United States Patent

[11] 3,581,606

[72] Inventor Bosko Grabovac, Altadena, Calif.
(C.D.I., 818 E. Broadway, San Gabriel, Calif. 91776)

[21] Appl. No. 827,331
[22] Filed May 23, 1969
[45] Patented June 1, 1971

[54] **TORQUE WRENCH**
8 Claims, 8 Drawing Figs.

[52] U.S. Cl. 81/52.4
[51] Int. Cl. B25b 23/14
[50] Field of Search 81/52.4, 52.5

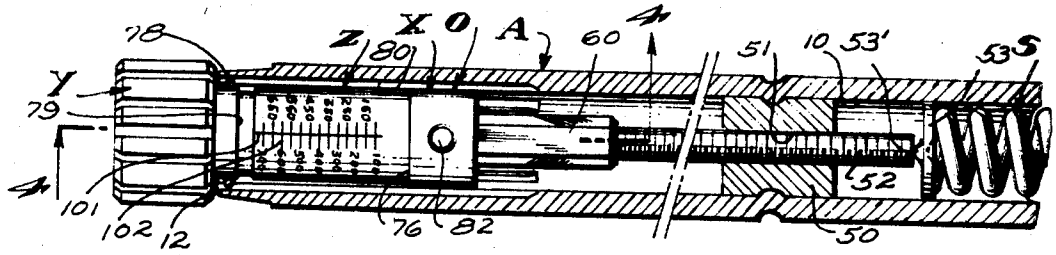
[56] References Cited

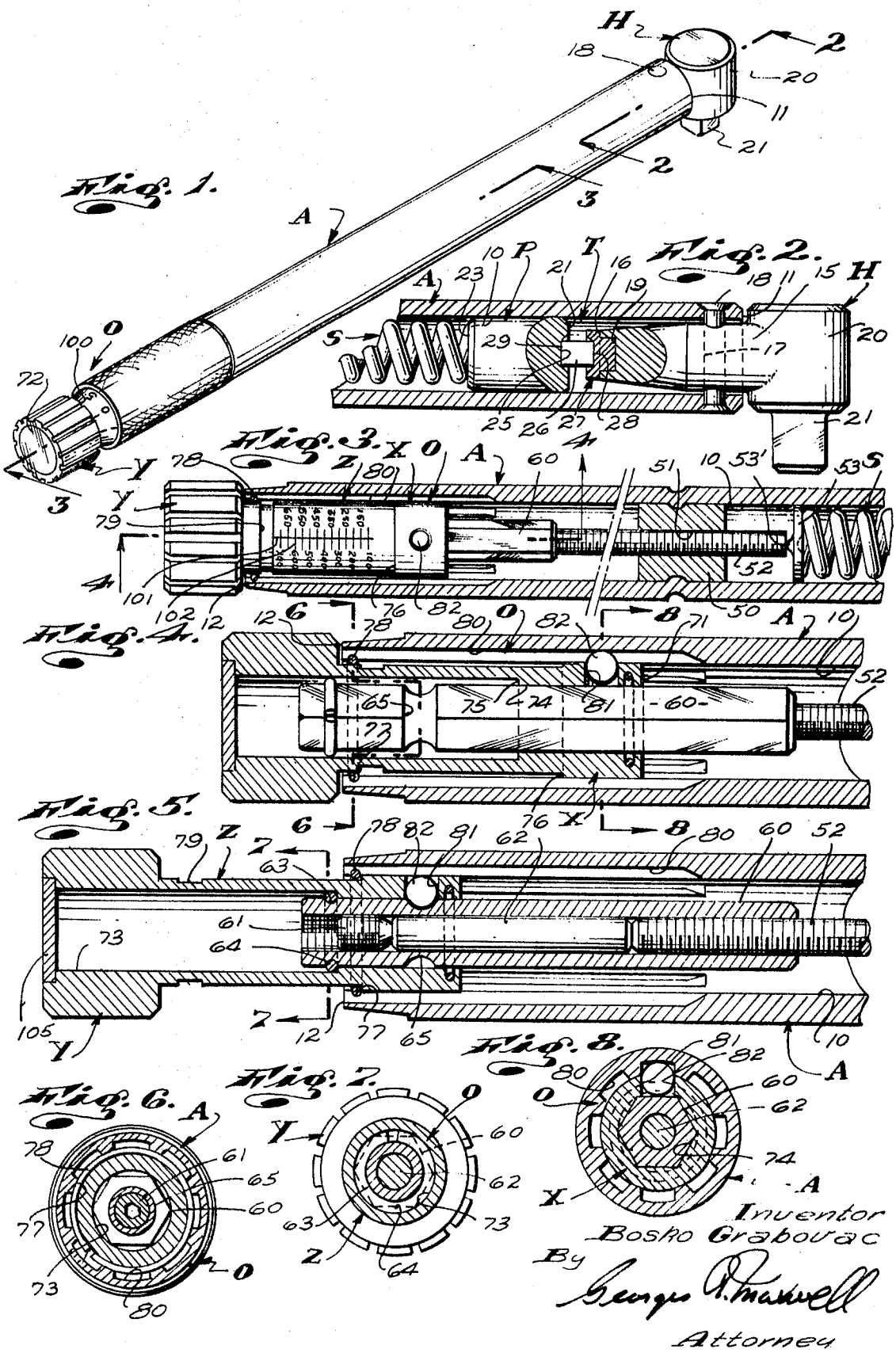
UNITED STATES PATENTS

2,732,747	1/1956	Livermont	81/52.5
2,792,733	5/1957	Walraven et al.	81/52.4

Primary Examiner—Travis S. McGehee
Attorney—Georges A. Maxwell

ABSTRACT: An adjustable torque wrench having an elongate tubular lever arm with front and rear ends, a work engaging head pivotally connected to its front end, spring actuated means within the arm to yieldingly prevent the head from pivoting relative to the arm, and manually operable adjusting means to vary the resistance of the spring actuated means, said manually operable means including an elongate, calibrated cylindrical part with a manually engageable enlargement at its rear end rotatably and shiftable engaged in the rear end of the arm and shiftable from a normal position where the part occurs within the arm and the enlargement occurs adjacent the rear end of the arm to an actuated position where the calibrated part projects rearwardly from the arm, screw means in the arm to vary the resistance of the spring actuated means, axially shiftable rotary drive means between the screw means and said part and lock means to releasably lock said part against rotation relative to the arm when said part is in its normal position.





Inventor
Bosko Grabovac
By George A. Maxwell
Attorney

TORQUE WRENCH

This invention has to do with an improved torque wrench and is more particularly concerned with a torque wrench having novel means for adjusting and setting the torque limits of said wrench.

