

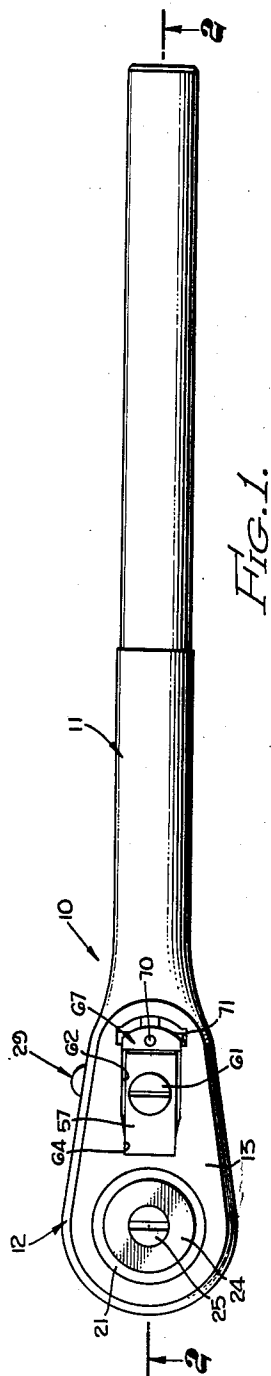
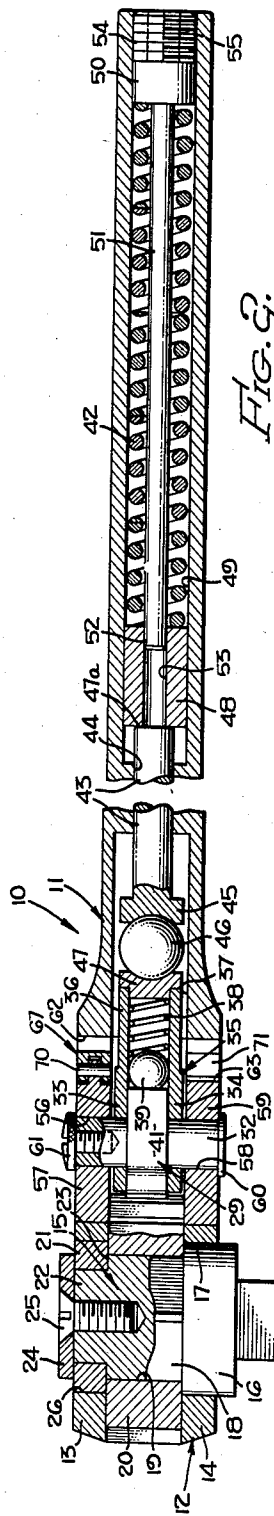
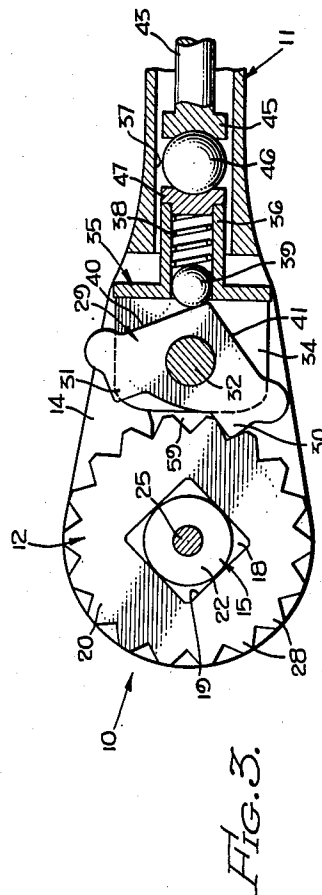
Aug. 17, 1954

F. W. LIVERMONT  
RATCHET-TYPE TORQUE WRENCH

2,686,446

Filed April 12, 1952

3 Sheets-Sheet 1



FRANK W. LIVERMONT,  
INVENTOR.

