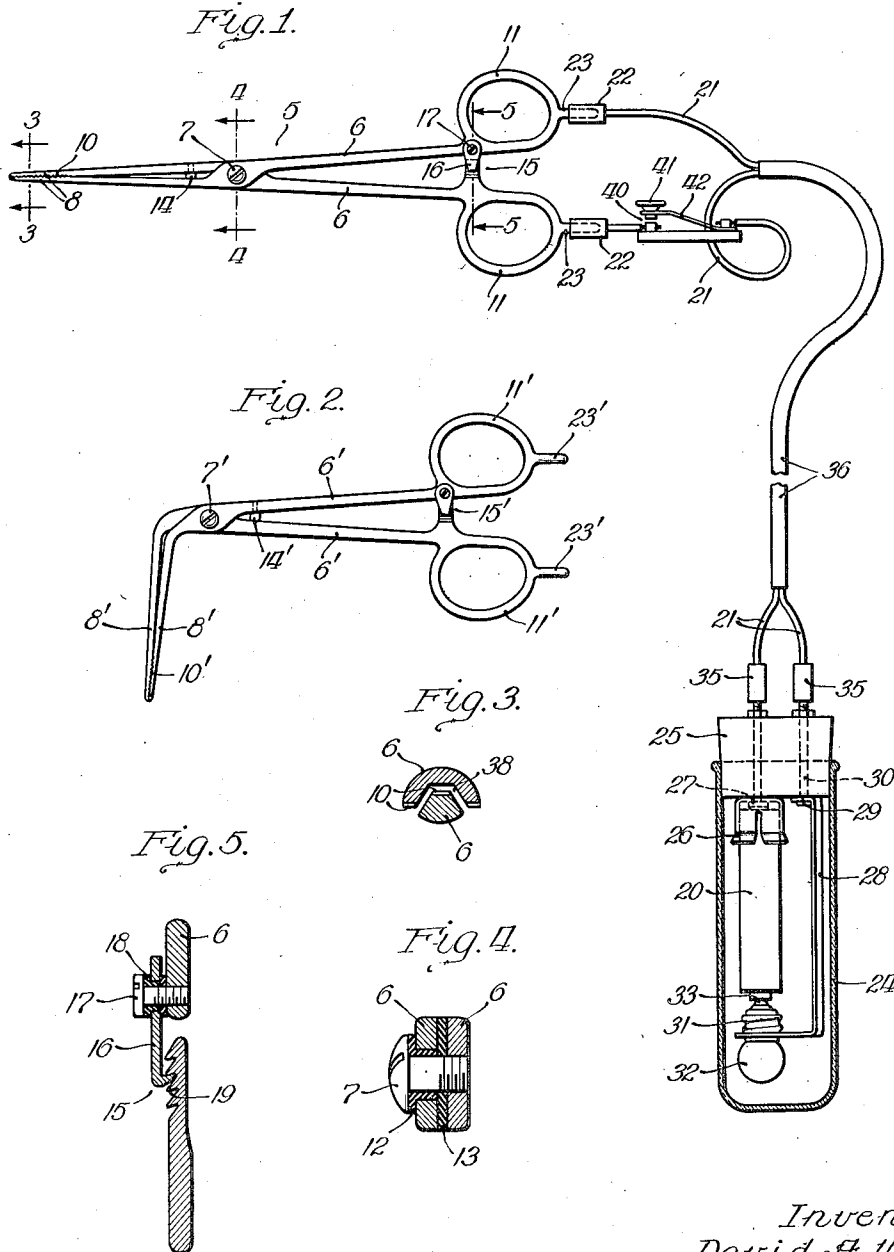


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APPARATUS FOR FINDING AND REMOVING METAL  
PARTICLES FROM HUMAN AND ANIMAL BODIES  
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## UNITED STATES PATENT OFFICE

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APPARATUS FOR FINDING AND REMOVING  
METAL PARTICLES FROM HUMAN AND  
ANIMAL BODIES

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6 Claims. (Cl. 177—324)

The invention relates to apparatus for finding and removing metal particles from human and animal bodies.

