No. 736,773. PATENTED AUG. 18, 1903.

A. N. PETIT.

# METHOD OF FORMING METAL MATRICES FOR DUPLICATING SOUND RECORD CYLINDERS.

APPLICATION FILED OCT. 11, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

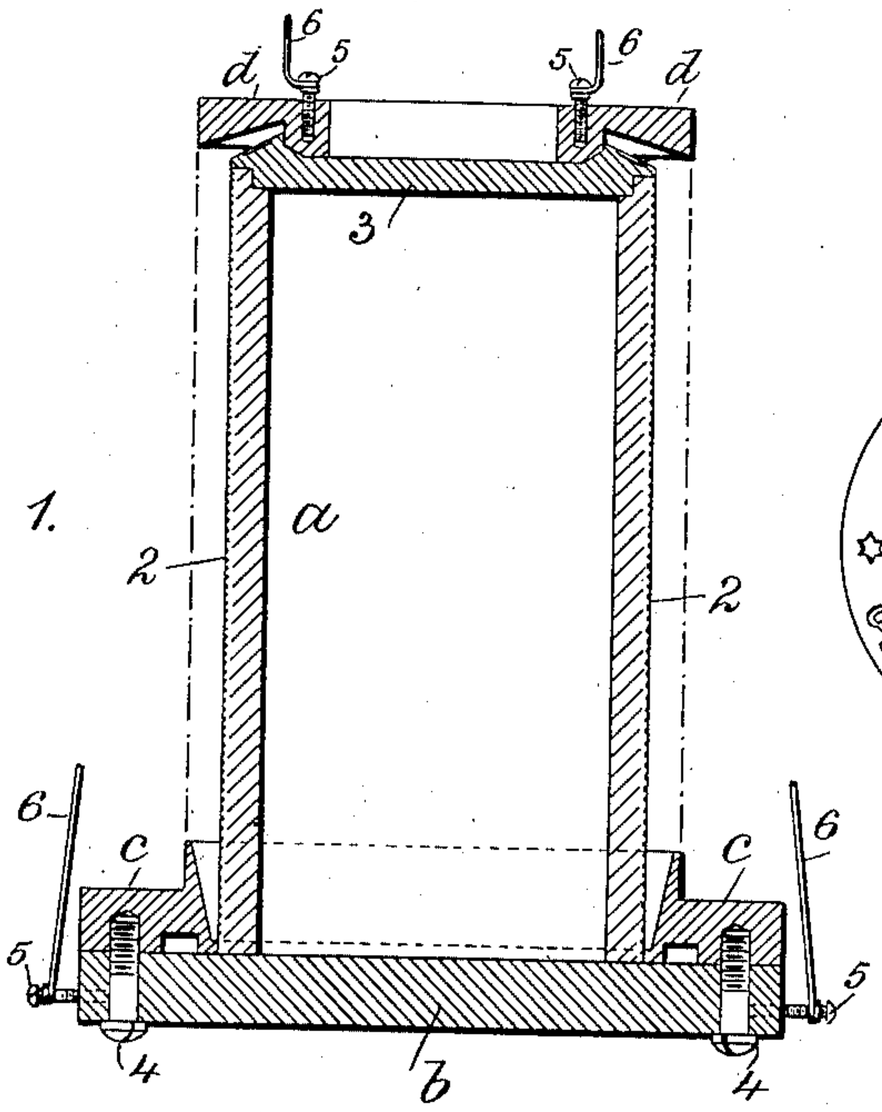



Fig. 2.

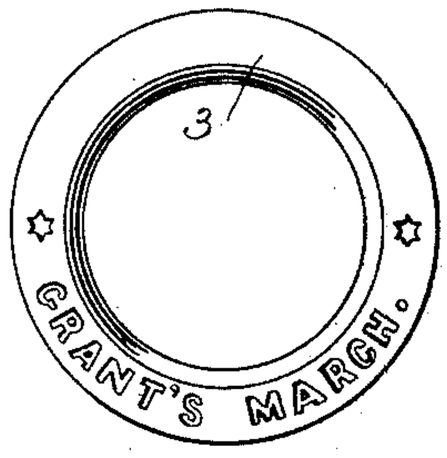



Fig. 3.

