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Grabovac

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[54] **DIAL TORQUE WRENCH**

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[52] **U.S. Cl.** **73/139**
[51] **Int. Cl.** **G01l 5/24**
[58] **Field of Search**..73/139

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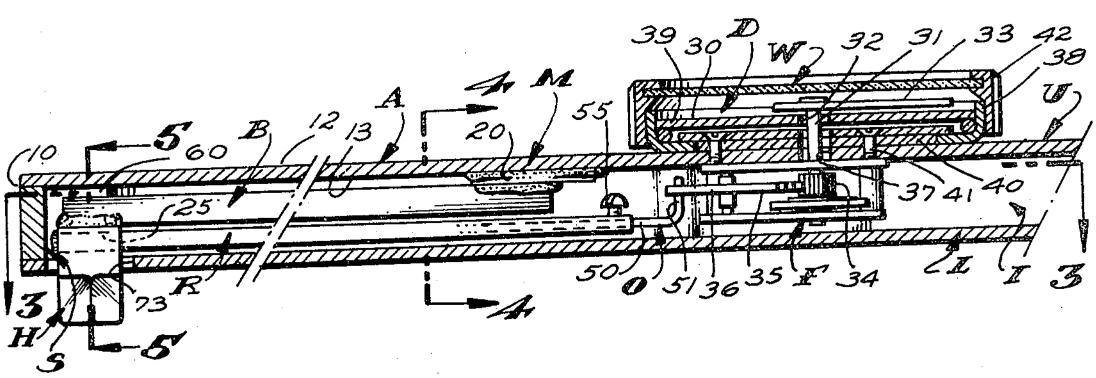
[57] **ABSTRACT**

A dial torque wrench including an elongate manually engagable lever arm coextensive with the wrench, an elongate deflection beam of limited longitudinal extent in parallel relationship with and between the ends of the arm means fixing one end of the beam to the arm, a work-engaging head at the other end of the beam, an elongate operating rod in spaced parallel relationship with the beam with an end fixed to the head, a dial means carried by the arm and operatively related to the other end of the rod. The longitudinal extend of the beam being a fraction of the effective length of wrench and is shrouded and protected by the lever arm throughout its longitudinal extent.

