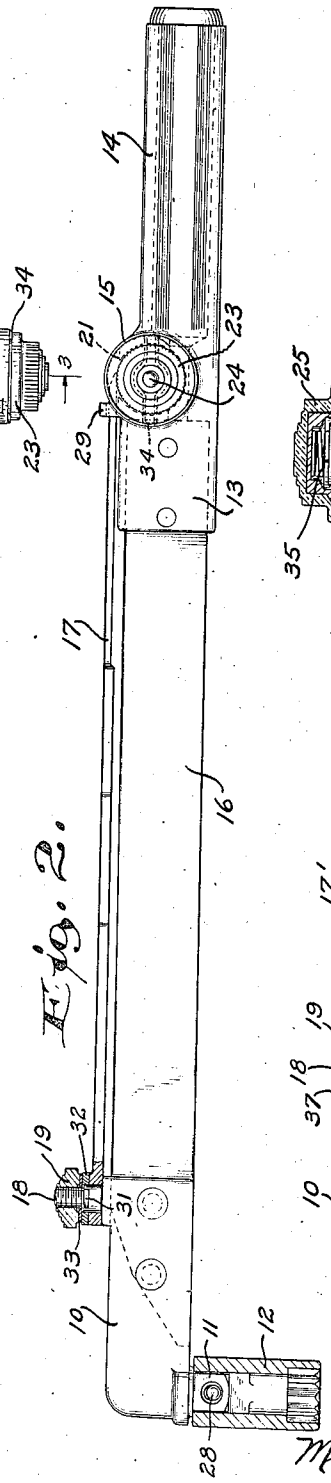


Fig. 2.

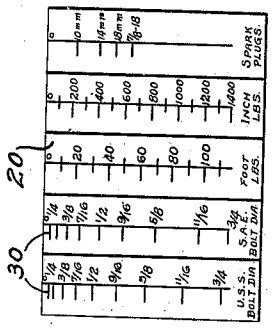


Fig. 5.

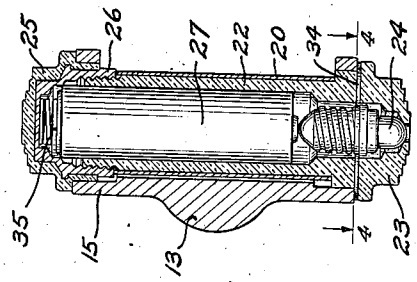


Fig. 3.

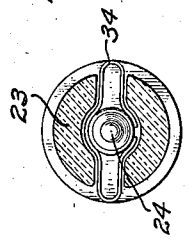


Fig. 4.

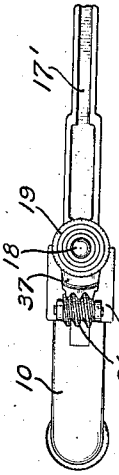


Fig. 6.

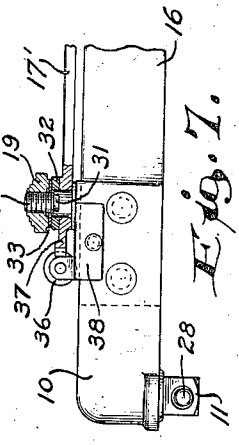


Fig. 7.

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UNITED STATES PATENT OFFICE

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TORQUE WRENCH

Siegmund Mandl, Milwaukee, Wis., assignor to Blackhawk Mfg. Co., Milwaukee, Wis., a corporation of Wisconsin

Application August 15, 1938, Serial No. 224,911

16 Claims. (Cl. 265—1)

My present invention relates generally to improvements in the construction of torque or tension wrenches wherein indicating means are provided for revealing to the operator the force being applied during normal use of such tools.

An object of my invention is to provide a new and useful torque wrench which is extremely simple and durable in structure, and which is also highly efficient and flexible in its uses.

As shown and described in my copending application Serial No. 215,622, filed June 24, 1938, I have previously devised a torque wrench equipped with a flash light for indicating or showing the operator when a predetermined force has been applied to the wrench handle. While the wrench forming the subject of this prior application is highly satisfactory and extremely accurate in use, the structure of the wrench is rather complicated and delicate, and the cost of construction is quite prohibitive for ordinary uses. The prior wrenches of this general type are moreover relatively restricted as to range of use, because of the limited space available for gages or dials bearing diverse sets of indicator graduations. Due to their rather delicate construction, the prior tools of this type are also apt to have their accuracy materially affected or destroyed, when they are dropped or abused during normal use. The former indicating wrenches moreover cannot be as readily reversed, or used for right or left pull, as is frequently desirable, thus making the prior torque wrenches relatively objectionable for numerous specific reasons.

