(No Model.) 3 Sheets—Sheet 1.

R. VARLEY, Jr.

MACHINE FOR WINDING ELECTRO MAGNETS.

No. 512,769. Patented Jan. 16, 1894.

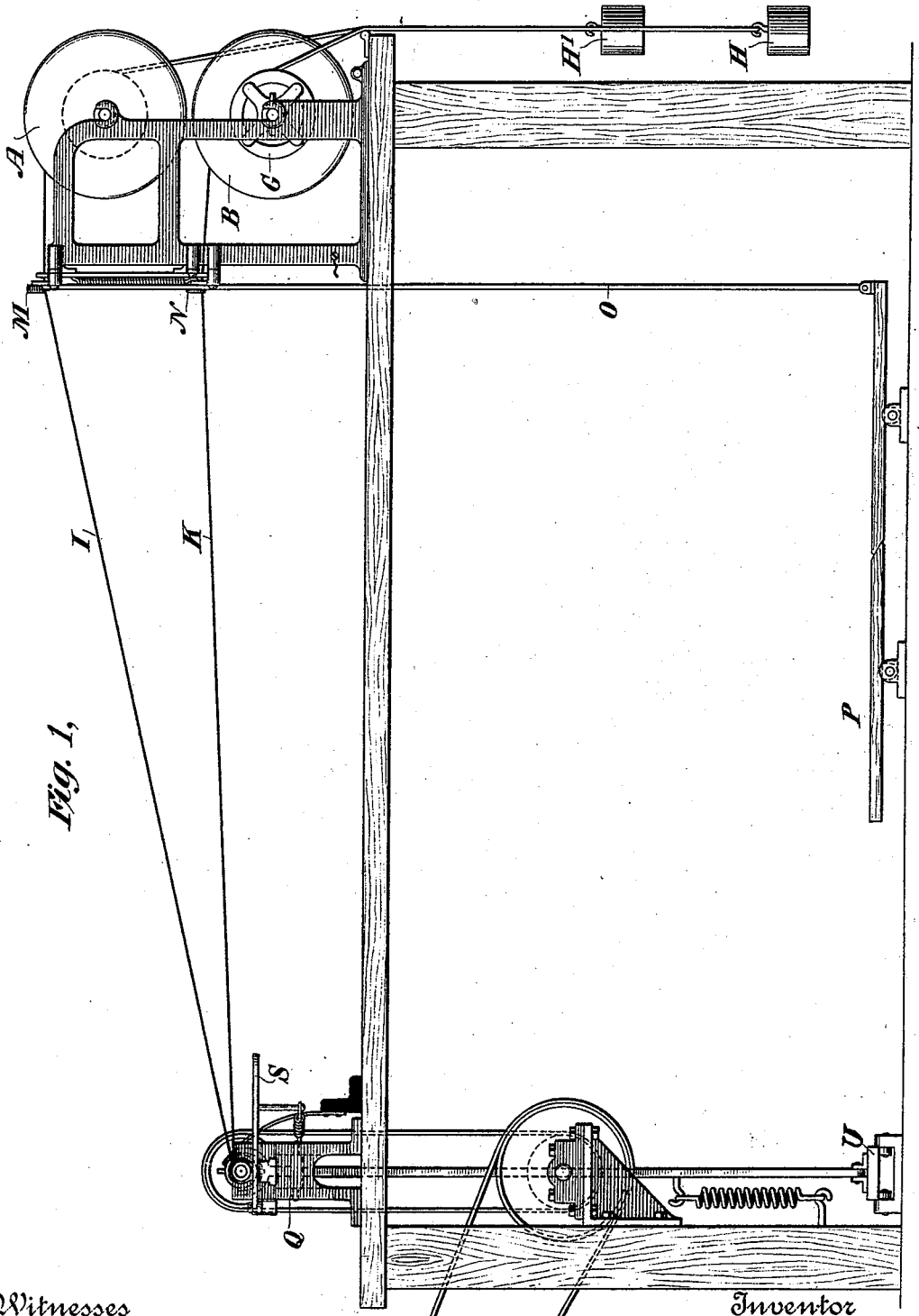

Fig. 1,

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(No Model.) 3 Sheets—Sheet 2.