11 Claims, 6 Drawing Figures



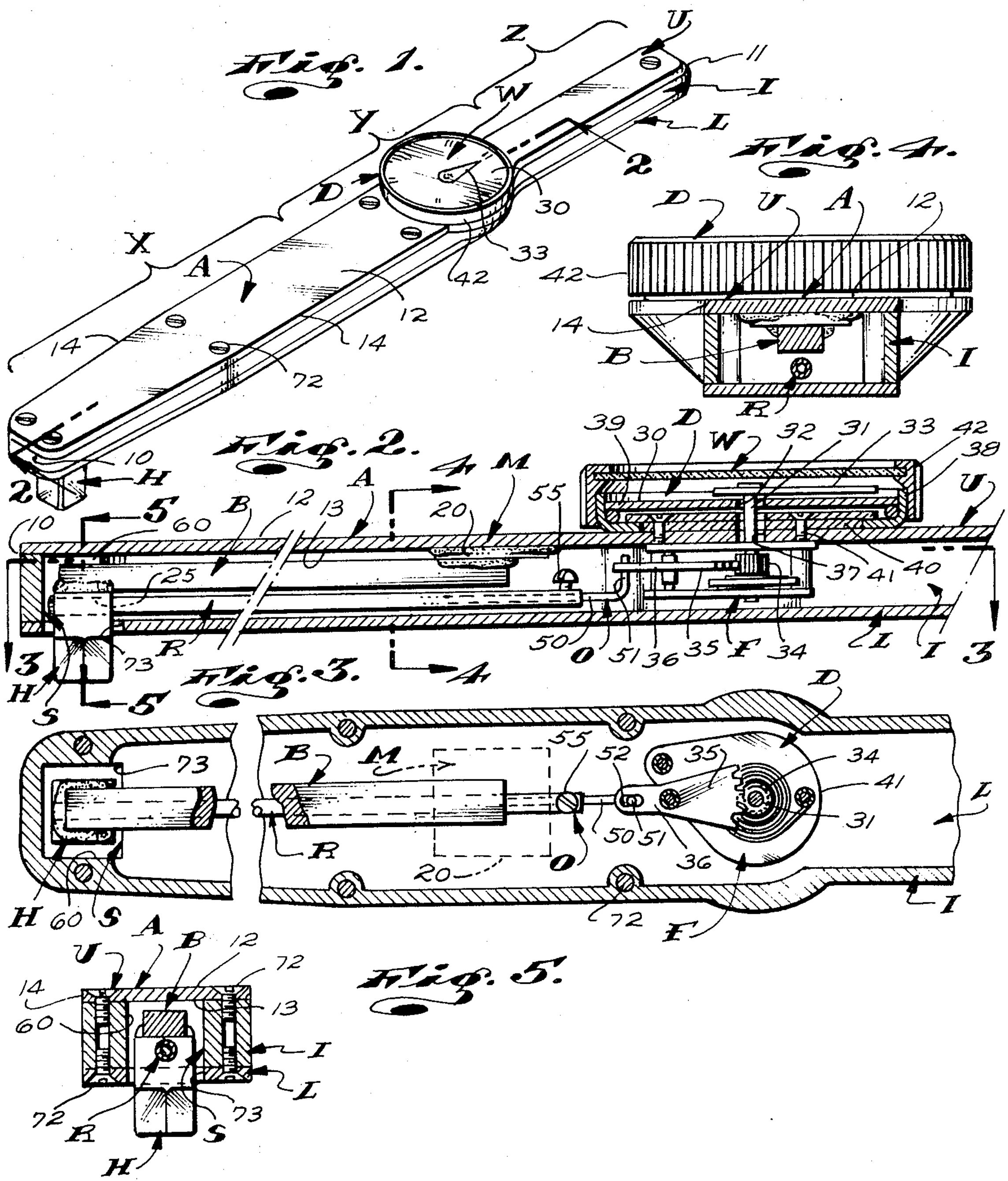


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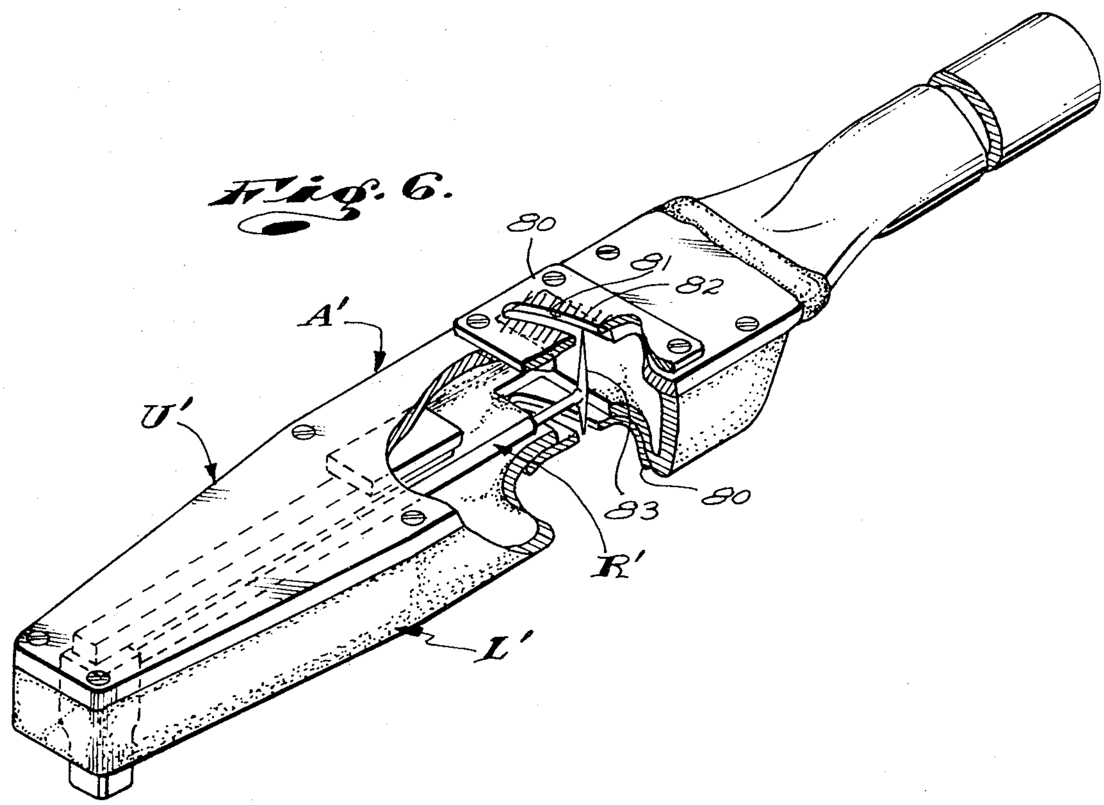
Fig. 6.