It is therefore an object of the present invention to provide an improved indicating wrench, having numerous gages with wide-spread graduations or calibrations, adapted to be made quickly and conveniently accessible to the operator, so that the tool may be utilized for various purposes and for either right or left pull.

Another specific object of the invention is to provide a compact and sturdy tension wrench having improved indicating gage and pointer mechanism which is readily adjustable so as to insure accurate and diverse readings or indications.

A further specific object of my invention is to provide improved structure for housing a flash light within an indicator wrench assembly, whereby the light bulb is effectively protected while permitting convenient access thereto and to the battery.

Still another specific object of my present invention is to provide an improved torque wrench wherein the accuracy of performance is not affected by virtue of accidental distortion of the indicating pointer, and in which the pointer may be conveniently adjusted for various classes of readings and may also be locked in adjusted position.

An additional object of the invention is to provide a simple and attractive tension wrench which besides being durable and extremely utilitarian in construction, may be manufactured and sold at moderate cost.

These and other objects and advantages of the invention will be apparent from the following detailed description, and some of the novel features of torque wrench construction shown and described but not specifically claimed herein, from the subject of my copending application Serial No. 215,622, filed June 24, 1938.

A clear conception of the present improvement, and of the construction and operation of several types of tension wrenches built in accordance with the invention, may be had by referring to the drawing accompanying and forming a part of this specification, wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is a plan view of one of my improved wrenches, showing the indicating needle in central position in solid lines, and in dot-and-dash lines in adjusted position;

Fig. 2 is a part sectional side elevation of the wrench and detachable socket of Fig. 1;

Fig. 3 is an enlarged transverse vertical section through the wrench of Figs. 1 and 2, taken along the line 3—3 of Fig. 1;

Fig. 4 is a section through the flash light confining portion of the wrench, taken along the line 4—4 of Fig. 3;

Fig. 5 is a development of one type of graduated indicator gage;

Fig. 6 is a fragmentary plan view of another type of the improved wrench, having a modified type of indicator needle adjustment; and

Fig. 7 is a part sectional side elevation of the modified structure of Fig. 6.

While I have shown the improved features embodied in a specific type of manually operable torque wrench having a square shank which is detachably attachable to a work engaging socket, it is not intended to unnecessarily restrict the scope by virtue of such specific embodiment, nor is it the intent to restrict the invention by the use of specific descriptive terms.

Referring to the drawing, my present im-

proved tension or torque wrench as illustrated therein, comprises in general a work engaging end member 10 having an integral square shank 11 which is detachably attachable to a work embracing socket 12; a manipulating and gage supporting member 13 having a hollow handle 14 and an annular transverse cage 15 formed integral therewith; a relatively stiff but flexible bar 16 rigidly interconnecting the members 10, 13; an indicating pointer 17 swingably adjustably secured to the end member 10 by means of a threaded stud 18 and a thumb nut 19 coacting therewith; a hollow cylindrical graduated chart or dial 20 rotatably adjustably confined within the cage 15 and having a section thereof visible through an elongated opening 21 formed in the cage; a hollow flash light support 22 snugly engaging the dial 20 and having one end open and its opposite end 23 formed for internal reception of a light bulb 24; a closure cap 25 for the open end of the support 22 and having a pointer engaging metal cup 26 confined therein; and a battery or dry cell 27 confined within the support 22 by the cap 25 and having opposite poles connectible with the bulb 24 and cup 26 respectively when the tubular support 22 is clamped within the cage 15 by the cap 25.

