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No. 767,216.

PATENTED AUG. 9, 1904.

T. A. EDISON.
APPARATUS FOR VACUOUSLY DEPOSITING METALS.

NO MODEL.

APPLICATION FILED AUG. 1, 1903.

3 SHEETS—SHEET 1.

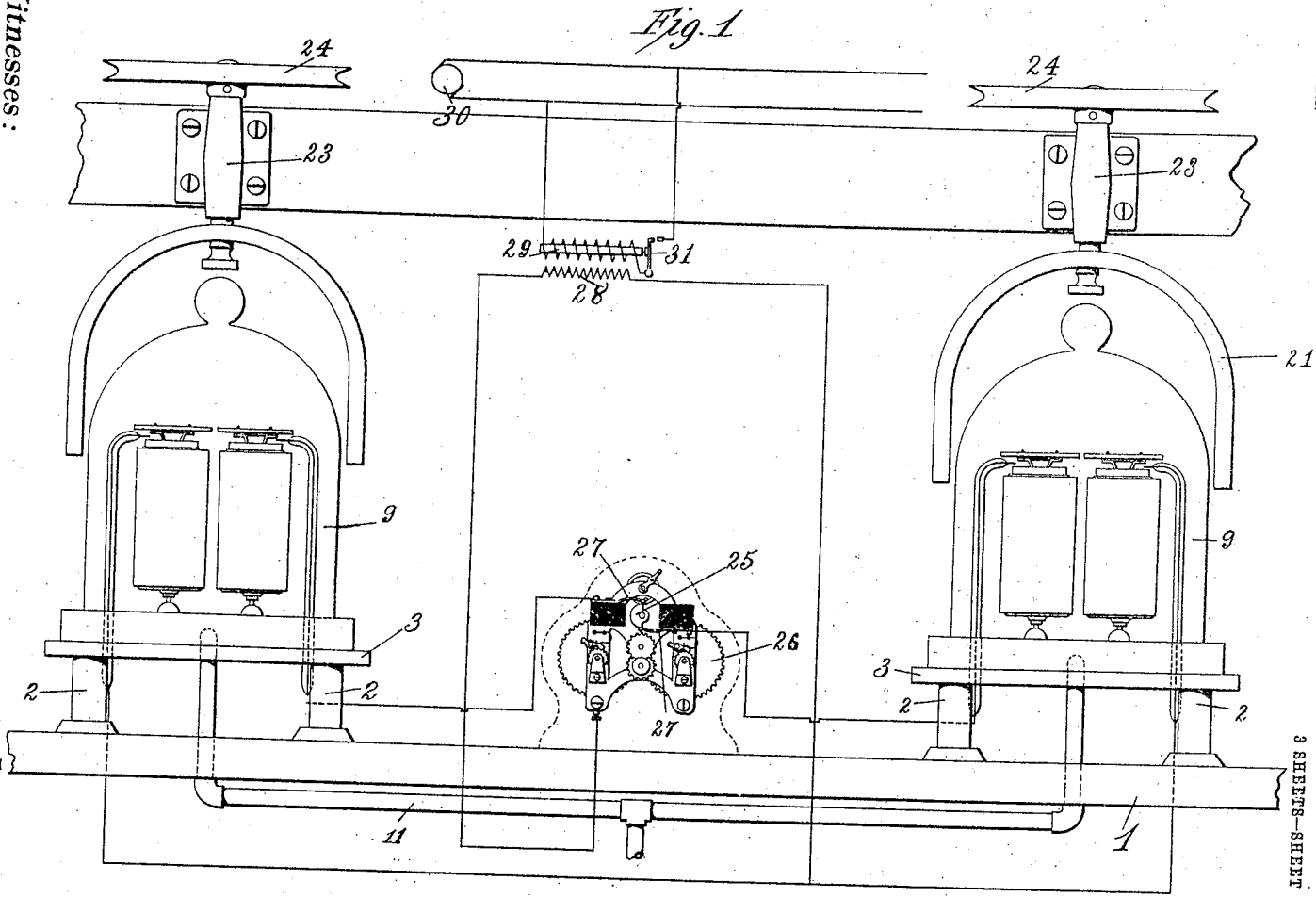


Fig. 1

Witnesses:

William A. Nelson
August 9, 1904

Thomas A. Edison
Inventor
By Frank T. Hoyer
Attorney

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3 SHEETS—SHEET 2.

