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REMOVAL OF METALLIC PLATING, COATING, OR FOULING FROM METALLIC OR OTHER SURFACES.  
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908,937.

Patented Jan. 5, 1909.

Fig. 1.

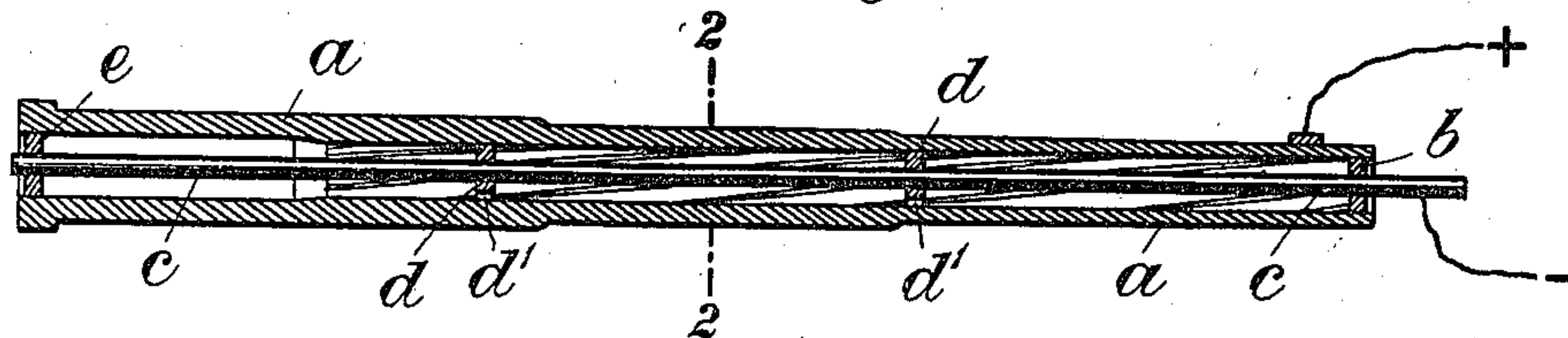


Fig. 2.

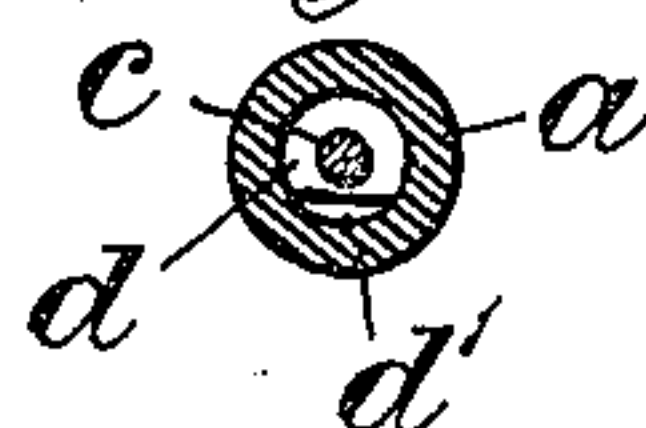


Fig. 3.