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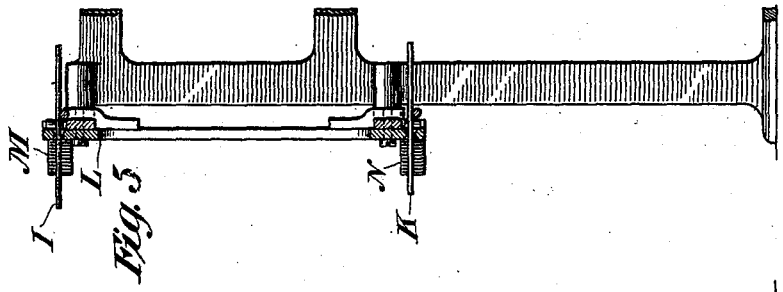

Fig. 5

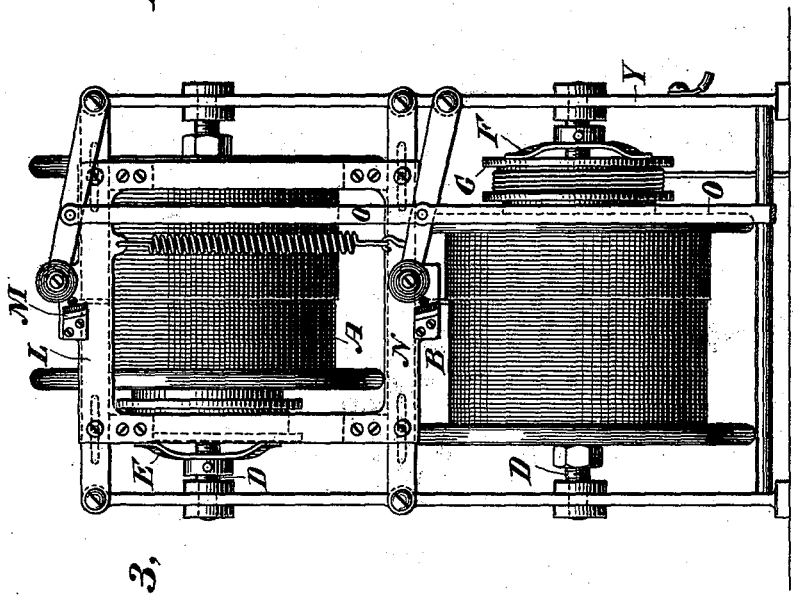

Fig. 3,

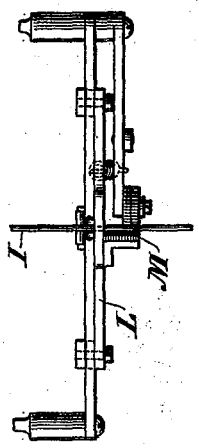

Fig. 4,

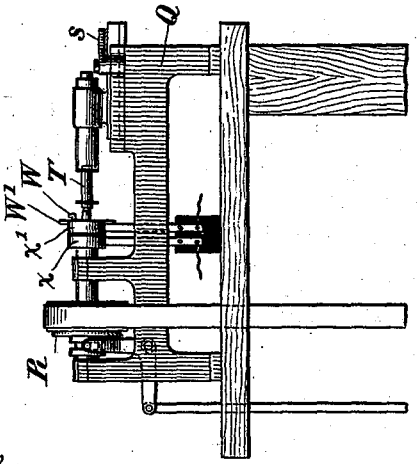

Fig. 2,

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(No Model.) 3 Sheets—Sheet 3.

R. VARLEY, Jr.

MACHINE FOR WINDING ELECTRO MAGNETS.

