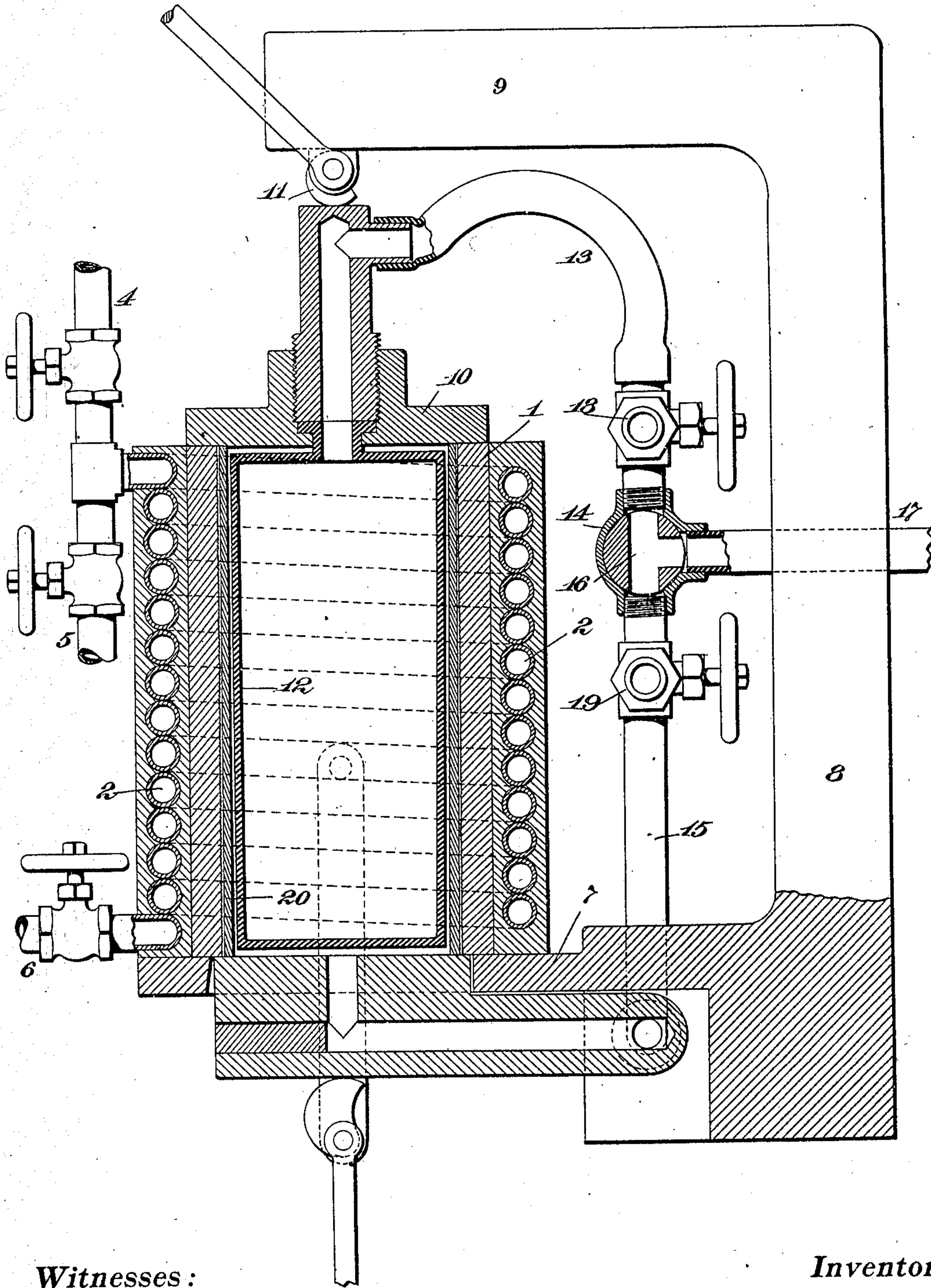


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J. W. AYLSWORTH.
METHOD OF DUPLICATING SOUND RECORDS.
APPLICATION FILED DEC. 8, 1906.



Witnesses:

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UNITED STATES PATENT OFFICE.

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METHOD OF DUPLICATING SOUND-RECORDS.

No. 871,554.

Specification of Letters Patent.

Patented Nov. 19, 1907.

Application filed December 6, 1905. Serial No. 290,540.

To all whom it may concern:

Be it known that I, JONAS W. AYLSWORTH, a citizen of the United States, residing at 223 Midland avenue, East Orange, county of Essex, and State of New Jersey, have invented a certain new and useful Method of Duplicating Sound-Records, of which the following is a specification.