In the art of torque wrenches, a number of different and special types or classes of such wrenches are provided. One type or class of wrench and with which the present invention is concerned or related is best described as a torque limit indicating wrench and is such that upon application of predetermined forces through the wrench and onto a piece of work with which the wrench is related, a signal is transmitted, which signal is sensed by the operator of the wrench. Such wrenches are sometimes referred to as "predetermined torque releasing wrench."

The most effective and dependable wrench of the above-noted class of wrenches includes an elongate, tubular lever arm with a hand engaging rear end and work-engaging heads at its other or front end. The head is pivotally carried by the arms and has a rearwardly projecting stem which projects rearwardly into the arm. Spaced rearward of the stem is an axially shiftable plunger. Between the plunger and the stem is a tripping mechanism which includes a pair of seat members or parts with flat, axially spaced opposing surfaces and an axially extending trip block with flat, axially disposed ends normally engaging the noted opposing surfaces. The plunger is normally yieldingly urged forwardly to maintain the block in predetermined pressure engagement with the construction with the noted surfaces in flat pressure bearing engagement. The block normally maintains the stem of the head in axial alignment with the arm. Upon the exertion of predetermined torsional forces on and through the head, which tend to turn said head about its pivotal connection with the arm and results in swinging misalignment of the stem in the arm, the block is urged and trips out of axial alignment in the construction, urging the plunger rearwardly and permitting the stem to swing laterally in and to strike a side of the interior of the arm, thereby transmitting a short striking impact force and corresponding sound which can be readily sensed by the operator.

