

No. 645,920.

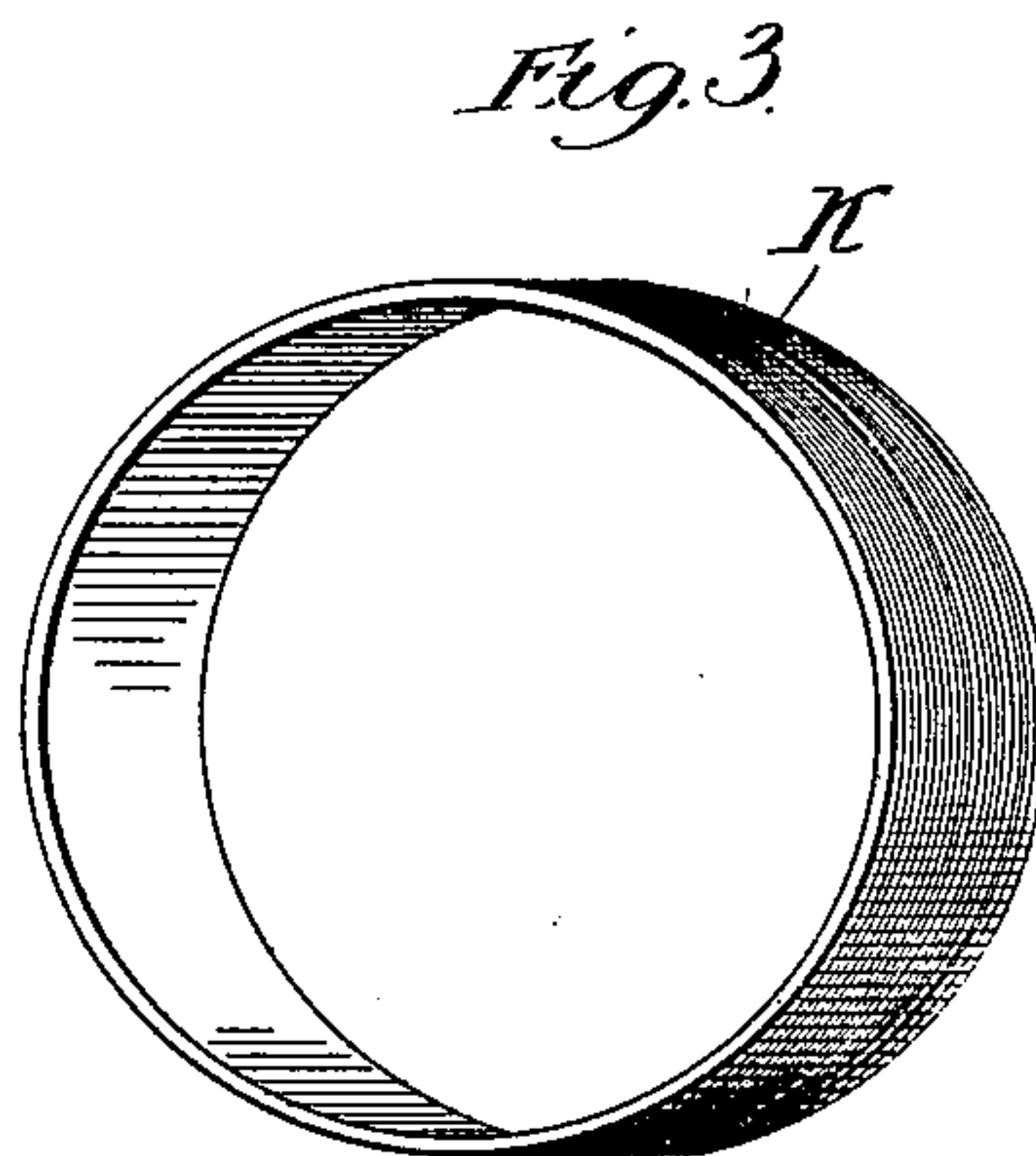
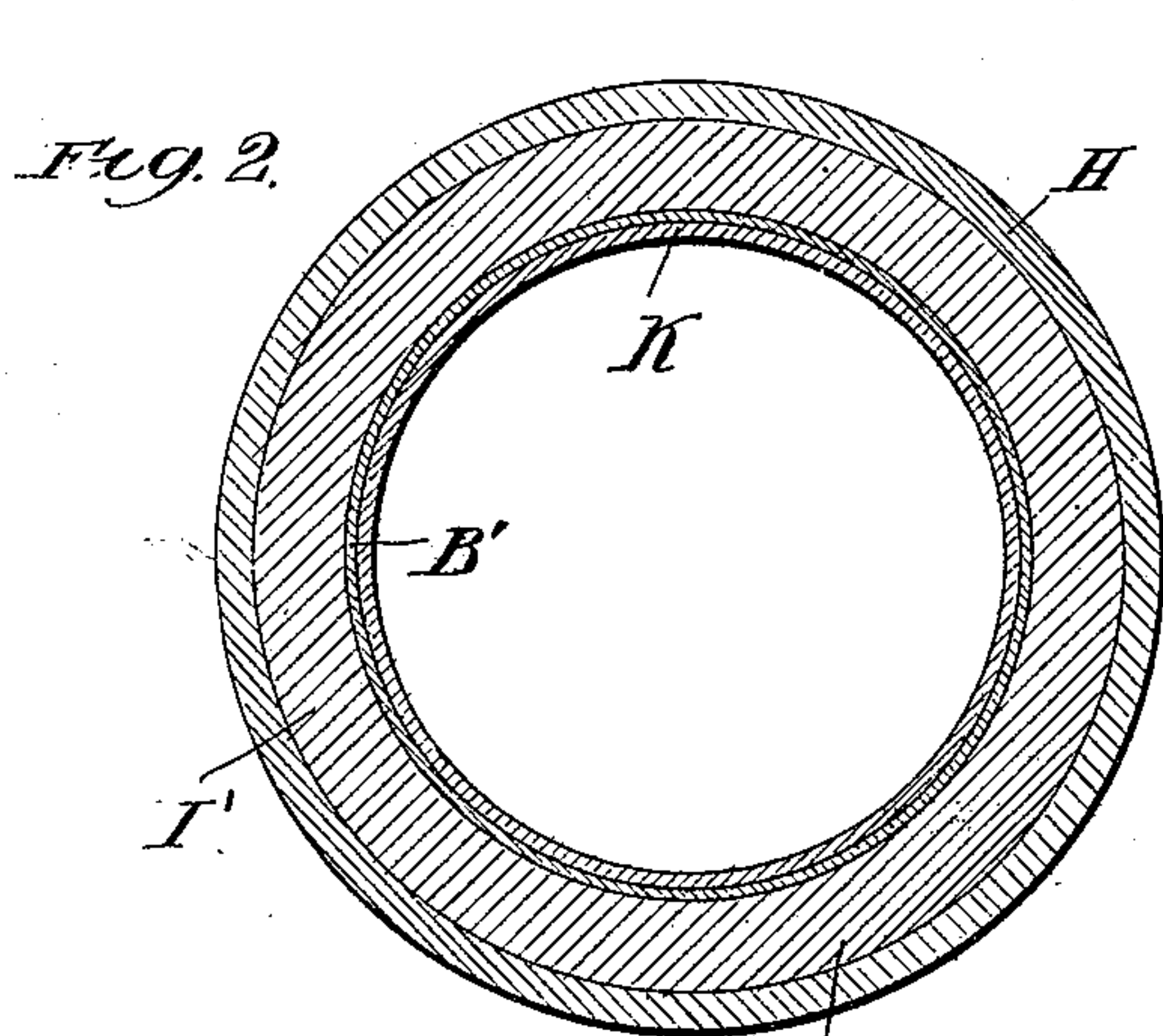