Fig. 2

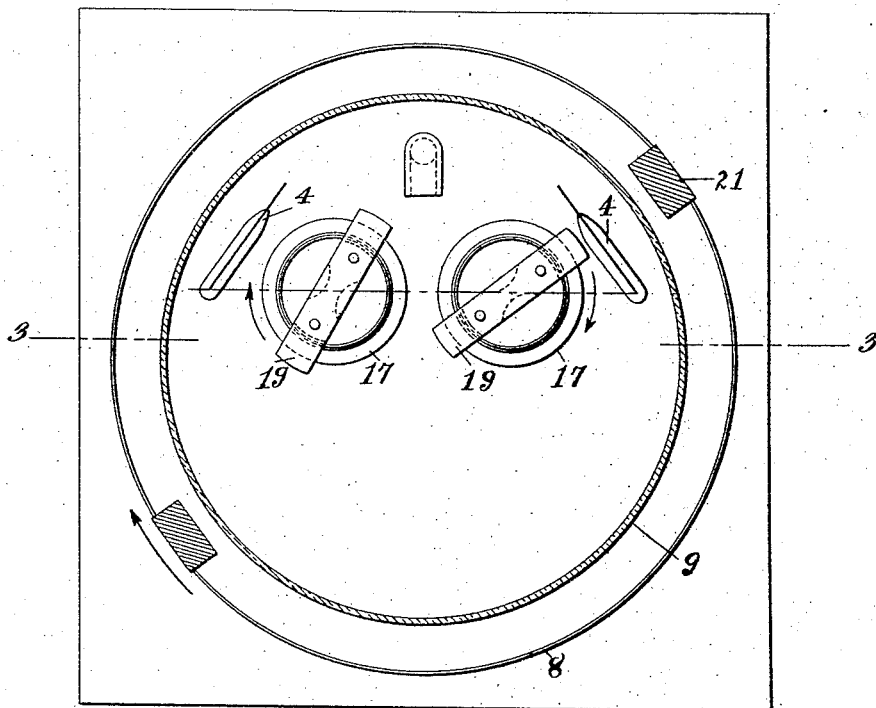
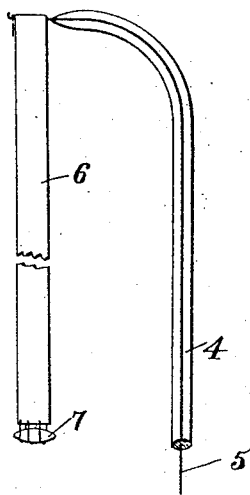


Fig. 4



Witnesses:

Ludwig F. Alt

William A. Deane

Inventor

Thomas Edison

by Frank L. Sperry
Attorney

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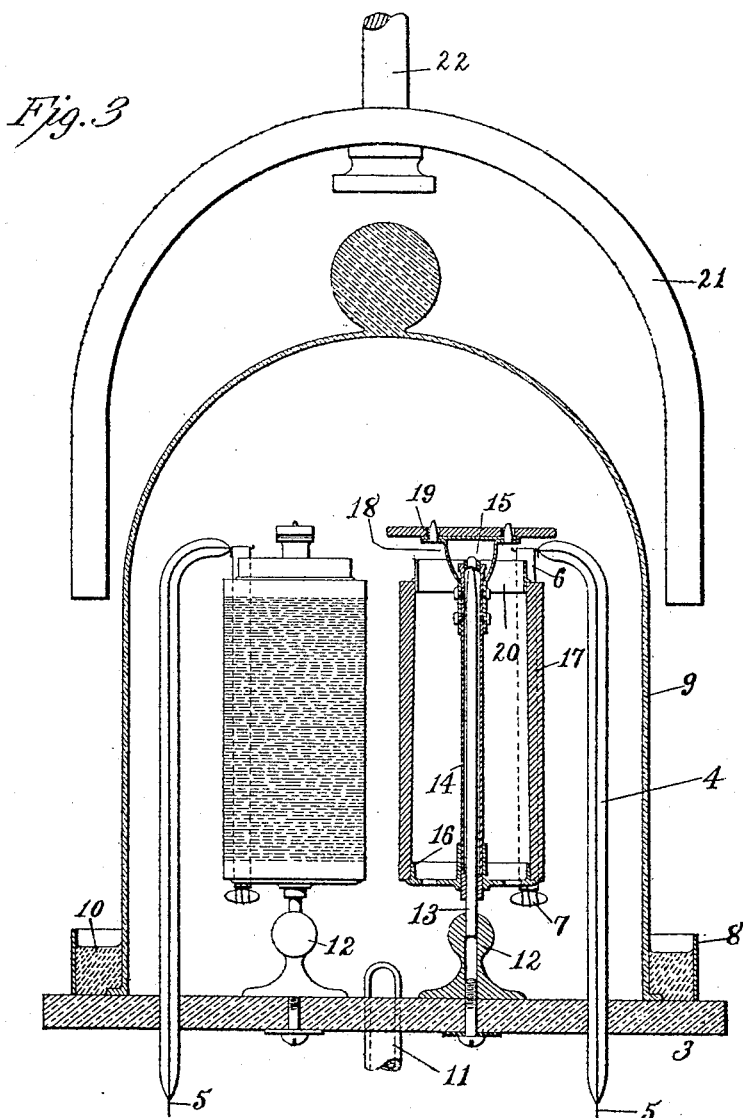
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APPLICATION FILED AUG. 1, 1903.