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DIAL TORQUE WRENCH

This application is a continuation in part of my co-pending application, Ser. No. 803,737 for "DIAL TORQUE WRENCH" and filed on Mar. 3, 1969, now abandoned.

The present invention relates to that form or class of torque tool or torque wrench including a calibrated dial to indicate the forces applied onto a piece of work by the wrench and which is commonly referred to as a dial wrench or dial torque wrench.

Dial torque wrenches provided by the prior art employ or incorporate one of two basic mechanical means. The first such means includes a torsion bar fixed to an end of a lever arm on an axis at right angle to the axis of the arm and in axial alignment with a related fastener or work-engaging part, and an elongate operating rod fixed to the bar and extending longitudinally of the arm to engage and operate a suitable force indicating dial carried by the arm. The other of said means commonly employed in such wrenches includes an elongate, resilient, deflecting lever arm, a work-engaging part at one end of the arm and a handle at its other end; an elongate operating rod is fixed to the end of the arm which carries the work-engaging part and extends freely longitudinally of the arm to engage and operate a force indicating dial carried by the deflecting arm. In this form of wrench, deflection of the lever arm, as a result of applied force, is measured.

The first above-noted means provided by the prior art is wanting in that the effective length of the torque bar must be extremely short in order to maintain the outside dimensions of the resulting wrench within allowable and acceptable limits. The necessary shortness of limited longitudinal extent of the torque bars in such srenches results in a structure wherein the rods are difficult to establish accurately and must be subjected to extremely high torsional stresses when operated, with resulting early and premature work hardening and failure.

The other or second referred to type of means employed by the prior art in dial torque wrenches has proved to be wanting in that the arm of the wrench, being the deflective member, must be carefully and accurately engaged so the applied force results in proper predetermined deflection of the arm.

In such wrenches, if force is applied to the arms at points intermediate their engaging ends, rather than at the handles thereon, deflection is limited to the portions of the arms between their work related ends and the points of applied force, with the result that the stress characteristics are totally upset and the wrenches are rendered inoperative for their intended purpose. It will be further apparent that when using this last form of wrench, care must be taken to avoid engagement of the arm on structure about a work site, as such engagement adversely affects the operation of the wrench.

Still further, in the second noted form of means employed in wrenches provided by the prior art, the longitudinal extent of the wrenches is controlled and dictated by the length of the deflection arms and vice versa, and the longitudinal placement or location of the dials is limited or restricted by the length and character of the deflection arms.

While a number of other dial torque wrenches employing unique operating means have been provided by the prior art, they have met with limited commercial success and acceptance and are sufficiently distinct from those wrench structures considered above and from the instant invention as not to warrant further and particular consideration.

An object of my invention is to provide a dial torque wrench having novel operating means and including an elongate, manually engagable, rigid lever arm with front and rear ends, an elongate deflection beam of limited longitudinal extent extending longitudinally of the front end portion of the arm, means securing the rear end of the beam to the arm, a work-engaging head fixed to the front end of the beam, an elongate dial operating rod fixed to the front end of the beam and extending rearwardly therefrom and a dial carried by the arm and operatively related to the rod.

It is an object of this invention to provide a wrench of the character referred to wherein all applied forces are transmitted through the deflection beam in such a manner that deflection of said beam and resulting measurement of said forces is unaffected by the longitudinal extent of the arm and the location or point of applied forces on said arm.

It is another object of this invention to provide a wrench of the character referred to which is such that deflection of the beam and resulting operation of the dial and indication of forces applied therethrough is not adversely affected by the application of interfering forces on and through the arm.