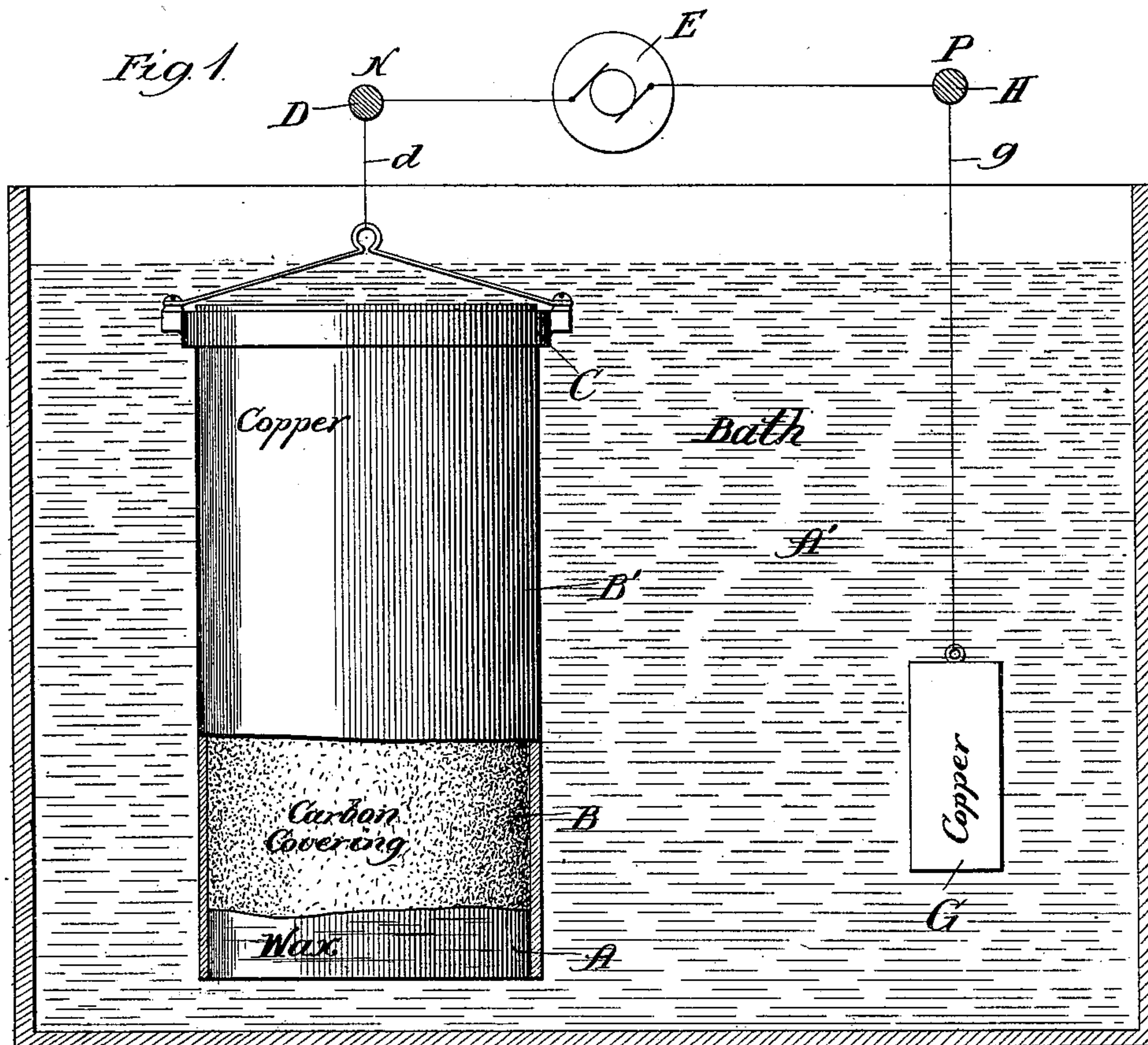
Patented Mar. 20, 1900.

