No. 689,118. Patented Dec. 17, 1901.

A. N. PETIT.

METHOD OF MAKING DUPLICATE SOUND RECORDS FOR PHONOGRAPHS.

(Application filed Mar. 23, 1901.)

(No Model.)

Fig. 1.

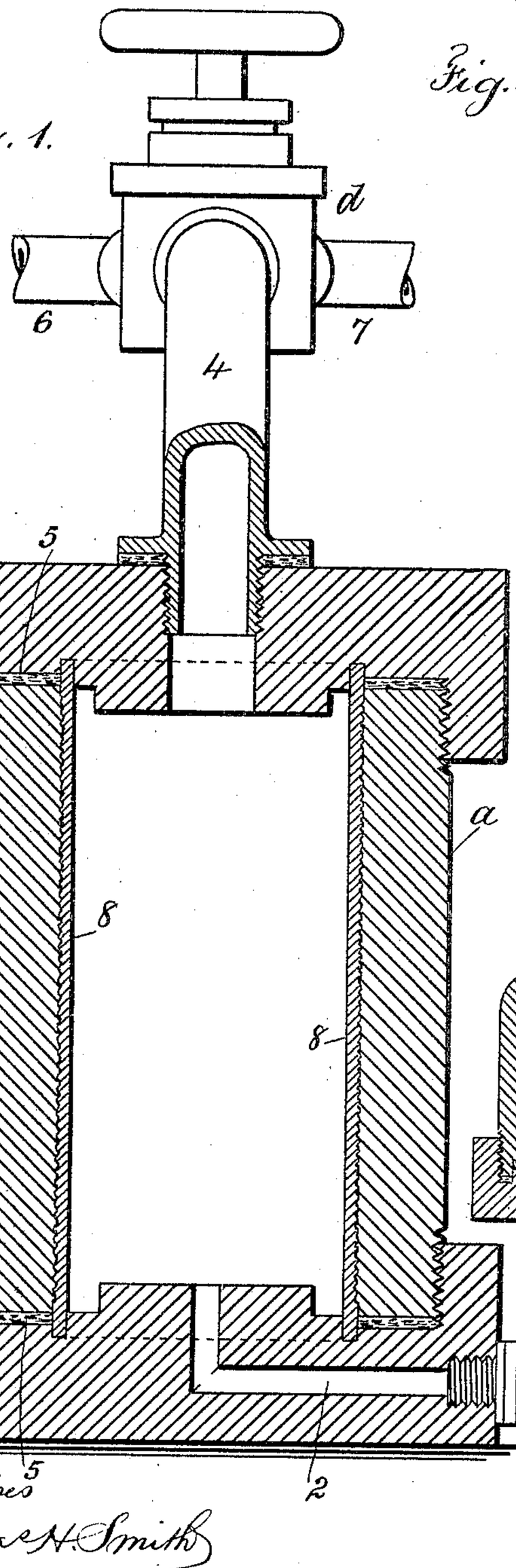


Fig. 4.

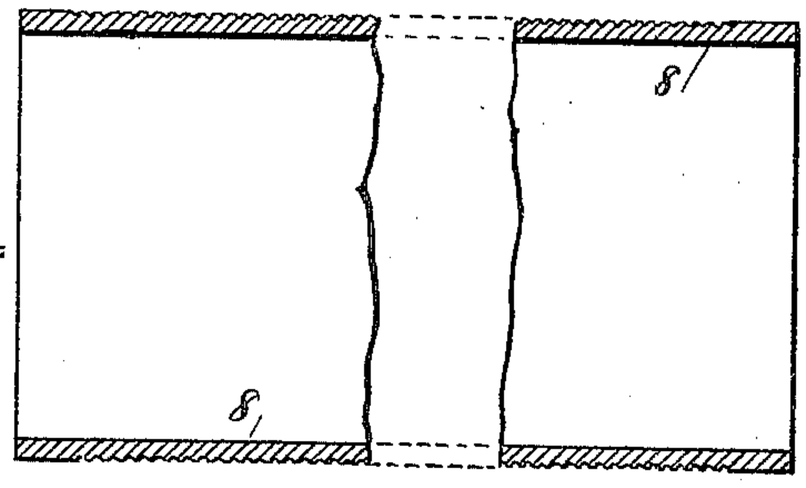


Fig. 5.