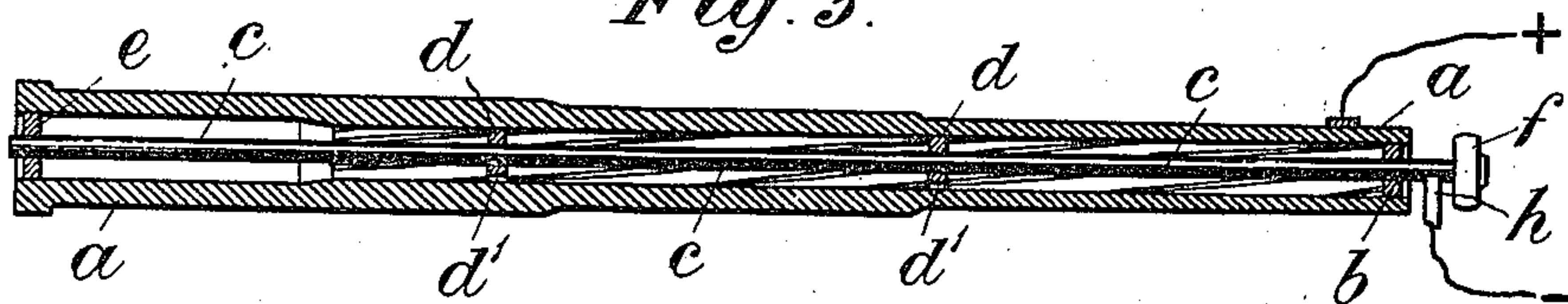
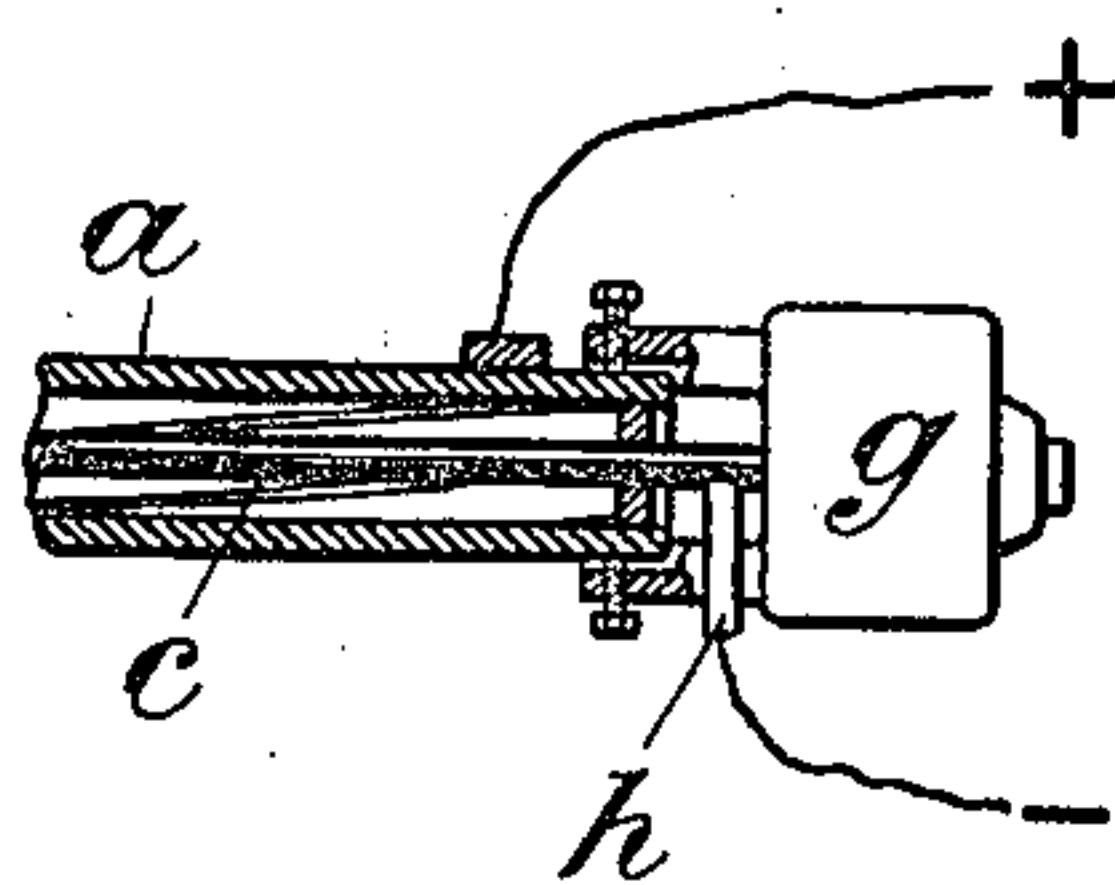


Fig. 4.