As shown, the yieldable or flexible bar section 16 is rigidly attached to the end members 10, 13 by means of rivets, but these may be replaced by welding, or the end members and the intermediate yieldable or flexible section may be formed of a single piece of metal. The shank 11 which is formed integral with the end member 10 is attachable to the work engaging socket 12 by means of a spring pressed latch plunger 28 of well known construction, thus permitting substitution of sockets 12 of different sizes or shapes, and the socket may obviously be formed integral with the member 10 if so desired. The end member 13 is provided with a transverse guide rail 29 beneath which the indicating end of the pointer 17 is movable along the opening 21 and in close proximity to the graduations 30 of the dial 20; and the stud 18 upon which the pointer 17 is pivotally mounted, is provided with a flattened portion 31 with which a washer 32 coacts. The washer 32 directly engages the end of the pointer 17 but is fixed against rotation relative to the stud 18, and a spring washer 33 is interposed between the washer 32 and the thumb nut 19 so that when the nut 19 is manipulated to clamp or release the pointer 17, the rotation of the nut will merely cause the clamping washer 32 to move slightly along the stud 18 without causing the washer to rotate and thereby destroy the setting of the pointer 17. The pointer 17 is thus frictionally attached to the work engaging end member 10, and may be either pre-set to coact with any predetermined graduation 30 of the dial 20 before deflection of the bar 16, or off-set from a predetermined position by such deflection.

The cylindrical graduated chart or dial 20 which normally snugly embraces the tubular support 22 and is confined within the tubular cage 15, may be formed of any suitable sheet material such as paper, cellulose film or thin metal, and may be provided with diverse scales of graduations 30 as shown in Fig. 5. These graduations 30 may be under either the British or metric system, or under any other desired system, ranging from zero to any selected higher value within the range of operation of the tool. After the dial sheet has been provided with the calibrations or graduations 30 and has been bent and secured in cylindrical form, it may be applied to the tubular support 22 either as shown, with the zero graduations near the open end of the support, or in reverse position with the zero graduations nearest the support end 23, and the hollow cylindrical dial 20 may then be adjusted about the support 22 so as to bring any desired scale or set of graduations 30 in alinement with the opening 21.

The support 22 and cap 25 are preferably formed of relatively transparent and hard material having electric insulating qualities or properties, so that the dry-cell 27 which is confined within the support 22 is insulated from the cage 15. The light bulb 24 is removably confined within the support end 23 by means of a metal spring clip 34 which is confined within the support 22 as shown in Figs. 3 and 4. This spring clip 34 may be formed of spring wire and is adapted to snugly engage the metal cage 15 when the support 22 is clamped therein, so as to establish an electrical connection between the bulb 24 and the metal end member 13, and the battery or cell 27 is adapted to be forced into electrical contact with the end terminal of the light bulb 24 by means of a coil spring 35 coacting with the opposite end of the battery cell and with the interior of the metal cup 26. The cup 26 forms a lining for the closure cap 25, and has screw thread coaction with the open end of the support 22, so that when the cap 25 and cup 26 are inserted within the cage 15 are are screwed together, these parts are clamped in position but without causing the cup 26 to contact the cage 15. The pointer 17 is however swingable into contact with the exposed portion of the metal cup 26, and when such contacting is effected, the electric circuit through the battery and light is completed and the bulb 24 is illuminated. The support 22 may be clamped within the cage 15 in either direction thus making the tool usable for either right or left operation, and when the clamping cap 25 is effective, the graduated dial 20 is also locked against rotation about the support 22.

Referring more particularly to Figs. 6 and 7, here I have shown simple but effective means for adjusting the indicator needle or pointer and for locking it in adjusted position. The pointer 17' of this modification is provided with a toothed extension or worm wheel segment 37 which coacts with a worm 36 journalled in a bracket 38 secured to the work engaging member 10. The worm 36 may be rotated by application of a finger or thumb, and when rotated will cause the pointer 17' to swing about its pivot stud 18. The clamping nut 19 and washers 32, 33 function as previously described, and the worm 36 when stationary will obviously lock the pointer 17' in adjusted position.

During normal use of the improved wrench, the calibrated chart or dial 20 should first be properly positioned upon the support 22 and adjusted thereabout so as to bring the desired scale of graduations 30 in proper cooperative relation to the pointer 17. The pointer 17 should also be properly initially positioned either by manually shifting and causing the same to register with the desired maximum graduation which is to be reached during subsequent use and by clamping the pointer in that position; or by causing the pointer tip to initially register with the zero calibration and by thereafter deflecting the bar 16 to move the pointer by such deflection into regis-