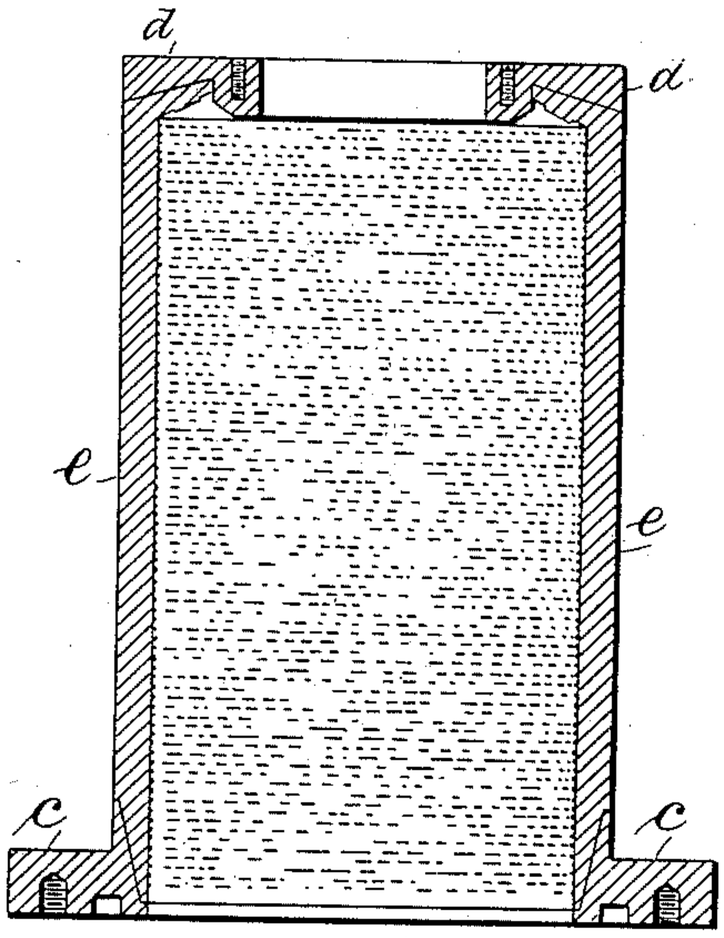
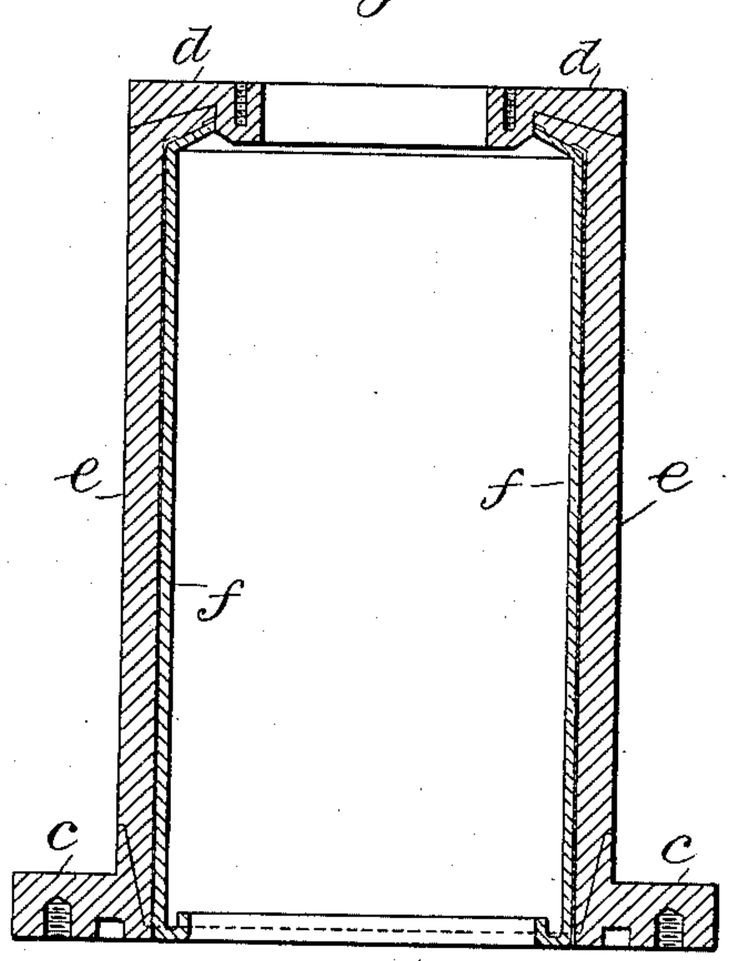



