This invention relates to torque wrenches. More particularly, it relates to wrenches for automatically releasing themselves when a predetermined high torque is exerted thereupon.

This invention is an improvement on my invention entitled "Torque Wrench" filed by me April 9, 1951, Serial Number 219,903. The torque wrench disclosed and claimed by me in that application is highly satisfactory, but like most torque wrenches it is limited to use upon devices whereupon only a small or moderate amount of torque is to be exerted. My present invention, as disclosed and claimed herein constitutes an improvement upon my invention disclosed in my previous application with respect to torque wrenches in general and more especially with respect to torque wrenches constructed and to be used for imposing a high torque upon the elements to be turned thereby.

Various wrenches have been constructed previously for the purpose of applying a torque to an element to be turned and some of these are automatically releasable. None of these, however, to the applicant's knowledge, are adapted for applying a high torque to the element to be turned and to automatically release itself when a predetermined high torque is applied to that element. All of the automatically releasing torque wrenches known to the applicant prior to the instant invention are adapted solely for use with small to moderate amounts of torque.

It is a general object of my invention to provide a novel and improved torque wrench of cheap and simple construction.

A more specific object is to provide a novel and improved torque wrench which will require a high torque before it automatically releases.

Another object is to provide a torque wrench requiring high torque for its release and in which adjustment may be made to cause the wrench to release at any desired predetermined high torque.

Another object is to provide a novel and improved high torque wrench of compact size and capable of ready adjustment to release at other predetermined high torques.

Another object is to provide a high torque wrench which may be quickly and easily reset after its release.

These and other objects and advantages of my invention will more fully appear from the following description made in connection with the accompanying drawings, wherein like reference characters refer to similar parts throughout the several views, and in which:

Fig. 1 is a longitudinal sectional view of one embodiment of my invention with a portion of the handle broken away;

Fig. 2 is a fragmentary side elevational view of the same with the head member shown in longitudinal section taken in a plane at right angles to the plane shown in Fig. 1; and

Fig. 3 is a top plan view of the head member with the top plate intact and of the interior shank portion of the handle.

One embodiment of my invention may include, as shown in Figs. 1-3, an interiorly tapped handle member indicated generally as H and having rigidly secured thereto at its outer end a head member 6. The head member 6 has a hollowed out portion 7 formed therein, this hollowed area being somewhat elongated but generally circular at each of its end portions as best shown in Fig. 1 and indicated by the numeral 8. An opening 8a is formed in the bottom wall of the hollowed out head member so that a passage extends transversely through the head member 6. This is best shown in Fig. 2. A second opening 9b is formed in the bottom wall to receive a pivot pin to be hereinafter described. Mounted for rotation in the outer end portion of the head member is a rotatable body or socket 8. This socket 9 has an opening 9a extending therethrough of the proper size and shape to engage the element desired to be turned by the wrench. The socket 9 has a central circumferential rib 11 which provides a shoulder 12 to cooperate with the portions 13 of the bottom wall which define the opening 9a to hold the socket from sliding outwardly from the head member 6.

A plate 14 is secured to the other side of the head member by cap screws 15, this plate 16 having an opening 16 therein of sufficient size to permit the outer edge portions of the socket to extend outwardly therethrough. A smaller opening 16a is also formed in the plate 16 to receive the pivot pin previously referred to and to be hereinafter described. Formed in the outer circumferential surface of the central rib 11 of the socket 8 are a plurality of ratchet teeth 17 which are directed in a general direction around the socket member (this direction being shown as clock-wise in Fig. 1). Absent any engaging element cooperating with these ratchet teeth 17 the socket 8 is free to rotate in the hollow portion 8 of the head member but is confined to that portion.

The handle H is comprised of a shank 18 which, as shown in Fig. 1, is formed integrally with the head member 6. This shank 18 has a longitudinally extending bore 19 which communicates with the hollowed out portion 7 of the
head 6 and which extends throughout the entire length of the shank. The medial portion of the shank 18 is externally threaded as at 20 while the reverse or inwardly extended shoulders 22 are disposed opposite each other as best shown in Fig. 1 and Fig. 3. The shank 18 is grinded on the surface 23 along the circumference of its outer end portion. 3

The other section of the handle H is internally threaded as at 24 to cooperate with the external threads 26 of the shank 18 as best shown in Fig. 1. This section has an interior bore extending inwardly from its outer end and of sufficient diameter to accommodate the shank 18. The bore is of sufficient length to also accommodate a relatively strong spring 25 which is maintained at its inner end in central position with respect to the shank 18. This section also has an internally threaded aperture 27 and is adapted to receive a set screw 30 opposite the reduced portion 21 of the shank 18. Mounted for limited sliding movement within the shank 18 of the handle H is a rod 31 as best shown in Fig. 1. The inner end of this rod is externally threaded as at 32 to threadedly receive a nut 33 of external diameter equal to the spacing between the opposite shoulders 22. As best shown in Fig. 1, this rod 31 is of sufficient length so that its inner end extends inwardly beyond the shank 18 and a nut 33 is received at the outer end of the spring 25 and is of sufficient length so that its outer end 34 extends into the hollowed out area 7 of the head member 6.