try with the desired maximum indicating graduation so as to cause the friction nut 19 and washers 32, 33 to frictionally retain the pointer in predetermined off-set position. For example, the pointer 17 may be initially manually set as shown in Fig. 1, with the pointer point in approximate registration with 800 inch pound registration, and when the wrench is applied to a bolt, nut or the like, and a pull of 800 inch pounds is exerted on the handle 14, the pointer 17 will contact the cup 26 and the bulb 24 will illuminate, thereby giving a visible indication of attainment of the desired maximum or predetermined force to be applied. On the other hand, the pointer point may be initially set at zero and the bar 16 may thereafter be deflected by applying a pull on the handle 14 so as to cause the pointer 17 to be shifted by a pull of predetermined value of say 800 inch pounds. When the handle 14 is subsequently released and the bar 16 assumes normal position the pointer point will register with the 800 inch pound registration, and this operation may be used for checking against a master gage. The pointer 17 may swing from one end of the opening 21 to the other, and by utilizing a single scale from zero to the maximum range of the tool, and by reversing the gage for right or left operation, the distance between indicating lines or graduations 30 may be made relatively great. The implement may obviously be used either for tightening or loosening threaded elements having either right or left hand threads, and the accuracy of indication is not affected by accidental permanent bending or distortion of the pointer 17 or of the bar 16. The modified mechanism shown in Figs. 6 and 7 may be used for more accurate mechanical adjustment of the pointer 17' and for locking thereof, and in any event, the flashing of the light gives a visible indication of the attainment of the predetermined or desired pull or force which is applied to the handle 14.

From the foregoing detailed description of the construction and operation of my improved implement, it will be apparent that the invention provides an accurate and highly flexible torque wrench which is extremely simple in construction and readily manipulable. The adjustability of the pointer 17 and the rotatably adjustable and reversible chart or dial 20, provide extreme utility and range of use, and the removability of the dial 20 permits convenient substitution of other types of scales. The flashlight is also thoroughly protected against possible damage due to dropping of the tool, and the battery or dry cell 27 and bulb 24 are readily removable and replaceable. The spring clip 34 while effectively holding the bulb 24 in normal position, also protects the same against damage due to shock, and the housing of the flashlight within the dial 20 and cage 15 also makes compactness possible. The improved wrench besides being compact and durable in structure, may be manufactured and sold at moderate cost, and has proven highly satisfactory and practicable in use.

It should be understood that it is not desired to limit the invention to the exact details of construction or to the precise mode of use, herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

I claim:

1. In a wrench, relatively yieldable work-engaging and handle members, a calibrated dial carried by one of said members, a pointer carried by the other member and being movable along said dial upon relative deflection of said members, said pointer being angularly adjustable relative to its carrying member, and manually manipulable worm gearing for effecting adjustment of said pointer and for positively locking the same in various positions of adjustment relative to its carrying member.

2. In a wrench, relatively yieldable work-engaging and handle members, a calibrated dial carried by one of said members, a pointer carried by the other member and being movable along said dial upon relative deflection of said members, said pointer being angularly adjustable relative to its carrying member, and self-locking worm gearing coacting with the pivoted end of the pointer for effecting adjustment of said pointer and for positively locking the same in various positions of adjustment.

3. In a wrench, relatively fixed and movable work-engaging and manipulating members, a yieldable connection between said members, a cylindrical indicating dial carried by said movable member and being rotatably adjustable about its axis, a pointer carried by said fixed member and being coperable with said dial, an indicating light housed within said dial, and contact means operable to illuminate the light only when said pointer has reached a predetermined indicating position.

4. In a wrench, relatively fixed and movable work-engaging and manipulating members, a yieldable connection between said members, a hollow cylindrical support carried by one of said members, a dial embracing said support and being adjustable thereabout, a pointer carried by the other of said members and being cooperable with said dial, a flash light assemblage housed within said support, and contact means operable to illuminate said light only when said pointer reaches a predetermined position.

5. In a wrench, relatively movable work-engaging and manipulating members, a yieldable connection between said members, a removable support carried by and extending transversely of one of said members, a dial embracing said support and being reversible thereon to accommodate relative movement of said members in either direction, and a pointer carried by the other of said members and being cooperable with said dial, said pointer being movable in opposite directions corresponding to the direction of relative movement of said members and cooperating with said dial when reversed to change the assemblage from right to left hand and vice versa.

6. In a wrench, relatively movable work-engaging and manipulating members, a yieldable connection between said members, a removable support carried by and extending transversely of one of said members, a dial embracing said support and being reversible thereon to accommodate relative movement of said members in either direction, a pointer carried by the other of said members and being cooperable with said dial, said pointer being movable in opposite directions corresponding to the direction of relative movement of said members and cooperating with said dial when reversed to change the assemblage from right to left hand and vice versa, and a visible indicator associated with said support and being operable by movement of said pointer to a predetermined indicating position along said dial.