The force required to effect operation of the tripping mechanism is determined by the yielding force which is exerted by the plunger onto and through said mechanism.

To adjust, vary and control the forces required to operate the above-noted tripping mechanism, the prior art provides a number of different manually operable adjusting and setting means. These means characteristically include a compression spring in the lever arm, rearward of the plunger and screw actuated means rearward of the spring and operable to vary the force exerted by the spring on the plunger. The screw actuated means must be such that they can be calibrated so that the constructions can be adjusted and set to operate under predetermined forces and they must be such that they can be locked or set in their adjusted positions or conditions and thereby be prevented from being inadvertently moved out of adjustment.

The adjusting and setting means provided by the prior art are costly and complicated to manufacture; are difficult to service and maintain; are easily moved out of adjustment by inadvertance or mistake; and are characteristically delicate and subject to being damaged and rendered inoperative.

An object of my invention is to provide an improved wrench of the character referred to having a novel and improved adjusting and setting means which is less complicated and costly to manufacture; easier to operate and maintain; less subject to being accidentally moved out of adjustment; and which is more rugged and durable then the adjusting and setting means provided by the prior art.

The adjusting and setting means provided by the prior art characteristically includes a spring engaging screw part projecting rearwardly from the wrench lever arm and an elongate, thin walled, costly to make and delicate or fragile hand engaging operating sleeve for the screw part which sleeve is connected with the rear end of the screw part and projects forwardly into sliding supported engagement about the rear end portion of the lever arm. The noted sleeves serve to define the handgrips for the wrenches and are such that they require special locking means to prevent their being rotated out of adjustment when the wrenches are in use.

Further, due to their fragile nature and their being arranged outside of the lever arm and fully exposed, they are highly susceptible to being damaged.

An object of my invention is to provide novel adjusting and setting means which is normally substantially wholly within and protected by the lever arm of the wrench and a means which has no thin walled and fragile element or part which is normally exposed and, therefore, subject to being damaged.

Another object of the invention is to provide a means of the character referred to which is such that it leaves the rear end portion of the lever arm free and unobstructed whereby the said rear end portion of the arm can be directly manually engaged to operate the wrench.

Yet another object of the present invention is to provide a means of the character referred to which includes a calibrated part which normally occurs within the lever arm to be projected thereby, but which is such that it can be easily and conveniently drawn from within the arm for operation of said part and reading of the calibrations thereon.

Another object of my invention is to provide a means of the character referred to have novel and highly effective locking means for locking the construction in set position and which is such that it cannot fail or release without easy and clear detection by the operator thereof.

The foregoing and other objects and features of my invention will be understood from the following detailed description of a typical preferred form and application of said invention, throughout which description reference is made to the accompanying drawings, in which:

FIG. **1** is an isometric view of my new wrench;

FIG. **2** is a sectional view taken as indicated by line **2–2** on FIG. **1**;

FIG. **3** is a partial sectional view taken as indicated by line **3–3** on FIG. **1**;

FIG. **4** is an enlarged detailed sectional view taken as indicated by line **4–4** on FIG. **3**, with parts in a normal position;

FIG. **5** is a view similar to FIG. **4** with parts in an actuated position;

FIG. **6** is a sectional view taken as indicated by line **6–6** on FIG. **4**;

FIG. **7** is a sectional view taken as indicated by line **7–7** on FIG. **5**; and,

FIG. **8** is a sectional view taken as indicated by line **8–8** on FIG. **4**.

The wrench construction that I provide includes an elongate, tubular lever arm A with a cylindrical bore **10** and axially opening front and rear ends **11** and **12**. The arm A is established of high tensile steel and has a relatively thick or substantial wall thickness whereby said arm is extremely strong and is not subject to bending and deflection when subjected to forces likely to be encountered.

The wrench further includes a work-engaging head H at the forward end of the arm. The head H includes an elongate stem **14** with front and rear ends **15** and **16** and freely engaged in the front end portion of the bore **10** in the arm A with its forward end terminating forward of the front end **11** of the arm. The stem has a substantially cylindrical front portion, slightly smaller in diameter than the bore **10** and a rearwardly convergent rear portion. The front portion is provided with a vertically extending pivot pin receiving opening **17** intersecting the central longitudinal axis of the stem and the arm and through which a pivot pin **18** engaged through and carried by the arm is engaged. The rear end of the arm is shown provided with an axially rearwardly opening socket **19** with a flat rearwardly disposed bottom.