Still another object of the present invention is to provide a wrench of the character referred to wherein the longitudinal extent of the arm is independent of and is not dictated or controlled by the longitudinal extent of the deflection beam and the length of the deflection beam is independent of and is not dictated or controlled by the longitudinal extent of the arm.

Yet another object of this invention is to provide a wrench construction of the character referred to wherein location of the dial is not dictated by the longitudinal extent of the deflection beam, but which is such that the actuating rod can be varied in length and the dial can be located at any desired point longitudinally of the arm.

An additional feature of my invention is to provide stop means at the forward end of the arm to engage and limit deflection of the beam whereby the beam cannot be overstressed and rendered defective.

It is yet another feature of this invention to provide a wrench of the character referred to wherein the arm is established to encase and protect the beam.

It is an object of this invention to provide a structure of the character referred to wherein the physical characteristics of the deflection beam can be advantageously established with reference to the independent factors associated with the beam itself, such as its length, weight, strength, stability and stress limits, whereby the physical dimensions and weight of the deflection beam can be maintained at a minimum, without sacrifice of strength, stability or stress limits and so that the outside dimensions, weight and configuration of the overall wrench structure is restricted to a limited extent as compared with wrench structures provided by the prior art.

It is an object of this invention to provide a wrench construction of the character referred to which is easy and economical to manufacture, a structure which is rugged and durable and a structure which is highly effective and dependable in operation.

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

FIG. 1 is an isometric view of the wrench that I provide;

FIG. 2 is a sectional view taken substantially as indicated by line 2—2 on FIG. 1;

FIG. 3 is a view taken substantially as indicated by line 3—3 on FIG. 2;

FIG. 4 is a view taken substantially as indicated by line 4—4 on FIG. 2;

FIG. 5 is a view taken substantially as indicated by line 5—5 on FIG. 2; and,

FIG. 6 is an isometric view of another form of the invention.

The wrench construction that I provide includes, generally, an elongate lever arm A, an elongate deflection beam B, mounting means M securing one end of the beam to the arm, a work-engaging head H at the other end of the beam, an operating rod R mounted in fixed relationship to the beam and head and a dial means D in fixed relationship to the arm and beam and operatively related to the rod.

The above elements and/or parts are co-related so that the beam B is, from the standpoint of applied forces, interposed between the arm and the head and so that all forces exerted between the arm and head are transmitted through the beam in a fixed, predetermined, uniform and uninterrupted manner.

In the preferred carrying out of the invention, the structure provided further includes stop means S to limit deflection and prevent overstressing of the beam B.

The arm A is such that it defines a longitudinally extending chamber in which the beam and rod freely extend whereby the beam and rod are protected against damage or adverse effects by external forces and the like which might otherwise be applied thereto.

In that form and embodiment of the invention shown, the arm A is a fabricated steel structure including a simple, flat, elongate, upper, primary plate U, a lower secondary plate L and a central intermediate element E. The primary plate U is shown as having front and rear ends **10** and **11**, flat top and bottom surfaces **12** and **13** and opposite side edges **14**. The plate U, when in use, is adapted to receive and transmit forces directed in horizontal planes and is of sufficient thickness and lateral extent to be rigid and substantially non-yielding in horizontal planes.

The arm (and the plates and insert by which it is defined) has or can be considered to have a forward portion X, a central portion Y and a rear portion Z. The forward portion X serves to shroud and protect the beam B, rod R and head H, and serves to carry or define the stop means S, as will hereinafter be described. The central portion serves to support the beam B and the dial means D. The rear portion defines a hand engaging part or portion and can be of any desired longitudinal extent.

The beam B is a simple, elongate rod or bar of resilient steel having predetermined stress characteristics. The beam can be of any desired cross-sectional configuration and area.

The cross-sectional configuration and area and the effective longitudinal extent of the beam B is determined and established by the stress characteristics of the metal of which it is established in conjunction with the work or stresses and the cycling to which the bdam is to be subjected. In practice, the beam B is or can be established of a length, cross-sectional configuration and area so that it is as short, small in cross-sectional area and as light as is possible, without diminishing its dimensions in such a manner as to make its manufacture costly and difficult to control or to cause it to be stressed excessively when put to its intended use.

The beam can be made as long as desired, giving due consideration to the desired longitudinal extent of the wrench to be established and placement of the dial thereon.