7. In a wrench, relatively movable work-engaging and manipulating members, a yieldable connection between said members, a removable

support carried by and extending transversely of one of said members, a dial embracing said support and being reversible thereon to accommodate reverse relative movement of said members, a pointer carried by the other of said members and being cooperable with said dial, said pointer being movable in opposite directions and cooperating with said dial when reversed to change the assemblage from right to left hand and vice versa, and common means for locking said support to its carrying member and said dial to said support.

8. In a wrench, relatively movable work-engaging and manipulating members, a yieldable connection between said members, a cage carried by one of said members, a dial rotatably adjustable within said cage, a pointer carried by the other of said members and being cooperable with said dial, a flashlight mounted within said dial and being secured to said cage and contact means for effecting illumination of said flashlight only when said pointer reaches a predetermined position relative to said dial.

9. In a wrench, relatively movable work-engaging and manipulating members, a yieldable connection between said members, a cage carried by one of said members and extending thereacross, a dial mounted within said cage and being revolvable therein, a tubular support for said dial secured to said cage, a pointer carried by the other of said members and being cooperable with said dial, and a flashlight mounted within said support and being operable by movement of said pointer relative to said dial and only when said pointer reaches a predetermined position.

10. In a wrench, relatively yieldable work-engaging and manipulating members, an elongated cylindrical dial reversibly suspended from one of said members and having several sets of graduations thereon, means for effecting adjustment of said dial about and reversal thereof relative to its longitudinal axis to place a selected set of said graduations in working position, a pointer carried by the other of said members and being interchangeably cooperable with said sets when in said working position, and means for effecting adjustment of said pointer for proper cooperation with the graduations of each set.

11. In a wrench, relatively yieldable work-engaging and manipulating members, a dial reversibly suspended from one of said members and having several sets of graduations thereon, means for effecting adjustment and reversal of said dial to place a selected set of said graduations in working position, a pointer carried by the other of said members and being interchangeably cooperable with said sets when in working position, and means for effecting relative adjustment of said pointer and dial to cause said pointer to properly cooperate with the graduations of each set as selected.

12. In a wrench, relatively yieldable work-engaging and manipulating members, an elongated hollow indicating dial carried by one of said members and being rotatably adjustable about its longitudinal axis, a pointer carried by the other of said members and being cooperable with said dial, a signal light housed within said dial, and contact means operable by the wrench structure upon predetermined relative yielding of said members to illuminate said light.

13. In a wrench, relatively yieldable work-engaging and manipulating members, an elongated indicating dial carried by one of said members, said dial having several sets of graduations thereon and being adjustable to place a selected set of said graduations in working position, a pointer carried by the other of said members and being interchangeably cooperable with said sets when in working position, a signal housed within said dial, and means operable by the wrench structure upon predetermined relative yielding of said members for actuating said signal.

14. In a wrench, relatively yieldable work-engaging and manipulating members, an elongated hollow indicating dial disposed transversely of and carried by one of said members, said dial having several sets of graduations extending along its axis and being rotatable about said axis to place a selected set of said graduations in working position, a pointer carried by the other of said members and being interchangeably cooperable with said sets when in working position, a signal housed within said dial, and means operable by the wrench structure upon predetermined relative yielding of said members for actuating said signal.

15. In a wrench, relatively yieldable work-engaging and manipulating members, an elongated hollow indicating dial disposed transversely of and carried by one of said members, said dial having several sets of graduations extending along its axis and being rotatable about said axis to place a selected set of said graduations in working position, a pointer carried by the other of said members and being interchangeably cooperable with said sets when in working position, a flashlight housed within said dial, and contact means operable upon predetermined movement of said pointer relative to said dial due to relative movement of said members to illuminate said light.

16. In a wrench, relatively yieldable work-engaging and manipulating members, an elongated hollow indicating dial disposed transversely of and carried by one of said members, said dial having several sets of graduations extending along its axis and being rotatable about said axis to place a selected set of said graduations in working position, a pointer carried by the other of said members and being interchangeably cooperable with said sets when in working position, and a flashlight mounted within said dial and being operable upon movement of said pointer relatively to said dial and only when said pointer reaches a predetermined position.

SIEGMUND MANDL.