NO MODEL.

3 SHEETS—SHEET 3.



Witnesses:

Ludwig F. Cott

William A. Deane

Inventor

Thomas A. Edison

by Frank L. Spurr

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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO NEW JERSEY PATENT COMPANY, OF ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

APPARATUS FOR VACUOUSLY DEPOSITING METALS.

SPECIFICATION forming part of Letters Patent No. 767,216, dated August 9, 1904.

Application filed August 1, 1903. Serial No. 167,930. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, Orange, in the county of Essex, State of New Jersey, have invented certain Improvements in Apparatus for Vacu-
5 ously Depositing Metals, of which the following is a description.

My invention relates to an improved apparatus for more expeditiously carrying into effect the process for depositing metals *in vacuo*
10 of the general character covered by my Patents No. 526,147, of September 18, 1894, and No. 713,863, of November 18, 1902.

The apparatus has been designed particularly for depositing on phonograph-records a minutely thin film of vaporized metal which shall act as a foundation for the heavier electroplated deposit in order that a matrix or mold of such a record may be secured.
15

With my improved apparatus I utilize a plurality of phonograph-records or other objects to be coated in the same vacuum-chamber and simultaneously deposit the metal on such objects by maintaining a high-tension discharge
20 between electrodes formed of the metal to be deposited. This materially facilitates the process, since considerable time is occupied in mounting and sealing the vacuum-chamber and in exhausting the same.

I find in the practical operation of my process that if the electrical discharge is maintained continuously between the metallic electrodes, and particularly if the latter are very thin, as is preferable, the electrodes become
30 objectionably heated and may in time actually melt, so as to destroy their utility. This objection could of course be overcome by periodically interrupting the current, so as to permit the electrodes to cool; but, as it is
40 preferable that the induction-coil and other electrical apparatus, as well as the mechanical and magnetic appliances, should operate continuously, I secure the desired result by employing a pair of exhausted chambers in which
45 the depositing takes place alternately, so that during the time that metal is being deposited on the object or objects in one chamber the

electrodes of the other chamber are permitted to cool.

The present invention not only relates to the details of construction and arrangement already indicated, but it relates also to further
50 constructional details, all as will be more fully hereinafter described and claimed.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, in which—
55

Figure 1 is a front view of the apparatus for use in coating four phonograph-records and showing the circuits diagrammatically; Fig. 2, a cross-sectional view through one of the vacuum-chambers; Fig. 3, a vertical sectional view on the line 3 3 of Fig. 2, and Fig. 4 a
60 separate detailed view of one of the electrodes and its support.
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In all of the above views corresponding parts are represented by the same numerals of reference.

The base 1 is provided with supports 2, on which are mounted the base-plates 3, made, preferably, of glass. Extending up through the base-plates 3 are glass tubes 4, carrying circuit-wires 5 5. Depending from the ends of these conductors are electrodes 6, made of the metal which is to be deposited and preferably in the form of thin strips of foil. For the coating of phonograph-records I preferably use gold, owing to the fact that it may be highly comminuted and also because of its non-oxidizable character. I find that the best results are secured and the most even coating obtained when the electrodes are perfectly flat, and I therefore preferably attach a small weight 7 to the bottom of each to effect this
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75
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85 result.

Mounted on the plate 3 is a metal rim 8, within which is placed a glass bell or jar 9, having a flanged lower end resting on said plate. A layer of paraffin 10 or similar wax-like sealing material in molten condition is now flowed into the space within the rim 8, so as to make a perfectly-tight joint. Air from within the glass jar or bell 9 is exhausted
90

therefrom through a pipe 11, connected with a vacuum-pump of any suitable and approved type. Within the vacuum-chamber are one or more supports 12, which carry vertical shafts 13, having tapered upper ends. Surrounding each of these shafts is a sleeve 14, provided with a hardened bearing-cup 15 at its top, which engages the shaft 13. The lower end of the sleeve 14 carries a disk 16, which receives the record or other object 17. Extending up from the sleeve 14 are arms 18, which receive a removable armature 19.