The invention has particular utility in finding and removing metal splinters, needles, projectiles, bullets, shrapnel, and like objects from human and animal bodies, and one of the main objects of the invention is to provide an apparatus which is adapted for finding and removing objects of this sort expeditiously and in one operation—i. e., without two separate and distinct operations, one for finding the object and the other for removing the same.

It is also an object of my invention to provide an instrument for finding and removing objects of this sort through a small incision and without requiring dissection or large incisions as usually necessary heretofore in the art.

Another object is to provide an instrument, the functioning of which is such that tissue, muscles, nerves, blood vessels and the like are not accidentally grasped and torn or otherwise injured in grasping and removing the object, and particularly an instrument which is operative to indicate when the object to be removed is grasped for removal, free of all body tissue, muscles, nerves, blood vessels and the like.

Another object is to provide an instrument which is not only adapted for locating and removing objects of this sort, but is also adapted for spreading the tissues and muscles in exploring for and locating the object, and in grasping the same for removal.

Another object is to provide an instrument which is operative to apprise the operator when sensitive nerves are engaged, so that the operator may avoid such nerves in locating and removing the object.

Another object of the invention is to provide an apparatus of simple and inexpensive construction and which may be handled and operated conveniently and effectively; also an apparatus all parts of which are adapted to be sterilized conveniently and effectively.

Further objects and advantages of the invention will be apparent from the following detailed description, taken in connection with the accompanying drawing, in which:

Figure 1 is a view partially in elevation and partially in section showing one form of apparatus embodying the present invention;

Figure 2 is a view showing another form of forceps for use with the present invention;

Figure 3 is a detail section taken on the line 3—3 of Figure 1;

Figure 4 is a detail section taken on the line 4—4 of Figure 1; and

Figure 5 is a detail section taken on the line 5—5 of Figure 1.

The embodiment of the invention shown in Figures 1, 3, 4 and 5 of the drawing, comprises a forceps 5 which, except for changes which will presently appear, may be the usual or any suitable or preferred surgical forceps. The forceps shown comprise a pair of jaws 6, 6, pivoted together at 7. The ends 8 of the jaws 6 constitute the grasping ends of the jaws, and the inner grasping surfaces thereof may be serrated as shown at 10. The opposite ends of the jaws 6 are provided with suitable handles 11.

The jaws 6 are insulated from each other at the pivot 7 by means of an insulating bushing 12 and an insulating washer 13. An insulating stop 14, carried by one jaw 6, engages the other jaw as shown in Figure 1, to prevent closing of the grasping ends 8 of the jaws into contact by means of the handles 11.

Ratchet latch means at 15 locks the jaws closed upon the object grasped by the jaws, as well understood in the art. This ratchet means 15 may be similar to the ratchet means now in use except that the ratchet pawl 16, instead of being connected directly to the jaw 6 carrying the same, is connected to this jaw by a screw 17 and is insulated from the jaw by suitable insulation at 18. The hooked end of the pawl 16 engages the teeth 19 in the other jaw 6 to lock the jaws in their closed positions.

A source of current in the form of a small dry cell battery 20 is adapted for connection across the jaws 6, 6 by leads 21. To facilitate such connection the leads 21 are provided with socket terminals 22 which are adapted to be readily engaged over and disengaged from terminals 23 on the handles 11 of the jaws 6.

The battery 20 may be a small 1½ volt dry cell battery of the type commonly used in fountain pen flashlights and the like. In the embodiment of the invention illustrated in the drawing, the battery 20 is enclosed in a tube 24 which is preferably formed of glass or other suitable transparent material, or is provided with a window the purpose of which will presently appear. The open end of the tube 24 is provided with a rubber or other suitable insulating stopper 25 which fits tightly in the open end of the tube 24 and seals the interior of the tube so that the entire apparatus may be sterilized conveniently and effectively without subjecting the battery or other

parts within the tube 24 to moisture, or otherwise injuring the same.