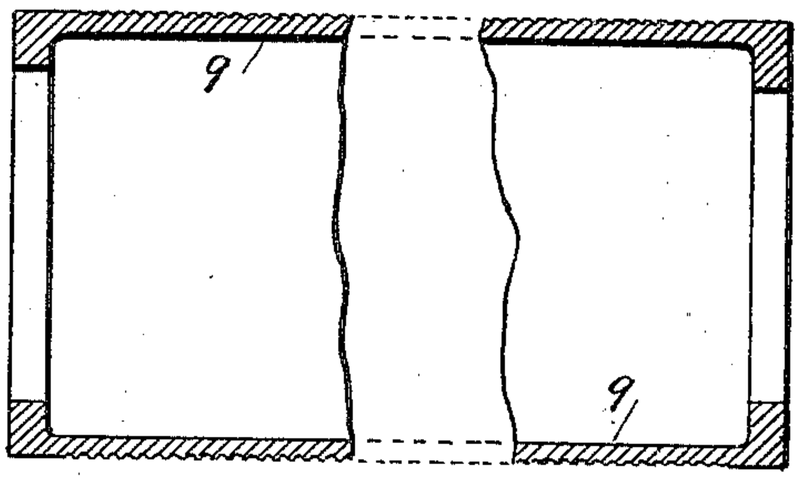
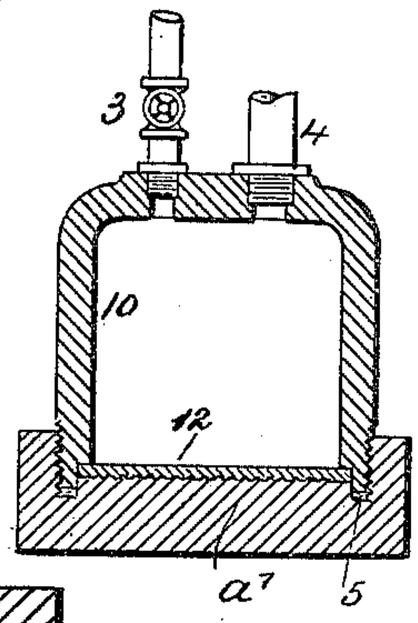
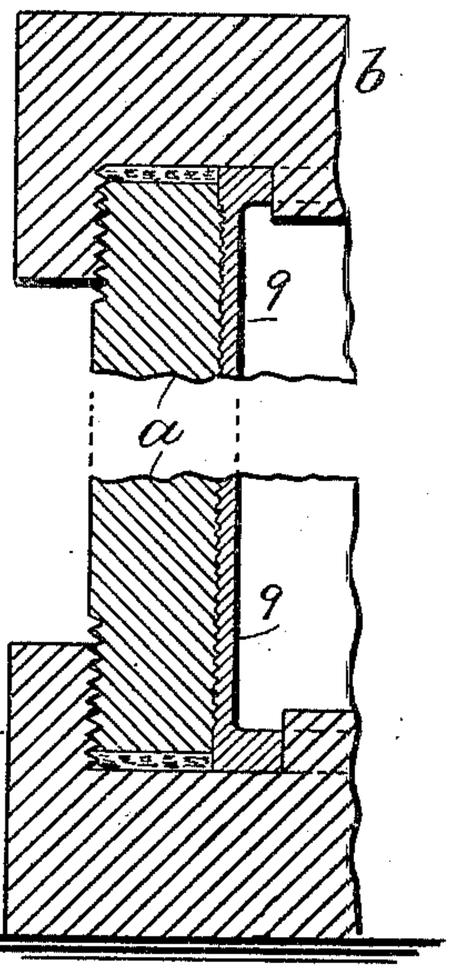


Fig. 2.