BY

Lyon & Lyon

ATTORNEYS

Aug. 17, 1954

F. W. LIVERMONT

2,686,446

RATCHET-TYPE TORQUE WRENCH

Filed April 12, 1952

3 Sheets-Sheet 2

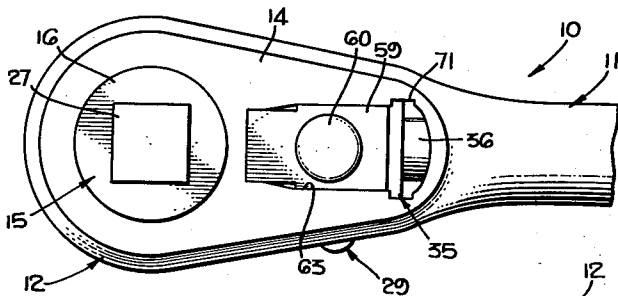


FIG. 4.

FIG. 5.

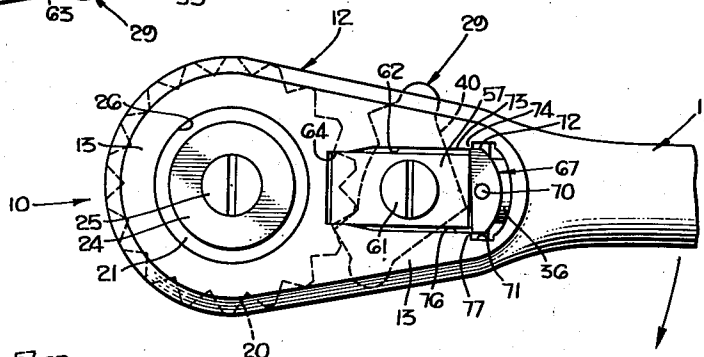
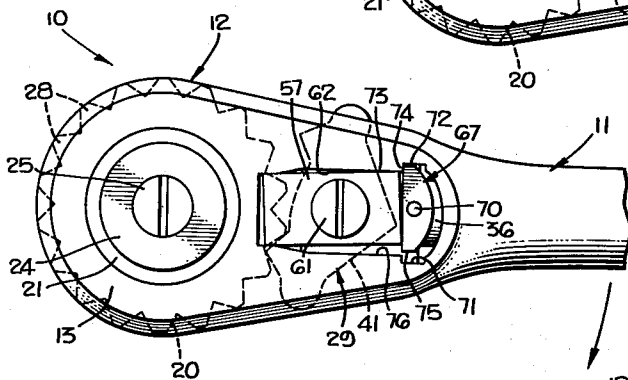


FIG. 6.

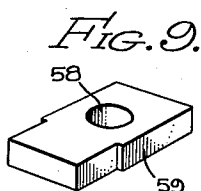


FIG. 9.

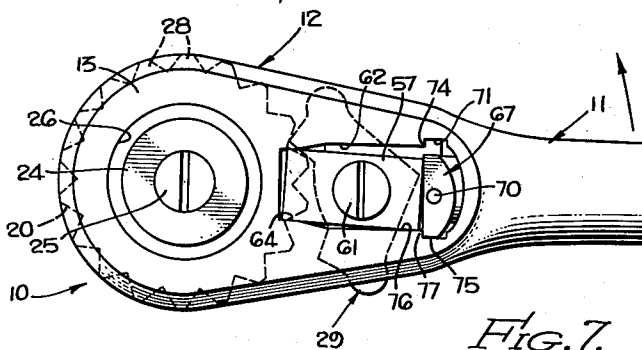


FIG. 7.

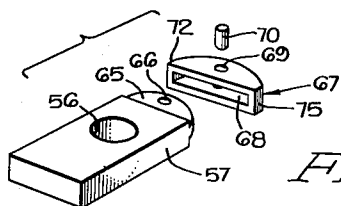


FIG. 8.

FRANK W. LIVERMONT,  
INVENTOR.