The significance of the latitude afforded by this invention to the physical size and dimensions of the beam B cannot be over-emphasized as such latitude materially simplifies and reduces the cost of manufacture of the beam and at the same time leaves great latitude with respect to the ultimate size, weight and configuration of the overall wrench structure.

In the form of the invention illustrated, the beam B is rectangular in cross-section and is approximately the same length as the forward portion X of the arm A.

The beam is arranged in spaced relationship below the forward portion of the plate U and extends parallel therewith.

The mounting means M involves a simple, flat, rectangular mounting block **20** welded to an extended rear end portion of the beam, which block is welded to the bottom surface **13** of the plate U at the central portion thereof.

In practice, the block **20** is first welded to the beam, the assembled block and beam are then heat treated. Finally, the block is welded to the plate U. The block is sufficiently great in area and size so that it can be conveniently welded to the arm without annealing or causing other adverse effects on and to the heat treated beam.

The block **20** also serves as orienting means to position the beam in desired spaced relationship below the plate U, during assembly of the construction.

The work-engaging head H that I provide can be of any suitable, desired form and/or type of work-engaging part designed to transmit torsional forces. The head H is an elongate part arranged with its longitudinal axis extending vertically and normal to the axis of the beam B, and is suitably fixed to the forward end of the beam.

In the preferred carrying out of the invention, the head is an elongate, vertically extending, block-like part, polygonal or square in cross-section and is fixed to the forward end of the beam B as by welding to depend therefrom at right angle thereto. The lower end of the head is formed to cooperatively engage and establish driving engagement with a fastener, a fastener engaging tool, such as a bolt engaging socket, or the like.

The head H is shown welded to a forward extension on the beam B which extension overlies the upper or top end of the head.

In practice, the head H and beam B, like the block 20 and the beam, are assembled and welded together prior to heat treating of the beam and so that the head is suitably heat treated with the beam and plate and so that the stress characteristics of the beam are not upset or adversely affected by the weld securing the head and beam together, as would be the case if the head were welded to the beam subsequent to heat treatment of the beam and the plate.

It will be apparent that the block, beam and head, assembled and heat treated as set forth above, establishes a simple, easy and economical to make sub-assembly, which sub-assembly is easy and convenient to handle, and to assemble with the other elements and parts of the construction.

The operating rod R is a simple, straight, elongate, rigid part and is preferably established of tube stock so as to provide maximum rigidity with minimum weight. The rod R is suitably fixed to and carried by the head H to extend and project freely and rearwardly therefrom in spaced relationship with the arm and toward the central portion Y thereof and the dial means D.

The rod R can be arranged to occur above or below the beam B, as circumstances require or as desired. In the structure illustrated, the rod R is shown in spaced, normally parallel relationship below the beam B.

The forward end of the rod R can be secured to the head H in any suitable manner and is shown as having its forward end portion snuggly engaged through an opening 25 in the head and as being secured and fixed in and with the head by welding, at its forward terminal end.

The dial means D carried by the central portion Y of the arm A, or plate U of said arm, and related to the rod R can vary widely in form and construction. In the preferred carrying out of the invention, the means D includes a flat, circular, calibrated dial face 30 carried by the arm, a central shaft 31 rotatably supported relative to the arm and dial face and projecting through a central opening in said dial face, an indicator arm or pointer 33 carried by the shaft to project radially therefrom and to occur in spaced relationship with the calibrated surface of the dial face. a pinion gear 34 carried by the shaft, a quadrant rack 35 pivotally supported in spaced relationship from the shaft on an axis parallel with the shaft and in meshed engagement with the gear 34, a lever arm 36 projecting radially from the pivotal axis of the quadrant rack and drive means O between the lever arm 36 and the rear end of the rod R.

The elements and parts 30 through 36 of the means D set forth above, are the basic elements and parts of a large number of commercially available dial movements, anv one of which could be employed in carrying out the present invention.

The commercially available dial movements referred to above normally include such additional elements and parts as frameworks to support the shaft and quadrant rack and to facilitate mounting of the movement, balance springs, dial face housing means with transparent dial viewing windows therein to facilitate mounting the dial faces and to protect said faces and pointers related thereto, and other suitable and appropriate elements and/or parts.