One end of the battery 20 engages in a socket member 26, with the adjacent end of its negative shell in contact with a terminal screw 27. Instead of relying on engagement with the terminal screw 27, the socket member 26 may constitute one terminal for the battery. Also enclosed within the tube 24 is a metal strap member 28 having an angular end 29 secured by a second terminal screw 30 to the inner end of the stopper 25. The opposite end of the strap member 28 is turned at right angles to position beneath the adjacent end of the battery 20, and has an opening through which the base 31 of a small incandescent lamp 32 is threaded into engagement with the positive terminal 33 of the battery 20. The strap member 28 supports the lamp 32 and connects the same to the terminal screw 30. To permit removal of the battery after first removing the stopper 25 and the parts carried by the stopper from the tube 24, the strap member 28 may be adapted to turn about the vertical axis of the terminal screw 30 to and from the position shown.

The externally projecting ends of the terminal screws 27 and 30 are adapted to be readily engaged in and disengaged from socket terminals 35 on the adjacent ends of the leads 21. The leads 21 are preferably rubber covered and moisture-proof to permit sterilization of all parts as above set forth, and the intermediate portions of the leads are preferably covered by an additional rubber tube as indicated at 36.

The grasping end 8 of one jaw 6 is preferably of channeled formation, as indicated at 38 in Figure 3, for nesting cooperation with the adjacent grasping end of the other jaw. The space shown between the jaws 6 in Figure 3 illustrates the space between the grasping ends of the jaws when the jaws are closed. This spacing of the grasping ends of the jaws 6 in their closed position prevents completing the electric circuit through the paws merely by closing the same.

In removing a needle or other metal object with the apparatus of the present invention, a small incision is made usually at the point of entrance of such object. This incision may be very small because it is not necessary to spread the flesh at the incision in order to endeavor to see and locate the object through the incision.

The grasping ends of the forceps 5 are then inserted and when these ends strike the metal object, this object closes the circuit through the lamp 32, which is illuminated and apprises the operator that the grasping ends of the forceps are against the metal object. If body tissue, muscles, nerves, blood vessels or the like are accidentally grasped along with the object, the circuit will not be completed and therefore, until the lamp 32 is illuminated, the operator knows that he is not grasping the metal object free of body tissue, muscles, nerves, blood vessels and the like. However, upon illumination of the lamp 32, he is apprised that he is grasping with the forceps the metal object free of all body tissue, muscles, nerves, blood vessels and the like, and this object may then be withdrawn without tearing or otherwise injuring body tissue or other parts of the body, as above set forth.

The apparatus has a further advantage in that if the grasping ends of the forceps are engaged with a nerve, the patient will indicate by the reaction of the small electric current from the battery 20 upon such nerve that a nerve is being

contacted and the operator may then proceed in a manner to avoid such nerve. The grasping ends of the jaws of the forceps are adapted for spreading the tissues or muscles in exploring for and locating the object and in grasping the same for removal, and the locating and removal of the object are accomplished in a single operation.

If desired, one of the leads 21, preferably adjacent the forceps 5, may be provided with a suitable switch 40 which is adapted to be closed by pressing the finger against the button 41 on the spring contact 42 as suitable or desired. This permits the circuit to remain open until the grasping ends of the forceps reach the object to be removed, whereupon slight pressure upon the button 41 will close the circuit. Upon grasping the object, the switch contact 42 is released, thereby opening the circuit and extinguishing the lamp 32 during the withdrawal of the object from the body.

The forceps shown in Figure 2 are substantially the same as the forceps shown in Figure 1, except that the grasping ends 8' of the jaws 6' are turned at substantially right angles to the handle portions of the jaws. The pivotal connection is indicated at 7', the handles at 11', the terminals at 23', and the ratchet locking mechanism is indicated at 15', these parts all being the same as the corresponding parts in the embodiment of the invention shown in Figure 1. In Figure 2, however, the insulating stop 14', carried by one of the jaw members and adapted for preventing closing of the grasping ends of the jaws into contact by means of the handles 11', is disposed on the handle side of the pivot 7' instead of on the opposite side as in the other embodiment of the invention.

