

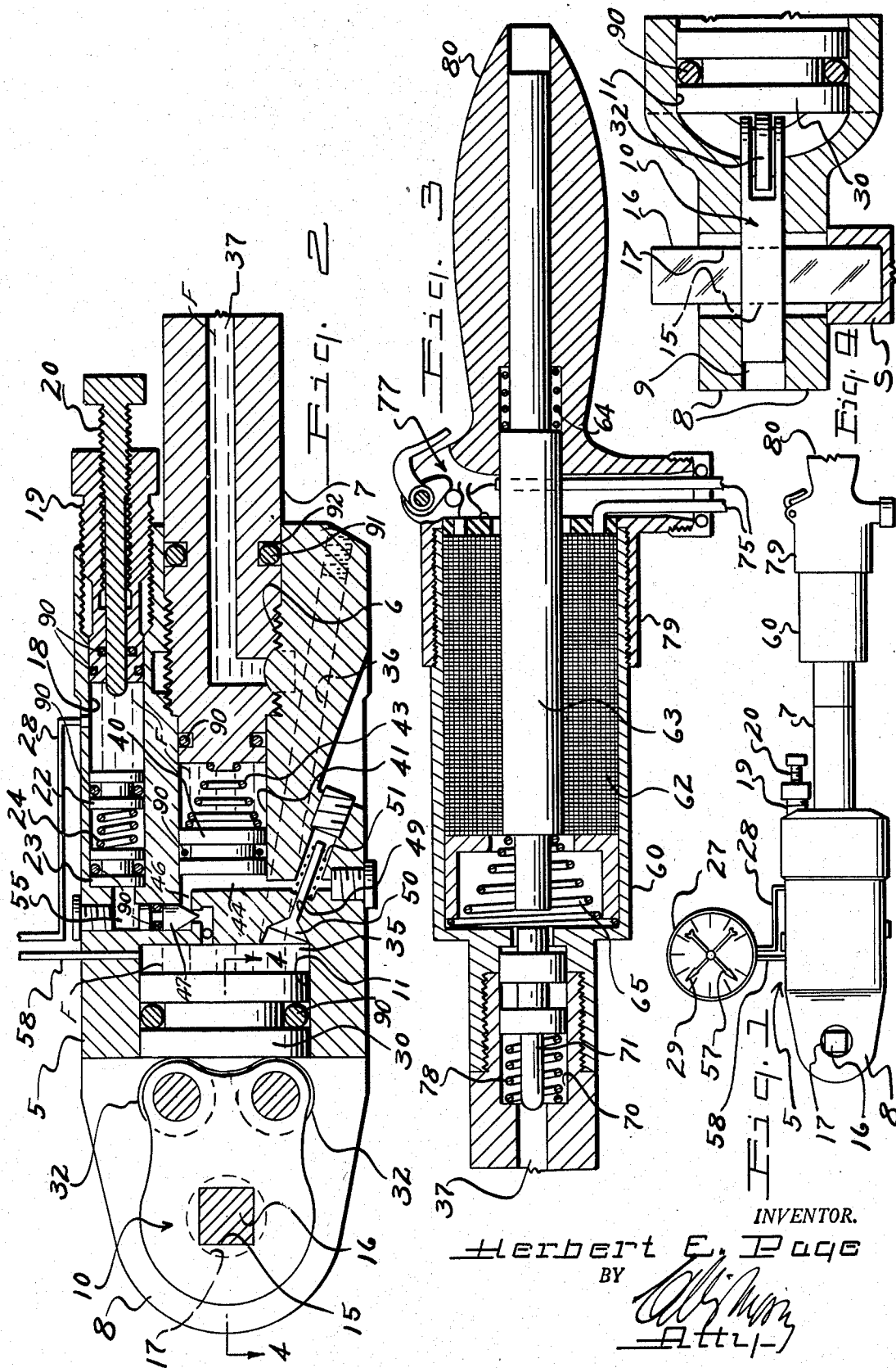
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HYDRAULIC TORQUE WRENCH

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HYDRAULIC TORQUE WRENCH

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This invention has to do with wrenches, relating in its more particular aspects to wrenches for measuring the force of the torque applied in the tightening and loosening of nuts, studs and the like.