T. B. LAMBERT.

METHOD OF REPRODUCING PHONOGRAPH RECORDS.

(Application filed Aug. 14, 1899.)

(No Model.)



Witnesses:

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# UNITED STATES PATENT OFFICE.

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TO BRIAN F. PHILPOT AND JOSEPH POWELL, OF SAME PLACE.

## METHOD OF REPRODUCING PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 645,920, dated March 20, 1900.

Application filed August 14, 1899. Serial No. 727,183. (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, Cook county, Illinois, have invented certain new and useful Improvements in Processes for Producing Record-Cylinders for Phonographs, of which the following is a specification.

My invention relates to that class of mechanisms which are styled "record-cylinders" and which are adapted to be used in connection with phonographs and similar instruments—that is, instruments adapted to be operated for the purpose of vibrating a diaphragm and imitating speech and musical notes.

The invention relates particularly to a cylinder and the material of which it is formed, so as to render it of excessive longevity by the use of material practically infrangible, and, further, to the means, methods, or processes by which this and duplicate cylinders may be produced, all of which will more fully hereinafter appear.

The principal object of my invention is to provide a simple, economical, and efficient method for constructing infrangible record-cylinders.

A further object of the invention is to provide a record-cylinder of such material as to render it practically infrangible; and the invention consists in the methods, features, combinations, and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a vertical sectional elevation of a bath containing an electrolytic solution adapted to electrically form a matrix by which a record-cylinder for phonographs may be produced, showing other elements attached, as will be more fully hereinafter explained; Fig. 2, a plan view of a completed matrix, and Fig. 3 a perspective view of a completed record-cylinder.

In the art to which this invention relates it is well known that it is desirable to produce a record-cylinder of such nature and construction as will make it practically indestructible, and, further, to provide means and methods by which such a cylinder can be economically and efficiently formed and du-

plicated in quantities as desired. To these features my invention principally relates.