My invention relates to an improved method for duplicating sound records from matrices or molds by the expansion of a blank, and is adapted particularly for the making of records from relatively hard material, such as hard rubber, celluloid and similar compositions, although the invention may be used for making records from wax-like compositions, such as those now employed in the art of making duplicate phonograph records by a molding operation.

The object of the invention is to provide a simple and effective method for the purpose.

In order that the invention may be better understood, attention is directed to the accompanying drawing, forming part of this specification, and in which I illustrate a sectional view of an apparatus suitable for carrying out my invention.

The matrix or mold 1 is of the common type now used in the art, being provided on its interior with a negative impression of the record to be duplicated and being of any desired thickness. Provision is made for alternately heating and cooling the matrix or mold, preferably by surrounding the same with a coil 2, embedded in a jacket of lead, or other fusible metal. Steam (saturated or super-heated) for heating the coil, or water for cooling the same, are admitted through the pipes 4 and 5 respectively, and having suitable controlling valves therein, as shown. The valved outlet 6, permits any water or condensed steam to be drawn off from the coil at the bottom thereof. The matrix or mold is seated on a suitable base 7, and may, if desired, be permanently connected to the same; said base is carried by a frame 8 having an upper member or arm 9. Engaging the top of the mold is a cap 10 adapted to be firmly clamped in place in any suitable way, as for example, by a cam 11, carried by the arm 9. The cap 10, is provided with a flexible expander 12, made preferably of rubber, adapted to fit within the matrix or mold, and to leave

sufficient space for the reception of the blank on which the record surface is to be impressed. Connected with the interior of the expander 12, is a flexible pipe 13, leading to the chamber 14 of the vacuum valve. A pipe 15 connects the interior of the matrix or mold with the chamber 14. The vacuum valve 16 is an ordinary three-way valve and when in the position shown, connects the vacuum pipe 17 with the pipes 13 and 15 so as to exhaust the air from the mold and from the interior of the expander 12. When the vacuum valve is moved 90 degrees clockwise, it connects the vacuum pipe 17 with the pipe 15 only, and when moved to a further extent of 90 degrees, it cuts off the vacuum pipe 17 entirely, as will be understood. The vacuum pipe 17 is connected to any suitable source of vacuum, preferably an ordinary exhausting pump.

To provide regularity and rapidity of operation, a reservoir is preferably interposed between the exhausting pump and the duplicating apparatus, so as to permit the necessary exhaustion to be quickly obtained, and also to permit a number of duplicating machines to be connected with the same reservoir, as will be understood.

A valved pipe 18 connects with the pipe 13 above the vacuum valve and may be open directly to the air or may be connected with a source of compressed air, as may be necessary when the materials to be duplicated are but slightly expansible. Another valve 19 below the vacuum valve permits atmospheric air to enter the pipe 15. The blank 20 may be made of any suitable material capable of being softened or rendered plastic or semi-fluid by heating (such as hard rubber, celluloid, shellac composition, or the ordinary wax-like materials of which duplicate phonograph records are now made) and of any desired thickness. By means of my invention, records can be effectively duplicated on extremely thin blanks, which can be subsequently mounted on any suitable and permanent support, as for instance, by making the blank slightly tapered, so as to engage the support frictionally. Or, instead, the blank may be a composite structure formed of a suitable base of paper, fabric, rubber composition, or similar material capable of moderate expansion without rupture, and carrying a coating of a smooth and sufficiently hard material (such as cel-

luloid or similar substance, capable of being softened by heat) on its outer surface. Preferably the bottom of the mold is constructed so as to swing downwardly as shown to permit the blank to be introduced, and the finished record to be withdrawn, suitable means being provided to rigidly lock the bottom in its closed position during the duplicating operation. The blank 20 is made very slightly smaller than the bore of the matrix or mold so as to be readily introduced therein surrounding the expander, as shown. The matrix or mold is now heated (or it may be heated before the blank is introduced) by admitting the steam to the coil 2 or in any other suitable way. This results in heating the blank so as to soften its outer face and permit it to readily take an impression.

