

Jan. 12, 1943.

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2,308,428

WRENCH-ACTING TOOL

Filed June 29, 1939

3 Sheets-Sheet 1

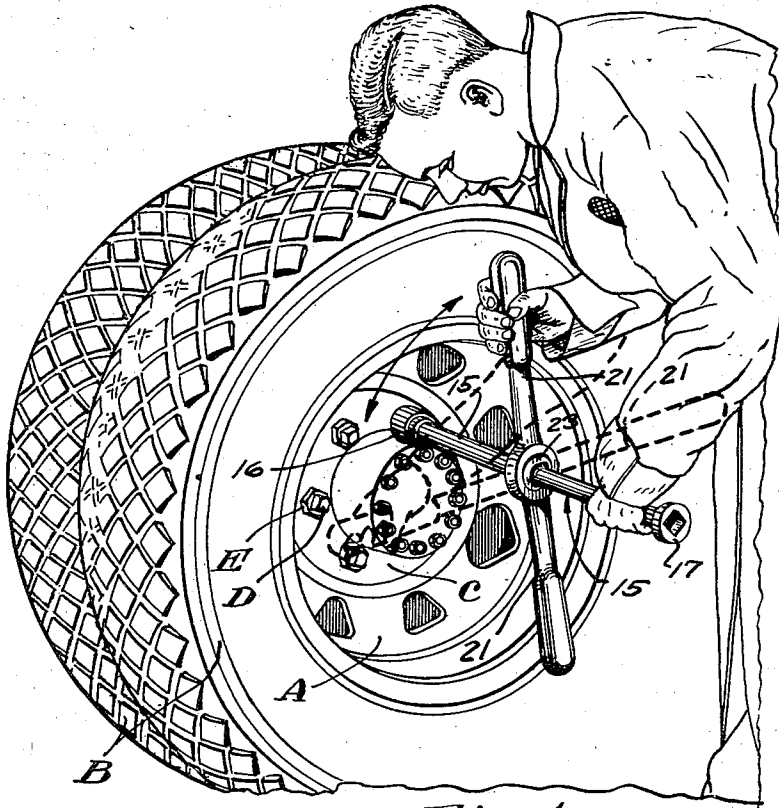


Fig. 1

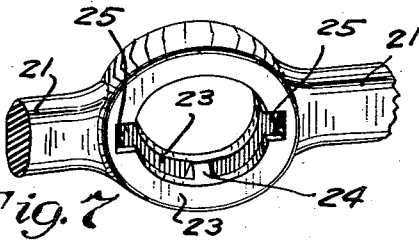


Fig. 7

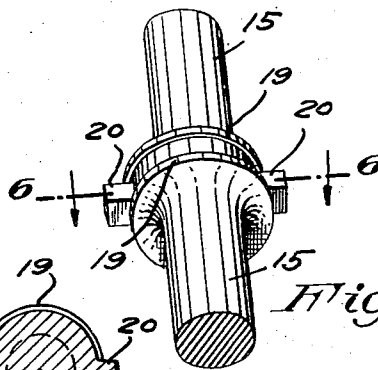


Fig. 5

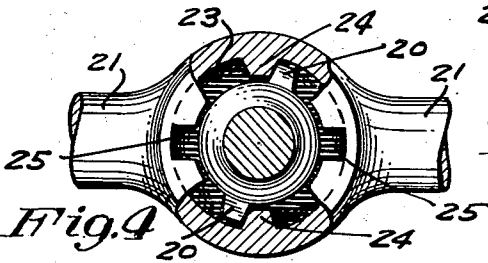


Fig. 4

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3 Sheets-Sheet 2

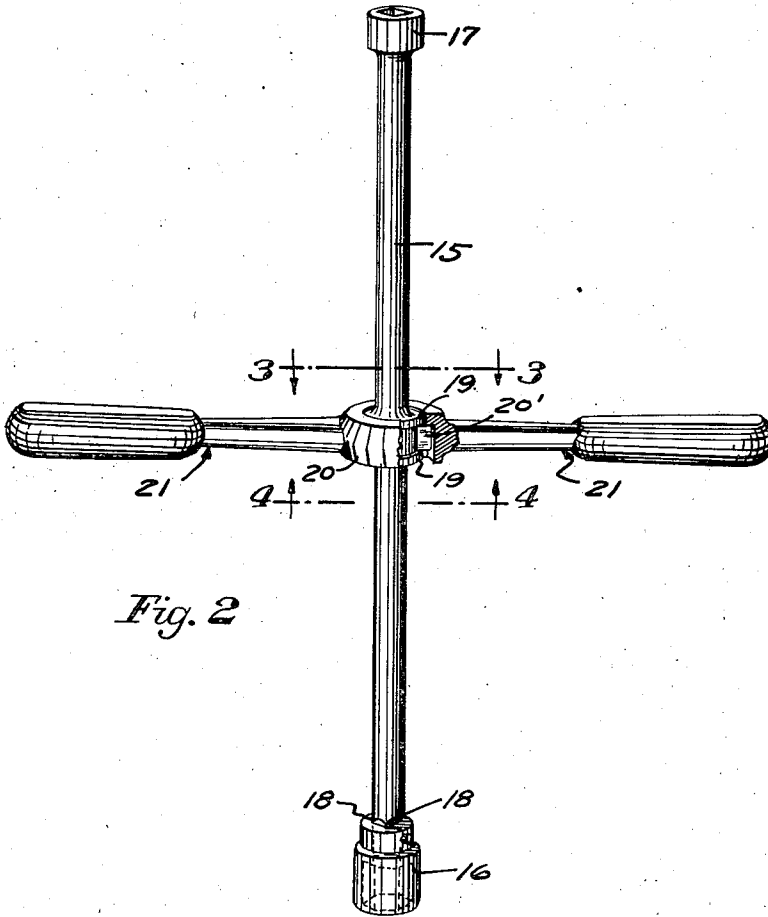