In the case illustrated, the dial means is shown as having a frame F fixed to the lower surface 13 of the central portion Y of the plate U. The shaft 31 is carried by the frame F and projects upwardly therefrom through an opening 37 in the arm. The quadrant rack 35 is pivotally carried by the frame at a point spaced forward of the shaft and with the lever arm 36 normally projecting forwardly therefrom in substantial parallel relationship with the longitudinal axis of the arm A. The dial face 30 is shown arranged within and carried by a cup-like part 38 of the housing means engaged on the top surface 12 of the plate U and secured in fixed relationship with the plate U and frame F by means of a pair of related disc-like plates 39 and 40 and screw fasteners 41 engaged in, through and into said plates 39 and 40, plate U and the frame F.

Finally, the dial means is shown as including a decorative sleeve or ring 42 engaged about the cup part 38 and carrying the window pane or crystal W which occurs in covering spaced relationship above the dial face and pointer.

The drive means O between the lever arm 36 and the rod R can be considered a part of the dial means D or a part of the rod R.

In the case illustrated, the means O includes an elongate stem 50 slidably engaged in the rear end of the tubular rod R and having a laterally, and in the case illustrated, upwardly turned finger 51 at its rear end, which finger projects upwardly through a slot opening 52 in the lever arm 36 to establish sliding bearing and driving engagement therewith.

It will be noted that the stem 50 of the means O is in the nature of an extension of the rod R and that, if considered as part of the rod, the rod is axially extensible and adjustable to facilitate proper positioning and engagement of the finger 51 in the slot opening 52 in the lever arm 36.

Finally, and in addition to the foregoing, the means O includes means for securing the stem in fixed position in the rod, which means can, as illustrated, include a simple set screw 55 engaged in and through the rod and engaging the portion of the stem therein.

The handle portion Z of the arm A is shown as a simple, straight portion, of any desired length and continues rearwardly from the central portion Y of the arm.

With the structure thus far described, it will be apparent that when the head H is engaged with a piece of work and torsional forces are exerted, left or right, onto and through the head by the application of lateral forces onto and through the arm A, the forces are transmitted between the arm and head by and through the beam B and the beam is yieldingly bent or deflected laterally right or left relative to the longitudinal axis of the arm. Such deflection of the beam results in corresponding lateral displacement of the head H and pivoting of the rod R relative to the axis of the arm. The above-noted pivoting of the rod R results in lateral movement of the rear end of the rod and the finger 51 of the means O in an arcuate path, left or right, and effects pivoting of the quadrant 35 and corresponding rotation of the shaft 31 and of the pointer 33 relative to the dial face 30.

In accordance with the above, it will be apparent that the dial means D faithfully and accurately indicates the deflection of the beam B.

It will be further apparent that the stress characteristics of the beam can be accurately established and/or determined and the dial foace 30 of the means D can be suitably calibrated so that the dial means faithfully and accurately transcribes the amount of deflection of the beam into the foot pounds of force required to effect such deflection.

It is important to note that the rod R, though extending rearwardly from the forward free end of the beam B, functions as if it were a forwardly projecting extension of the beam and serves to multiply or amplify the deflection of the beam where it connects or is coupled with the means D. Accordingly, slight or little deflection of the beam results in considerable lateral displacement of the rear end of the rod R and the finger 51 of the means O, which lateral displacement of the rod and finger is sufficient to effect operation of the means D to an extent to make accurate and easy visual reading of the dial means possible.

More important, it is to be noted that the relationship of the beam, rod and means O results in an assembly or parts of short or limited longitudinal extent which, through compound motion of parts, results in lateral displacement of the finger 51 a distance equal to that obtainable by a structure, the longitudinal extent of which is equal to the the combined longitudinal extent of the beam, rod and means O.

In addition to the foregoing, it is preferred that the stop means S, referred to above, be provided to limit lateral deflection of the beam to prevent its being deflected beyond predetermined stress limits.

The stop means S includes a pair of laterally spaced stop shoulders 60 defined by the arm structure at the forward end thereof. The shoulders 60 normally occur in spaced relationship from opposite sides of the head H and are adapted to be engaged by the head H upon predetermined maximum lateral displacement of the head H and corresponding predetermined maximum deflection of the beam B. Accordingly, the means S is such that it effectively limits lateral displacement of the head and overstressing of the beam.