With the above relationship of parts, it will be apparent that the stem **14** of the head H is pivotally carried by the arm A on a vertical axis and that the front and rear ends thereof are free

to swing laterally about the pivotal axis of the stem. It will be further apparent that lateral swinging or preventing of the stem is limited by the relationship between the rear end of the stem and the bore **10** in the arm since the rear end portion of the arm engages and is stopped on the bore in the arm upon predetermined lateral movement therein.

The head H further includes work-engaging means at its forward end, which means is adapted to connect with or engage a piece of work to be turned by the wrench. The work-engaging means is adapted to engage or connect with the work with the turning axis of the work normal to the axis of the arm and parallel with the pivotal axis of the stem.

In practice, the work-engaging means can be of any desired form and shape. For the purpose of illustration, the work-engaging means is shown as including a cylindrical enlargement **20** on the forward end of the stem and a vertically extending downwardly projecting polygonal projection **21** such as is commonly employed to engage and carry bolt or nut engaging sockets.

The head is preferably a unitary, rugged and durable forged and heat-treated part.

The wrench unit includes a tripping means or mechanism T which serves to normally yieldingly hold the stem **14** of the head H in alignment with the central longitudinal axis of the arm A and which is such that upon the application of predetermined torsional forces on the noted vertical axis of the head and resulting lateral forces at the rear end of the stem, the stem is released and permitted to swing laterally and into stopped engagement in the bore of the arm.

The means T includes an elongate cylindrical plunger P, with front and rear ends **22** and **23**, slidably engaged in the arm A in rearward spaced relationship from the stem **14**, and having a central socket **25** with a flat forwardly disposed bottom in its forward end, and a trip block **26** engaged in and extending between the sockets **19** and **25**.

In practice, a substantially flat disc-shaped case hardened seat member **27** with an axially opening socket with a flat axially disposed bottom can be engaged in the socket **19** and/or the socket **25** to provide a hard replaceable seat for the block **27**. In the case illustrated, a seat member **27** is shown related to the stem **17** of the head H.

The trip block **26** is an elongate block having flat front and rear ends **28** and **29** and is arranged between the plunger P and the stem of the head H or, as illustrated, between the plunger and the seat member **27** with its ends in normal flat bearing engagement on and with the bottoms of the socket **25** and the bottom of the socket in the seat member.

Finally, the tripping means includes spring means S in the arm, rearward of and normally yieldingly engaging and urging the plunger forwardly to hold the block **27** in compression between the plunger and the stem of the head and maintaining the surfaces **28** and **29** in flat engagement with their related socket bottoms. The spring means S is shown as a simple, elongate helical compression spring with front and rear ends.

The front end of the spring seats on the rear end **23** of the plunger P.

With the tripping means T set forth above, it will be apparent that the stem **14** of the head H is prevented from swinging laterally until such time as sufficient turning force is exerted to tip or trip the block **27** laterally between the plunger and the stem on the head H resulting axial rearward shifting of the plunger in the arm, against the resistance of the spring S.

It will be further apparent that the forces required to trip the block **27** that is, the operating forces, are directly proportional to the holding force exerted by the spring S and that the operating forces can be adjusted and varied as desired or as circumstances require by adjusting and varying the holding force of the spring.

The tripping means T referred to above is well known to those skilled in the art and is such that it can be varied considerably in form without departing from the spirit of this invention.

The wrench of the present invention further includes novel adjusting and setting means O for varying the holding force of the spring S and the resulting operation force required to trip the means T and thereby operate the wrench.

The means O that I provide includes a carrier block **50** fixed in the arm A, spaced rearward of the spring S and having a central threaded opening **51**, an elongate threaded shaft **52** with front and rear ends engaged through said opening **51** and a disclike spring seat **53** between the rear end of the spring S and the forward end of the shaft **52**. The seat **53** is provided with a central, rearwardly projecting bearing dimple **53'** to engage the forward end of the shaft and to assure free relative rotation thereabout.