BY *Lyon & Lyon*  
ATTORNEYS

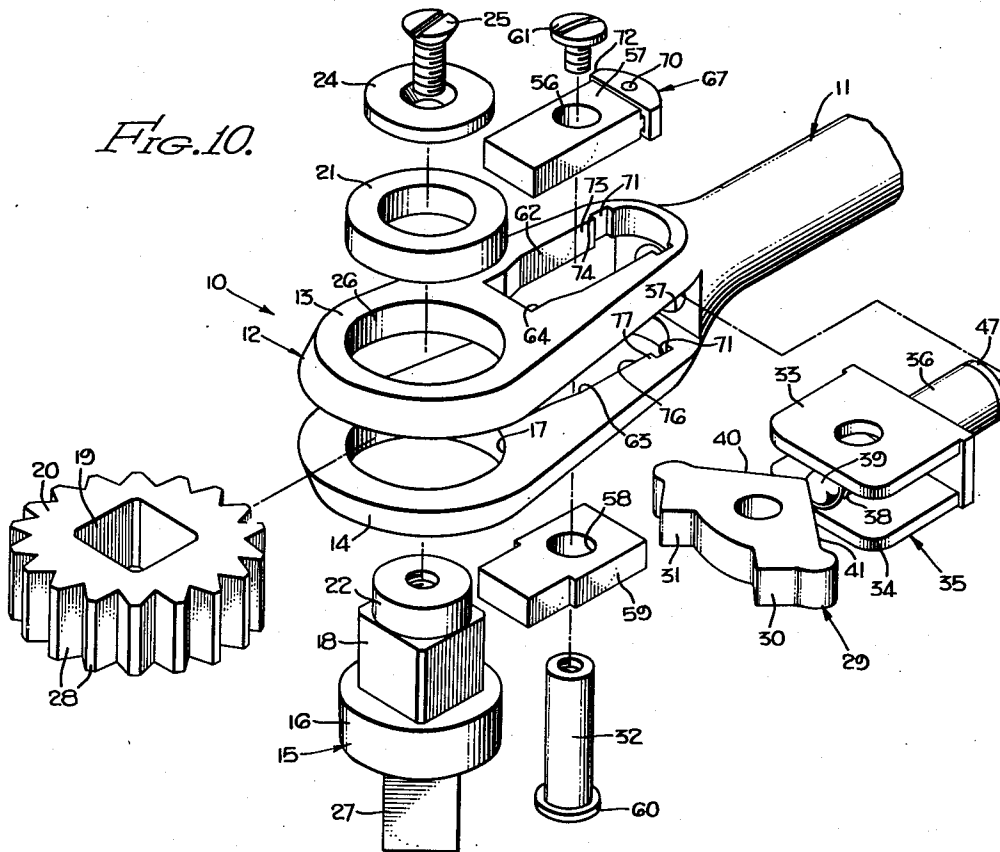
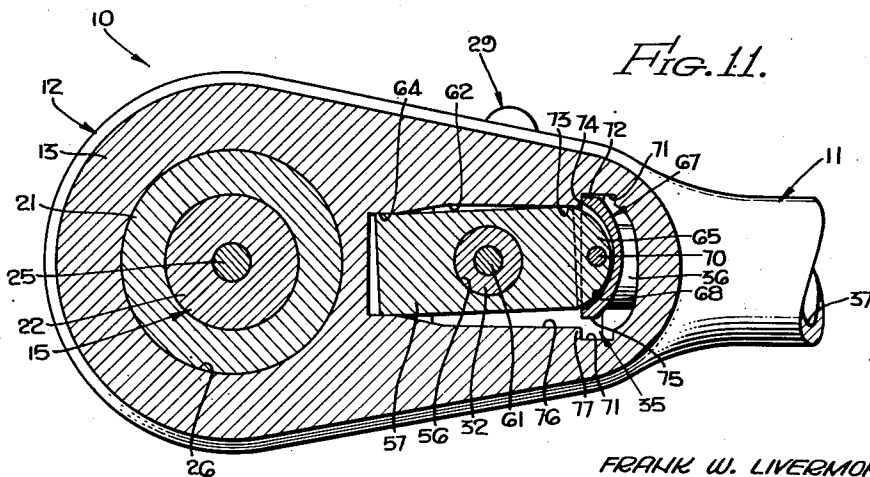
**Aug. 17, 1954**

F. W. LIVERMONT  
RATCHET-TYPE TORQUE WRENCH

**2,686,446**

Filed April 12, 1952

3 Sheets-Sheet 3



FRANK W. LIVERMONT,  
INVENTOR.