The lower plate L and intermediate element or insert I of the arm A supplement and cooperate with the primary plate U to reinforce the lever arm A, making it exceedingly rigid and strong and cooperate to define a longitudinal chamber within the arm in which the beam B, rod R, upper portion of the head H, means O and the frame of the means F of the means D are arranged, obscured and protected.

The lower plate L is similar in plane configuration with the plate U and is arranged in spaced relationship below the plate U and the note protected elements and parts. The insert I is of cast or machined metal and is arranged between the plates U and L to define a continuous wall about and between the perimeters of the plates. The plate U and insert I are secured together by suitable screw fasteners 72 engaged through the edge portions of the plates and into the insert.

The forward end of the plate U is provided with an opening or aperture 73 through which the lower portion of the head H projects freely and which defines the laterally spaced stop surfaces 60 of the means S.

The forward end of the insert I can, as shown, be formed to cooperate with the opening 73 in the plate to define the stop surfaces 60 of the means S.

It will be apparent that, if desired, the stop surfaces 60 need not be defined by both the insert and the plate, but can be established by either of said parts alone.

It will be apparent that the plates U and L and the insert I cooperate to define a stiff, rigid and exceedingly strong, yet light-weight, box section, the forward portion of which define the longitudinally extending chamber in which the elements and parts B, H, R, O and F are mounted, housed and protected and with which the opening 73 communicates.

In practice, the plate U and insert I or the plate L and insert I can be formed integrally together without departing from the spirit of the present invention.

In FIG. 6 of the drawings, I have shown a modified form of my invention wherein the arm A′ is established by an upper plate U′ and an elongate, cast, upwardly opening cup-like shell L′ of limited longitudinal extent and secured to the lower side of the central and forward portions of the plate A′.

The dial means in this form of the invention includes openings in the plate U′ and shell L′ adjacent the rear end of the rod R′, dial plates 80 with arcuate slots 81 and related calibrations 82 in the plates 80 and a T-shaped pointer 83 on the rear end of the rod, with the ends of the cross-head projecting into the slots 81.

This second form of my invention serves to show and indicate the nature and extent to which the invention here provided can be modified without departing from the spirit thereof.

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 that may appear to those skilled in the art.

Having described my invention, I claim:

1. A torque wrench comprising an elongate manually engagable rigid lever arm with front and rear ends and co-extensive with the longitudinal extent of the wrench, said lever arm having a chamber extending longitudinally therethrough and a lateral opening adjacent its front end communicating with the chamber, an elongate resilient deflection beam with front and rear ends within and extending longitudinally freely through the chamber, mounting means securing the rear end of the beam in fixed position in the chamber and relative to the arm at a point spaced rearward of said opening, an elongate head with an inner end portion within the chamber and a work-engaging outer portion projecting laterally and freely through the opening and from the arm, means securing the inner portion of the head in fixed relationship to the front end of the beam, an elongate rigid operating rod with front and rear ends, said rod being greater in longitudinal extent than the beam and positioned in the chamber to extend longitudinally freely therethrough in spaced relationship with the beam, means securing the front end of the rod in fixed relationship with the inner portion of the head, the rear end of the rod terminating in the chamber at a point spaced rearward of the rear end of the beam, visibly readable dial means carried by the arm adjacent the rear end of the rod and having a part within the chamber engaged with the rear end of the rod.

2. A structure as set forth in claim 1 wherein said mounting means includes a mounting block welded to the rear end of the beam and projecting laterally rela-

tive to the central longitudinal axis of the beam and welded to an adjacent surface of the chamber and in fixed relationship with the arm.

3. A structure as set forth in claim 1 wherein the dial means is positioned and is visibly readable at the side of the arm opposite from that side of the arm from which the outer portion of the head projects.

4. A structure as set forth in claim 1 wherein the dial means is positioned and is visibly readable at the side of the arm opposite from that side of the arm from which the outer portion of the head projects, said mounting means includes a mounting block fixed to the rear end of the beam and projecting laterally relative to the central longitudinal axis of the beam, said head, beam and block establishing an integral assembly and heat treated portions of the block spaced from the beam being welded to an adjacent surface of the chamber and in fixed relationship with the arm.

