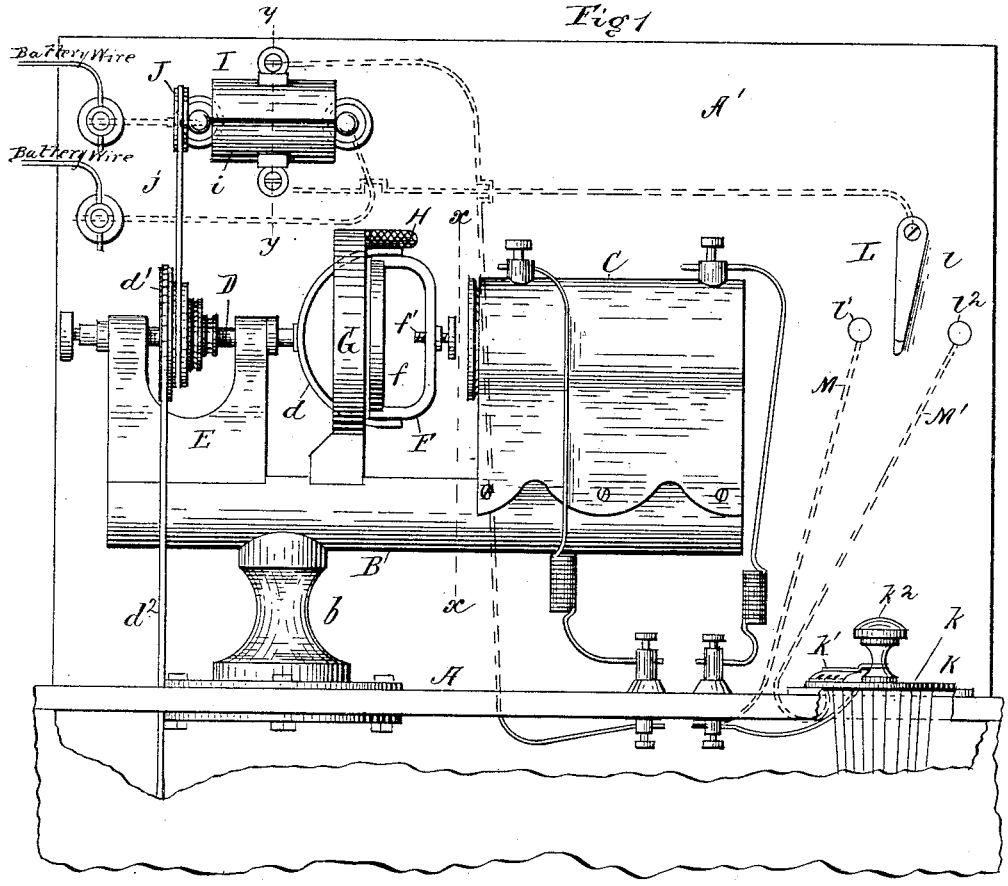
(No Model.) 2 Sheets—Sheet 1.

C. K. GILES & R. E. FENNER.

APPARATUS FOR DEMAGNETIZING WATCHES.

No. 345,838. Patented July 20, 1886.