**BY**

Lyons Lyons

ATTORNEYS

## UNITED STATES PATENT OFFICE

2,686,446

## RATCHET-TYPE TORQUE WRENCH

Frank W. Livermont, Duarte, Calif.

Application April 12, 1952, Serial No. 281,973

15 Claims. (Cl. 81—52.5)

1

This invention relates to torque wrenches and is particularly directed to a ratchet-type wrench which gives a signal to the user when the desired torque is applied.

Ratchet-type wrenches are commonly provided with a head formed integrally with a handle and have a ratchet wheel mounted to turn on the head. A spring-urged pawl allows the ratchet wheel to turn only in one direction.

It is the principal object of my invention to provide improved torque-indicating means for wrenches of this type.

It is another object of my invention to provide a torque wrench of this type which provides both a visual and audible indication when the applied torque reaches a predetermined value.

Another object is to provide a device of this type having rugged and dependable operating parts which are not apt to get out of order and which provide a reliable and accurate signal when the applied torque reaches the desired value.

Other and more detailed objects and advantages will appear hereinafter.

In the drawings:

Figure 1 is a plan view showing a preferred embodiment of my invention.

Figure 2 is a sectional elevation taken substantially on the line 2—2 as shown in Figure 1.

Figure 3 is an enlarged fragmental plan view partly in section.

Figure 4 is a plan view of the underside of the wrench head.

Figure 5 is a plan view of the upper side of the wrench head showing the position of the parts during application of torque below the desired value.

Figure 6 is a view similar to Figure 5 showing the position of the parts after the torque has reached the predetermined magnitude.

Figure 7 is a view similar to Figure 6 showing the pawl shifted to permit the wrench to be used in a counterclockwise direction.

Figure 8 is a detailed perspective view showing parts of the pivoted slide block.

Figure 9 is a perspective view showing the guided slide block.

Figure 10 is an exploded view showing the manner of assembly of the various parts at the head end of the wrench.

Figure 11 is a sectional view on an enlarged scale showing the action of the pivoted slide block in its slot.

Referring to the drawings, the wrench generally designated 10 includes a handle 11, and an integral bifurcated head 12. The head 12 in-

2

cludes the parallel cheek plates 13 and 14 which are integrally joined with the handle 11. A driver member 15 has a cylindrical portion 16 mounted for rotation in the cylindrical bore 17 in the cheek plate 14. The driver member 15 also has a non-circular portion 18 which fits within the non-circular bore 19 of the ratchet wheel 20. The ratchet wheel 20 is received within the space between the cheek plates 13 and 14 and turns with the driver member 15. An annular ring 21 is received on the central cylindrical projection 22 of the driver member 15 and is clamped against the annular shoulder 23 by means of the washer 24 and screw element 25. The ring 21 is received within the cylindrical bore 26 in the cheek plate 13. The bores 17 and 26 are aligned and are of the same diameter so that the square projecting portion 27 of the driver member 15 may be assembled to project from either cheek plate as desired.