The apparatus of the present invention may be handled and operated conveniently and effectively, and it is of service to mankind in enabling the finding and removal of metal particles quickly, through a very small incision, and without pain or discomfort.

Indication by sound and other indicators are also contemplated within the scope of the broader of the appended claims.

I do not intend to be limited to the precise details shown or described.

I claim:

1. An indicating attachment comprising a source of relatively weak current, an indicator, and a common enclosure of transparent non-conducting material for said source of current and said indicator, said source of current and said indicator being sealed in said enclosure in a manner to facilitate sterilization of said attachment as an entirety, said indicator being visible through said enclosure.

2. An indicating attachment comprising a transparent enclosure, a stopper sealing said enclosure, terminals mounted on said stopper, a battery positioned within said enclosure and having one end held against one of said terminals, a contact member positioned within said enclosure and connected to the other terminal, said contact member having one end turned into proximity to the other end of the battery, and an incandescent lamp positioned within said enclosure and having a base threaded through the turned end of said contact member and into engagement with the end of said battery in proximity to which the turned end of said contact member is positioned.

3. An indicating attachment comprising a transparent enclosure permanently closed at one

end and open at its opposite end, a stopper sealing the open end of said enclosure, terminals mounted on said stopper, a battery positioned within said enclosure and having one end held against one of said terminals, a contact member comprising a relatively narrow strap positioned within said enclosure and connected to the other terminal, said strap having a substantially horizontally disposed portion positioned between the opposite end of said battery and the permanently closed end of said enclosure, and an incandescent lamp supported by the horizontal portion of said strap and threading therethrough into engagement with said battery.

4. An indicating attachment comprising a transparent enclosure permanently closed at one end and open at its opposite end, a resilient stopper received within and sealing the open end of said enclosure, terminals extending through and projecting from opposite ends of said stopper, a socket secured to the inner surface of said stopper by one of said terminals, a battery disposed in said enclosure and having one end engageable in said socket, a contact member comprising a relatively narrow strap positioned within said enclosure and connected to the other terminal, said strap having a substantially horizontally disposed portion positioned between the opposite end of said battery and the permanently closed end of said enclosure, and an incandescent lamp supported by the horizontal portion of said strap and threading therethrough into engagement with said battery.

5. An indicating attachment comprising a transparent enclosure permanently closed at one end and open at its opposite end, a stopper sealing the open end of said enclosure, terminals mounted on said stopper, a battery positioned within said enclosure and having one end held against one of said terminals, a contact member comprising a relatively narrow substantially U-shaped strap positioned within said enclosure and having legs of different length, the shorter leg of said strap being secured to the other of said terminals and the longer leg of said strap being positioned between the opposite end of said battery and the permanently closed end of said enclosure, and an incandescent lamp supported by the longer leg of said strap and threading therethrough into engagement with said battery.

ing the open end of said enclosure, terminals mounted on said stopper, a battery positioned within said enclosure and having one end held against one of said terminals, a contact member comprising a relatively narrow substantially U-shaped strap positioned within said enclosure and having legs of different length, the shorter leg of said strap being secured to the other of said terminals and the longer leg of said strap being positioned between the opposite end of said battery and the permanently closed end of said enclosure, and an incandescent lamp supported by the longer leg of said strap and threading therethrough into engagement with said battery.

6. An indicating attachment comprising a transparent enclosure of non-conducting material permanently closed at one end and open at its opposite end, a resilient stopper received within and closing the open end of said enclosure, terminals extending through and projecting from opposite ends of said stopper, a socket secured to the inner surface of said stopper by one of said terminals, a battery disposed in said enclosure and having one end engageable in said socket, a contact member comprising a relatively narrow substantially U-shaped strap positioned within said enclosure and having legs of different length, the shorter leg of said strap being secured to the other of said terminals and the longer leg of said strap being positioned between the opposite end of said battery and the permanently closed end of said enclosure, and an incandescent lamp supported by the longer leg of said strap and threading therethrough into engagement with said battery.

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