Witnesses, —

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# UNITED STATES PATENT OFFICE.

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## REMOVAL OF METALLIC PLATING, COATING, OR FOULING FROM METALLIC OR OTHER SURFACES.

No. 908,937.

Specification of Letters Patent.

Patented Jan. 5, 1909.

Application filed February 18, 1908. Serial No. 416,539.

*To all whom it may concern:*

Be it known that we, THOMAS RICHARD BAYLISS, WILLIAM RICHARD HODGKINSON, JOHN HERSCHEL HARDCASTLE, ARTHUR HERBERT COOTE, and RICHARD ALFRED ERNEST PAYNE, subjects of the King of Great Britain, and respectively residing at "Belmont," Northfield, near Birmingham; 18 Glenluce road, Blackheath, Kent; 70 Burnt Ash road, Lee, Kent; 36 Humber road, Westcombe Park, Kent, and 20 Vernon road, Edgbaston, Birmingham, all in England, have invented certain new and useful Improvements Relating to the Removal of Metallic Plating, Coating, or Fouling from Metallic or other Surfaces, of which the following is a specification.

The said invention consists of the new or improved method and means hereinafter described for removing the metallic plating coating or fouling from metallic or other surfaces and is particularly applicable to the removal of copper, nickel, cupro-nickel or zinc from surfaces of iron or steel, plated, coated or fouled thereby; and the said invention has for its object to effect the rapid removal of the said metallic plating coating or fouling without injuriously affecting the surface from which the plating, coating or fouling has been removed.

In carrying the said invention into effect we make the metallic plated, coated or fouled article the anode of an electrolytic arrangement in which an ammoniacal solution, preferably of the kind hereinafter described, is used as the electrolyte, the cathode consisting of one or more suitably shaped metallic plates, bars, tubes, rods or other electrical conductors.

The cathode of the electrolytic arrangement may be stationary, but we prefer to provide means, hereinafter described, whereby a preferably rapid rotary motion may be given to the said cathode.

The electrolyte may be composed of the amid of an acid, or of an ammonium salt of an acid, preferably of an organic acid, in solution with free or uncombined ammonium hydroxid or ammonia.

We will describe the said invention in connection with the removal of the metallic

fouling from the "lands" or "grooves" of the bore of a breech loading gun, for which purpose the said invention is particularly applicable, the arrangement of the parts constituting the electrolytic combination being diagrammatically illustrated in the accompanying drawing.

Figure 1 represents the arrangement of parts when a stationary cathode is employed. Fig. 2 is a cross section on the dotted line 2—2 Fig. 1. Figs. 3 and 4 represent arrangements of parts which may be employed when the cathode is to be rotated.

The same letters of reference indicate the same parts in the several figures of the drawing.

*a* is the breech loading gun from the bore of which the copper or other metallic fouling is to be removed, which gun and metallic fouling are to constitute the anode of the electrolytic arrangement.

The muzzle of the gun *a* is suitably plugged, the said plug, marked *b*, preferably constituting an insulating support for one end of the rod *c* of iron or other conducting material, which rod *c* is introduced axially into the bore of the gun *a*, and constitutes the cathode when the said gun *a* and rod *c* are respectively connected to the positive and negative terminals of a source of electricity, after the introduction of the electrolyte into the bore of the gun.

Insulating supports *d*, *d* may be placed at intervals along the rod *c* for insulating the said rod from the body of the gun, the said supports having cut away parts or perforations *d'* for permitting the electrolyte to fill the bore of the gun around the cathode or negative pole piece *c*.

The insulating supports may be so constructed and arranged as to partake of a slow longitudinal motion in the bore of the gun in order that no portion of the fouled surface shall remain covered by the said supports during the whole of the time required for the removal of the fouling.