The ratchet wheel 20 is provided with the usual ratchet teeth 28 on its periphery, and a pawl 29 is provided with a pair of abutments 30 and 31 for selective engagement with the ratchet teeth 28. The pawl 29 is carried on a pivot pin 32, and this pin connects the pawl 29 to the parallel flanges 33 and 34 of the carrier generally designated 35. The carrier is provided with a tubular stem 36 which projects into an axial bore 37 provided on the handle 11. A spring 38 acts to urge a ball 39 into engagement with either of the surfaces 40 or 41 on the pawl 29. When the ball 39 engages the surface 40, as shown in Figure 3, the abutment 30 is in position to engage the teeth 28 of the ratchet wheel 20. Accordingly, the pawl 29 permits the ratchet wheel to turn in a clockwise direction as viewed in Figure 3 but prevents a counterclockwise rotation of the ratchet wheel. When the abutment 31 is swung into teeth-engaging position the ball 39 engages the surface 41 of the pawl 29 and the ratchet wheel 20 is permitted to turn counterclockwise but not clockwise as viewed in Figure 3.

In accordance with my invention the carrier 35 is guided for movement longitudinally of the handle 11 and moves against the force of a spring 42 confined within the handle 11. A plunger 43 is slidably mounted within a bore 44 extending longitudinally of the handle 11, and this plunger is provided with an enlarged end 45 for engagement with the ball 46. The end 47 of the carrier 35 also engages the ball 46. The end 47a of the plunger 43 engages the sleeve 48 which is mounted to slide axially of the bore 49 within the handle 11. The spring 42 is confined within

the bore 49 and at one end engages the sleeve 48 and at the other end engages the enlarged end 50 on the rod 51. The forward end 52 of the rod 51 is slidably received within the bore 53 of the sleeve 48. A set screw 54 is threaded into the outer end of the bore 49 and serves to compress the spring 42. The set screw 54 may be provided with the usual noncircular socket 55 so that it may be turned by means of a wrench (not shown) insertable into the socket.

The pivot pin 32 which connects the pawl 29 to the carrier 35 also passes through aperture 56 on the pivoted slide block 57 and through aperture 58 on the guided slide block 59. The pin 32 is provided with an integral head 60 on one end and is provided on the other end with a removable retaining screw 61. The slide block 57 is received within a slot 62 provided in the cheek plate 13 while the slide block 59 is mounted within a slot 63 provided in the cheek plate 14. Both slide blocks 57 and 59 move within their respective slots when the carrier 35 moves longitudinally against the action of the spring 42. The slots 62 and 63 are substantially duplicates in order that each may receive either of the slide blocks 57 or 59.

The slide block 59 is guided for longitudinal movement within the slot 63 but does not pivot with respect to the cheek plate 14. The slide block 57, however, slidably fits the slot 62 only at its narrowed forward end 64. The remainder of the length of the slide block 57 has considerable clearance with the sides of the slot 62. The result is that the slide block 57 may pivot about the pin 32 as it moves longitudinally in the slot 62.

As clearly shown in Figure 8 the slide block 57 is provided with a semi-circular projection 65 having a central aperture 66. A lug 67 is provided with a recess 68 to receive the projection 65 and is also provided with aligned apertures 69. A pivot pin 70 extending through the apertures 69 and 66 pivotally connects the lug 67 to the slide block 57. The proportions of the parts are such that the lug 67 may have limited pivotal motion with respect to the slide block 57. The over-all width of the lug 67 is such that it may be slidably received within the slot 62. The slots 62 and 63 are both provided with enlargements 71 at one end.

In operation the parts may be assembled as shown in Figure 2. The set screw 54 is turned to produce the necessary force in the spring 42. The squared portion 27 of the driver is engaged with a socket to be turned. The pawl 29 is swung manually so that the turning force applied to the work may be right-hand or left-hand as desired. Assuming that the work is to be turned in a clockwise direction as viewed in Figure 3, the pawl 29 is moved to bring the abutment 30 into engagement with the ratchet teeth 28. When the handle 11 is turned clockwise as viewed in Figure 5 a force is exerted by the ratchet wheel 20 against the pawl 29 and against the pin 32. This force causes the end 72 of the lug 67 to engage the surface 73 of the slot 62 and also causes the slide blocks 57 and 59 to move longitudinally of the handle against the action of the spring 42 acting through plunger 43 and carrier 35. As the torque applied to the handle 11 increases, the slide blocks 57 and 59 continue to move longitudinally away from the axis of the ratchet wheel 20. During this sliding movement of the block 57 the lug 67 assumes the position shown in

Figure 5 because of the frictional drag of its end surface 72 on the surface 73 of the slot 62.