Fig. 4.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 5.

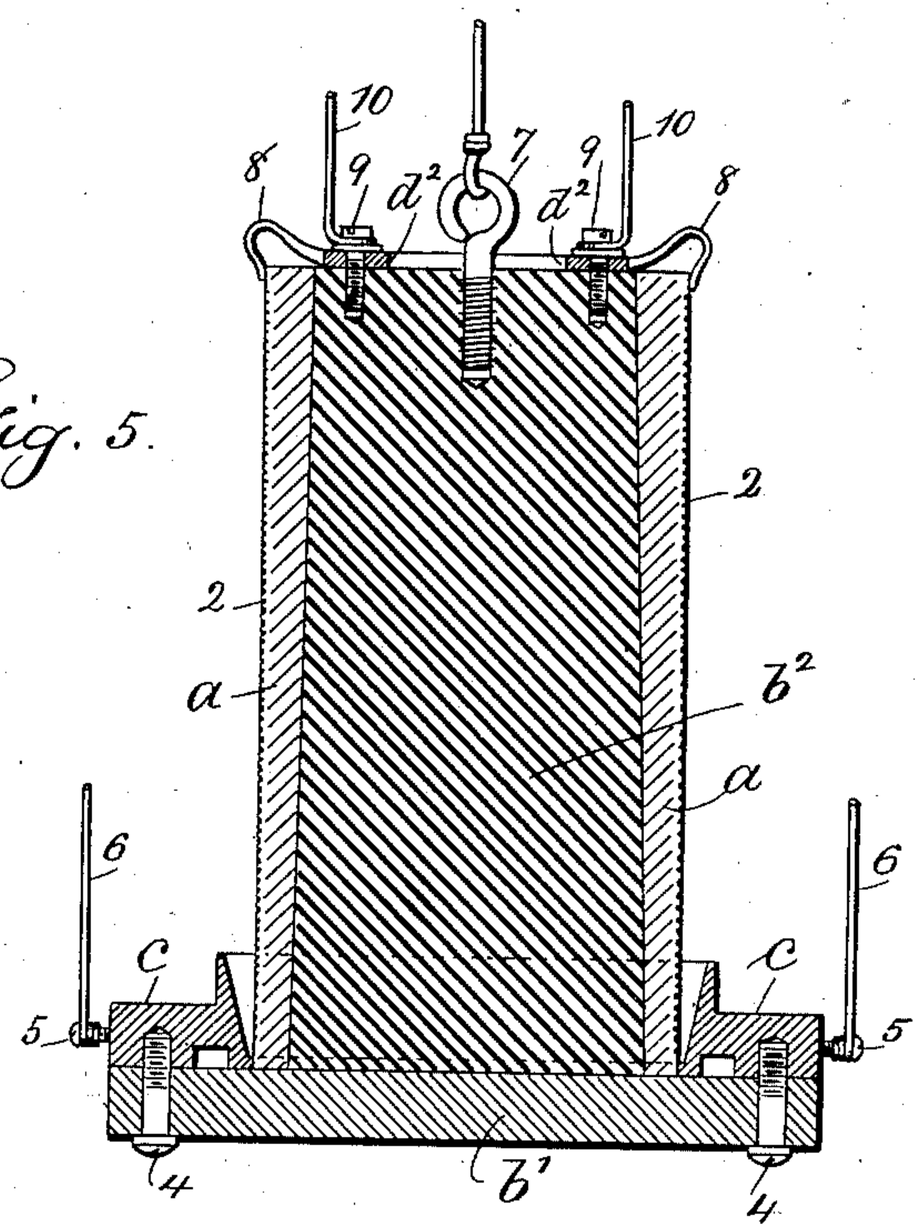
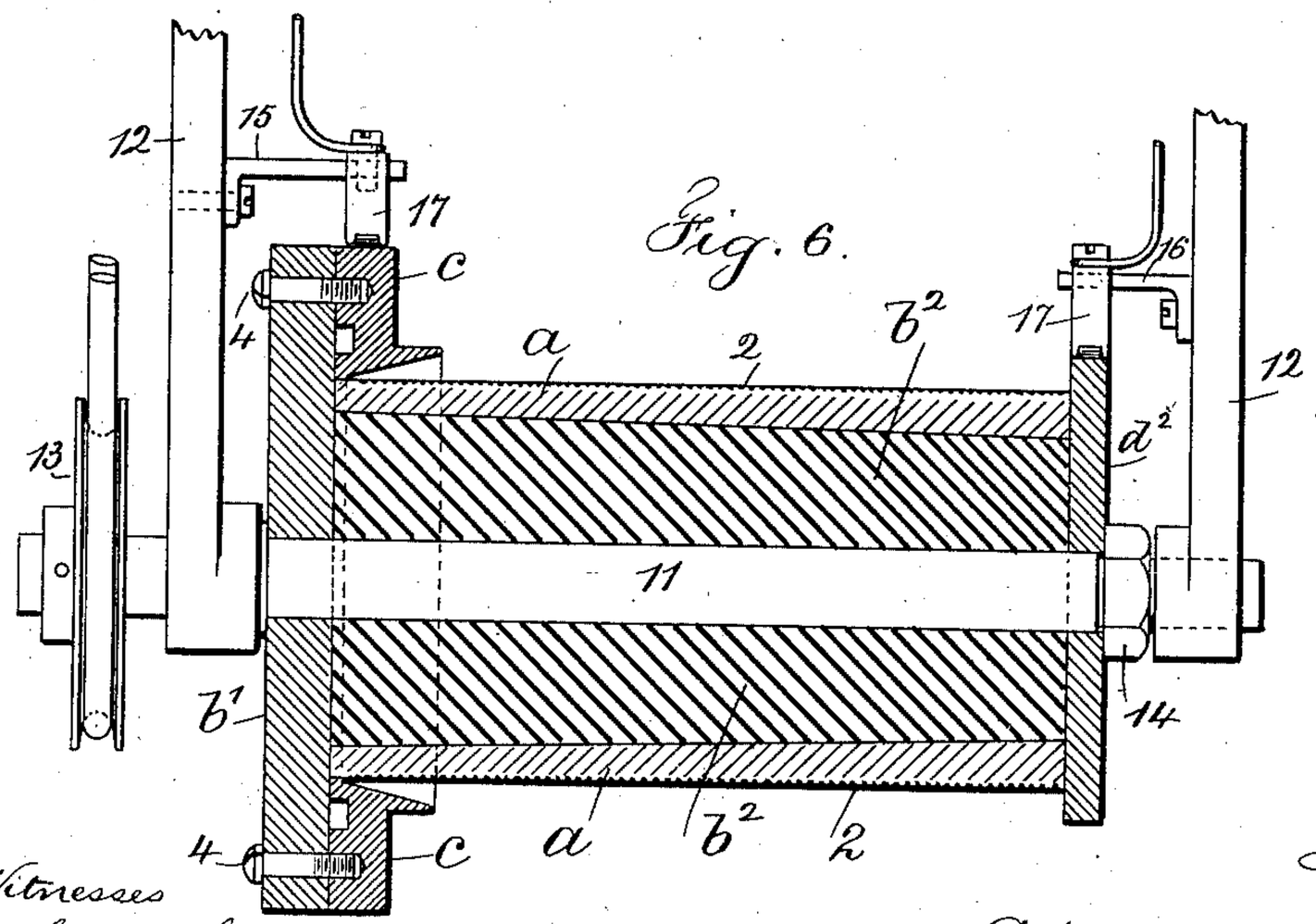



