

No. 742,455.

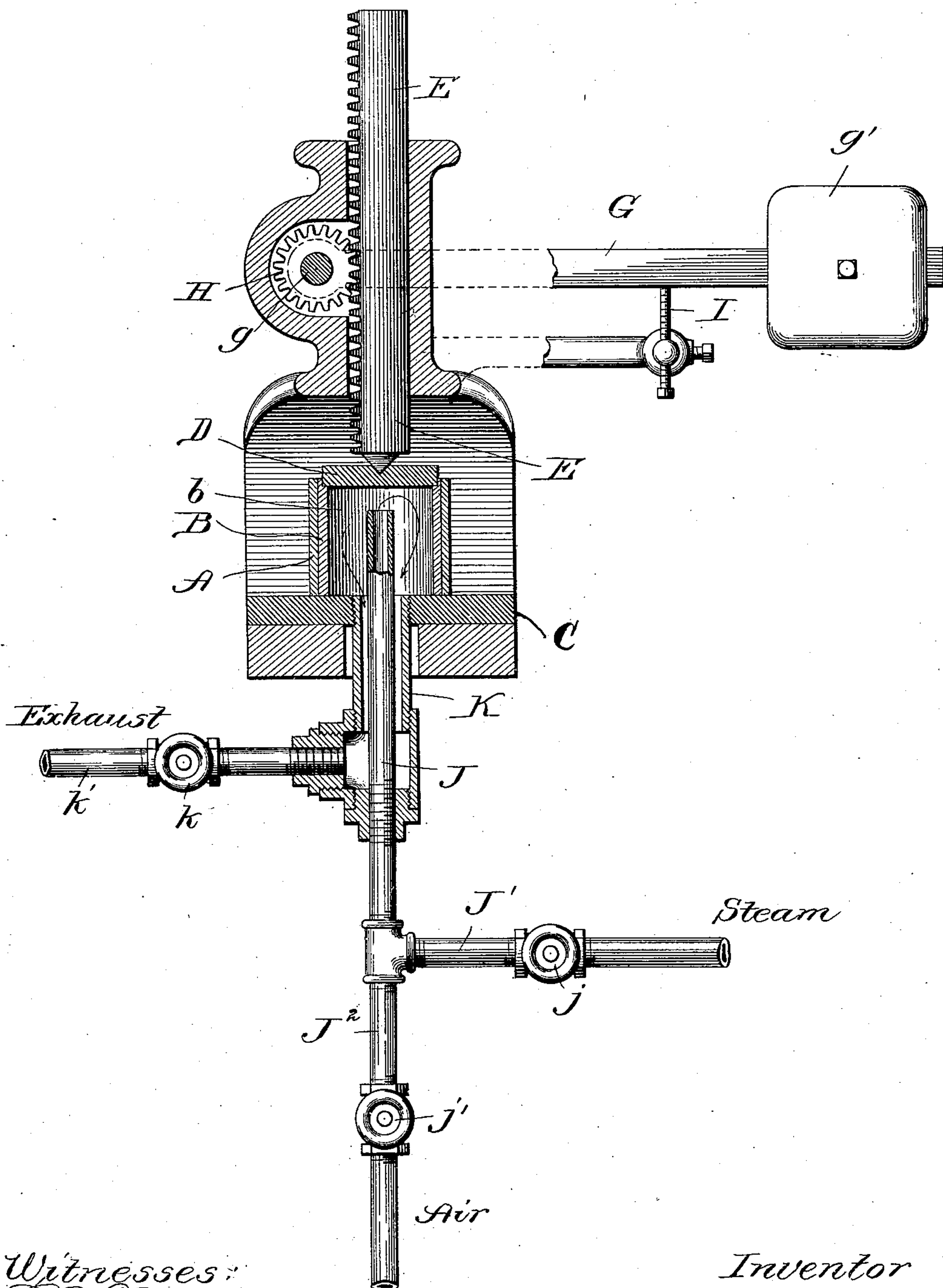
PATENTED OCT. 27, 1903.

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APPARATUS FOR REPRODUCING PHONOGRAPHIC RECORDS.

APPLICATION FILED JUNE 14, 1900.

NO MODEL.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR REPRODUCING PHONOGRAPHIC RECORDS.

SPECIFICATION forming part of Letters Patent No. 742,455, dated October 27, 1903.