When the end surface 72 on the lug 67 eventually rounds the corner 74 at the end of the slot surface 73 the slide block 57 suddenly moves laterally, pivoting about the pin 32 and bringing the side of the block 57 into engagement with the surface 73. This action results in reversing the pivotal position of the lug 67 with respect to the slide block 57 and the parts take the position shown in Figures 6 and 11. An audible sound in the form of a sharp metallic "click" is produced when the lug 67 rounds the corner 74. This sudden change in position of the parts 57 and 67 also sends a shock wave down the handle 11 which is readily detected by the hand of the user. This change in position of the parts also provides a visual indication to the user. These various signals are given simultaneously and the user promptly discontinues the application of torque to the handle 11. The set screw 54 may be turned to produce any desired torque value within the range of operation of the tool. The initial setting may be determined by a torque-measuring device, or in any other desired manner. Once set the torque wrench will produce the signals whenever the predetermined torque value is reached, and within very close limits.

When it is desired to use the tool in a counterclockwise direction the pawl 29 is swung to the position shown in Figure 7. When the handle 11 is turned in a counterclockwise direction the surface 75 on the lug 67 rides on the surface 76 of the slot 62. When the predetermined torque value is reached the end surface 75 rounds the corner 77 and the slide block 57 pivots about the pin 32 to engage the surface 76. At the same time the lug 67 pivots with respect to the block 57. This action produces the same signals above described and the user of the wrench is thus notified that the desired torque has been applied.

The sides of the slots 62 and 63 are hardened and the slide blocks 57 and 59, as well as the lug 67, are likewise hardened to minimize wear at the points where sliding action occurs. The corners 74 and 77 are subjected to the greatest amount of wear. When these corners have been worn down the parts may be assembled with the slide block 57 in the groove 63 and the slide block 59 in the groove 62. In this way the service life of the tool is considerably extended.

Having fully described my invention, it is to be understood that I do not wish to be limited to the details herein set forth, but my invention is of the full scope of the appended claims.

I claim:

1. In a ratchet-type torque wrench, the combination of: a handle having a head at one end, a ratchet wheel mounted for rotation on the head, a pawl cooperating with the ratchet wheel to prevent turning motion thereof in one direction, a carrier mounted for movement longitudinally of the handle, a pivot pin connecting the pawl to the carrier, resilient means mounted on the handle to resist movement of the carrier in a direction away from the ratchet wheel, and signal means operative upon predetermined travel of the carrier.

2. In a ratchet-type torque wrench, the combination of: a handle having a head formed integrally therewith, a ratchet wheel mounted for rotation on the head, a pawl cooperating with the ratchet wheel to prevent turning motion thereof in one direction, a carrier mounted for movement longitudinally of the handle, a pivot

5

pin connecting the pawl to the carrier, a spring within the handle resisting movement of the carrier away from the ratchet wheel, and signal means operative upon predetermined longitudinal movement of the carrier.

3. In a ratchet-type torque wrench, the combination of: a handle having a head at one end, a ratchet wheel mounted for rotation on the head, a pawl cooperating with the ratchet wheel to prevent turning motion thereof in one direction, a carrier mounted for movement longitudinally of the handle, a pivot pin connecting the pawl to the carrier, a spring within the handle resisting movement of the carrier away from the ratchet wheel, means for adjusting the force of the spring, and signal means operative upon predetermined longitudinal movement of the carrier.

4. In a reversible ratchet-type torque wrench, the combination of: a handle having a head at one end, a ratchet wheel mounted for rotation on the head, a pawl having spaced abutments each cooperable with the ratchet wheel to prevent turning motion thereof in one direction, a carrier mounted for movement longitudinally of the handle, a pivot pin connecting the pawl to the carrier, the pawl being shiftable about the pivot pin to bring either abutment into operative engagement with the ratchet wheel, resilient means mounted on the handle to resist movement of the carrier away from the ratchet wheel, and signal means operative upon predetermined longitudinal movement of the carrier.

