May 9, 1933. W. N. KOCH ET AL 1,908,260

ELECTROMAGNETIC AXLE PULLER

Filed May 12, 1932

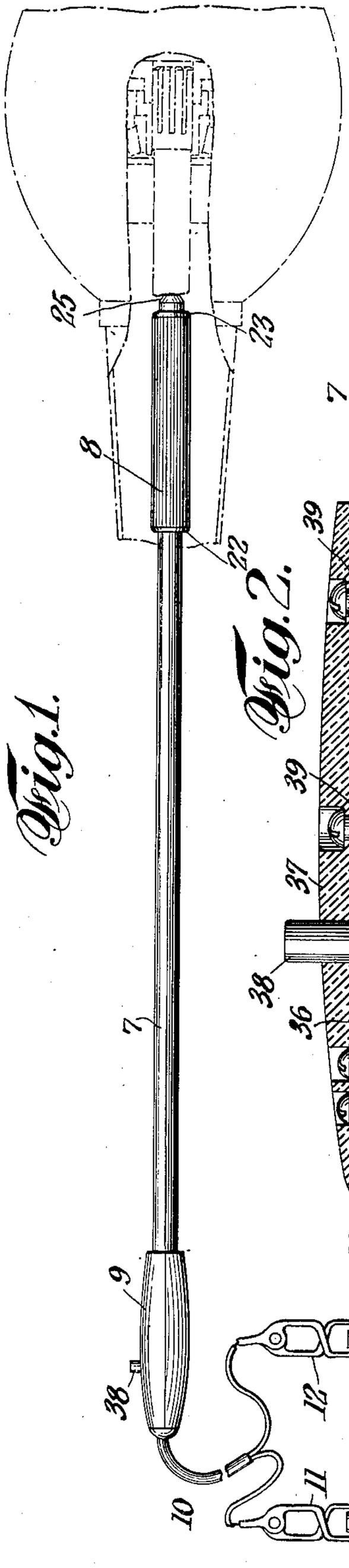

Fig. 1.

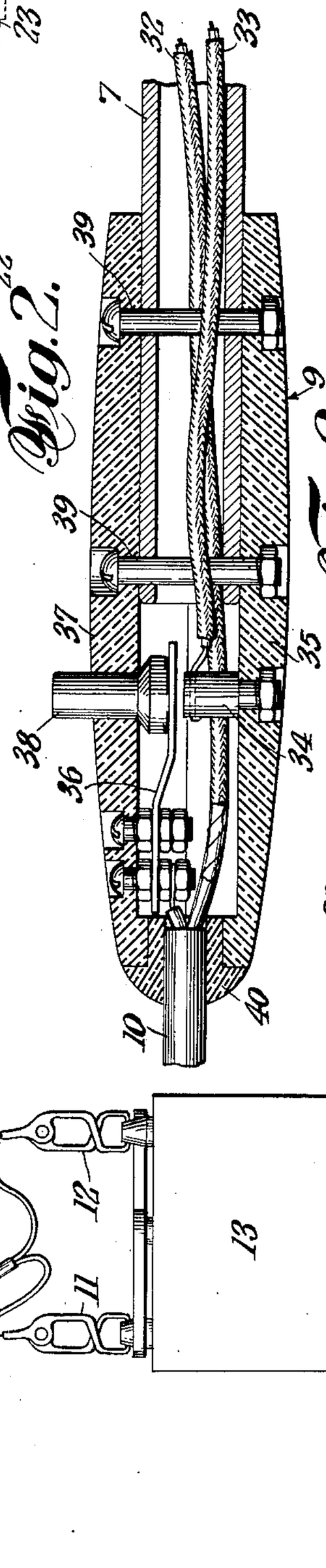

Fig. 2.