Fig. 2

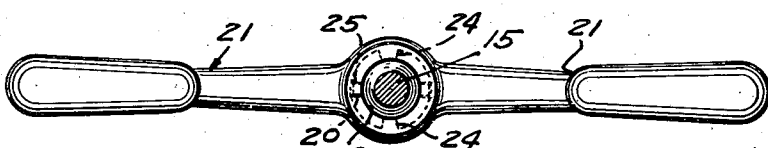


Fig. 3

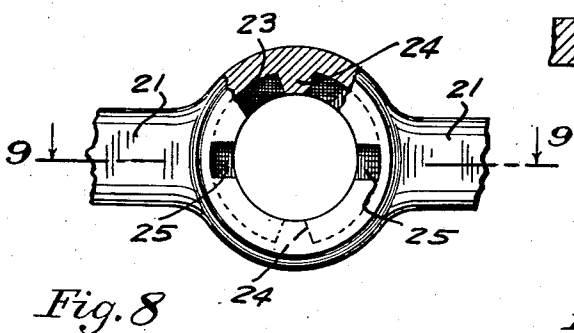


Fig. 8

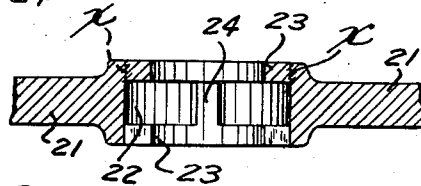


Fig. 9

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3 Sheets-Sheet 3

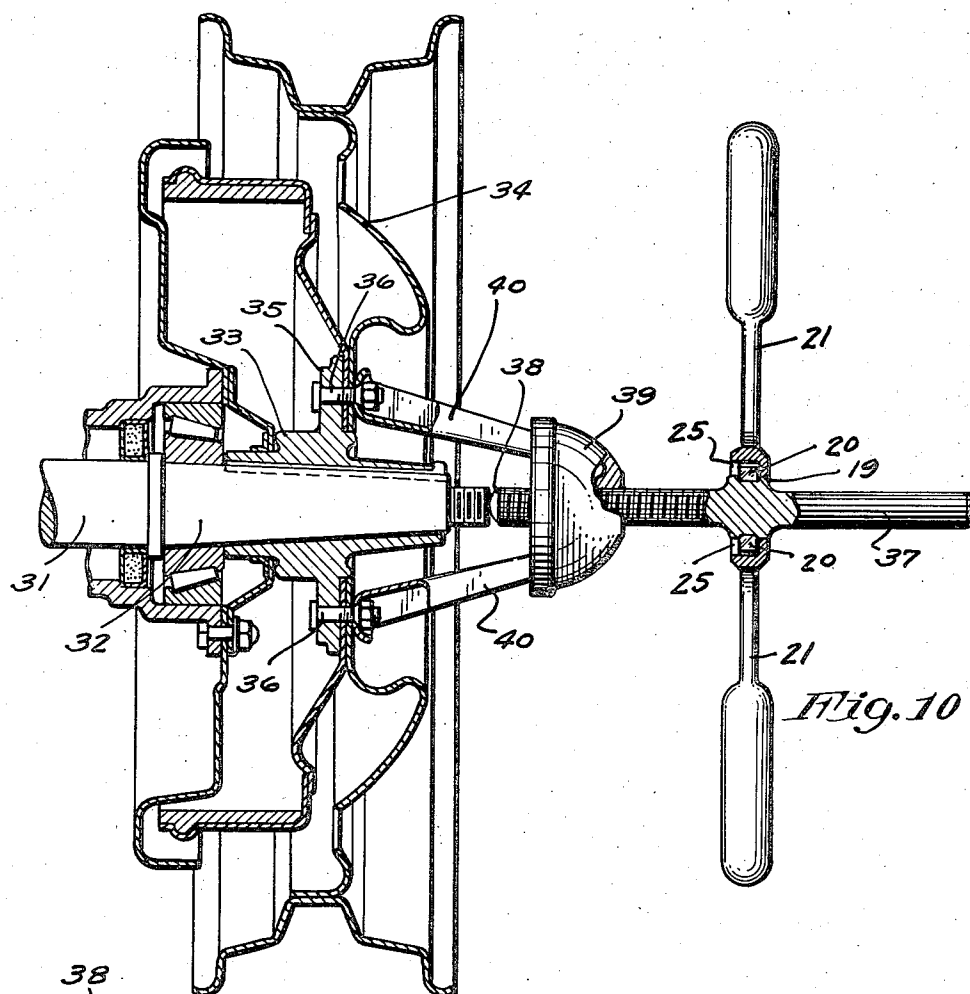


Fig. 10

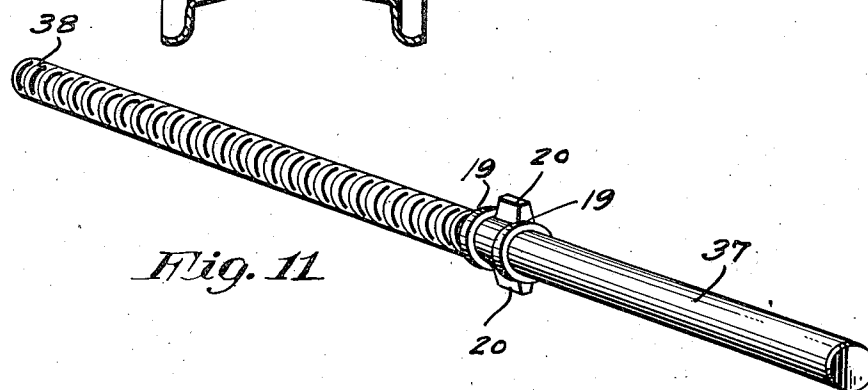


Fig. 11

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UNITED STATES PATENT OFFICE

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WRENCH-ACTING TOOL

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3 Claims. (Cl. 81-53)

This wrench-acting tool, while particularly adapted for heavy duty twisting operations such as the extreme tightening up of and loosening of extremely tightened nuts, bolts, screws and the like, is also adapted for various other uses requiring a high degree of torque to perform the operation with a minimum of effort exerted.