It will be apparent that by rotating and advancing the shaft axially relative to the block **50**, the extent to which the spring S is compressed and the holding force exerted by the spring through the tripping means T and the resulting operating force of the wrench can be effectively varied and adjusted.

The means O further includes means for effecting rotation of the shaft which means includes an elongate, internally threaded extension tube **60** with open front and rear ends and a polygonal exterior. The front end of the tube is threadedly engaged on and about the rear end of the shaft **52**. A setscrew **61** is engaged in the rear end of the tube **60** and a locking rod **62**, of relatively soft or mild steel is engaged in the tube between the setscrew **61** and the rear end of the shaft **52**.

With the structure set forth above, it will be apparent that the extension tube **60** can be rotated on the shaft **52** to vary and adjust its axial position on said shaft and the distance it projects from the rear end of the shaft and that when so adjusted can be locked and set by advancing the setscrew **61** forwardly in the tube to urge and hold the bar **62** into tight compressive engagement between the rear end of the shaft and said setscrew.

The soft steel locking bar **62** can be dispensed with and the setscrew **61** can be advanced into direct engagement with the shaft to lock the assembly together, but it has been found that the provision of the bar **62** greatly enhances the effectiveness and reliability of the locking effect sought to be gained.

In addition to the foregoing, the tube **60** is provided with an annular radially outwardly opening retaining ring receiving groove **63** adjacent its rear end and in which a suitable retaining ring **64** is engaged to project radially outwardly from the exterior of the tube. The rear portion of the tube is further provided with an annular, radially outwardly opening race **65** spaced forward of the groove **63**.

The rear end of the shaft **52** terminates in the arm in spaced relationship from the rear end **12** thereof and the rear end of the tube **60** normally terminates in close proximity to the rear end **12** of the arm.

Engaged about the tube **60** and engaged within the rear end portion of the bore **10** of the arm A is an elongate operating sleeve **70**.

The sleeve **70** is an elongate, tubular part with front and rear ends **71** and **72**. The sleeve **70** has a front portion X, an enlarged rear end portion Y and a reduced cylindrical central portion Z.

The sleeve **70** has a bore **73** entering its rear end, coextensive with the portions Y and Z and terminating therein to define an axially rearwardly disposed bottom and forwardly opening polygonal counterbore **74** communicating with the bore **73** at the bottom thereof and cooperating therewith to define an annular rearwardly disposed stop shoulder **75**.

The counterbore **74** slidably receives the tube **60** for free axial shifting and against relative rotation, and the bore **73** freely accommodates the tube **60** and the stop ring **64** about the rear end of the tube.

The sleeve is shiftable axially relative to the tube from a normal, forward position where the front end of the sleeve occurs about the front end portion of the tube and the rear end of the tube occurs in the rear end portion of the bore **73** of the sleeve, to rear actuated position where the front end portion of the sleeve occurs about the rear portion of the tube and the

rear portion of the tube occurs in the forward portion of the bore 73 with the stop ring 64 in stopped engagement with the shoulder 75.

It is to be noted that the stop ring 64 limits rearward shifting of the sleeve relative to the tube and disengagement of said parts.

The forward cylindrical end portion X of the sleeve 70 establishes sliding bearing engagement in the rear end portion of the bore 10 of the arm A. The reduced central portion Z of the sleeve 70 is cylindrical and normally occurs within the bore 10 of the arm in spaced relationship therewith and cooperates with the forward portion X to define an annular rearwardly disposed stop shoulder 76. The enlarged rear end portion Y of the sleeve is larger in diameter than that bore 10 of the arm and normally occurs adjacent to the rear end 12 of the arm. The portion Y is preferably approximately equal in diameter with the outside diameter of the arm and is preferably provided with slots or the like about its exterior to facilitate manual engagement of the sleeve.

The arm A is provided with an annular radially inwardly opening stop ring receiving groove 77 in the rear end portion of the bore 10 in which a stop ring 78 is engaged. The ring 78 is adapted to be engaged by the shoulder 76 when the sleeve is moved to its rear or fully actuated position and to thereby stop the sleeve and prevent disengagement of the sleeve from the arm.