Fig. 6.

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# UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF LIVERPOOL, ENGLAND, ASSIGNOR TO THE INTERNATIONAL PHONOGRAPH AND INDESTRUCTIBLE RECORD COMPANY, LIMITED, OF LIVERPOOL, ENGLAND.

## METHOD OF FORMING METAL MATRICES FOR DUPLICATING SOUND-RECORD CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 736,773, dated August 18, 1903.

Application filed October 11, 1902. Serial No. 126,863. (No model.)

*To all whom it may concern:*

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Liverpool, in the county of Lancaster, England, have invented an Improvement in the Methods of Forming Metal Matrices for Duplicating Sound-Record Cylinders, of which the following is a specification.

The object of my invention is to produce a superior matrix adapted to form a more perfect and commercial duplicate sound-record of cylindrical form and preferably made of celluloid than it has heretofore been possible to produce in an effort to overcome the harsh and grating sounds usually incident to records of sound in celluloid or similar material.

In carrying out my invention my improved method consists in applying to the surface of the wax master-record cylinder conductive material, providing a suitable base upon which the master sound-record cylinder thus treated is mounted, providing a ring of metal at one end thereof and connecting the same to a support, providing electric connections at the respective ends of the said master-record cylinder, and supporting the same in a bath or battery for the electrodeposition of metal upon the surface of said master-record cylinder and in contact with the ring end secured to the support. I may employ a second ring end at the opposite end of the master-record cylinder, so that the metal electrodeposited upon the surface of said master-record may join with both ring ends to form an integral or more complete matrix, and instead of simply supporting the master-record cylinder with the parts connected therewith in a quiescent condition in a bath or battery I have discovered that superior results are obtained by revolving the record during the electrodeposition of the metal, as the same obviates any tendency to granulation.

In the apparatus employed for carrying out my improved method I prefer to provide a suitable support for one end of the wax or other similar composition record, and one or both of the respective ends of the record are preferably surrounded by ring-like parts which form permanent portions of the matrix and are connected by the metal electrodeposited upon the surface of the wax or other similar composition record. These ring-like ends are both peculiarly formed for this purpose, and I prefer to insert between one of these rings and one end of the wax cylinder a device carrying the name of the record and which afterward gives form to the cylindrical and duplicate sound-record formed in the matrix. The apparatus employed by me for carrying out the method herein described forms the subject of a separate application for Letters Patent filed May 15, 1902, Serial No. 107,454.

In the drawings I have shown an apparatus adapted for carrying out the method, in which—

Figure 1 is a vertical section showing the wax or other composition cylinder upon which is formed a master sound-record and the parts associated therewith preparatory to electrodepositing metal upon the surface thereof. Fig. 2 is a plan of the name or title ring. Fig. 3 is a vertical section of the matrix complete. Fig. 4 is a similar vertical section showing the celluloid blank placed within the matrix before the same is connected up in the apparatus shown and described in my application, Serial No. 107,453, filed May 15, 1902. Fig. 5 is a vertical section of a modified form of the invention, showing the parts assembled for insertion into the chemical bath for the electrodeposition of the metal; and Fig. 6 is a vertical longitudinal section of a modified form of the invention, showing the wax cylinder, upon which is a master-record suitably mounted for rotation in the chemical bath during the electrodeposition of the metal upon the surface thereof.