In forming a record-cylinder I first take and make an impression upon a wax cylinder A (see Fig. 1, in which the wax cylinder is in the bath) in an ordinary phonograph, and then remove this wax cylinder from the phonograph and provide it at one end with a coating of carbon B or other electric conducting material. I next place this cylinder in an electrolytic bath, having first surrounded and connected it with a metal ring C, which is supported on a metal rod D by means of a wire *d* and connected with the negative pole of a dynamo E. This cylinder, with its attached mechanism, is then placed, as above suggested, in the electrolytic bath, which brings it in circuit with the anode G, of copper or other metal, hung by means of a metal wire *g* upon a metal rod H and connected with the other pole of the dynamo. The dynamo being started, the copper is electrically deposited upon the carbon-coated wax cylinder, and after it has reached the desired thickness forms a copper cylinder, which is then removed from the bath and disconnected from the dynamo. The wax is next shrunk by means of cold application, so that the copper cylinder may be removed therefrom. These operations form a copper cylindrical matrix *b'*, the inner cylindrical surface of which contains a counterpart of the impressions on the wax cylinder. It is desirable now to produce the indestructible record-cylinders from this copper matrix in quantities as desired. To accomplish this result, the matrix is placed inside of a metal ring I, considerably larger in diameter than the matrix, and the space between the same filled with type-metal I', which securely locks the matrix in position and furnishes a firm backing for the same. I next take a soft ring of cellulose or vulcanized rubber, either in a raw or partially-cured state or previously softened with some solution and of sufficient thickness to receive in perfect form the indentations of the matrix and at the same time furnish a suitable backing or support for the phonographic reproduction of the record. This relatively-thick ring or tube is then



placed within the cylindrical opening of the matrix and by means of an expansive pressure with heat forced outwardly, completely filling the matrix and against the inner surface thereof, thus making a counterpart of the same and a record similar to that on the original wax cylinder. The ring thus formed, having on its outer face a faithful imprint of the matrix, is then allowed to harden, either naturally or by artificially curing the substance thereof, through which hardening it shrinks sufficiently to enable its subsequent removal to be made from the matrix without injury to either. As a shrinking or reducing medium I have used a solution of hydrochlorous acid and water in which the tube and matrix are placed, as above, so that the tube can be removed from its engagement with the matrix. When it has become dried and hardened, it forms a cylinder K, as shown in perspective view in Fig. 3, preferably of cellulose, and which is practically infrangible. I prefer to use cellulose for this purpose in that it is easier to manufacture and more durable in operation, though the same method may be used for forming cylinders of different materials.

In carrying out my process it is an absolute requirement that the blank phonograms or tubes must be of a thickness to receive and retain in a perfect form the indentations of the matrix and at the same time have within itself a sufficient backing or support for the reproduction of the record phonographically after the formation of the record on its face and the removal of the tube from the matrix. It is practically impossible to use very thin walled tubes or hollow cylinders for my process, because the phonographic reproduction of sound from such thin records, supposing the tubes to be capable of even temporarily maintaining or holding their shape, would be weak, distorted, indistinct, and imperfect; but as a matter of fact the records themselves made of thin material are not capable of retaining their shape and would be impractical in actual use. By using a relatively-thick-walled tube or hollow cylinder the objections which would occur in practice with a very thin tube are entirely overcome and the produced records are a merchantable article. It is to be understood that in applying pressure

to the interior of the tube or cylinder for forcing the same outwardly and against the face of the matrix such pressure must be simultaneously exerted over the entire surface of the tube or cylinder and in a uniform manner, so as to simultaneously force the entire exterior surface against the interior face of the matrix, for if otherwise there would be great danger and liability of a flow of material and a consequent distortion therefrom, producing an imperfect record.

I claim—

1. The method of producing record-cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively-soft material, rendering the surface of the wax cylinder electrically conductive and electrolytically depositing metal thereon, forming a matrix and then outwardly expanding under pressure within the matrix, a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix and finally removing the cylinder or tube by direct longitudinal movement, substantially as described.

2. The method of producing record-cylinders for phonographs which consists in first forming a record on a cylinder of relatively-soft material such as wax, then coating such cylinder with carbon or other electric conducting material, and electrolytically depositing metal thereon forming a matrix, then shrinking the soft cylinder to remove the electrically-formed matrix and backing such matrix to form a matrix-mold, then outwardly expanding under pressure a cylinder or tube sufficiently thick to maintain its shape after disengagement from the matrix and of softened material such as cellulose, within the matrix for the pressure to reproduce on the outer surface the counterpart of the indentations in the matrix, then allowing such cellulose cylinder or tube to harden within the matrix and removing the record cylinder or tube from the matrix and then drying and hardening the record-cylinder, substantially as described.

THOMAS B. LAMBERT.

Witnesses:

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