A suitable radially outwardly opening annular groove 79 is provided in the rear portion of the central portion Z of the sleeve to facilitate removal of the ring 79 and disassembly of the construction.

Finally, the operating means includes releasable lock means, which means is adapted to normally lock the sleeve against rotation in the arm and which serves to establish unlocked or rotatable relationship between the arm and sleeve when the sleeve is moved axially rearwardly from its normal to its actuated position.

The releasable lock means includes the annular race 65 in the rear portion of the tube referred to above, a plurality of circumferentially spaced, radially inwardly opening, longitudinally extending drive member receiving grooves to channels 80 in the rear end portion of the bore 10 of the arm A, a radial port 81 in the forward end portion X of the sleeve 70 and a radially shiftable drive member 82 in the port 81. The port is shown as a cylindrical port and opens radially inwardly and outwardly. The drive member 82 is shown as a spherical ball and is larger in diameter than the wall thickness of the forward portion X of the sleeve and is preferably equal in diametric extent with the combined depths of the channels 80 and the wall thickness of the portion X of the sleeve and/or the combined depth of the race 65 and the wall thickness of said portion X of the sleeve.

The drive member 82, held captive in the port 81 is normally held radially outwardly in the port by the tube 60 to project from said port into engagement in one of the channels 80 in the arm and to lock the sleeve against rotation relative to the arm, but permitting axial shifting of the said sleeve relative to said arm.

The port 81 is arranged and positioned in the sleeve so that when said sleeve is in its out, rear or actuated position and is stopped by the stop ring 64, the port is in the same radial plane as the race 65 in the tube and so that the drive member 82, held captive in the port 81 shifts radially inwardly from engagement in a channel 80 into engagement in the race 65 and the tube is released for free rotation relative to the arm.

When the tube and sleeve are thus unlocked it will be apparent that upon manual engagement of the rear portion Y of the sleeve, the sleeve, tube and shaft can be rotated to adjust the spring S.

When the spring S is thus adjusted and it is desired to lock and set the construction, the sleeve 70 is manually urged forwardly relative to the arm and to its above-noted unactuated or normal position.

Upon such forward urging of the sleeve 70, if the port 81 is not in complete register with one of the channels 80, sufficient register with at least one of the channels does occur so that such urging of the sleeve results in driving the drive member 82 outwardly in the port by the reaction of the tube thereon and in such a manner as to effect sufficient turning of the sleeve to bring about the full registering of the port with the channel and subsequent movement of parts to the full and above-noted normal locked position.

In the case illustrated and so that the details of the construction can be adequately shown, the size and extent of the channels 80 have been enlarged and exaggerated, with the result that the most effective and desirable number of channels has not been shown. In practice, 10 channels 80 are provided in the arm, rather than eight as shown, and said channels are preferably semicircular in cross section.

The provision of 10 recesses 80 in the arm is preferred since such a number of recesses divides one complete rotation of the sleeve into 10 equal parts or segments and makes possible the provision of suitable standard calibrations 100 about the rear end of the arm, and a mark or line 101 on the portion Z of the sleeve 70 to ascertain the circumferential extent to which the sleeve is turned beyond or short of one full revelation.

The central portion Z of the sleeve is provided with axially spaced calibrations 102, related to the mark 101 and which are established in accordance with the established and known characteristics of the spring S.

The calibrations are such that they are read relative to the terminal end 12 of the arm A, that is, the rear end 12 of the arm is employed as the marker or indicator for reading the calibrations.

The calibrations 102 are preferably spaced one from the other so that upon one full revolution of the sleeve, the sleeve is advanced from one to the next calibration. Further, the calibrations or lines 102 are suitably marked to indicate the operating force of the wrench when it is set to the different lines or calibrations.

In practice, it is frequently necessary to make initial and fine adjustments of and between the spring and the calibrations. This is accomplished by adjusting the longitudinal positioning of the tube 60 on the shaft 52 and by means of the setscrew 61 and lock bar 62 referred to above. Access to the setscrew 61 in the tube 60 is provided through the rear open end of the bore 73 in the sleeve. Once such initial and fine adjustment is effected, a cover plate 105 can be provided to close the rear end of the base 73 and to render the construction tamperproof.