The outer end of the rod 31 is flattened and reduced as at 35 to receive the inwardly extended circular enlargement 36 of a toggle member indicated generally as T. The bracket arms 36 are spaced from each other to accommodate the flattened portion 35 between them and have apertures formed therein to accommodate a pivot pin 37 which extends through each of the arms 36 and the flattened portion 35. This pivot pin 37 is arranged to extend transversely with respect to the rod 31 and on an axis substantially parallel to the axis of rotation of socket member 8.

The toggle member T is provided with an outwardly extending circumferential shoulder 38 and is further provided at its outer end portions with a cylindrically shaped key 39. This key 39 extends transversely with respect to the rod 31 and substantially parallel to the pivot pin 37. A relatively weak spring 40 is carried by the outer end 34 of the rod 31 and by the inner end of the toggle member T. This spring abuts against the shoulder 36 and against the wall of the head member 6 which defines the hollowed area 7. The walls of the hollowed area 7 are sufficiently spaced from the toggle member T so that the latter may swing sufficiently far to either side of the longitudinal center of the rod 31 to cause the key 39 to become completely disengaged from the lever member to be hereinafter described.

Pivoted mounted between the bottom wall of the head member 6 and the plate 4 upon a pivot pin 41 is a lever member indicated gener-
over, the toggle T automatically, for all practical purposes, causes the lever member 43 to release the socket S even though a much lower torque will be required to cause the socket to rotate relative to the tooth 44 when the tooth is swung to the position shown in broken lines in Fig. 1. Thus it can be seen that the socket member 9 is free to rotate relative to the handle H after the toggle T has swung to the broken line position.

After the toggle T has come over, the wrench can be immediately reset for use on the next element by swinging the reset arm 43 back to its original position, thereby causing the lever arm of the lever member 43 to thrust the toggle mechanism T back beyond its original position until the key 33 can again slip into the recess 46. When this is done the tooth member 44 will again be engaging the ratchet teeth 17 of the socket member 9 and the wrench is again ready for use.

The torque required to cause the toggle T to cam over may be predetermined at various degrees of compression exerted on the spring 25 and the same may be indicated on the shank 18 by graduations as indicated in Fig. 3. Thus the user may readily adjust the compression exerted on the spring 25 by tightening or loosening the portion of the handle carrying the set screw with respect to the shank 18. When the handle has been adjusted so that the desired torque will be required to cause the toggle T to cam over, that fact will be indicated by reference to the reading 26 as shown in Fig. 2. Thus it is possible to adjust the wrench readily to cam over at various predetermined torques.

Thus it can be seen that it becomes impossible with this wrench regardless of carelessness or adjustment in the use of wrenches to tighten a given element beyond a predetermined high torque for the socket S will automatically be released as soon as that predetermined torque is exceeded. At the same time it is possible to tighten elements which require a high torque and yet to have the automatic release feature available. In other words, it is possible, through the use of my wrench, to tighten a given element to a high degree of torque with full assurance that when that torque is reached there is no danger of exceeding the same.

It should be noted that my wrench is also adjustable to compensate for changes which may take place over a period of time in the resistance which the spring 25 offers to compression. By adjusting the nut 33 on the thread end of the rod 31 the amount of compression can be changed even though the two sections of the handle remain in the same position with respect to each other.

It should be noted that I have provided a torque wrench which is cheap and simple to construct and which may be quickly and easily reset after its release. My torque wrench is constructed to exert a high torque previously impossible in torque wrenches and to automatically release this torque when a predetermined limit is reached. This positively prevents the element being tightened by the wrench from being damaged seriously. It is highly important in various assembling operations that the tensile material being used be of such a nature as to rupture when a predetermined torque is exceeded. My wrench provides a ready and efficient means for accomplishing this function. For example, it is imperative in the installation of spark plugs that the plugs be inserted with a high torque in order to insure long life of the plugs. When the plugs are installed merely through guessing at the amount of torque applied thereto there is constant danger that either insufficient torque will be used or that the plug itself will be damaged by an excess of torque being applied thereto. My wrench positively prevents the occurrence of such damage or improper installation and enables even the most unskilled type of laborer to install spark plugs at the optimum torque.

It should also be noted that my wrench, despite the fact that it is possible of exerting unusually high torque upon a given element and is capable of automatically releasing when a predetermined high torque is attained, is very compact and relatively simple to manufacture. In spite of its simplicity, compactness and inexpensiveness, it is a highly efficient tool which takes the risk out of tightening elements to a high torque because the element of guess-work is completely removed.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departing from the scope of my invention.

What is claimed is:

1. An automatically releasing torque wrench comprising a handle member, a rotatable body mounted for free rotation upon said handle member adjacent one end thereof, a rotatable body mounted for free rotation in the opposite direction about a fulcrum to yieldably hold said rotatable body against rotation in the opposite direction so long as a predetermined torque is not applied thereto, said portion of said lever member being swingable into non-engaging position relative to said rotatable body when such predetermined torque is applied to said rotatable body to permit the latter to thereafter turn without being re-engaged by said portion of said lever.