Fig 1



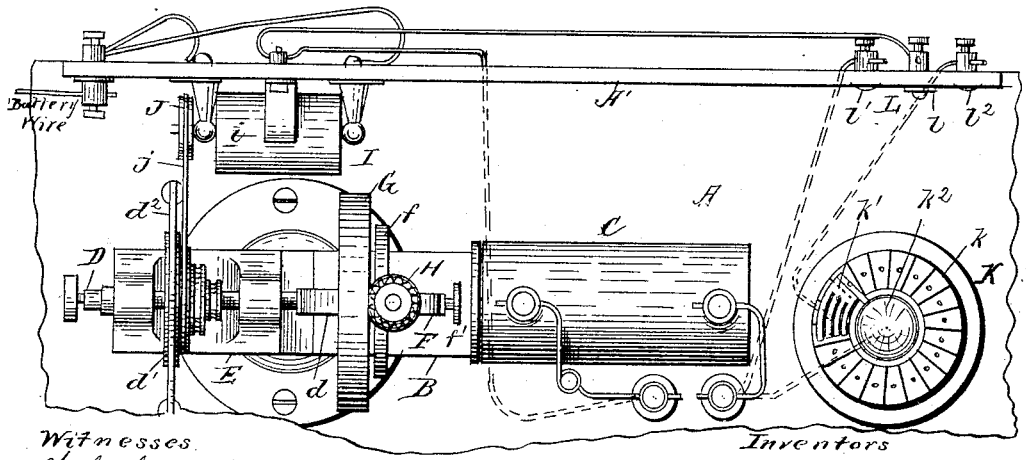


Fig 2

Witnesses
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(No Model.) 2 Sheets—Sheet 2.

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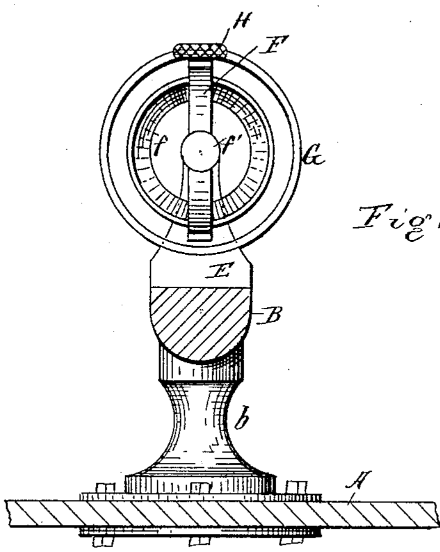

Fig 3

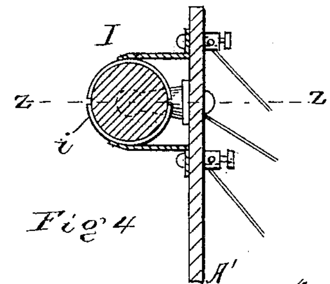

Fig 4

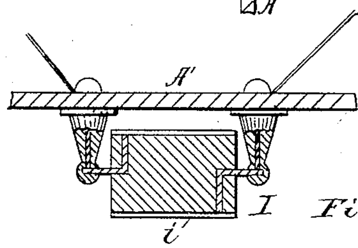

Fig 5

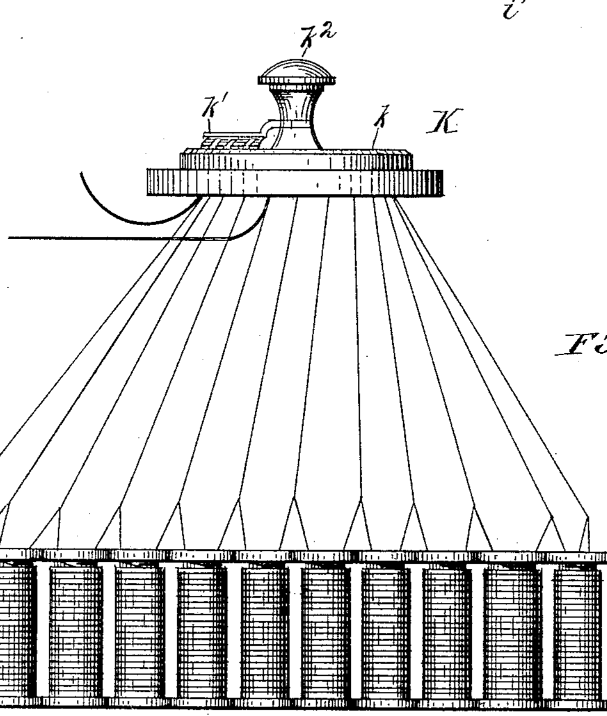

Fig 6

Witnesses

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR DEMAGNETIZING WATCHES.

SPECIFICATION forming part of Letters Patent No. 345,838, dated July 20, 1886.

Application filed August 14, 1884. Serial No. 140,571. (No model.)