During the heating of the blank, the vacuum valve 16 is operated to exhaust air from the interior of the expander 12, and also, from the interior of the mold, so as to equalize the pressure on the expansible walls of the expander. By thus applying a vacuum to the interior of the matrix or mold, I effectively exhaust any air, or gas, or moisture from between the blank and the record surface of the matrix, so that when the blank is expanded it will take a perfectly clear and sharp impression from the record surface. Furthermore, this exhaustion of the air film between the blank and matrix is effected without the necessity of sealing the ends of the blanks in any way and the result is obtained whether the blank is relatively thick or is very thin. The vacuum valve 16 is now moved clock-wise 90 degrees, so as to still maintain the exhaust connection to the pipe 15, and the valve of the pipe 18 is open to permit atmospheric air or compressed air to enter the expander 12, thereby expanding the flexible walls of the latter and forcing the blank intimately into engagement with the record surface. When the blanks are formed of material that is expanded with difficulty, or that softens only slightly, I preferably use compressed air in the expander, or superheated steam in the coil 2, or both, for effecting this operation, but with thin blanks of celluloid, or similar material, atmospheric pressure will be sufficient. After the blank has been thus expanded into engagement with the matrix and is held closely in such engagement by the inflation of the expander 12, I turn off the steam in the coil 2 and admit cold water to the same, so as to rapidly chill the matrix and also the surface of the record in contact therewith. This chilling takes place while the record is tightly compressed against the bore of the matrix, so that the material is set and becomes fixed while in such engagement. This results in a sharper and more permanent impression on the resulting duplicate

than would be secured if the setting of the material was brought about after detachment of the record from the mold. Preferably, before the record has been cooled entirely throughout, but after its surface has been set and hardened as explained, the vacuum valve 16 is moved to shut off the vacuum pipe 17, and the valve 19 is opened to equalize the pressure on the walls of the expander 12, the elasticity of whose walls withdraws the expander from the record to its normal size. The mold with the record therein is now allowed to cool (or an artificial cooling operation may be performed) whereby the record will contract diametrically so as to free itself from the matrix and be allowed to be removed by swinging the mold bottom downwardly. This separation of the finished duplicate from the matrix will be facilitated if the bore of the matrix is formed with a very slight taper, as is common in the art.

Although I have referred in the preceding description to the use of a vacuum, it will be understood that I use the expression in its topical sense and mean any such condition of rarefaction as can be commercially secured by a well designed exhausting or vacuum pump.

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

1. A process of duplicating sound records which includes introducing within a hollow matrix a tubular blank of impressionable material, introducing within the blank a hollow flexible expander, exhausting the air from the matrix and from the expander and expanding the blank outwardly into engagement with the matrix, substantially as set forth.

2. A process of duplicating sound records which includes introducing within a hollow matrix a tubular blank of impressionable material, introducing within the blank an expander, exhausting the air from the matrix and at the same time preventing the expansion of the expander, and then expanding the blank outwardly into engagement with the matrix by means of the said expander, substantially as set forth.

3. A process of duplicating sound records which includes introducing within a hollow matrix a tubular blank of impressionable material, introducing within the blank a hollow flexible expander, exhausting the air from the matrix and from the expander and admitting air into the expander to expand the blank into engagement with the matrix, substantially as set forth.

4. A process of duplicating sound records which includes introducing within a hollow matrix a tubular blank of impressionable material, introducing within the blank a hollow flexible expander, exhausting the air

from the matrix and from the expander, and forcing the air under pressure into the expander to expand the blank into engagement with the matrix, substantially as set forth.

5 5. A process of duplicating sound records which includes introducing within a hollow matrix a tubular blank of material which may be softened by heat, introducing within the blank a hollow flexible expander, ex-
10 hausting the air from the matrix and from the expander, heating the matrix to soften the blank and expanding the blank outwardly into engagement with the matrix, substantially as set forth.

15 6. A process of duplicating sound records which includes introducing within a hollow matrix a tubular blank of material which may be softened by heat, introducing within the blank a hollow flexible expander, ex-
20 hausting the air from the matrix and from the expander, heating the matrix to soften the blank, expanding the blank outwardly

into engagement with the matrix, and cooling the matrix so as to set the impression, substantially as set forth.

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7. A process of duplicating sound records which includes introducing within a hollow matrix a tubular blank of material which may be softened by heat, introducing within the blank a hollow flexible expander, ex-
30 hausting the air from the matrix and from the expander, heating the matrix to soften the blank, expanding the blank outwardly into engagement with the matrix, cooling the matrix so as to set the impression, and finally
35 shrinking the resulting duplicate diametrically to permit its removal, substantially as set forth.

This specification signed and witnessed this 29th day of Novr. 1905.

JONAS W. AYLSWORTH.

Witnesses:

FRANK L. DYER,

ANNA R. KLEHM.