Application filed June 14, 1900. Serial No. 20,285. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. LAMBERT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Producing Duplicate Phonographic Records, of which the following is a specification.

This invention relates particularly to the processes by which the ordinary record now used in connection with phonographs may be duplicated any number of times, and especially to the reproduction of indestructible records, all of which will more fully herein-
after appear.

The principal object of the invention is to provide a simple, economical, and efficient apparatus for producing duplicate phonographic records; and the invention consists in the features, combinations, and details of construction hereinafter described and claimed.

The accompanying drawing represents a vertical sectional elevation of one style of an apparatus constructed in accordance with my improvements.

In constructing a machine in accordance with my improvements and using the same I provide a matrix A of the desired size, shape, and strength and which is preferably cylindrical in contour and formed of copper which has been electrochemically deposited upon a wax cylinder in the manner shown and described in Patent No. 645,920, issued to me the 20th day of March, 1900, and which it is therefore unnecessary to show and describe in detail here. The inner side of this copper matrix is provided, as is shown in the above-named patent, with a negative duplicate of a record-cylinder, and in order to make duplicates of the same I place within such matrix a blank record-cylinder B, formed of celluloid or similar substance. In fact, it can be formed of any substance which is susceptible of being softened by heat and rehardened by cooling. This blank record, which may be made of celluloid or other desirable material, is, as above stated, placed within the matrix, so that the record and matrix both rest upon a base C of the machine, which acts as a closure for one end of the record-

chamber b. A head portion D is next provided and placed upon the record-cylinder to complete the closure thereof. An air-tight chamber, which I will designate as the "record-chamber," is thus formed within the blank record-cylinder and between the movable head D and the base C. This movable head should be of such diameter as to leave an opening between it and the matrix when the head is in contact with the record-cylinder at a point within or near the matrix, and the opening should be narrower than the thickness of the record-cylinder. The opening will then be closed and sealed by the record-cylinder when pressure sufficient to expand it is applied within, and, as will be readily seen, this opening affords an outlet for the air to escape between the head and matrix and from between the record-cylinder and matrix. This arrangement of the head and matrix leaves the matrix to rest loosely upon the base without anything to hold it unyieldingly against the base. The natural irregularities of the adjacent surfaces of the matrix and base thus afford a sufficient opening between the lower end of the matrix and base to permit air to escape from between the record-cylinder and matrix. In fact, in the absence of anything to hold the matrix rigidly and unyieldingly against the base—such, for instance, as a head in unyielding contact with the opposite end of the matrix—the application of the pressure within the record-cylinder will force the air from between the record-cylinder and base however regular their adjacent surfaces may be. The natural irregularities of the adjacent surfaces, however, insure a sufficient vent when the relation of the head and matrix is as described. A gear-spindle E, slidably arranged above the head, is allowed to drop down thereon. A weighted lever G is provided and mounted upon the shaft g, that carries a pinion H, which meshing with a rack e operates the spindle above named and in connection with a stop-screw I determines the position and the amount of pressure with which this spindle may rest on the head. It is now desirable to soften the record-cylinder, so that it may be expanded out against the record-surface of the

matrix. In order to accomplish this, a fluid, preferably steam under about thirty pounds pressure to the square inch, is forced into the record-chamber through a pressure-supply pipe J, which is connected by means of a branch pipe J' with a suitable source of steam-supply. The steam is permitted to escape again out through an exhaust-pipe K, connected with the outer air by means of the branch K'. The steam is kept at a substantially uniform pressure within the record-chamber, so as to by means of its peculiar heating qualities and other actions soften the record and force it out against the inner indented surface of the matrix. After this has been accomplished, and experience teaches the operator just how long under certain pressure it takes steam to accomplish this result, the steam-supply is shut off by means of the valve *j*, and a supply of air under pressure is permitted to enter through the supply-pipe J by opening the valve *j'* on a second branch pipe J², which connects with a source of air under pressure and keeps up practically the same pressure as heretofore, but leaving the valve *k* on the exhaust-pipe open, so that all moisture and steam are blown out of the cylinder formed by the record, as above described. When the steam has been blown out, the next step is to shut off the valve *k* and permit air under the desired pressure to stay in the record-chamber until such blank record is substantially forced into all the indentations made by the record on the inner surface of the copper matrix. As soon as this has been accomplished the air-supply is shut off, leaving just enough air inside the record-chamber to cool the same, and the exhaust-valve *k* is opened sufficiently to permit the air to blow through under certain pressure, and thus assist materially in cooling the record-cylinder. When the duplication of the record-cylinder has been completed, the spindle E is raised, the head D removed, and the matrix, with its duplicate record, removed from contact with the apparatus. The cooling of the record-cylinder also shrinks it, so that it can be easily removed from engagement with the matrix.