It is an object of my invention to provide a device of this character which accurately visually indicates the extent of the torque by hydraulic means.

Another object of the invention is the provision of a torque wrench which acts automatically to relieve the torque application when a predetermined point is reached.

A still further object is to provide in such a wrench novel means for delivering to the wrench head a series of hydraulically applied impacts to facilitate performance of the work being done by the wrench.

While my invention possesses still further objects and advantages, those will become apparent from the following description of a presently preferred embodiment which I have chosen for the purpose of explaining the invention, it being understood that within its broader scope as defined by the appended claims, the invention is capable of being embodied in other and modified physical forms which will be suggested by the following description to those skilled in this art.

For purposes of the following description I shall refer to the accompanying drawing, in which:

Fig. 1 is a side elevation;

Fig. 2 is an enlarged medial longitudinal section, partly in elevation, of the left-hand end portion of the device shown in Fig. 1;

Fig. 3 is an enlarged medial longitudinal section, partly in elevation, of the right-hand end portion of the device shown in Fig. 1; and

Fig. 4 is a section taken on line 4-4 of Fig. 2.

The numeral 5 denotes the body having an internally threaded bore 6 to receive the externally threaded handle portion 7, and having left-hand end bifurcations 8 with a space 9 therebetween in which to mount the rock member generally indicated by the numeral 10, and a bore providing a cylinder 11.

The rock member 10 has a transverse opening 15 of square cross-section in which fits the pivot member 16 of square cross-section, which extends through round holes 17 in bifurcations 8. On the outer end of the pivot member is mounted a conventional work-connecting socketed member 8 for engagement with the work.

The body provides a cylinder or chamber 18 in which is threadedly mounted a piston 19, the

latter piston having threadedly mounted axially therein an auxiliary piston 20, said elements constituting maximum torque regulating means. Mounted in the opposite end of cylinder 18 are pistons 22 and 23 urged apart by a spring 24, piston 23 seating against the left-hand end of the cylinder.

A conventional gauge 27 of well-known construction communicates by suitable connection line 28 with cylinder 18, the fluid pressure in cylinder 18 acting upon a maximum torque indicating pointer 29 in the gauge to indicate in association with suitable gauge indicia on the dial of the gauge the maximum torque which the wrench is to apply.

Reciprocally mounted in cylinder 11 there is a piston 30 which is acted upon in response to the applied torque by a pair of rollers 32 carried by the rock member. Piston 30 forms with the cylinder 11 a pressure chamber 35, which chamber in effect includes the passageway 36 and a bore 37 provided in the body and which will be referred to hereinafter.

Another piston 40 is reciprocally mounted in a cylinder 41 in the body, the latter piston being urged to the left by a coil spring 43. The front face of piston 40 forms with the left-hand end of the cylinder a chamber 44 which communicates with chamber 35 through a passageway 46 past a poppet valve 47 and also through a passageway 49 past a poppet valve 50, the latter valve being urged seated by a spring 51. Pop-pet 47 is urged seated by fluid pressure in chamber 55 provided in the body.

A second torque-indicating pointer 57 in the gauge 27 is acted upon by the fluid pressure in chamber 35 through a suitable connection line 58. In operation the chambers 18, 35, 44, 55 are charged with hydraulic fluid and by screwing one or both of the pistons 19, 20 inwardly the desired pressure is built up in chamber 18 to correspond with the maximum torque pressure to be applied by the wrench. This pressure is communicated through line 28 to the gauge and is indicated by the pointer 29.

As the rock member 10 rocks in response to applied torque, the rollers 32 selectively engage the piston 30 to push the latter inwardly of said chamber 35, the pressure in the latter chamber being communicated to the gauge through line 58 to actuate the pointer 57. If the torque pressure exceeds that for which the device is set, the poppet 47 will yield and move off its seat against the pressure in chamber 55, allowing fluid in the chamber 35 to pass into chamber 44, thus moving

piston 40 to the right against the spring 43. As the pressure in chamber 35 is thus relieved, the rock member may freely rock, and then by lessening of the applied torque, and consequent outward movement of piston 30, the spring 43 will act upon piston 40 to force the fluid in chamber 44 back into chamber 35 through passageway 49 past poppet 50. Thus the piston 30 is at all times kept in contact with one or both of the rollers 32.