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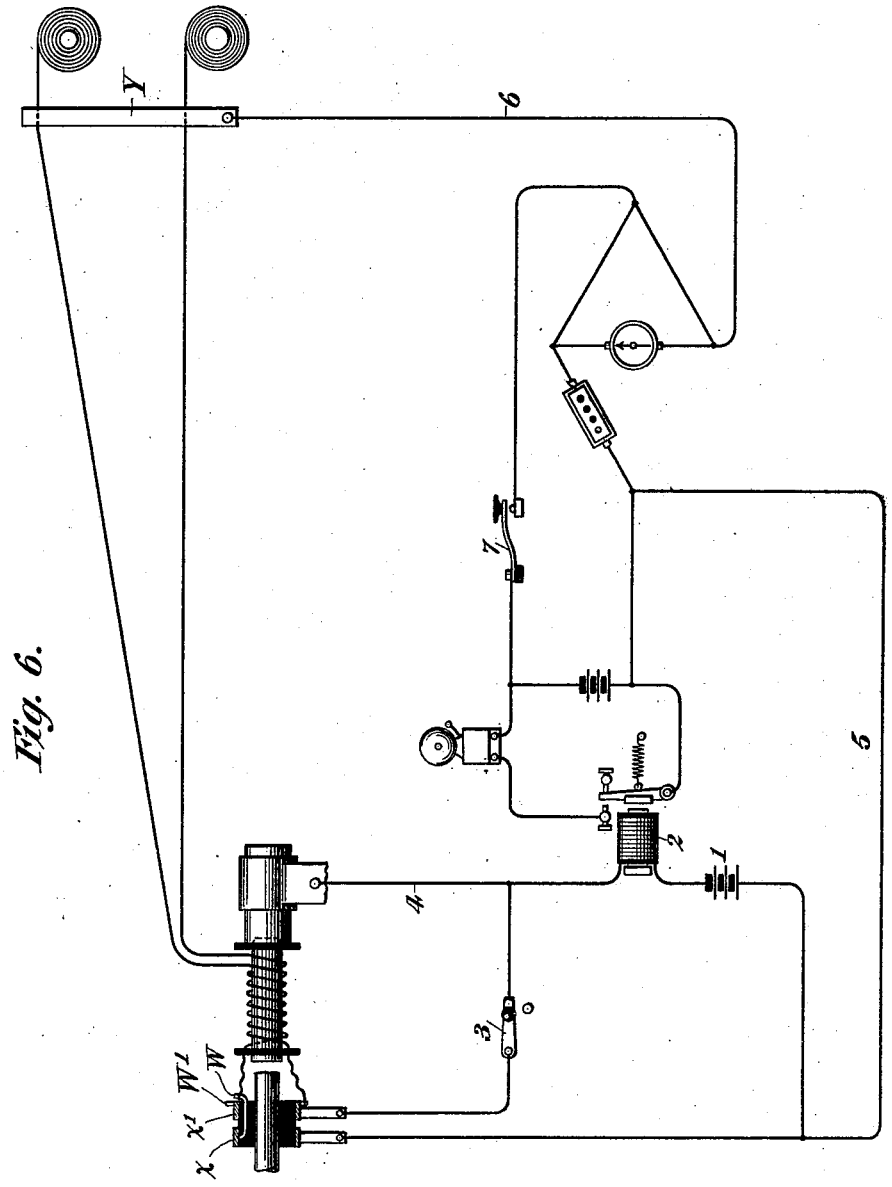

Fig. 6.

Witnesses
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UNITED STATES PATENT OFFICE.

RICHARD VARLEY, JR., OF ENGLEWOOD, NEW JERSEY.

MACHINE FOR WINDING ELECTRO-MAGNETS.

SPECIFICATION forming part of Letters Patent No. 512,769, dated January 16, 1894.

Application filed April 13, 1893. Serial No. 470,168. (No model.)

To all whom it may concern:

Be it known that I, RICHARD VARLEY, Jr., a citizen of the United States, residing at Englewood, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Machines for Winding Electro-Magnets; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to machines for winding two independent strands of fiber, cord or conductor, simultaneously. The machine is especially designed for winding magnets such as described in a patent issued to me, No. 489,277, dated January 3, 1893, comprising a spool wound with a duplex conductor, one of which is covered or insulated, and the other of which is bare. In winding such conductors in accordance with said patent it is necessary that the bare and covered conductor be laid on the spool simultaneously, so that the several convolutions of bare and covered wire will lie adjacent to one another throughout the winding and provide the insulation necessary to the operation of the magnet. The present machine is constructed so that the duplex conductor may be continuously wound upon the spool in an automatic way.

The invention comprises mechanism for feeding the two conductors in such a way that they will continuously fall in their proper places on the bobbin so as to form a complete layer thereon from end to end, and then reversing direction, this operation being automatically continued by the operation the machine until the desired number of layers have been placed upon the bobbin, when the operation of the machine is arrested.

The invention also comprises means for providing a proper tension upon the conductors and means for locking the same against displacement when a bobbin is removed from the winding apparatus.

The invention also comprises means for automatically announcing to the operator a short circuit or leak between the two parts of the duplex conductor being wound or a leak from the wire to the core.

It also comprises means for determining when the proper amount of wire has been wound.

The several features of novelty will be more particularly hereinafter described and definitely indicated in the claims appended to this specification.

In the accompanying drawings which illustrate the invention, Figure 1 is a side elevation of a machine embodying my improvements. Fig. 2 is a partial end elevation of the winding lathe. Fig. 3 is an end elevation of the supply reels and the feed regulating mechanism. Fig. 4 is a top plan view of mechanism for locking the conductors against displacement when a wound bobbin is removed from the lathe. Fig. 5 is a central sectional view looking in the direction indicated by the view shown in Fig. 1 of the locking mechanism; and Fig. 6 is a diagrammatic view of a testing system by which an alarm is given in case of insufficient insulation between the two wires or from the core, and by which the operator may be automatically advised when a sufficient amount of wire has been wound upon the bobbin.