5. A structure as set forth in claim 1 wherein said dial means includes a calibrated dial face carried by the arm at the exterior thereof, a shaft with an outer end adjacent the dial face and an inner end within the chamber, a pointer on the outer end of the shaft directed to the calibrations on the dial face and drive means between the inner end of the shaft and the rear end of the rod to rotate the shaft in response to lateral shifting of the head and deflection of the front end of the beam relative to the longitudinal axis of the arm and relative lateral shifting of the rear end of the rod.

6. A structure as set forth in claim 1 wherein said mounting means includes a mounting block welded to the rear end of the beam and heat treated therewith and projecting laterally relative to the central longitudinal axis of the beam and welded to an adjacent surface of the chamber and in fixed relationship with the arm and at locations spaced from the beam, said dial means includes a calibrated dial face carried by the arm at the exterior thereof, a shaft with an outer end adjacent the dial face and an inner end within the chamber, a pointer on the outer end of the shaft directed to the calibrations on the dial face and drive means between the inner end of the shaft and the rear end of the rod to rotate the shaft in response to lateral shifting of the head and deflection of the front end of the beam relative to the longitudinal axis of the arm and relative lateral shifting of the rear end of the rod.

7. A structure as set forth in claim 1 wherein the dial means is positioned and is visibly readable at the side of the arm opposite from that side of the arm from which the outer portion of the head projects, said dial means includes a calibrated dial face carried by the arm at the exterior thereof, a shaft with an outer end adjacent the dial face and an inner end within the chamber, a pointer on the outer end of the shaft directed to the calibrations on the dial face and drive means between the inner end of the shaft and the rear end of the rod to rotate the shaft in response to lateral shifting of the head and deflection of the front end of the beam relative to the longitudinal axis of the arm and relative lateral shifting of the rear end of the rod.

8. A structure as set forth in claim 1 wherein the dial means is positioned and is visibly readable at the side of the arm opposite from that side of the arm from which the outer portion of the head projects, said mounting means includes a mounting block fixed integrally to the rear end of the beam and projecting laterally relative to the central longitudinal axis of the beam and heat treated with the beam, said block welded to an adjacent surface of the chamber at points spaced from the beam and in fixed relationship with the arm, said dial means includes a calibrated dial face carried by the arm at the exterior thereof, a shaft with an outer end adjacent the dial face and an inner end within the chamber, a pointer on the outer end of the shaft directed to the calibrations on the dial face and drive means between the inner end of the shaft and the rear end of the rod to rotate the shaft in response to lateral shifting of the head and deflection of the front end of the beam relative to the longitudinal axis of the arm and relative lateral shifting of the rear end of the rod.

9. A torque wrench of the character referred to including an elongate, manually engagable, rigid lever arm with front and rear ends, an elongate deflection beam arranged in spaced parallel relationship with the forward portion of the arm and having front and rear ends, mounting means securing the rear end of the beam in fixed position on the arm, an elongate work-engaging head fixed to the front end of the beam and projecting laterally therefrom, an elongate operating rod with front and rear ends arranged in lateral spaced parallel relationship with the beam and arm, means securing the front end of the rod in fixed relationship with the forward end of the beam and dial means spaced rearward of the beam carried by and extending between the arm and the rear end of the rod, said structure further including overload prevention means at the front end of the arm to limit lateral deflection of the beam and including laterally spaced stop surfaces normally spaced from and opposing opposite sides of the head.

10. A structure as set forth in claim 9 wherein said dial means includes a calibrated dial face carried by the arm, a shaft related to the dial face and carrying a pointer directed to the calibrations on the dial face and drive means between the shaft and the rear end of the rod to rotate the shaft in response to the lateral movement of the rear end of the rod.

11. A structure as set forth in claim 9 wherein said dial means includes a calibrated dial face carried by the arm, a shaft related to the dial face and carrying a pointer directed to the calibrations on the dial face and drive means between the shaft and the rear end of the rod to rotate the shaft in response to the lateral movement of the rear end of the rod, said head having an inner end fixed to the front end of the beam, a free outer end portion adapted to engage a piece of work and means securing the rod to the inner portion of the head adjacent the beam.

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