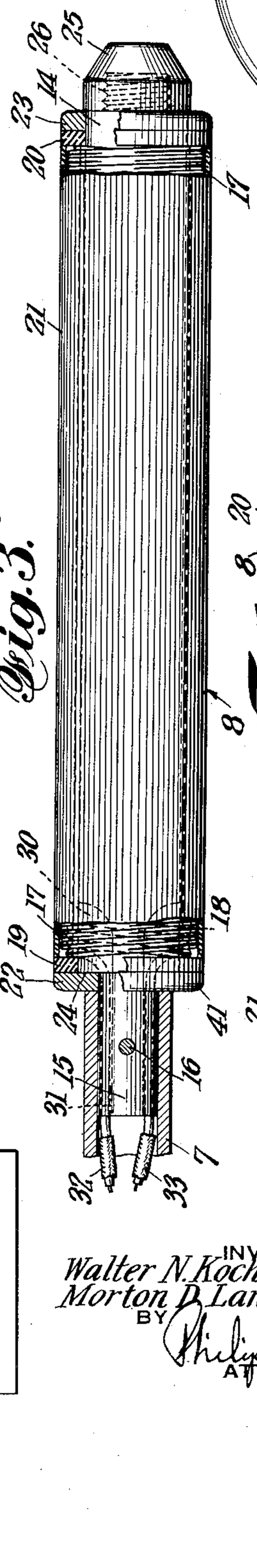

Fig. 3.

Fig. 6.

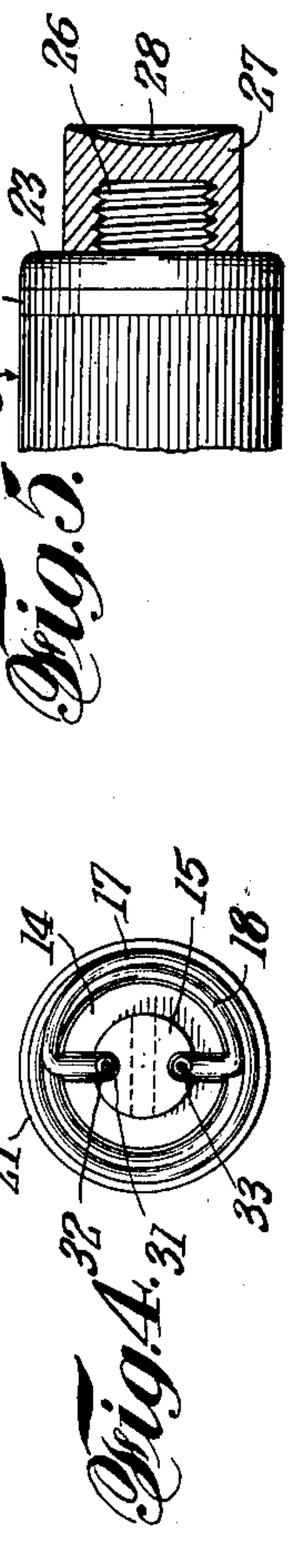

Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE

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ELECTROMAGNETIC AXLE PULLER

Application filed May 12, 1932. Serial No. 610,818.

The objects of this invention are to provide a practical tool for removing the broken parts of an automobile rear axle, which can be readily entered into and withdrawn through the axle housing, past the bearings and other projections or shoulders; which can be controlled to apply the pulling force at exactly the desired time and will have sufficient power to take out the broken pieces of axle or other parts and which will have the electrical parts all protected against wear and the injurious effects of water, grease, oil and heat, etc. and which in addition will be relatively simple, inexpensive, practical and efficient.

The objects mentioned and other desirable objects are attained by the novel features of construction, combinations and relations of parts hereinafter described, illustrated and broadly claimed.

The drawing accompanying and forming part of the specification illustrates one practical embodiment of the invention, but it should be understood as regards such illustration that the actual structure may be modified and changed in certain respects, all within the true intent and broad scope of the claims.

Fig. 1 is a side view of the tool illustrating use of the same as an axle puller;

Figs. 2 and 3 are enlarged broken sectional views showing the construction at opposite ends of the tool;

Fig. 4 is an end view of the magnetic head structure with the flanges which confine the coil removed;

Figs. 5 and 6 are broken part sectional details of different forms of magnetic pickups.

As illustrated in Fig. 1, the device will be seen to consist of a relatively long rigid tubular stock or handle 7 carrying a magnetizing head 8 at one end and provided at the opposite end with a hand grip 9 containing a switch and from which a current carrying cable 10 is extended, carrying, in this instance, terminal gripping clamps 11, 12 for engagement with the poles of the storage battery or other current source 13.