5. In a ratchet-type torque wrench, the combination of: a handle having a head at one end, a ratchet wheel mounted for rotation on the head, a pawl cooperating with the ratchet wheel to prevent turning motion thereof in one direction, a carrier mounted for movement longitudinally of the handle, a pivot pin connecting the pawl to the carrier, resilient means mounted on the handle to resist movement of the carrier in a direction away from the ratchet wheel, and signal means including an element pivotally connected to said pin, the element being guided for movement on the head and having a portion thereof movable laterally upon predetermined travel of the carrier.

6. In a torque wrench the combination of: a handle having a head at one end, work-engaging means on the head, a carrier mounted for movement longitudinally of the handle, means operatively interposed between the work-engaging means and the carrier to cause longitudinal movement of the carrier upon application of torque by the handle to the work-engaging means, resilient means mounted on the handle to resist movement of the carrier, and signal means including a guide means terminating in a laterally offset portion, an element so connected to said carrier as to bear laterally against said guide means and slide therein as said carrier is moved in opposition to said resilient means, and thereby move forcibly into said laterally offset portion upon predetermined travel of said carrier.

7. In a torque wrench the combination of: a handle having a head at one end, work-engaging means on the head, a carrier mounted for movement longitudinally of the handle, means operatively interposed between the work-engaging means and the carrier to cause longitudinal movement of the carrier upon application of torque by the handle to the work-engaging means, resilient means mounted on the handle to resist

6

movement of the carrier, signal means including a guide means terminating in a laterally offset portion, an element so connected to said carrier as to bear laterally against said guide means and slide therein as said carrier is moved in opposition to said resilient means, and thereby move forcibly into said laterally offset portion upon predetermined travel of said carrier.

8. In a torque wrench the combination of: a handle having a head at one end, the head having walls defining a slot extending longitudinally of the handle, work-engaging means on the head, a carrier mounted for movement longitudinally of the handle, means operatively interposed between the work-engaging means and the carrier to cause longitudinal movement of the carrier upon application of torque by the handle to the work-engaging means, resilient means mounted on the handle to resist movement of the carrier, and signal means including an element pivotally connected to the carrier and guided for movement along said slot, the element having a portion thereof movable laterally upon predetermined travel in the slot.

9. In a torque wrench the combination of: a handle having a head at one end, the head having walls defining a slot extending longitudinally of the handle, work-engaging means on the head, a carrier mounted for movement longitudinally of the handle, means operatively interposed between the work-engaging means and the carrier to cause longitudinal movement of the carrier upon application of torque by the handle to the work-engaging means, resilient means mounted on the handle to resist movement of the carrier, signal means including a slide block movable in said slot and pivotally connected to the carrier, a lug pivotally connected to one end of the slide block, the lug slidably engaging a wall of the slot and movable laterally upon predetermined travel along said slot.

10. In a torque wrench the combination of: a handle having a head at one end, the head having walls defining a slot extending longitudinally of the handle, the slot having a shoulder at one end, work-engaging means on the head, a carrier mounted for movement longitudinally of the handle, means operatively interposed between the work-engaging means and the carrier to cause longitudinal movement of the carrier upon application of torque by the handle to the work-engaging means, resilient means mounted on the handle to resist movement of the carrier, signal means including a slide block movable in said slot and pivotally connected to the carrier, a lug pivotally connected to one end of the slide block, the lug slidably engaging a wall of the slot and movable laterally upon traveling past said shoulder.

11. In a torque wrench the combination of: a handle having a head at one end, the head having walls defining a slot extending longitudinally of the handle, the slot having an offset recess at one end, work-engaging means on the head, a carrier mounted for movement longitudinally of the handle, means operatively interposed between the work-engaging means and the carrier to cause longitudinal movement of the carrier upon application of torque by the handle to the work-engaging means, resilient means mounted on the handle to resist movement of the carrier, and signal means including a slide block movable in said slot and pivotally connected to the carrier, a lug on the slide block slidably engaging a wall of the slot and movable laterally into the offset recess upon predetermined travel of the carrier.