A and B represent two supply reels upon which are placed coils of bare and covered wire respectively. These reels are rotatively mounted upon fixed shafts C and D, upon which are placed tension springs E, F, bearing against an extension of the reels, and the pressure of which may be controlled by suitable jam nuts as indicated. The ends of the reels as indicated at G are grooved, a cord being coiled in the groove and having one end fixed to the frame of the reel and carrying at the other end a weight H. Each of the reels is similarly equipped. The tension of the springs F is so regulated by the jam nuts that they will just support the weights H so that as the wire feeds forward during the operation of the machine the springs F will slip upon the ends of the reels under the influence of the weights. The wires I, K, one of which is covered and the other bare are carried through eyes formed in a plate L attached to the front of the supporting frame. At one side of each of these eyes is placed a plate M, N. Co-operating with the plates M, N are locking levers carrying small rollers at the inner extremity as indicated, said levers be-

ing pivoted upon the frame and controlled by a rod O connected with a foot lever P. The locking levers are normally retracted by the tension of a spring, as indicated in Figs. 1 and 3. During the winding operation the locking levers are retracted and the conductors are free to move through the eyes in the plates M, N, being guided thereto by three guide rolls V, V′, V², one of which is horizontal and the other two vertical, resulting in a smooth feed of the wire to the openings in the plates M and N.

Upon the front portion of the machine is mounted a winding lathe Q belted to some suitable source of power, upon which is a loose pulley with which co-operates a friction clutch R controlled by a foot lever U and normally held inactive by a controlling spring as indicated in Fig. 1.

Facing the operator on the lathe is a lever S controlled by a spring by operating which the chuck of the lathe may be withdrawn and the bobbin T upon which the wires are to be wound inserted. The two eyes formed in the plates M, N through which the wires are carried are placed vertically one over the other as indicated in Figs. 1 and 3 and are located at such a distance from the winding lathe, and placed at such a distance one above the other, that the wires will fall snugly in position as they run to and fro over the bobbin in the operation of winding. One wire being placed vertically above the other falls inevitably into its proper position relatively to the other during the operation of winding by reason of the convergence of the two wires to a point on the bobbin, and as the latter revolves the upper one bears against the lower one in such a position that it will fall snugly in place as the bobbin turns. The distance between the eyes through which the wires are carried and the winding lathe is made sufficient so that the travel of the wires from end to end of the bobbin will not materially displace their relative position. The ends of the two wires are affixed to projections W, W′ on the rotary part of the winding lathe. The wires I, K and the bobbin upon which they are now fixed are then drawn forward a sufficient distance to admit of being chucked in the lathe, the weights H maintaining a suitable tension, and the operation of winding begins. As each layer is automatically completed by the machine the operator inserts a layer of paper or some other separating medium, and the winding goes forward continuously until the bobbin has been filled with the desired number of layers, after which the foot lever P is pressed, thus throwing down the gripping ends of the levers, pinching the wires against the plates M, N, thus preventing the wires I, K from being pulled backward by the weights. Another bobbin is then connected to the wires and the winding operation repeated.

In winding bobbins of considerable length I may in some cases instead of increasing the distance at which the supply reels are placed from the lathe render the plate in which the guiding eyes are formed capable of sliding backward and forward, as indicated by the dotted slots shown in Fig. 3. In such case the gripping devices and feed rollers will also preferably be so arranged that they may move backward and forward through the frame which will accommodate itself to the position of the wires on the bobbin and shift laterally during the progress of winding a layer upon the bobbin.

It sometimes happens that there are bare spots in the insulated wire and it becomes desirable to have notice of this automatically given to the operator who is winding, so that the correction may be made before the magnet is completed. In order to accomplish this I provide the head of the lathe with two insulated ring contacts X, X′, upon which bear co-operating brushes. The ring contacts are provided with projections W, W′, the former passing through the insulated portion of the ring X′.