In its several forms herein illustrated, the invention includes a shaft-like element provided at one or both of its ends with a suitable work engaging head, sometimes in the nature of a nut engaging socket. Rotatively mounted on this shaft element, and preferably on the intermediate portion thereof, is a rotary hammer element, which hammer, as preferably illustrated, comprises a completely annular tubular hub portion having projecting therefrom a pair of relatively heavy arms that serve both as levers for manual application of torque pressure and as shock producing weights.

While the hammer is free for very material rotary movement with respect to the shaft, it is provided with radially overlapping striking surfaces which limit rotation between the hammer and shaft to less than 360° so that when the hammer is rotated with respect to the shaft, the striking surfaces are interengaged and abruptly transfer the inertia of the relatively heavy hammer to the shaft element, which is very effective in either loosening or tightening bolts, nuts or analogous devices.

As an important feature of the invention the cooperating striking surfaces which transfer the rotary inertia of the hammer to the shaft are so positioned with respect to the axial center of weight of the hammer that the rotary impact will be at such axial center of weight, with the result that the rotary impact will be transmitted from the hammer to the shaft with a minimum of vibration being set up in either the hammer or shaft. In this respect, attention is directed to the fact that in the preferred embodiment of the invention herein illustrated, the projecting end of the shaft opposite the used work engaging head thereof is employed as one handle of the device and is held for rotation in one of the operator's hands, while the other of the operator's hands is being used to rotate the hammer. Of course, in such a device if vibration is prevalent, a bad shocking effect will be produced in both of the operator's hands. However, as indicated, with the present device, this shocking effect is substantially eliminated by virtue of the balanced blow transmitted from the hammer to the shaft.

Another important object of the invention is

the provision of a device of the class described wherein the hammer with its completely annular or tubular hub is normally held against axial displacement from its operative position, but which can quickly and easily be removed axially of the shaft and interchangeably used with different shafts.

Another more specific object of the invention is the provision of a tool of the class described having characteristics of the last above noted device, and in which at least one of the cooperating rotary impact abutments serves in conjunction with a circumferentially extended surface of the hub to control axial positioning of the cooperating rotary impact abutments with respect to one and another.

In the forms of the device illustrated herein, the hub of the hammer is provided with at least one gate extending axially through at least one circumferentially extended guide surface for the reception of the impact abutment or abutments cooperating therewith to axially position the parts, so as to permit removal of the hammer in at least one position of rotation with respect to the shaft and in at least one axial direction.

A still more specific object of the invention is the provision of an improved wheel or gear pulling device. While the device described is adapted for a wide variety of uses, it has been found extremely useful and is finding wide sale for use in removing wheels of heavy vehicles from their hubs, and also for use in removing vehicle wheels, gear wheels and the like from their axles.

The above important objects and advantages of the invention will be made apparent from the following specification and claims.

In the accompanying drawings, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a perspective view illustrating the tool being used in removing the retaining nuts of a vehicle wheel;

Fig. 2 is a perspective view showing the tool disposed in a nearly vertical position and having some parts broken away and some parts shown in section;

Fig. 3 is a transverse sectional view taken on the line 3-3 of Fig. 2;

Fig. 4 is a view similar to Fig. 3 on an enlarged scale, with some parts broken away and some parts sectioned;

Fig. 5 is a fragmentary perspective view of the intermediate portion of the shaft of the tool;

Fig. 6 is a transverse sectional view taken on the line 6-6 of Fig. 5;

Fig. 7 is a fragmentary perspective view of the hammer:

Fig. 8 is a fragmentary view looking upwardly at the hub portion of the hammer with the shaft removed therefrom and with some parts broken away:

Fig. 9 is a sectional view taken on the line 9-9 of Fig. 8:

Fig. 10 is a view partly in axial section and partly in elevation with some parts broken away, showing still another adaptation of the invention; and

Fig. 11 is a perspective view of the shaft element of the device of Fig. 10.