The muzzle of the gun is depressed so that the gun is inclined at a convenient angle for the introduction and retention of the electrolyte therein, and the breech end is plugged by a plug *e* which preferably con-



stitutes an insulating support for the breech end of the axial iron or other conducting rod *c* constituting the cathode. Or where thought necessary or desirable the breech end of the gun may be first plugged the muzzle end in this case being elevated so as to incline the gun at a convenient angle for the introduction and retention of the electrolyte.

We have found an electrolyte composed of the following materials mixed together in, or about, the proportions stated below, to afford satisfactory results:—2 per cent. by volume of glacial acetic acid, best quality; 15 per cent. by volume of ammonia of 0.880 specific gravity; 83 per cent. by volume of water.

After the introduction of the electrolyte into the bore of the gun *a* the pole piece *c* is connected to the negative terminal and the gun to the positive terminal of a source of electricity and a current of say 100 amperes at a pressure of about 5 to 10 volts is passed through the electrolytic arrangement. During the passage of the current, the copper, or other metallic fouling, leaves the anode and is deposited or precipitated upon the cathode, or is dissolved in the electrolyte.

The completion of the removal of the copper fouling can be ascertained by examining the cathode occasionally and noting the rate and position of the copper deposit thereon, or in some cases by observing the color of the liquid.

The solution may be repeatedly employed so long as it is maintained ammoniacal.

By giving a preferably rapid rotary motion to the cathode (or cathodes) currents of greater density may be employed and the removal of the copper or other metallic coating or fouling from the coated or fouled surface of the anode is considerably accelerated.

The rapid rotary motion of the cathode may be effected in various ways. For example, the rod *c* constituting the cathode in the arrangement for removing the fouling from the bore of a gun may be mounted in suitable bearings in the said bore or near the ends of the gun and may have a pulley *f* fixed on one of its ends as is represented in Fig. 3, the said pulley being rotated by belt gearing, (not shown). Or the rod *c* may be driven directly by an electro-motor *g* as is illustrated in Fig. 4, which represents the muzzle end of a gun *a*, portion of axial cathode *c* therein and the motor frame or casing fitted on the end of the gun. Or the cathode, or cathodes, may be otherwise rotated.

Where the cathode is rotated a brush *h*, or other contact arrangement, must be em-

ployed at the negative terminal to contact with the said rotating cathode.

A similar method to that above described may be employed to remove the cupronickel fouling from the barrel of a rifle, say a 0.303 inch Lee-Enfield rifle, but the metallic pole piece inserted in the bore to constitute the cathode will necessarily be thin, a stretched iron wire for instance, the electric current in this case being reduced in strength so as to avoid undue heating or the liability of fusing the connections.

As a further illustration of the application of the said invention, assumé it is desired to replate an iron or steel article and the existing metallic coating has first to be removed, the latter operation can readily be accomplished by the means hereinbefore described. Thus the existing plating on the handle bar of a velocipede may readily be removed by constituting the said handle bar the anode of an electrolytic arrangement having suitable cathodes and an electrolyte of the kind hereinbefore described.

By suitably adjusting the strength of the electric current and the proportion of the ingredients in the solution, extreme cases of metallic fouling or coating such as that occurring from the automatic firing of a Maxim gun, can be efficiently and quickly removed.

In the preparation of the solution the presence of the halogens and sulfid compounds must be avoided since they tend to create a rusting effect on the iron or steel surfaces, and alkali or alkaline earth metals are to be avoided for a similar reason.

Having described our invention, what we claim as new and desire to secure by Letters Patent is—

The herein described method of removing metallic plate, coating or fouling from the surfaces of metallic articles consisting in electrically connecting the article to serve as an anode, confining an electrolyte within the article, said electrolyte consisting of an ammoniacal liquid which is held against the surface of the article to be treated, and introducing and rapidly rotating a cathode in the article and the electrolyte adjacent to the surfaces to be treated.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

THOMAS RICHARD BAYLISS.  
WILLIAM RICHARD HODGKINSON.  
JOHN HERSCHEL HARDCASTLE.  
ARTHUR HERBERT COOTE.  
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