In practice, the retaining ring 64 can establish frictional sliding engagement in the bore 73 to frictionally hold the sleeve in its normal position. However, it is preferred that special drag means be provided to perform such a function. In the case illustrated, the forward portion X of the sleeve is provided with a radially inwardly opening annular groove 90, forward of the port 81 and in which a friction member 91, in the form of a snapring, is engaged. The friction member establishes frictional engagement with the corners of the polygonal exterior of the tube and normally frictionally holds the sleeve against axial shifting relative to the tube.

With the construction set forth above, it will be apparent that all important and critical parts of the adjusting and setting means are normally within and protected by the arm A, that such parts are normally telescopically engaged with each other in such a manner that each lends support and strength to the other, and with the result that the construction is extremely strong, durable and protected against damage and fouling.

It will also be apparent that the construction is free of any difficult or costly to make and/or assemble parts and is such that it lends itself to the establishment of a highly accurate, efficient and easy to operate device.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any modifications and/or variations which may appear to those skilled in the art.

Having described my invention, I claim:

1. A torque wrench including an elongate, tubular lever arm with front and rear ends, a work-engaging head pivotally carried by the front end of the arm, an elongate compression spring within the arm, trigger means within the arm between the spring and head and normally yieldingly holding the head against pivotal movement relative to the arm, adjusting and setting means in the rear end of the arm and engageable with said spring to vary the effective force of said spring on said trigger means, said adjusting and setting means including a carrier in the arm spaced rearward of the spring, an elongate threaded shaft with front and rear ends threadedly engaged through the carrier, means establishing axial driving engagement between the shaft and the spring, an elongate tube with front and rear ends threadedly engaged on the rear end portion of the shaft and extending longitudinally through the rear end portion of the arm, an elongate tubular sleeve with front and central portions engaged about the tube with its front portion in rotary driving and axially shiftable engagement with said tube and in axially shiftable and rotatable engagement in the rear end portion of the arm and a manually engageable rear end portion accessible at the rear end of the arm, said sleeve being shiftable axially from a normal forward position where its rear portion occurs adjacent the rear end of the arm to an actuated position where its central portion projects rearwardly from the rear end of the arm and releasable lock means to lock the sleeve against rotation relative to the arm when the sleeve is in its normal position and to permit free rotation of the sleeve relative to the arm when the sleeve is in its actuated position.

2. A structure as set forth in claim 1 wherein said lock means includes a plurality of circumferentially spaced, radially inwardly opening grooves in the rear portion of the arm, an annular, radially outwardly opening race in the rear portion of the central portion of the tube and a radially shiftable drive member carried by the front portion of the sleeve to normally engage the exterior of the tube and project radially outwardly from the sleeve into one of the grooves and to shift radially inwardly to project radially inwardly from the sleeve and into the race when the sleeve is in its actuated position.

3. A structure as set forth in claim 1 including drag means to frictionally maintain the sleeve in its normal and actuated positions and including an annular radially inwardly opening groove in the front portion of the sleeve, a radially shiftable snapring carried by the groove and yieldingly engaging the tube about the exterior thereof, and retaining means to prevent disengagement of the sleeve and tube and including an annular axially rearwardly disposed stop shoulder in the forward portion of the sleeve and a radially outwardly projecting annular enlargement about the rear portion of the tube to engage and stop against the shoulder when the sleeve is in its actuated position.

4. A structure as set forth in claim 1 wherein said lock means includes a plurality of circumferentially spaced, radially inwardly opening grooves in the rear portion of the arm, a radially outwardly opening annular race in the rear portion of the central portion of the tube and a radially shiftable drive member carried by the sleeve to normally engage the exterior of the tube and project radially outwardly from the sleeve into one of the grooves and to shift radially inwardly to project radially inwardly from the sleeve and into the race when the sleeve is in its actuated position, drag means to frictionally maintain the sleeve in its normal and actuated positions, and including an annular radially inwardly opening outer groove in the front portion of the sleeve and a radially shiftable snapring carried by the groove and yieldingly engaging the exterior of the tube, and retaining means to prevent disengagement of the sleeve and tube and including an annular axially rearwardly disposed stop shoulder in the forward portion of the sleeve and a radially outwardly projecting annular enlargement about the forward end of the tube to engage and stop against the shoulder when the sleeve is in its actuated position.