The phonograph-record or other object preferably carries at its top a guard or shield 20, which fits within the top of the record 17 and is supported thereby. This guard may be of any material, brass being preferably used by me. The guard receives the metal which would ordinarily be deposited within the interior of the record 17, and when made of brass it appears to deflect the electrical discharge in a downward direction against or toward the outer surface of the record. The guard thus prevents the metal from depositing on the inside of the object and causes the metal to deposit evenly on its edge with a clear line of demarcation, so as to permit a uniform electroplating, as will be understood.

Mounted outside of each of the vacuum-chambers is a magnet 21, removably carried at the lower end of the shaft 22, mounted in the bearing 23 and rotated by a belt-wheel 24, to which power is applied. In order to operate the vacuum-chambers alternately to permit the electrodes within one to cool while the depositing is taking place in the other, I make use of a switch 25, preferably driven by a clockwork mechanism 26 and making contact alternately with contact-springs 27. These springs are connected each with one of the electrodes of the two chambers, as shown. The other electrodes (one in each chamber) are connected to one side of the secondary circuit 28 of an ordinary induction-coil. The other side of this secondary circuit connects with the switch 25 through the clockwork mechanism, as shown. The primary circuit 29 of the induction-coil is connected in multiple with the source of supply 30 and includes a circuit-breaker 31, as is common in this art. In operation a proper vacuum is created in the two chambers, and by means of the switch 25 the induction-coil will be connected alternately, first with the electrodes of one chamber and then with the electrodes of the other chamber. The discharge is so regulated as to secure between the electrodes a silent or brush discharge, as I describe in my patent last referred to. This discharge causes the metal composing the electrodes to be vaporized and deposited on the objects. The magnets 21 are simultaneously rotated, so as to rotate the objects, whereby a perfectly-uniform film will be deposited thereon. When this film is of the desired thickness, the bells

or jars 9 are removed, thereby permitting the coated objects to be removed for subsequent treatment, whereupon the operations described are repeated.

Having now described my invention, what I claim as new therein, and desire to secure by Letters Patent, is as follows:

1. In vacuum deposit apparatus, the combination with an exhausted chamber with metallic electrodes therein and means for effecting an electrical discharge between said electrodes, of supports within the chamber and between the electrodes for sustaining a plurality of objects to be coated, and means for simultaneously rotating said objects, substantially as set forth.

2. In vacuum deposit apparatus, a weighted metallic foil-like electrode, substantially as and for the purposes set forth.

3. In vacuum deposit apparatus, an electrode-foil supported at its upper end and a weight carried by said foil at its lower end, substantially as set forth.

4. In vacuum deposit apparatus, a shield or guard carried by the upper edge of the object to be coated, substantially as and for the purposes set forth.

5. In vacuum deposit apparatus, the combination with an exhausted chamber and electrodes therein, of a vertical shaft within said chamber, a sleeve rotatably mounted on said shaft, and a disk carried by said sleeve for supporting the object to be coated, substantially as set forth.

6. In vacuum deposit apparatus, the combination with an exhausted chamber and electrodes therein, of a vertical shaft within said chamber, a sleeve rotatably mounted on said shaft, a disk carried by said sleeve for supporting the object to be coated, a removable armature carried by said sleeve, and a magnet mounted externally of the chamber for attracting and rotating said armature, substantially as set forth.

7. In vacuum deposit apparatus, the combination with a pair of exhausted chambers, electrodes therein and supports for objects to be coated in said chambers, of a source of high-tension current, and means for alternately connecting said source with the electrodes of the respective chambers, substantially as and for the purposes set forth.

8. In vacuum deposit apparatus, the combination with a pair of exhausted chambers, electrodes therein and supports for objects to be coated in said chambers, of a source of high-tension current, and means for automatically and alternately connecting said source with the electrodes of the respective chambers, substantially as and for the purposes set forth.

9. In vacuum deposit apparatus, in combination, a plurality of supports for objects to be coated and of pairs of electrodes supported *in vacuo*, a source of high-tension current and

means for automatically and alternately connecting said source with each pair of electrodes, substantially as set forth.

5 10. In vacuous deposit apparatus, in combination, a plurality of supports for objects to be coated, a plurality of electrodes supported *in vacuo*, a source of high-tension current and means for automatically and regularly

connecting said source with said electrodes in pairs.

This specification signed and witnessed this 30th day of July, 1903.

THOS. A. EDISON.

Witnesses:

FRANK L. DYER,
WILLIAM A. DOLAN.