The tool shown in Figs. 1 to 9 inclusive will first be described. In this tool the shaft, indicated as an entirety by 15, is provided at one end with a work engaging head 16, and at its other end with a work engaging head 17. The work engaging head 17 is in the nature of a nut receiving socket and is formed as an integral part of the shaft 15, whereas the work engaging head 16 at the other end of the shaft, while also in the nature of a nut receiving socket, is removably applied to the shaft 15.

For the purpose of removable and interchangeable application of different sizes and kinds of work engaging heads, the end of the shaft shown as being provided with the head 16 is made of angular contour as at 18. At its intermediate portion the shaft 15 is circumferentially and radially enlarged to provide an externally cylindrical bearing surface 19. The axially intermediate part of this enlarged portion has been diametrically reduced so as to divide the external bearing surface 19 into two axially spaced sections. For reasons which will be hereinafter apparent, the diameter of the bearing forming periphery of this hub is preferably made greater than that of the work engaging head 17.

Formed integrally with the enlarged bearing portion of the shaft 15 and projecting radially outward of the bearing surface 19 are diametrically opposed rotary impact abutments or lugs 20. These lugs 20 are located in the axial center of the bearing surface 19 and between the opposite axially spaced sections thereof.

The annular or tubular hub portion of the hammer of this device of Figs. 1 to 9 inclusive is indicated as an entirety by 20', and the weighted diametrically opposed radial arms thereof are indicated as entireties by the numerals 21. The hub 20' is bored to rotatively receive the enlarged intermediate portion of the shaft 15 and is axially intermediately formed with an inwardly opening annular recess forming an intermediate channel 22 and axially spaced annular flanges 23, the inner peripheral surfaces of which operate as bearing surfaces and are rotatable on the shaft bearing surface sections 19. The annular channel 22 is of sufficient depth and width to freely receive the impact abutments 20.

For cooperation with the rotary impact abutments 20 of the shaft 15, the tubular hub is provided within the recess 22 thereof with a pair of diametrically opposed rigid impact abutments 24, each of which is provided at its circumferentially spaced sides with a striking surface for cooperation with similar striking surfaces on the rotary impact abutments 20. Of course, the abutments 24 will each cooperate with a different one of the abutments 20 under rotation to positively limit rotary movement of the hammer to less than 180° with respect to the shaft, but it will be obvious that if greater rotary movement is desired, the

hammer and shaft may be provided with only one abutment each, in which case, nearly 360° of rotation may be had. In most instances, however, it is found that considerably less than 180° of rotary movement is sufficient, and, of course, the absorption of the impact at two diametrically opposed points through two pair of abutments results in a stronger structure and one in which objectionable vibration is reduced to a minimum.

To permit free application and removal of the hammer axially of the shaft in one direction, one of the flanges 23 is provided with a diametrically opposed pair of inwardly opening axial passage ways or gates 25 of sufficient radial depth and circumferential width to freely axially receive the rotary impact abutments 20 of the shaft 15. With this construction the hub of the hammer is applicable to the shaft over the head 17, and may be readily applied in operative position on the enlarged intermediate portion of the shaft by rotatively positioning the same to align the gates 25 with the impact lugs 20 of the shaft. When the hammer is thus axially positioned and turned just sufficiently to bring the lugs 20 out of registration with the gates 25, the parts will be locked together against axial displacement in either direction. Under rotational movement the axially spaced sides of the lugs 20 will serve as guide surfaces in conjunction with circumferentially extended axially spaced guide surfaces formed by the inner faces of the flanges 23.