12. In a ratchet-type torque wrench, the combination of: a handle having a head at one end, a ratchet wheel mounted for rotation on the head, a pawl cooperating with the ratchet wheel to prevent turning motion thereof in one direction, a carrier mounted for movement longitudinally of the handle, a pivot pin connecting the pawl to the carrier, resilient means on the handle resisting movement of the carrier away from the ratchet wheel, the head having walls defining a slot therein extending longitudinally of the handle, the slot having an offset recess at one end, a slide block mounted for movement in the slot and pivotally connected to said pin, a lug pivotally connected to the slide block at one end, the lug slidably engaging a wall of the slot and movable laterally into the offset recess upon predetermined travel of the carrier.

13. In a reversible ratchet-type torque wrench, the combination of: a handle having a head at one end, a ratchet wheel mounted for rotation on the head, a pawl having spaced abutments each cooperable with the ratchet wheel to prevent turning motion thereof in one direction, a carrier mounted for movement longitudinally of the handle, a pivot pin connecting the pawl to the carrier, the pawl being shiftable about the pivot pin to bring either abutment into operative engagement with the ratchet wheel, resilient means on the handle resisting movement of the carrier away from the ratchet wheel, the head having walls defining a slot therein, the slot having offset recesses at one end, a slide block mounted for movement in the slot and pivotally connected to said pin, a lug on the slide block and extending laterally beyond the side edges of the slide block to slidably engage either wall of said slot, the slide block turning about the pivot pin to engage a wall of the slot when the lug enters one of the offset recesses.

14. In a ratchet-type torque wrench, the combination of: a handle having a head at one end, a ratchet wheel mounted for rotation on the head, a pawl cooperating with the ratchet wheel to prevent turning motion thereof in one direction, a carrier mounted for movement longitudinally of the handle, a pivot pin connecting the pawl to

the carrier, the pawl applying a force to the pin in a direction at an angle to the direction of movement of the carrier, resilient means resisting movement of the carrier away from the ratchet wheel, the head having walls defining a slot therein and provided with a shoulder, a slide block mounted for movement in the slot and pivotally connected to said pin, a lug on the slide block and extending laterally beyond the side edges of the slide block, the lug slidably engaging a wall of said slot, the slide block turning about the pivot pin by the action of said force when the lug travels beyond the said shoulder.

15. In a ratchet-type torque wrench, the combination of: a handle having a head formed integrally therewith, a ratchet wheel mounted for rotation on the head, a pawl cooperating with the ratchet wheel to prevent turning motion thereof in one direction, a carrier mounted for movement longitudinally of the handle, a pivot pin connecting the pawl to the carrier, a spring within the handle resisting movement of the carrier away from the ratchet wheel, means for adjusting the force of the spring, the head having walls defining a slot therein and provided with a shoulder, a slide block mounted for movement in the slot and pivotally connected to said pin, a lug pivotally connected to the slide block and extending laterally beyond a side edge of the slide block, the lug slidably engaging a wall of said slot, the slide block turning about the pivot pin to engage the said wall of the slot when the lug travels beyond the said shoulder.

### References Cited in the file of this patent

#### UNITED STATES PATENTS

| Number    | Name     | Date          |
|-----------|----------|---------------|
| 1,860,871 | Pouliot  | May 31, 1931  |
| 2,179,855 | Latimer  | Nov. 14, 1939 |
| 2,300,652 | Cooney   | Nov. 3, 1942  |
| 2,365,486 | Morris   | Dec. 19, 1944 |
| 2,427,153 | Mossberg | Sept. 9, 1947 |

#### FOREIGN PATENTS

| Number  | Country | Date         |
|---------|---------|--------------|
| 116,761 | Sweden  | July 2, 1946 |