Fig. 3





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UNITED STATES PATENT OFFICE.

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METHOD OF MAKING DUPLICATE SOUND-RECORDS FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 689,118, dated December 17, 1901.

Application filed March 23, 1901. Serial No. 52,472. (No model.)

To all whom it may concern:

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Methods of Making Duplicate Sound-Records for Phonographs and Similar Machines, of which the following is a specification.

Heretofore matrices have been made of original sound-records, and duplicates have been prepared from such matrices; and my present invention relates to the method of making duplicate sound-records from matrices of an original or master record.

In carrying out my invention I employ a blank formed from such materials or compositions as celluloid, gelatin, lac, glue, gum, collodion, or similar materials. The blank may be a disk or cylinder, and when the blank is in the form of a cylinder it is immaterial whether the same be provided with inturned ends or flanges or not, as this forms no necessary part of the present invention. The surface of this blank contains substances acting not only to soften the same, but otherwise to alter and change the character of the surface and to rearrange or change the molecular character of the material. This condition of the surface may be brought about in either one of two ways, namely: The surface may be treated by a mixture of a solvent for the material of which the blank is formed, together with a fatty material, or the fatty material may be added to the solvent and base in the manufacture of the blank. In the first instance the surface only is affected, permeated, and changed, while in the second instance the entire blank is affected and permeated. The preparation of the blank in the latter instance is advantageous over the former instance only in the point of cheapness, the result being to all intents and purposes absolutely the same. In the method employed by me this blank is placed against a matrix, which it closely fits, and in a suitable apparatus heat and pressure are employed to soften the blank and expand the same and also to force its surface into minute and intimate contact with the surface of the matrix. The heat passes through the blank from within outward and softens the same, and with the application of pressure to expand the blank and to force its surface into intimate contact with the matrix the softened surface will completely fill all of the delicate interstices and conformations of the matrix, imparting to the surface of the blank a positive of the negative surface of the matrix. Where the surface only has been treated, the same is softened to a slightly-greater extent than the other portions of the blank, it being especially advantageous that the surface should be caused to closely conform to the interstices of the matrix. Where the blank is of celluloid or collodion, I prefer to employ for the treatment of the same a solvent and fatty matter, as set forth in the United States patent granted to me December 4, 1900, No. 662,981. Where the blank is of gelatin, lac, glue, gum, or other similar material, a substance comprising a solvent and other suitable material is to be employed that is capable of treating the blank to alter and change its character or molecular structure in a manner similar or substantially identical with the operation performed by the solvent and fatty matter upon the blank where the same is formed of celluloid. I do not, however, limit myself in the present instance to the materials employed for this purpose nor to the fact of the blank being in the form of a disk or of a cylinder, as the method is equally applicable to either a disk or cylinder.

In the drawings, Figure 1 is a vertical section of an apparatus adapted for the carrying out of my improved method. Fig. 2 is a partial vertical section representing a slight modification. Fig. 3 is a vertical section representing a further modification, and Figs. 4 and 5 are broken sectional views of the blank in the form of a duplicate sound-record cylinder.

The apparatus for carrying out the method herein described and forming the duplicate sound-record cylinder preferably comprises a matrix *a*, which matrix may be made in any manner well known in the art, a head *b*, connected by a threaded flange to one end of the said matrix, and a base *c*, connected also by a threaded flange to the other end of the said matrix in a similar manner, there being packings 5 preferably between the ends of the ma-

trix in the inner surface of the head and base, so as to insure a tight joint. The base *c* is preferably provided with an exit-opening 2 and escape-cock 3, and the head is preferably provided with a pipe 4, connecting with a central opening through the head, and a three-way cock *d*, connected to the pipe 4, and from the opposite side of which there are a steam-pipe 6 and a pipe 7 for compressed air.