To all whom it may concern:

Be it known that we, CHARLES K. GILES and RICHARD E. FENNER, citizens of the United States, and residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Demagnetizing Watches, Watch-Makers' Tools, and other Articles, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents an elevation of an apparatus embodying our improvements; Fig. 2, a plan view of the same; Fig. 3, a detail cross-section taken on the line *x x*, Fig. 1; Fig. 4, a similar section taken on the line *y y*, Fig. 1; Fig. 5, a detail plan section taken on the line *z z*, Fig. 4; and Fig. 6, a detail elevation of the rheostat detached.

Our invention relates to an apparatus for demagnetizing the several parts of a watch without removing them from their place, and also other articles of steel or iron which may have become magnetized.

In our invention we employ a stationary electro-magnet with mechanism for giving the necessary revolution or revolutions in front thereof of the articles to be operated upon, and combine therewith a rheotrope and a rheostat, by the former of which the polarity of the electro-magnet is inverted with regularity, while by the latter the force of the current passing through said magnet is regulated so that it may be increased or diminished, as may be desired.

It is well known that metallic articles which have become magnetized may be demagnetized by placing them within a magnetic field in which the polarity is inverted at short and regular intervals, while the magnetic force is gradually diminished. It is the object of our improvements to accomplish this without the necessity of moving the different parts, or, in other words, changing the distance between the articles and the magnets.

We will proceed to describe in detail one way in which we have carried out our invention in practical form, and will then point out definitely in the claims the special improvements which we believe to be new, and wish to protect by Letters Patent.

In the drawings, A represents a suitable bench or table, on which the main parts of the apparatus may be mounted, and in this instance A′ is a back board set upright at the back of the bench, on which some of the parts are mounted. This arrangement is, however, a matter of convenience merely, and the parts may all be mounted on a horizontal bench or table. A bed-piece, B, is secured in a fixed position to the bench by means of a standard, *b*, and on one end of this bed-piece is arranged an electro-magnet, C, which may be of any known construction, and need not be further described. This magnet is secured rigidly to the bed, and is not intended to be moved. In front of the magnet is a horizontal shaft, D, which is mounted in suitable bearings in a yoke-standard, E, fastened to the other end of the bed. The inner end of this shaft is provided with a fork, *d*, in which is mounted by suitable journals a yoke, F, the axis of which is at right angles to the axis of the shaft. Within this yoke is rigidly fastened a ring, *f*, the inner face of which is concaved slightly, to adapt it to receive the face of a watch, and this fork and ring constitute the holder within which the watch is placed for operation. The back of the yoke is provided with a clamping-screw, *f′*, which is set up against the watch when placed in the holder, to securely fasten it in position. It will be seen that by rotating the shaft the fork at the end thereof will be revolved in front of the electro-magnet, and that the bearings of the holder will also be carried around in a vertical plane in front of the magnet. Rotary motion is given to the shaft in any suitable way. In the drawings we have shown a pulley, *d′*, over which a band, d^2, passes, which runs around another pulley at or near the floor, worked by a treadle or some other device. These last-named parts we have not shown, as they are well-known means for driving pulleys, and constitute no part of our improvements, in the operation of which we contemplate using any suitable devices for imparting the required motion to the shaft.

The rotation of the shaft and holder, as described, will obviously rotate a watch in a perpendicular plane in front of the magnet; but it is also required to give the watch an independent rotary movement about its own axis, which is effected by rotating the holder on its journals, and this we accomplish in the following way: A ring, G, is fastened rigidly to the bed in an upright position, being arranged so that the fork of the shaft revolves within it and stands at one side of the plane of revolution of the yoke-bearings. On one or both of the journal-bearings of the yoke F is a small friction-wheel, H, arranged to run in contact with the adjacent edge of the stationary ring G. Obviously, this device will rotate the watch-holder on its own axis when the carrying-shaft is rotated, for the friction-wheel will be carried around bodily, but remain in contact with the stationary ring, and so the watch within the holder will have a second motion imparted to it about the axis at right angles to the axis of the rotation first described.