In Fig. 1 a wheel of a heavy vehicle such as a bus or truck is indicated by A, a pair of pneumatic tires by B and the wheel hub by C. The bolts which anchor the wheel to the hub are indicated by D and lock nuts therefor by E. As previously indicated, one of the great demands for easily operated high power tools of this class that has yet been found is in the servicing of heavy vehicles such as busses, trucks, tractors and the like for use in removing wheels from the hubs. For this purpose, it is necessary that the anchoring nuts or bolts be drawn up very tightly, which in itself requires great torque. However, when the anchoring nuts or bolts, after having been taken up very tightly, have been permitted to remain in this condition until they become rusted or corroded require even greater torque to initially loosen the same. Prior to the introduction on the market of this invention, wrench-acting tools of various characters have been employed and in conjunction with such previously used tools, it has been the common practice to apply loosening and final tightening force to the tool with heavy hammers or other auxiliary pressure producing devices. In fact, in many instances, two men have been needed to accomplish the task. With this device, either final tightening or initial loosening of both the lock nuts and anchoring bolts is readily accomplished by one man with a single tool.

In Fig. 1 an operator is shown in the act of removing a lock nut E. The work engaging head 16 in this instance is of a character and size to fit the lock nuts E. In this figure it is assumed that the dotted line position of the hammer arms is the position in which the cooperating abutments 20 and 24 are in contact under counter-clockwise rotation with respect to the figure. To accomplish the initial loosening action, the operator simply grasps the enlarged handle end of one of the arms 21 and backs the same up perhaps 90° more or less and then rotates the same in a counter-clockwise direction with the full force of his arm back to the position shown by

dotted lines wherein the cooperating abutments come into engagement, at which time, the rotary inertia of the weighted hammer will be abruptly transferred to the shaft and through the shaft to the nut.

In practice it is found that the great torque jar thus produced will loosen nuts which are so tightly engaged as to be very difficult of removal with other means. In a tool of this kind, it is important that the arms be heavy throughout, and while the ends thereof may be additionally weighted, it is found best to distribute this weight over a considerable area as has been done by providing the handle grips illustrated adjacent the ends of the arms.

In the device of Figs. 1 to 9 inclusive, the shaft element inclusive of the head 17 but exclusive of the removable socket 16 is a monolithic structure formed from a single piece of steel by drop forging; and the hammer exclusive of the complete or unnotched annular flange 23, shown at the top in Fig. 9, is drop forged from a single piece of steel. In the original drop forging, the maximum internal diameter of the hammer hub, as within the channel 22, extends completely through the hub in one direction as shown by dotted lines *x* in Fig. 9.

The unbroken annular flange 23 of the hammer is formed as a separate unit and is inserted into the maximum diameter bore of the hub to the limit determined by engagement thereof with the ends of the hammer abutments 24. After this flange 23 has been inserted in place, as shown in the drawings, it is anchored to the structure, preferably by welding, in which latter instance the entire hammer becomes a monolithic structure.

It is important to note that the hammer is applicable to the shaft from either end thereof and when the tool is to be used in a vertical position it will, of course, be desirable to apply the tool from the upper end so that the unbroken annular flange 23 will be at the top and thereby prevent axial downward displacement under the action of gravity in all positions of rotation. The angular end 18 of the shaft 15 may, of course, be used to engage socket nuts or the like without having any work engaging sockets 16 applied therethrough, and therefore the angular portion 18 may be rightly considered a primary work engaging head and the socket or the like 16 a secondary or auxiliary work engaging head.

In Figs. 10 and 11 the features of the device of Figs. 1 to 9 inclusive are shown as embodied in a wheel or gear pulling device. The wheel pulling device of these Figs. 10 and 11 is shown in operative position on the wheel of a vehicle.