In Figs. 1 and 4, 8 represents a duplicate sound-record cylinder with plain ends, and 9 in Figs. 2 and 5 represents a duplicate sound-record cylinder with inturned ends or flanges. I prefer to employ within the head and base in the apparatus annular grooves to receive the ends of the foundation, with the object of insuring the steam and air pressure doing the work and preventing the same getting in between the cylindrical blank and the surface of the matrix.

The modification Fig. 3 illustrates the application of my improved method to the treatment of a disk blank. In this modification the matrix *a'* forms the bottom portion of a body, in which 10 forms the upper or cup-shaped portion, to which the matrix is attached, preferably, by a screw-joint with a washer, there being in this case also an annular groove in the base of the portion 10 to receive the edges of the disk blank 12.

The blank, whether a disk or cylinder, prepared in the manner hereinbefore set forth is to be placed in proximity to the matrix and the parts of the apparatus connected and steam admitted by the pipe 6, three-way cock, and pipe 4 into the space or cavity within the apparatus. The disk blank lies against the surface of the matrix, and the blank cylinder fits closely within the matrix. The edges of the disk blank are held in the annular grooves, and the edges of the cylindrical blank are also held in the annular grooves, and the cylinder may be provided with inturned ends or not. The heat of the steam admitted into the cavity or space within the apparatus softens the blank from the back outward, and the pressure of the steam tends not only to expand the blank, but to force the same against the matrix and cause the softened surface to closely fill all the delicate interstices of the matrix and to accurately conform to the negative record of sound thereon. Where the surface only of the blank is treated, the heat of the steam has a greater softening action thereon than on the other portions forming the blank, and this facilitates the material of the blank closely conforming to the negative of the matrix.

Where the entire blank is treated, the action is the same as where only the surface is treated; but the heating action consumes slightly less time, because in this instance the blank is slightly softer in its entire composition than where the surface only is treated. After sufficient time has elapsed for the action of the heat upon the blank the steam is closed off and compressed air admitted, the escape-cock 3 being preferably opened for a short period to permit of the escape of the steam remaining in the apparatus.

The pressure of compressed air is maintained to hold the blank into intimate contact with the surface of the matrix until the same cools and sets and is sufficiently hard to warrant the removal. This cooling action is advantageously facilitated by submerging the apparatus into a bath of cold water or subjecting the same to external cold of a dry character. The action of the cold is to suddenly chill the matrix and blank and cause a slight contraction of the blank from the matrix. After the parts are cooled and the duplicate sound-record, formerly a blank, is sufficiently set the compressed air is turned off and the parts of the apparatus are separated and the duplicate sound-record removed.

The method herein described is applicable alike to a blank whether the same be in the form of a disk or a cylinder and whether the same be of celluloid or of other suitable material, as hereinbefore set forth.

I do not limit myself either to the form of the blank or to the materials of which the same is composed.

I claim as my invention—

1. The method herein specified of making duplicate sound-records consisting in taking a blank having a surface treated by substances acting not only as solvents to soften the same, but to alter and change the molecular character thereof, inserting said treated blank into a suitable apparatus and upon a matrix embraced therein, applying in the apparatus and upon the blank heat and pressure to soften the blank and its surface and to force the same into intimate contact with the surface of the matrix and maintaining the pressure until the blank is set and thereafter removing the same from the apparatus and matrix, substantially as set forth.

2. The method herein specified of making duplicate sound-records, consisting in taking a blank having a surface treated by substances acting not only as solvents to soften the same but to alter and change the molecular character thereof, inserting said treated blank into a suitable apparatus and upon a matrix embraced therein, applying within the apparatus and upon the blank heat and pressure to soften the blank and its surface and to expand the same into intimate contact with the surface of the matrix and maintaining the pressure and applying cold to the apparatus to cause the duplicate sound-record to set, and thereafter removing the same from the apparatus and matrix, substantially as specified.