In starting to wind a bobbin the ends of the insulated and bare wires are fastened to the respective projections W′, W, and in case a bare spot exists in the covered wire contact will be made with the bare wire and a circuit closed through a suitable relay, ringing an alarm by which the attention of the operator is called to the fact that the winding is improperly insulated. In Fig. 6 are shown diagrammatically the circuit connections for accomplishing this result. The brushes which bear upon the ring contacts X, X′ connect with the opposite poles of a battery 1, which includes a relay 2 in its circuit, and a switch 3 by which the circuit may be opened by the operator for a purpose presently to be described. It will thus be seen that in winding, if the bare wire makes contact with the metallic portion of the insulated wire, a circuit will be closed through the battery 1, brush and ring X, out on one of the duplex wires, back on the other to ring X′, and by way of switch 3 and the relay to the other pole of the battery. The relay is thus energized, attracting its armature and ringing a bell operated by a local battery, as indicated. A branch wire 4 is led from the frame of the lathe so that in case the bare wire should touch the core of the bobbin the relay will be energized and the bell will ring. Thus provision is made against imperfect insulation between the two wires and the core of the bobbin. When the bell rings the operator is apprised of the fact that there is defective insulation, and if upon opening the key 3 the bell still continues ringing, he will know that the fault is due to contact of the bare wire with the core. If on opening the key 3 the alarm ceases, he will know that it is due to a cross connection between the insulated and the bare wire.

It is desirable in winding magnets in which a definite resistance is required to apprise

the operator when sufficient wire has been wound upon the bobbin. For this purpose an electric balance is provided which may be conveniently in the form of an electric bridge, by which, when the desired amount of wire has been wound upon the bobbin, a needle will be deflected or an alarm given to notify the operator. As the wire is duplex in character the test may be made upon the bare wire, the resistances being adjusted in the bridge so that when the required amount of wire is wound upon the bobbin the balance will be created. As shown in the drawings, a galvanometer is inserted in the bridge wire, and a balancing resistance or rheostat in one of the sides of the bridge system. In the other side is connected a branch wire 5 leading to the brush which bears upon the ring X′ to which the bare wire is connected. Any suitable portion of the frame Y upon which the supply reels A and B are mounted is electrically connected by wire 6 with the bridge. Thus there is provided an electric bridge which includes on one side a resistance fixed at a point to correspond with the required amount of wire, and the wire being wound is connected in the other side. In this circuit may be provided a key 7.

In winding a bobbin, when the operator reaches a point approximating the complete bobbin, a depression of the key 7 will deflect the needle of the galvanometer, and as the winding continues the difference of potential between the two sides of the bridge will grow less and less, until, when they are perfectly balanced, the needle will drop back to zero and the operator will know that the magnet has the desired amount of resistance.

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

1. A machine for winding upon a bobbin simultaneously a plurality of strands, comprising a turning head for rotating the bobbin, and a frame provided with guides through which the strands pass to the bobbin, said guides being placed in a plane transverse to the axis of the bobbin.

2. A machine for winding upon a bobbin simultaneously a plurality of strands, comprising a turning head for rotating the bobbin, a frame provided with guides or eyes through which the strands pass to the bobbin, said guides being placed in a plane transverse to the axis of the bobbin, and means for maintaining a continuous tension upon the strands during the process of winding.

3. A machine for winding two wires simultaneously upon the same bobbin, comprising a rotating head to which the bobbin may be secured, a frame in which the reels of wire are mounted, means for maintaining a tension upon the reels, and two guides or eyes placed one above the other in a plane transverse to the axis of the bobbin, as and for the purpose described.

4. A machine for winding two wires simultaneously upon the same bobbin, comprising a rotating head to which the bobbin may be secured, two wires extending through guides or openings, reels for supplying the wire, said reels being provided with suitable tension devices, and means for locking the reels against displacement when the winding operation has been completed.

5. A machine for winding two wires simultaneously upon the same bobbin, comprising a rotating head to which the bobbin may be secured with its axis substantially horizontal, two wires extending through guides located one above the other in the same vertical plane, and means for maintaining a tension on the wire during winding.

6. The combination with a machine for winding electro-magnets, of a circuit including a battery and alarm mechanism, said circuit having its terminals electrically connected with the core of the magnet and the wire respectively, whereby notice will be given of defective insulation.

7. A machine for winding bare and insulated wire simultaneously upon the same bobbin, comprising a turning head for rotating the bobbin, ring contacts with which the wire terminals are electrically connected, and an alarm circuit electrically connected with the ring contacts, said alarm circuit being normally inactive but adapted to give an alarm upon connection being made between the two wires.

8. In combination with a magnet winding machine, a testing circuit connected at opposite sides of the winding on the magnet, said testing circuit being provided with an indicating device by which an announcement will be made to the operator when the required amount of wire has been wound.

In testimony whereof I affix my signature in presence of two witnesses.

RICHARD VARLEY, JR.

Witnesses:
EDWARD C. MOORE,
JOHN GEORGE MEYERS.