The wax cylinder *a* is of usual material and construction, with an engraved surface of a master sound-record, and the inner walls thereof may be parallel or tapering, as desired. The surface of this cylinder *a* is prepared with conductive material at 2. I provide a support or base *b* for use during the electrodeposition of metal, also a ring or annulus *c* of metal receiving the lower end of the wax cylinder *a* and a ring or annulus *d* of metal at the upper end of the wax cylin-

der, said parts *c* and *d* forming limit-gages at the ends of the wax cylinder and also permanent ends for the matrix. The base *b* is provided with screws 4, passing through the same into interiorly-threaded openings in the ring or annulus *c*, whereby the two parts are removably connected. There are screws 5 in the base *b* and in the ring or annulus *d*, to which circuit-wires 6 are connected for conveying the electric current in the liquid bath or battery for the electrodeposition of the metal, and these circuit-wires 6 may also be suspending devices for said parts in said bath. The upper end of the wax cylinder *a* is preferably recessed, and I prefer to provide a name-plate 3, preferably of wax and adapted to fit into the upper end of the wax cylinder to close the same and also form a support and a centering structure for the metal ring or annulus *d*. This ring or annulus *d* is cut away on the under side from the periphery toward the center, so that when in place, as shown in Fig. 1, there is an appreciable space formed toward the axial center of the parts, said ring or annulus being of greater diameter than the wax cylinder *a*. The central opening of the ring or annulus *c*, receiving the lower end of the wax cylinder *a*, is outwardly flared or tapered, providing an annular wedge-shaped space between the surface thereof and the surface of the wax cylinder.

In forming the matrix in the bath by the action of the electric current the metal, such as copper, is not only deposited upon the conductive-material surface of the wax cylinder *a* and the surface of the name-ring 3, similarly prepared, but is also deposited upon the flared surface of the open center of the ring or annulus *c* and the under surface of the ring or annulus *d*, it being understood that the other metal surface of the associated parts are to be covered with varnish or some other material to prevent the electrodeposition of metal except at the places desired and hereinbefore stated. The metal is to be deposited until it assumes a thickness substantially agreeing with the diameter of the ring or annulus *d*, after which the electrodeposited cylinder *e*, with rings or annuli *c d*, form an integral structure which constitutes the matrix for further use and from which the wax cylinder, with the record, is broken out after removing the base or support *b*. This matrix is shown in Fig. 3, in which it will be noticed that the opening at the lower end is of the full diameter of the matrix, while the opening at the upper end is constructed and governed by the aperture in the ring portion *d*.

The celluloid blank *f* or blank of other suitable material is preferably made with one end turned over and the other end inturned, and this blank is appreciably smaller than the internal diameter of the matrix and is passed into the same from the lower larger end, (see Fig. 4,) it being understood that the turned-over end of the blank comes against the upper inclined portion of the matrix, at which place the matrix shows the name in relief.

In the modified form of my invention shown in Fig. 5 the base *b'*, similar to the base *b* hereinbefore described, is provided with a core $b^2$, integral therewith or connected thereto, and both parts are preferably of insulating or non-conducting material, and to the same is advantageously secured a screw-eye 7, from which the parts collectively are advantageously suspended in the bath or battery during the electrodeposition of metal. In this figure the wax cylinder *a* with a conductive-material surface, the ring or annulus *c*, and the screws 4 are the same as the parts hereinbefore described. Upon the upper end of the core $b^2$, I secure a ring $d^2$ or its equivalent structure provided with several radiating fingers 8, made integral therewith and extending over upon the upper surface of the wax cylinder *a*, in contact with its conductive surface. This ring is preferably fastened to the core by screws 9, which also serve as binding-posts for the circuit-wires 10. Secured to the ring or annulus *c* are screws 5 and circuit-wires 6, similar to those parts employed in Fig. 1, the screws 5 and wires 6 and the screws 9 and wires 10, together with the ring *d'* and the fingers 8, constituting devices for a complete electric circuit through the annulus *c* and the conductive-material surface 2 of the cylinder.