As is well known, the axles of automobile wheels are usually tapered, and the wheel hubs provided with tapered bores which are drawn up tightly on the tapered ends of the shafts. In the removal of hubs from these tapered shafts, various types of wheel pullers are customarily employed. The vehicle axle of Fig. 10 is indicated by 31, the end thereof is indicated by 32, the internal tapered bored wheel hub by 33 and the vehicle wheel by 34. The nut equipped bolts which normally anchor the wheel to the flange 35 of the hub 33 are indicated by 36.

The wheel pulling device of Figs. 10 and 11, which embodies the structural features of Figs. 1 to 9, includes a rotary hammer illustrated as being identical to the hammer of Figs. 1 to 9. From this it will be obvious that a single rotary hammer may be used with various different

wrench-acting shafts each adapted for a different purpose but provided with the proper bearing surfaces, abutments, etc., for removably receiving the common hammer. The various elements of the hammer of Fig. 10 will therefore be indicated by the same characters as indicate like parts of Figs. 1 to 9.

The shaft 37 of Figs. 10 and 11 has a rounded or pointed work-engaging head portion 39 at one end thereof, which end portion is externally screw threaded and works in internal screw threads of a body 39 that is provided with two or more anchoring arms 40. The outer or free ends of the arms 40 are apertured to receive the anchoring bolts 36 of the wheel and are shown as being temporarily anchored to the wheel hub by means of the wheel anchor bolts and nuts.

When the body 39 is thus anchored, the shaft 37 is axially aligned with the axle shaft 32. At its intermediate portion the shaft 37 is enlarged and formed exactly the same as the shaft of the Figs. 1 to 9, so as to form the bearing surface sections 19 and abutments 20. In this device, as in the device of the other figures, the one end of the shaft is always used as a handle for guiding the tool.

To withdraw the wheel hub from its tight wedging engagement with the axle shaft, the tool shaft 37 is screwed up into engagement with the projecting screw threaded end of the axle shaft as shown by rotation of the hammer through the arms, and then when the manual turning becomes difficult, the hammer is merely backed up and spun to a point where the cooperating impact lugs engage so as to transfer the rotary inertia of the hammer to the screw threaded shaft, which will produce a considerable additional rotation of the shaft over and above that which was possible by direct manual power. If one such blow does not serve to fully loosen the wheel, the operation may, of course, be repeated several times.

What is claimed is:

1. The combination with a wrench-equipped shaft, of an inner hub applied to said shaft for rotation therewith, said hub having laterally spaced cylindrical bearing surfaces and between said surfaces diametrically opposite striking lugs that project radially beyond said spaced cylindrical bearing surfaces, an outer hub having laterally spaced internally cylindrical wall-forming flanges rotatively mounted on the cylindrical bearing surfaces of said inner hub and provided between said flanges with diametrically opposite striking lugs that project radially inward thereof and are engageable with the striking lugs of said inner hub, one of the flanges of said outer hub having circumferentially spaced notches through which the striking lugs of said inner hub may be moved laterally to effect the assembling and disassembling of said hubs.

2. In a lost-motion socket wrench having a shaft member adapted for operation with its axis in a substantially horizontal position, impact lug means projecting laterally outwardly from said shaft member and having oppositely disposed impact surfaces, cylindrical bearing surfaces on opposite sides of said impact lug means adjacent the base thereof, a cooperating outer hammer-acting hub member having on opposite sides thereof spaced wall-forming flanges projecting radially inwardly therefrom a distance greater than the height of said impact lug means for embracing same therebetween, said flanges having internally formed cylindrical bearing surfaces for

rotatably engaging the corresponding cylindrical bearing surfaces of said shaft member, and striking lug means on said outer hub member projecting radially inwardly between the wall-forming flanges thereof and having oppositely disposed striking surfaces engageable with corresponding surfaces of said impact lug means on relative rotation of said hub and shaft members.

3. The structure defined in claim 2 wherein

one of said wall-forming flanges of said hub members has lug releasing means therein by which the impact lug means of the shaft member may be moved laterally of said hub member to effect assembling and disassembling of said members.

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