The magnetizing head is shown as consisting of a magnetic core 14 having a reduced neck 15 entered in the end of the tubular stock and secured there by cross pin or key 16, the full diameter portion of the core carrying a magnetizing winding 17 insulated therefrom by an insulating sleeve 18 and insulating end heads or washers 19, 20, said insulating sleeve and heads forming in effect a spool carrying the winding. For mechanical and other protection, the winding is shown as covered by a surrounding sleeve of insulating material 21 held between the insulating heads 19, 20 and metallic washers or heads 22, 23 are shown engaged on the core, outside the washers 19, 20 and rigidly retaining the latter in position. The washer 22 is shown as forced over the reduced shank portion 15 of the core against the shoulder 24 and the other washer 23 is shown as forced over the body of the core with a solid drive fit. In addition, the outer confining washer 23 may be locked in place by a removable magnetic tip 25 partly overstanding the same and shown as held in place by engagement over a screw threaded outer end portion 26 on the core.

The screw connected tip is a desirable feature, enabling the substitution of tips of different magnetic permeability and different shapes for special uses. In Figs. 1 and 3, the removable tip is of frusto-conical shape suited to picking up the broken portions of a rear axle while in Fig. 5 there is shown a cylindrical form of tip 27 having a spherical socket 28 adapted to fit a more or less rounded object.

In Fig. 6 an angularly turned form of tip 29 is illustrated adapted to be screwed on to the end of the magnetic core.

The lead wires of the coil are fully protected in the illustration by extending them down through cuts or kerfs 30 through the shoulder 24 into grooves 31 in opposite sides of the neck portion 25, said wires 32, 33 then extending through the tubular stock to the combined grip and switch handle at the opposite end.

As shown in Fig. 2, one of the wires, 33 is brought to a switch contact plug 34, in one side member or half portion 35 of the tubular insulating handle, opposite a spring contact 36 secured inside the other half 37 of the

handle. One wire of the cable is connected with this spring contact and the other wire of the cable is simply a through continuation of the coil wire 32.

The spring switch contact is indicated as operated by a push button 38 slidingly guided in the handle segment 37. The two segments or halves of the handle are shown as secured together by the bolts 39 which extend through openings in the tubular stock to lock the handle parts together and to the end of the stock. A bushing 40 for the cable is shown caught between the two halves of the handle for gripping and insulating the cable where it emerges from the handle.

The tubular stock may be made of aluminum to make the tool light enough for ordinary handling and so as to insure concentration of the magnetic energy in the tip of the tool. This stock also is rigid and strong so as to serve as a lever for working the tool about in picking up broken or lost magnetic particles.

In use of the device as an axle puller, the tool is inserted into the axle housing with the current either off or on, or intermittently off and on, as the best judgment dictates. In many cases the current is not turned on until the tip of the tool makes solid contact with the end of the axle and then when the switch is closed, a magnetic coupling is effected with the broken axle part which then can be withdrawn, the circuit being kept closed during such latter operation. The small diameter of the stock permits the tool being twisted and turned about, beyond the outer wheel bearing, to reach down into the axle housing for picking up smaller broken pieces. The flanges at the ends of the coil are shown as bevelled or rounded at 41 to enable the device to readily ride over shoulders or other obstructions in the axle housing. The magnet coil is fully protected against abrasion and wear and guarded against the effects of water, oil, etc. The entire structure is sturdy and strong and may be used as a prod to work parts loose so that they will come out by the magnetic pull. At the same time, in case of necessity, the device can be readily taken apart, for instance for the substitution of a different magnetic head of greater or less pulling power or for service on different voltages. Also such separation can be effected without twisting the wires as upon removal of the transverse fastenings for the magnetic head and handle parts they may be separated from the ends of the stock without any twisting movement. The fastening of parts also is such that the device cannot pull apart under the maximum magnetic pull. The device is a complete self-contained unit and is under instant control at all times, the switch being so placed in the handle grip that it is operable by the hand on such grip.

What is claimed is:

1. An electromagnetic axle puller, comprising a long tubular stock of aluminum or similar light rigid non-magnetic material, a magnetic core having a reduced shank portion secured in one end of said stock, said shank being grooved and the body of the core being kerfed in communication with the grooved portion, a magnet winding on the core having supply wiring extending through the kerfed and grooved portions of the core into and through the tubular stock, a hollow grip handle secured to the opposite end of the tubular stock, a switch housed within said hollow handle and having an exposed operating button, the wiring for the magnet winding being connected with said switch within the hollow handle and service wiring connected with the switch, extending from the handle and provided with suitable terminal means for communication with an electrical source.