In the modified form Fig. 6 the base *b'* and the core $b^2$ are centrally perforated for a shaft 11, the same being rotatably hung in arms 12, suspended from any fixed point, said shaft being provided with a nut 14 to clamp the base *b'* and core $c^2$ to the shaft and between a collar thereon and said nut, and on this shaft is preferably placed a pulley 13, surrounded by a band for rotating the shaft, the base *b'*, core $b^2$, the ring or annulus *c*, secured thereto by the screws 4, the wax cylinder *a*, surrounding the core $b^2$, and a ring $d^2$, placed against the right-hand end of the core $b^2$ and held thereto by the clamping of the nut 14. The said ring $d^2$ substantially agrees in diameter with the full diameter of the finished matrix, and in order to bring to the ring $d^2$ and the ring or annulus *c* the electric current in suitable form I provide brackets 15 16 upon the arms 12 and spring-contacts 17, which run upon the surfaces or peripheries of said ring or annulus *c* and the ring $d^2$ during the rotation of the parts in the bath or battery. The arms 12 are to be constructed for the ready separation therefrom of the base *b'*, core $b^2$, and base connected therewith, so that the finished matrix may be removed and the wax cylinder broken out therefrom.

The matrix made as hereinbefore described is substantial, strong, and lasting and eminently adapted for continuous and repeated use in the manufacture of duplicate sound-records of celluloid or other suitable materials.

I have discovered that in the electrodeposition of the metal upon the surface of the master-record when the same is in the bath

the best results are obtained by starting the operation with one circuit-wire at one end until a substantial or appreciable thickness is obtained, because the electric action is continuous from one end to the other, whereas when two circuit-wires are employed the action of deposition is from both ends to the center. This latter manner of operation is satisfactory after the appreciable foundation is made, whereas if the action is commenced with two wires there will be an appreciable central line as a result, which is consequently detrimental.

I claim as my invention—

1. The method of forming the matrix of metal for the production of duplicate sound-record cylinders of celluloid or similar material, the same consisting in applying to the surface of the wax record-cylinder conductive material, placing the same between metal ring ends or annuli, electrodepositing metal upon the surface of the wax or master-record cylinder and upon adjacent surfaces of said ring ends until the metal deposited and the ring ends are formed into an integral matrix, substantially as set forth.

2. The method herein described of forming a matrix of metal for the purpose of producing duplicate sound-record cylinders, the same consisting in applying to the surface of the wax master-record cylinder conductive material, placing the same between metal ring ends or annuli upon a suitable support, providing electric connections therefor, rotating the said parts in a bath or battery and simultaneously electrodepositing metal upon the surface of the master wax record-cylinder and upon the adjacent surfaces of said ring ends until the metal deposited and the ring ends are formed into an integral matrix, substantially as set forth.

3. The method herein described of forming a matrix of metal for the purpose of producing duplicate sound-record cylinders, the same consisting in applying to the surface of the wax master-record cylinder conductive material, mounting the said master sound-record cylinder upon a suitable base, placing a ring of metal at one end thereof and connecting the same to said support, providing electric connections at the respective ends of the said master-record cylinder and supporting the same in a bath or battery and simultaneously electrodepositing metal upon the surface of said master-record cylinder and in contact with the ring end secured to the support, substantially as specified.

4. The method herein described of forming a matrix of metal for the purpose of producing duplicate sound-record cylinders, the same consisting in applying to the surface of the wax master-record cylinder conductive material, placing the same between metal ring ends or annuli upon a suitable support, providing electric connections therefor, rotating the said parts in a bath or battery and simultaneously electrodepositing metal upon the surface of the master wax record cylinder and ring ends or annuli, substantially as set forth.

Signed by me this 23d day of September, 1902.

ADEMOR N. PETIT.

Witnesses:

RICHARD HEILBORN,

H. WATSON.