It will be seen from this description that when the electro-magnet is properly connected up with a battery or other mechanism for producing an electrical current the rotation of the watch described above will be within a magnetic field, and of course the watch will be brought within the influence of the magnet. As already stated, in order to produce the desired effect, it is required to invert the electrical current in quick succession. We effect this result by placing within the circuit, between the battery and the magnet, a rheotrope, I, which, as shown in the drawings, is mounted on the back board, but may be mounted on the bench or table or in any other convenient place.

No particular construction of rheotrope is required, for one of any well-known type may be employed, the usual appliances for operating it being provided.

We have shown in the drawings a rheotrope of ordinary construction, sometimes called a "cylinder-rheotrope." The construction and operation of this device are well known, and do not require specific description here. We need only say that *i* is the usual cylinder, mounted on suitable bearings, and that to one of its journals is fastened a pulley, J, over which a band, *j*, runs from a pulley on the shaft D, so that the required motion is imparted to the cylinder from the same shaft which rotates the watch. The parts are so constructed and arranged relatively that each revolution of the shaft D will give one revolution to the cylinder of the rheotrope. Obviously, when the apparatus is put into operation the effect of the rheotrope will be to constantly invert the current passing to the electro-magnet at short intervals, depending upon the rapidity with which the working-shaft is driven, and so the polarity of the magnetic force exercised upon the watch will be changed with greater or less rapidity. The remaining requisite to produce the desired effect is to gradually diminish the force of the current within the magnetic field within which the watch is located. This we effect by means of a rheostat, K, which is located somewhere in the circuit between the rheotrope and the magnet. It will be understood at once that a rheostat will be required of such construction that the resistance may be varied. We therefore preferably employ a rheostat of a well-known type, generally known as the "sunflower-rheostat," and we have shown it in the drawings located at one end of the bench, though it may be arranged at any other convenient point, provided it is placed properly within the circuit. The construction and operation of the sunflower-rheostat is so well known that a description in detail is not necessary here. Its application in this relation will be readily understood from what we have stated above, and we have only to add that the disk *k* and regulator *k'*, turned by the button k^2, are located on the surface of the bench, as shown in the drawings, within easy reach of the operator, while the resistance-coils are below. Further details of description we omit, though in the drawings the construction of this rheostat, as well as of the rheotrope mentioned, is fully illustrated.

We have shown a sunflower-rheostat and prefer it in practical use, because of its convenience, but it will be understood that a rheostat of variable resistance of any suitable construction may be applied instead of the sunflower. It will be seen that with a variable rheostat placed in the circuit, as described, we are enabled to regulate the force of the current passing to the magnet, so that it may be decreased from full battery-power to zero, or substantially that. This, of course, is effected by moving the regulator from one leaf to another, thereby bringing into circuit additional coils, and so increasing the resistance in a well-known way.

In the operation of the apparatus it will be desired at times to send the full battery force to the magnet, and in order to accomplish this we provide a switch, L, by means of which the current is sent either directly to the magnet or around through the rheostat thereto. As shown in the drawings, the pivoted switch-lever *l* is connected to one of the wires leading from the rheotrope, that one being selected which conducts the current around through the rheostat. From the switching-point two wires lead to the magnet, one, M, directly to the connections with the magnet, so as to make a direct circuit thereto, and the other, M', to the rheostat, from which, in turn, another wire leads to the connections of the magnet, thus providing for another circuit to the magnet around through the rheostat. The wire M terminates in an anvil or button, *l'*, and the wire M', in a similar piece, l^2, both being arranged within the radius of

the button on the switch-lever whenever the latter is turned, so that in a well-known way the circuit may be formed either directly to the magnet through the wire M or to the rheostat through the wire M'. Of course, in the former case the full battery-power is sent to the electro-magnet, while in the latter case the power is regulated by the rheostat.