2. An electromagnetic axle puller, comprising a long tubular stock of aluminum or similar light rigid non-magnetic material, a magnetic core having a reduced shank portion secured in one end of said stock, said shank being grooved and the body of the core being kerfed in communication with the grooved portion, a magnet winding on the core having supply wiring extending through the kerfed and grooved portions of the core into and through the tubular stock, a hollow grip handle secured to the opposite end of the tubular stock, a switch housed within said hollow handle and having an exposed operating button, the wiring for the magnet winding being connected with said switch within the hollow handle and service wiring connected with the switch, extending from the handle and provided with suitable terminal means for communication with an electrical source, a coil confining washer about the shank of the core and interposed between the grooved shank portion and the kerfed body portion of the core and a coil confining washer secured on the core at the opposite end of the magnet winding.

3. An electromagnetic axle puller, comprising a long tubular stock of aluminum or similar light rigid non-magnetic material, a magnetic core having a reduced shank portion secured in one end of said stock, said shank being grooved and the body of the core being kerfed in communication with the grooved portion, a magnet winding on the core having supply wiring extending through the kerfed and grooved portions of the core into and through the tubular stock, a hollow grip handle secured to the opposite end of the tubular stock, a switch housed within said hollow handle and having an exposed operating button, the wiring for the magnet winding being connected with said switch within the hollow handle and service wiring connected with the switch, extending

from the handle and provided with suitable terminal means for communication with an electrical source, a coil confining washer about the shank of the core and interposed between the grooved shank portion and the kerfed body portion of the core, a coil confining washer secured on the core at the opposite end of the magnet winding and a magnetic tip removably engaged with the end of the core and overstanding said last mentioned coil confining washer.

4. An electromagnetic axle pulling tool, comprising a long tubular stock, a hollow sectional handle engaged over one end of said tubular stock, through bolts detachably securing the sections of said handle together and extending through the end portion of the tubular stock to prevent separation of the handle from the stock by longitudinal pull, a switch enclosed within the hollow handle and having an exposed control element, service wiring extending from the handle, magnet wiring extending from the switch through the hollow handle and tubular stock, a magnetic core having a reduced shank portion secured in the end of the stock and having passes for the magnet wiring extending from within the tubular stock to the core outside the tubular stock, a magnet coil on the core connected with said wiring and coil protective flanges fixed on the core at opposite ends of said coil.

5. An electromagnetic axle pulling tool, comprising a long tubular stock, a hollow sectional handle engaged over one end of said tubular stock, through bolts detachably securing the sections of said handle together and extending through the end portion of the tubular stock to prevent separation of the handle from the stock by longitudinal pull, a switch enclosed within the hollow handle and having an exposed control element, service wiring extending from the handle, magnet wiring extending from the switch through the hollow handle and tubular stock, a magnetic core having a shank portion secured in the end of the stock and having passes for the magnet wiring extending from within the tubular stock to the core outside the tubular stock, a magnet coil on the core connected with said wiring, coil protective flanges fixed on the core at opposite ends of said coil and interchangeable magnetic tips detachably engageable with the end of the core over the flange at one end of the coil.

6. An electromagnetic axle pulling tool, comprising a long tubular stock, a hollow sectional handle engaged over one end of said tubular stock, through bolts detachably securing the sections of said handle together and extending through the end portion of the tubular stock to prevent separation of the handle from the stock by longitudinal pull, a switch enclosed within the hollow handle and having an exposed control element, service wiring extending from the handle, magnet wiring extending from the switch through the hollow handle and tubular stock, a magnetic core having a shank portion secured in the end of the stock and having passes for the magnet wiring extending from within the tubular stock to the core outside the tubular stock, a magnet coil on the core connected with said wiring, coil protective flanges fixed on the core at opposite ends of said coil and a coil protecting sleeve tightly held between said coil confining flanges.

7. An electromagnetic axle puller, comprising a rigid tubular stock, a magnet core having a body portion with an exposed magnetic tip at one end and a reduced shank portion at the opposite end, said reduced shank portion being entered in one end of the tubular stock, said shank portion and the adjacent body portion having wire passages therein between the interior of the tubular stock and the body portion of the core, a magnet winding on said body portion of the core, a substantial casing entirely enclosing said winding protecting the same from mechanical injury, oil and grease and the like, wiring extending from the magnet winding through the aforesaid passages and through to the other end of the tubular stock, a hollow handle secured on the opposite end of the tubular stock, a switch within said hollow handle connected with the magnet wiring and service wiring connected with said switch and extending from the end of said handle.