3. The method herein specified of making duplicate sound-records, consisting in taking a blank treated by a solvent and a fatty matter to soften the surface and to alter and change the molecular character thereof, inserting said treated blank into an apparatus and against the surface of a matrix forming

a part thereof, applying within the apparatus and upon the blank heat and pressure to soften the blank and its surface and to expand and force the same into intimate contact with the surface of the matrix and maintaining the pressure until the same is set, and thereafter removing the same from the matrix, substantially as set forth.

4. The method herein specified of making duplicate sound-records, consisting in taking a blank treated by a solvent and a fatty matter to soften the surface and to alter and change the molecular character thereof, inserting said treated blank into an apparatus and against the surface of a matrix forming a part thereof, applying within the apparatus and upon the blank heat and pressure to soften the blank and its surface and to expand and force the same into intimate contact with the surface of the matrix and maintaining the pressure and applying cold to the apparatus to cause the duplicate sound-record to set and thereafter removing the same from the matrix, substantially as set forth.

5. The method herein specified of making duplicate sound-record cylinders, consisting in taking a blank cylinder of celluloid in which the surface of the celluloid is treated with a mixture of a solvent and a fatty matter to soften the surface and alter and change the molecular character thereof, placing the treated blank cylinder into a matrix, applying within the matrix and within the treated cylinder of celluloid heat and pressure to soften the celluloid and its treated surface and to expand and force the same into intimate contact with the surface of the matrix to impart from the negative matrix a positive impression to the celluloid cylinder for making a duplicate sound-record, maintaining the pressure within the matrix until the celluloid cylinder is sufficiently set to maintain its shape, and thereafter separating the duplicate sound-record cylinder from the matrix, substantially as set forth.

6. The method herein specified of making duplicate sound-record cylinders, consisting in taking a blank cylinder of celluloid in which the surface of the celluloid is treated with a mixture of a solvent and a fatty matter to soften the surface and to alter and change the molecular character thereof, placing the treated blank cylinder into a matrix, applying within the matrix and within the treated cylinder of celluloid heat and pressure to soften the celluloid and its treated surface and to expand and force the same into intimate contact with the surface of the matrix to impart from the negative matrix a positive impression to the celluloid cylinder for making a duplicate sound-record, maintaining the pressure within the matrix, applying cold to the matrix to cause the duplicate sound-record cylinder to set and thereafter separating the duplicate sound-record cylinder from the matrix, substantially as set forth.

7. The method herein specified of making duplicate sound-record cylinders, consisting in taking a blank cylinder of celluloid treated by a mixture of a solvent and a fatty matter to soften the surface and to alter and change the molecular character thereof, placing the treated blank cylinder into a matrix, applying within the matrix and within the treated blank heat and pressure to soften the celluloid blank and force the same into intimate contact with the surface of the matrix to impart from the negative matrix a positive impression to the celluloid cylinder for making from the blank a duplicate sound-record, maintaining the pressure within the celluloid cylinder until the same is sufficiently set to maintain its shape, and thereafter separating the said duplicate sound-record cylinder from the matrix, substantially as set forth.

8. The method herein specified of making duplicate sound-record cylinders, consisting in taking a blank cylinder of celluloid treated by a mixture of a solvent and a fatty matter to soften the surface and to alter and change the molecular character thereof, placing the treated blank cylinder into a matrix, applying within the matrix and within the treated blank heat and pressure to soften the celluloid blank and to force the same into intimate contact with the surface of the matrix to impart from the negative matrix a positive impression to the celluloid cylinder for making from the blank a duplicate sound-record, maintaining the pressure within the celluloid cylinder and applying cold to the matrix to cause the duplicate sound-record cylinder to set and thereafter separating the said duplicate sound-record cylinder from the matrix, substantially as set forth.

Signed by me this 18th day of March, 1901.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,

S. T. HAVILAND.