In using our apparatus practically the operation is as follows: The watch is mounted and secured in the holder as described, the switch is turned so as at first to send the full battery-current to the magnet, and of course the watch will be under the influence of the full power of the electro-magnet. The shaft D is now set in motion, thereby giving the watch the double rotation already described, and also operating the rheotrope, when, of course, the well-known effect will be produced, occasioned by the change of polarity in the magnetic field. The switch-lever is changed to the wire M', so as to send the current through the rheostat, the latter being at first set so as to offer its least resistance. The revolution of the shaft is kept up and the rheostat is set successively from one point to another, so as to gradually increase the resistance, thereby weakening the current sent to the magnet, until finally it is substantially zero. The necessary result of this operation will be a constant successive inversion of the current, while at the same time the latter is gradually weakened, and so the effect upon the watch must be, as already described, gradually removing the magnetic power from any of its parts, until finally it is entirely freed therefrom. It will be understood, of course, that in order to secure this operation the rheostat must be constructed so as to have at least sufficient resistance to substantially neutralize the full force of the battery.

The apparatus which we have described above and shown in the drawings is practically operative for the purpose stated; but we do not wish to be understood as limiting ourselves to all details of construction and arrangement as described and shown, for they may be changed in many respects without departing from the main idea of our invention, which consists in the employment of a stationary magnet in connection with a rheotrope for inverting the current, and also this magnet in connection with a rheostat for regulating the force of the current; and we wish to be understood as claiming, broadly, the combination of the magnet with either one of the devices, or both together.

In the detailed description of the apparatus given above we have only referred to watches, and for operation upon them it is necessary to have the devices for revolving the watch in the manner described; but, as stated at the outset, our invention is not intended to be limited to its application to demagnetizing watches, for other articles may also be acted upon by this apparatus. With ordinary articles, however, it will not be necessary to revolve them, but they may be fixed in a stationary rest in front of the magnet, or, in cases of simple tools and instruments, may be held by the operator in front of the magnet and gradually withdrawn from the field; but in this latter case the rheostat is not necessary, and may be cut out from the circuit.

We have not described the complete mode of connecting up the different parts between the battery and magnet to make the circuit; but these connections are fully shown in the drawings, from which they will be readily understood.

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

1. In a demagnetizing apparatus, a holder for the article to be demagnetized, in combination with mechanism for turning the same, an electro-magnet with its poles presented to said holder, a pole-changer in the circuit of said electro-magnet, and means for varying the resistance of the circuit.

2. In a demagnetizing apparatus, a holder for the article to be demagnetized, in combination with mechanism for turning the same, an electro-magnet with its poles presented to said holder, a rheotrope in the circuit of said electro-magnet, a rheostat of variable resistance, and a switch whereby the rheostat may be thrown into or out of the circuit of the electro-magnet.

3. In a demagnetizing apparatus, a holder mounted in a fixed relation to the magnet, in combination with mechanism for rotating said holder on two axes at about right angles to each other, a stationary electro-magnet, a rheotrope, and a rheostat of variable resistance, substantially as and for the purposes set forth.

4. In a demagnetizing apparatus, the revolving shaft D, in combination with the holder mounted thereon, the stationary ring G, the friction-wheel H on one or both of the holder-journals, the electro-magnet C, the rheotrope I, and the rheostat K, substantially as and for the purposes set forth.

5. In a demagnetizing apparatus, the holder-shaft D, in combination with the cylinder *i* of the rheotrope, and the band *j*, running over pulleys on the shaft D and journal of the cylinder, whereby the rheotrope is operated by the same shaft that revolves the holder, substantially as described.

6. In a demagnetizing apparatus, a stationary electro-magnet, in combination with a rheostat, a switch, L, and the two circuit-wires M and M', whereby the battery-current may be sent to the magnet either directly or around through the rheostat, substantially as and for the purposes set forth.

7. In a demagnetizing apparatus, a stationary electro-magnet, in combination with a rheotrope, a rheostat of variable resistance, a switch between the rheotrope and rheostat,

and two circuit-wires from the switch, one leading directly to the magnet and the other to the rheostat, substantially as and for the purposes set forth.

8. In a demagnetizing apparatus, a revolving holder mounted in a fixed relation to the magnet, in combination with a stationary electro-magnet, a rheotrope, a rheostat of variable resistance, a switch between the rheotrope and rheostat, and two circuit-wires from the switch, one leading directly to the magnet and the other to the rheostat, substantially as and for the purposes set forth.

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