8. An electromagnetic axle puller, comprising a rigid tubular stock, a magnetic core having a body portion with an exposed magnetic tip at one end and a reduced shank portion at the opposite end, said reduced shank portion being entered and secured in one end of the tubular stock, said shank portion and the adjacent body portion having wire passages therein and extending from the body portion of the core to the interior of the tubular stock, a magnet winding on said body portion of the core, lead wires extending from said magnet winding through the passages aforesaid and through the tubular stock, protective flanges at opposite ends of said magnet winding and a casing extending between said flanges and entirely enclosing said magnet winding and protecting the same from mechanical injury, oil and grease.

9. The herein disclosed electromagnetic axle puller, comprising an elongated rigid tubular handle, a magnetic core, a neck portion of reduced diameter at one end of said magnetic core and entered in one end of said tubular handle and rigidly secured therein, said neck portion having longitudinally extending grooves in opposite sides of the same providing wire passes from the magnetic core into the adjoining end portion of the

tubular handle, a shoulder at the opposite end portion of the magnetic core, a magnetizing winding on the core between said shoulder at one end and said reduced neck portion at the opposite end, feed wires extending from said coil through said grooves in the neck portion into the tubular handle, and through said tubular handle to the far end of the same and a protective cover over said winding and extending from said end shoulder back to the junction of the neck portion with the tubular handle, whereby said winding and all wiring are covered and protected from harm in the necessarily rough usage of the tool.

10. The herein disclosed electromagnetic axle puller, comprising an elongated rigid tubular handle, a magnetic core having a neck portion at one end of the same telescopically engaged with one end of said tubular handle and rigidly secured to the latter, said parts having enclosed wire passes extending from the end of the magnetic core into the adjoining end portion of the tubular handle, winding confining heads at the ends of said magnetic core, a magnetic winding on the core between said end heads, a protective sleeve between said end heads and entirely covering said winding and feed wires extending from the core within said protective sleeve through the wire passes aforesaid into the tubular handle and through said rigid handle to the far end of the same.

11. The herein disclosed electromagnetic axle puller, comprising an elongated rigid tubular handle, a magnetic core having a neck portion at one end of the same telescopically engaged with one end of said tubular handle and rigidly secured to the latter, said parts having enclosed wire passes extending from the end of the magnetic core into the adjoining end portion of the tubular handle, winding confining heads at the ends of said magnetic core, a magnetic winding on the core between said end heads, a protective sleeve between said end heads and entirely covering said winding, feed wires extending from the core within said protective sleeve through the wire passes aforesaid into the tubular handle and through said rigid handle to the far end of the same, one of the end heads comprising a washer engaged on said neck portion at one end of the core and said neck portion having telescopic engagement with the tubular handle by being entered in the end of the same to position with the end of the tubular handle holding said washer against the end of the magnetic core.

12. The herein disclosed electromagnetic axle puller, comprising an elongated rigid tubular handle, a magnetic core having a neck portion at one end of the same telescopically engaged with one end of said tubular handle and rigidly secured to the latter, said parts having enclosed wire passes extending from the end of the magnetic core into the adjoining end portion of the tubular handle, winding confining heads at the ends of said magnetic core, a magnetic winding on the core between said end heads, a protective sleeve between said end heads and entirely covering said winding, feed wires extending from the core within said protective sleeve through the wire passes aforesaid into the tubular handle and through said rigid handle to the far end of the same, the end head at the free end of the magnetic core comprising a washer of insulating material surrounding the core and enclosed within the protective sleeve.

13. The herein disclosed electromagnetic axle puller, comprising an elongated rigid tubular handle, a magnetic core having a neck portion at one end of the same telescopically engaged with one end of said tubular handle and rigidly secured to the latter, said parts having enclosed wire passes extending from the end of the magnetic core into the adjoining end portion of the tubular handle, winding confining heads at the ends of said magnetic core, a magnetic winding on the core between said end heads, a protective sleeve between said end heads and entirely covering said winding, feed wires extending from the core within said protective sleeve through the wire passes aforesaid into the tubular handle and through said rigid handle to the far end of the same, the free end of the magnetic core having one element of a screw thread connection outside the end head thereat and a magnetic tip having the corresponding element of a screw thread connection detachably engaged with the first mentioned screw thread connection.

In testimony whereof we affix our signatures.

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