5. A structure as set forth in claim 1 wherein said tube is threadedly engaged on the shaft for longitudinal adjustment relative thereto, said tube carrying means to releasably set the tube against rotation and axial shifting relative to the shaft and including a setscrew in the tube engaging the rear end of the shaft and accessible through the open rear end of the tube.

6. A structure as set forth in claim 1 wherein said tube is polygonal in cross section and the interior of the front portion of the sleeve is polygonal in cross section and slidably receives the tube, said tube being threadedly engaged on the shaft for longitudinal adjustment relative thereto, said tube carrying means to releasably set the tube against rotation and axial shifting relative to the shaft and including a locking bar in the tube engaging the rear end of the shaft and a setscrew in the tube engaging the rear end of the bar and accessible from the open rear end of the tube.

7. A structure as set forth in claim 1 wherein said lock means includes a plurality of circumferentially spaced, radially inwardly opening grooves in the rear portion of the arm, an annular radially outwardly opening race in the rear portion of the central portion of the tube and a radially shiftable drive member carried by the sleeve to normally engage the exterior of the tube and project radially outwardly from the sleeve into one of the grooves and to shift radially inwardly to project radially inwardly from the sleeve and into the race when the sleeve is in its actuated position, drag means to frictionally maintain the sleeve in its normal and actuated positions and including an annular radially inwardly opening groove in the front portion of the sleeve, and a radially shiftable snapring carried by the grooves and yieldingly engaging the exterior of the tube, retaining means to prevent disengagement of the tube and sleeve and including an annular axially rearwardly disposed stop shoulder in the sleeve spaced forward of the rear end thereof and a radially outwardly projecting annular enlargement on the rear end of the tube to engage and stop against the shoulder when the sleeve is in its actuated position, said tube being threadedly engaged on the shaft for longitudinal adjustment relative thereto, said tube carrying means to releasably set the tube against rotation and axial shifting relative to the shaft and including a setscrew in the tube engaging the rear end of the shaft and accessible through the open rear end of the tube.

8. A torque wrench having an elongate tubular arm with front and rear ends, a work-engaging head pivotally mounted on the front end of the arm, said head having an elongate stem extending longitudinally in the arm, trigger means cooperating with the stem to releasably hold said head and stem against pivotal movement relative to the arm, said trigger means comprising a plunger in the arm spaced rearward of the stem and shiftable axially relative thereto, flat axially spaced seating surfaces on the stem and plunger, an elongate block with flat oppositely disposed bearing surfaces between the stem and plunger with said surfaces normally establishing flat bearing engagement on the seating surfaces, an elongate, axially extending compression spring with front and rear ends in the arm with its front end engaging the plunger to yieldingly urge the plunger forwardly and adjusting means in the arm rearward of the spring to vary and set the force of the spring and including, a carrier in the arm spaced from the rear end thereof, an elongate threaded shaft with front and rear ends threadedly engaged through the carrier, means establishing axial driving engagement between the front end of the shaft and the rear end of the springs, an elongate polygonal tube with front and rear ends threadedly engaged on the rear end of the shaft and extending longitudinally through the rear end portion of the arm, an elongate tubular sleeve with front and central portions, said front portion slidably and rotatably engaged in the rear end portion of the arm, and having a polygonal opening slidably receiving the tube and an enlarged manually engageable rear end portion accessible at the rear end of the arm, said sleeve being shiftable axially from a normal forward position where its central and forward portions occur wholly within the arm and its rear portion occurs adjacent the rear end of the arm to an actuated position where its central portion projects rearwardly from the rear end of the

arm and the rear portion is spaced therefrom and lock means carried by the sleeve to releasably lock the sleeve against rotation relative to the arm when the sleeve is in its normal position and to release the sleeve for free rotation relative to the arm, when the sleeve is in its actuated position.