Whenever desirable or necessary, the outer periphery of the matrix may be backed by plaster-of-paris, having a lead or other metallic confining-ring to give it sufficient rigidity to secure the duplication or reproduction of the records, and this is very clearly shown and described in the patent above referred to.

I claim—

1. In an apparatus for producing records of the class described, the combination of a frame, a cylindrical matrix arranged therein, a base portion and a head portion arranged at each end of the matrix and adapted to hold a blank record-cylinder within the matrix, forming in connection with and within the record-cylinder an air-tight chamber and arranged to leave a passage for air adjacent to the matrix and outside of the record-cyl-

inder, and means for admitting fluid under pressure into the chamber within the record-cylinder, substantially as described.

2. In an apparatus for producing records of the class described, the combination of a frame, a cylindrical matrix arranged therein, a stationary base, and a movable head portion arranged at each end of the matrix and adapted to hold a blank record-cylinder within such matrix, forming in connection with and within the record-cylinder an air-tight chamber and arranged to also form adjacent to the matrix and outside of the record-cylinder a passage for the outlet of air from within the matrix, means for admitting fluid under pressure into the chamber within the record-cylinder, and means for holding the movable head in operative contact therewith, substantially as described.

3. In an apparatus for producing records of the class described, the combination of a frame, an open cylindrical matrix arranged therein provided with indentations upon its inner surface, a base portion and a head portion arranged at each end of the matrix and adapted to partially close the same and hold a blank record-cylinder within such matrix in position to be operated upon and also forming in connection with and within such record-cylinder an air-tight chamber, means for admitting heated fluid under pressure into the chamber within the record-cylinder, means for permitting such fluid to escape, and means for admitting cool fluid within such chamber, substantially as described.

4. In an apparatus for producing records of the class described, the combination of a cylindrical matrix, a base portion, and a head portion arranged at the ends of the matrix and adapted to hold a blank record-cylinder within the matrix and close the ends of such cylinder forming in connection therewith a closed interior chamber, one of such inclosing end portions being out of contact with the matrix, substantially as described.

5. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion arranged in contact with the other end of the blank record-cylinder and in connection with such cylinder and the base forming a chamber within the record-cylinder, and means for furnishing a supply of fluid under pressure into the chamber, substantially as described.

6. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion in contact with the other end of the blank record-cylinder and in connection with such cylinder and the base forming a chamber within the record-cylinder, and a pipe communicating with such

chamber adapted to form a passage for the admission of fluid under pressure thereto, substantially as described.

7. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion arranged in contact with the other end of the blank record-cylinder and adapted to form an outlet-passage communicating with the space between the record-cylinder and matrix and form in connection with the record-cylinder and base a chamber within such cylinder, means for holding the head in engagement with the record-cylinder, and means for furnishing a supply of fluid under pressure to the chamber, substantially as described.

8. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion arranged in contact with the other end of the blank record-cylinder and adapted to form an outlet-passage communicating with the space between the record-cylinder and matrix and form in connection with the record-cylinder and base a chamber within such cylinder, a spindle operating against the head portion to hold it in engagement with the record, and a pipe leading into one end of the chamber for furnishing a supply of fluid under pressure, substantially as described.

9. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion arranged in contact with the other end of the blank record-cylinder and adapted to form an outlet-passage communicating with the space between the record-cylinder and matrix and form in connection with the record-cylinder and base a chamber within such cylinder, means for holding the head in engagement with the record-cylinder independently of the matrix, a pipe communicating with such chamber and forming a passage for the admission of fluid under pressure thereto, and an exhaust-pipe also communicating with such chamber to permit the fluid to escape therethrough, substantially as described.

10. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion arranged in contact with the other end of the blank record-cylinder and adapted to form an outlet-passage communicating with the space between the record-cylinder and matrix and form in connection with the record-cylinder and base

a chamber within such cylinder, means for holding the head in engagement with the record-cylinder independently of the matrix, a supply-pipe for furnishing steam under pressure to one end of the record-chamber, an exhaust-pipe connected with the record-chamber for permitting the steam to blow therethrough and exhaust therefrom, and a branch pipe connected with the supply-pipe for furnishing a supply of air under pressure to the record-chamber, substantially as described.

11. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix provided with sound-record indentations thereon, a base portion arranged at one end thereof and in contact with the end of the blank record-cylinder to be operated upon, a movable head portion arranged in contact with the other end of the blank record-cylinder and adapted to form an outlet communicating with the space between the record-cylinder and matrix and in connection with such cylinder and the base forming a chamber within such record-cylinder, and a pipe arranged to communicate with the chamber and form a passage for the admission of fluid under pressure thereto, substantially as described.

12. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix provided with sound-record indentations thereon, a base portion arranged at one end thereof and in contact with the end of the blank record-cylinder to be operated upon, a movable head portion arranged in contact with the other end of the blank record-cylinder and adapted to form an outlet communicating with the space between the record-cylinder and matrix and in connection with such cylinder and the base forming a chamber within such record-cylinder, a pipe arranged to communicate with such chamber and form a passage for the admission of steam under pressure thereto, means for exhausting steam from the chamber, and means for furnishing a supply of cool fluid to such chamber, substantially as described.

13. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, the head portion arranged in contact with the other end of the blank record-cylinder and provided with means for holding the end of such cylinder in operative contact with such head while such end is out of contact with the matrix and, in connection with such cylinder and the base, forming a chamber within the record-cylinder, and means for furnishing a supply of fluid under pressure into the chamber, substantially as described.

14. In an apparatus for producing records of the class described, the combination of an

open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion in contact with the other end of the blank record-cylinder and, in connection with such cylinder and the base forming a chamber within the record-cylinder, means for holding each of the ends of such cylinder in operative contact with the cylinder-holding end portion while such cylinder end is out of contact with the matrix, and a pipe communicating with such chamber adapted to form a passage for the admission of fluid under pressure thereto, substantially as described.

15. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion arranged in contact with the other end of the blank record-cylinder and adapted to form an outlet-passage communicating with the space between the record-cylinder and matrix and form in connection with the record-cylinder and base an innermost chamber within such cylinder, means for holding the head in engagement with the record-cylinder independently of the matrix, and means for furnishing a supply of fluid under pressure to the chamber, substantially as described.

16. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix provided with sound-record indentations thereon, a base portion arranged at one end thereof and in contact with the end of the blank record-cylinder to be operated upon, a movable head portion arranged in contact with the other end of the blank record-cylinder and out of contact with the matrix and forming in connection with the base and cylinder a chamber, such head portion being provided with means for holding the end of such cylinder in operative contact with the head independently of the matrix to form a temporary passage between the cylinder and matrix, and a pipe arranged to communicate with the chamber and form a passage for the admission of fluid under pressure thereto, substantially as described.

17. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix provided with sound-record indentations thereon, a base portion arranged at one end thereof and in contact with the end of the blank record-cylinder to be operated upon, a movable head portion arranged in contact with the other end of the blank record-cylinder and, in connection with such cylinder and the base, forming a chamber within such record-cylinder, such head portion being provided with means for holding the end of the cylinder in operative contact with the head independently of the matrix, a pipe arranged to communicate with such chamber and form a passage for the ad-

mission of steam under pressure thereto, means for exhausting steam from the chamber, and means for furnishing a supply of cool fluid to such chamber, substantially as described.

18. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold an indented matrix, a matrix mounted upon such base and arranged to encircle the cylinder to be operated upon, means for forming a record-chamber in connection with the blank record, means for furnishing a supply of steam under pressure to the record-chamber, and means for furnishing a supply of air to the same chamber, substantially as described.

19. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold a cylindrical matrix containing a blank record-cylinder and close one end of the chamber formed within such record-cylinder, a matrix provided with indentations upon its inner surface, a head portion arranged to close the other end of the record-cylinder, means for holding the head in engagement with the record, and means for furnishing a supply of steam under pressure to the chamber formed by the record-blank, substantially as described.

20. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold a cylindrical matrix containing a blank record-cylinder and arranged to close one end of the chamber formed within such record-cylinder, a matrix provided with indentations upon its inner surface, a head portion for closing the other end of the record-cylinder, a spindle operating against the head portion to hold it in engagement with the record, and a pipe leading into one end of the cylindrical chamber for furnishing a supply of steam under pressure, substantially as described.

21. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold a cylindrical metallic matrix containing a blank record-cylinder and arranged to close one end of the record-chamber formed within such record-cylinder, a matrix provided with indentations upon its inner surface, a head portion for closing the other end of the record-cylinder, a spindle operating against the head portion to hold it in engagement with the record, a pipe leading into one end of the record-chamber for furnishing a supply of steam under pressure, and means for furnishing a supply of air to the cylindrical record-chamber above described, substantially as described.

22. In an apparatus for forming records of the class described, the combination of a base portion adapted to receive and hold a cylindrical matrix carrying a blank record and close one end of the chamber formed within the blank record-cylinder, a matrix provided

with indentations on its inner surface, a head portion for closing the other end of the record-cylinder, a spindle arranged to contact the head portion, a weighted lever for operating the spindle and holding it at a predetermined pressure against the head, a pipe for furnishing a supply of steam under pressure to one end of the record-chamber, and an exhaust-pipe connected with the cylindrical record-chamber to permit the steam to blow therethrough and exhaust therefrom, substantially as described.

23. In an apparatus for forming records of the class described, the combination of a base portion adapted to receive and hold a cylindrical matrix and blank record-cylinder and close one end of the record-chamber formed within the blank record-cylinder, a matrix within which such cylinder is mounted, a head portion for closing the other end of the record-cylinder, a spindle arranged to contact the head portion, a weighted lever for operating the spindle and holding it at predetermined pressure against the head, a supply-pipe for furnishing a supply of steam under pressure to one end of the record-chamber, an exhaust-pipe connected with the record-chamber to permit the steam to blow therethrough and exhaust therefrom, and a branch pipe connected with the supply-pipe for furnishing a supply of air under pressure to the record-chamber, substantially as described.

24. In an apparatus of the class described, the combination of a matrix having a blank record-cylinder therein to be operated upon, a base portion arranged at one end of the blank record-cylinder and extending outward radially of such cylinder beyond the inner walls thereof, a head portion arranged at the other end of the blank record-cylinder and extending outward radially of such cylinder beyond the inner wall thereof to close the end of such cylinder for forming a pressure-chamber therein, and means for admitting fluid under pressure to such chamber, substantially as described.

25. In an apparatus of the class described, the combination of a base portion arranged at one end of a blank record-cylinder to close the end of such cylinder, a head portion movable independently of such base arranged at the other end of the blank record-cylinder to close such end and form in connection with the

base and cylinder a chamber, a matrix arranged outside of the record-cylinder, and means for admitting fluid under pressure to the chamber formed within the record-cylinder, substantially as described.

26. In an apparatus of the class described, the combination of a base portion arranged at one end of a blank record-cylinder to close the end thereof and adapted to support a matrix thereon, a matrix mounted upon such base outside of the record-cylinder, a head portion arranged at the other end of the blank record-cylinder for closing such end and forming in connection with the base and record-cylinder a chamber, and means for admitting fluid under pressure to such chamber, substantially as described.

27. In an apparatus of the class described, the combination of a base portion arranged at one end of a blank record-cylinder to close such cylinder, a matrix mounted upon such base and arranged to surround the cylinder, a head portion movable independently of the base arranged at the other end of the blank record-cylinder for closing such end and forming in connection with the base and record-cylinder a pressure-chamber, means for supplying heated fluid under pressure to such chamber, means for exhausting such fluid therefrom, and means for supplying cool fluid under pressure to such chamber, substantially as described.

28. In an apparatus of the class described, the combination of a base portion arranged at one end of a blank record-cylinder and extending outwardly radially of such cylinder beyond its inner wall to close the end thereof, a head portion movable independently of the base arranged at the other end of the blank record-cylinder and extending outward radially of such cylinder beyond its inner wall to close the end thereof for forming a pressure-chamber within such cylinder, means for admitting steam under pressure to such chamber, means for exhausting such steam therefrom, and means for admitting air under pressure thereto, substantially as described.

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