2. An automatically releasing torque wrench comprising a handle member having a head portion at one end thereof, a rotatable body mounted for free rotation upon said head portion of said handle member and having outwardly extending teeth on the outer circumferential surface thereof and adapted to be connected to the element to be turned by the wrench, a movable lever member carried by said handle member adjacent said rotatable body, a portion of said lever member engaging said rotatable body to ordinarily prevent its rotation and resilient mechanism normally urging said portion of said lever member in a predetermined direction about its fulcrum to yieldably hold said rotatable body against rotation in the opposite direction so long as a predetermined torque is not applied thereto, said portion of said lever member being swingable into non-engaging position relative to said rotatable body when such predetermined torque is applied to said rotatable body whereby said body will then become freely rotatable relative to said handle member without being re-engaged by said portion of said lever.

3. An automatically releasing high torque wrench for applying a high torque to an element
2,663,436

5. An automatically releasing high torque wrench comprising a handle member having a head portion thereupon, a rotatable body mounted for rotation upon said head portion of said handle member and adapted to be connected to the element to be turned by the wrench, a movable first-class lever member carried by said handle member adjacent said rotatable body and having a longer lever arm and a shorter lever arm, a pivot being provided therein, said rotatable body engaging said rotatable body to ordinarily prevent its rotation, and a resilient means normally urging said portion of said lever arm in a predetermined direction about its fulcrum to yieldably hold said rotatable body against rotation in the opposite direction so long as a predetermined torque is not applied thereto, said resilient means including toggle mechanism extending normally diagonally to said lever member and engaging the longer lever arm of said lever member to insure that said rotatable member will not be permitted to rotate until a predetermined high torque is applied thereto, said shorter lever arm being swageable into non-engaging position relative to said body when such a predetermined high torque is applied to said body to permit the latter to thereafter turn without being re-engaged by said portion of said shorter lever arm.

6. An automatically releasing high torque wrench for use in applying a high torque to an element to be turned, said wrench comprising a handle member having a head portion thereupon, a rotatable body mounted for rotation upon said head portion of said handle member and adapted to be connected to the element to be turned by the wrench, a movable first-class lever member carried by said handle member adjacent said rotatable body and having a longer lever arm and a shorter lever arm, a pivot being provided therein, said rotatable body engaging said rotatable body to ordinarily prevent its rotation, and a resilient means normally urging said portion of said lever arm in a predetermined direction about its fulcrum to yieldably hold said rotatable body against rotation in the opposite direction so long as a predetermined torque is not applied thereto.

7. An automatically releasing high torque wrench comprising an at least partially hollow head member, a rotatable body mounted for free rotation in the hollow portion of said head member and adapted to engage the element to be turned by the wrench, a movable lever member having a pivot being provided therein, said movable lever member being engaged by said rotatable body to rotate freely in the direction of the torque without being re-engaged by said rotatable body.

8. An automatically releasing high torque wrench comprising an at least partially hollow head member, a rotatable body mounted for free rotation in the hollow portion of said head member and adapted to engage the element to be turned by the wrench, a movable lever member having a pivot being provided therein, said movable lever member being engaged by said rotatable body to rotate freely in the direction of the torque without being re-engaged by said rotatable body.
municating with said hollow portion of said head member, a rod mounted within said bore for limited sliding movement longitudinally of the handle, a toggle member swingably connected to the outer end of said rod and normally extending at an angle thereto and having an engaging element on the outer end portion of the same, resilient means constantly urging said rod toward said rotatable body, a movable lever member interposed between said toggle member and said rotatable body, a portion of said lever member being engaged by the engaging element of said toggle member to urge said lever arm to move in one direction and the other portion of said lever member engaging said rotatable body to ordinarily prevent its rotation in the opposite direction, said lever member functioning to move said last mentioned portion to non-engaging position relative to said rotatable body when a predetermined torque is exceeded to permit said rotatable body to rotate freely, and manual resetting mechanism connected to said lever member and extending outwardly of said head member whereby said lever member may be readily returned to engaging position with respect to said body.

OREN B. HARMES.

References Cited in the file of this patent
UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,574,865</td>
<td>Boykin</td>
<td>Mar. 2, 1926</td>
</tr>
<tr>
<td>2,172,561</td>
<td>Kruse</td>
<td>Sept. 12, 1939</td>
</tr>
<tr>
<td>2,427,153</td>
<td>Mossberg</td>
<td>Sept. 9, 1947</td>
</tr>
<tr>
<td>2,556,587</td>
<td>Keen</td>
<td>June 12, 1951</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Country</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>100,874</td>
<td>Australia</td>
<td>Feb. 20, 1940</td>
</tr>
<tr>
<td>565,315</td>
<td>Great Britain</td>
<td>Nov. 6, 1944</td>
</tr>
<tr>
<td>574,346</td>
<td>Great Britain</td>
<td>Jan. 1, 1946</td>
</tr>
<tr>
<td>717,570</td>
<td>Germany</td>
<td>Feb. 17, 1942</td>
</tr>
<tr>
<td>804,186</td>
<td>Germany</td>
<td>Apr. 16, 1951</td>
</tr>
</tbody>
</table>