In the operation of such a wrench it sometimes becomes desirable to facilitate, for instance, the loosening or tightening of a bolt or stud by means of a series of blows or impacts against the rock member. I shall now describe pulsating means incorporated in my device for accomplishing this purpose.

A casing 60 is threadedly mounted on the right-hand end of the body handle, the casing containing a solenoid coil 62 having a core 63, movement of the core being yieldably opposed in each direction by means of the respective springs 64, 65.

Reciprocally mounted in a bore 70 in the handle there is a piston 71 whose right-hand end is adapted to be engaged by the left-hand end of the core 63. Alternating current is applied to the coil through wires 75 when switch 77 is closed, causing the core 63 to reciprocate rapidly, striking piston 71, which latter is returned by a spring 78. Piston 71 acts upon the fluid in bore 37, which bore is connected through passageway 36 with chamber 35, thus converting the inward movement of the piston 71 into hydraulic impacts against piston 30 and thus to the rock member. The casing 60 has an end extension 79 threaded thereon which provides a handle extension 80.

Mounted in the packing ring grooves of the respective pistons 19, 20, 22, 23, 30 and 40, as well as in the poppet 47, I provide conventional fluid-tight packing rings 90. A packing ring 91 is also mounted in the annular groove 92 in handle 7.

I claim:

1. A torque-measuring wrench comprising a body presenting a pair of fluid chambers, a torque-actuated member carried by the body for movement relative thereto and being adapted for operative connection with the work, a piston movably mounted in the first chamber to create a predetermined pressure therein, a second piston reciprocally mounted in the second chamber, said second piston being reciprocable in response to movement of the torque-actuated member relative to the body to generate fluid pressure in the second chamber, and valve means operable in response to pressure in the second chamber in excess of the pressure in the first chamber to relieve fluid pressure in the second chamber.
2. A torque-measuring wrench comprising a body presenting three fluid chambers, a rock member pivotally carried by the body for rocking movement relative thereto in response to torque applied to the work, means for operatively con-

necting the rock member with the work, a piston threadedly mounted in the first chamber and movable therein to create a predetermined fluid pressure therein, a second piston reciprocally mounted in the second chamber and being operatively engaged by the rock member whereby to be reciprocated in response to movement of the rock member and thereby to generate pressure in the second chamber according to torque applied to the work, valve means operable in response to pressure in the second chamber in excess of the pressure in the first chamber to pass fluid from the second chamber to the third chamber, piston means in the third chamber and spring means cooperating with the last-named piston when the pressure in the second chamber is below that in the first chamber to return fluid from the third to the second chamber.

3. A torque wrench comprising a body, a torque-actuated member carried by the body for movement relative thereto, said member being adapted for operative connection to the work and movable in response to torque applied to the work, and means for successively impacting said member comprising a piston reciprocally mounted in the body for impacting engagement with said member and hydraulic means operatively associated with the piston to generate a pulsating fluid pressure against the latter.

4. A torque wrench comprising a body, a torque-actuated member carried by the body for movement relative thereto, said member being adapted for operative connection to the work and movable in response to torque applied to the work, and means for successively impacting said member comprising a piston reciprocally mounted in the body for impacting engagement with said member and hydraulic means operatively associated with the piston to reciprocate the latter, said hydraulic means including body walls providing a fluid chamber, a piston reciprocally mounted in the chamber and electrical means operatively associated with the latter piston to actuate the same.

5. A torque wrench comprising a body, a torque-actuated member carried by the body for movement relative thereto, said member being adapted for operative connection to the work and movable in response to torque applied to the work, and means for successively impacting said member comprising a piston reciprocally mounted in the body for impacting engagement with said member and hydraulic means operatively associated with the piston to reciprocate the latter, said hydraulic means including body walls providing a fluid chamber, a piston reciprocally mounted in the chamber, spring means urging the latter piston in one direction in the chamber, and electrical solenoid means having a reciprocable core engageable with said latter piston.

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