

No. 614,168.

Patented Nov. 15, 1898.

H. J. HAGEN.
DEVICE FOR REPRODUCING SOUND.

(Application filed Jan. 14, 1898.)

(No Model.)

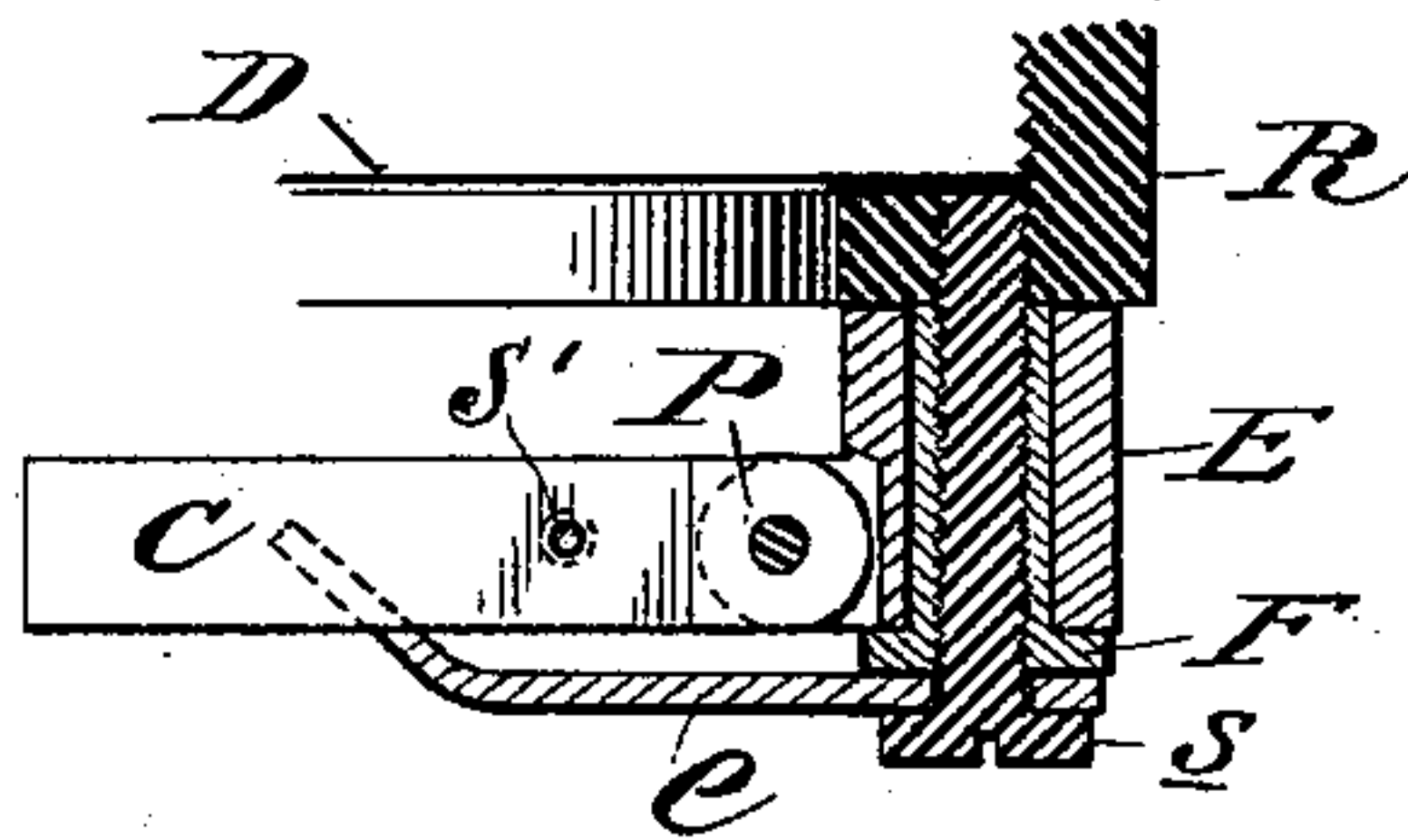
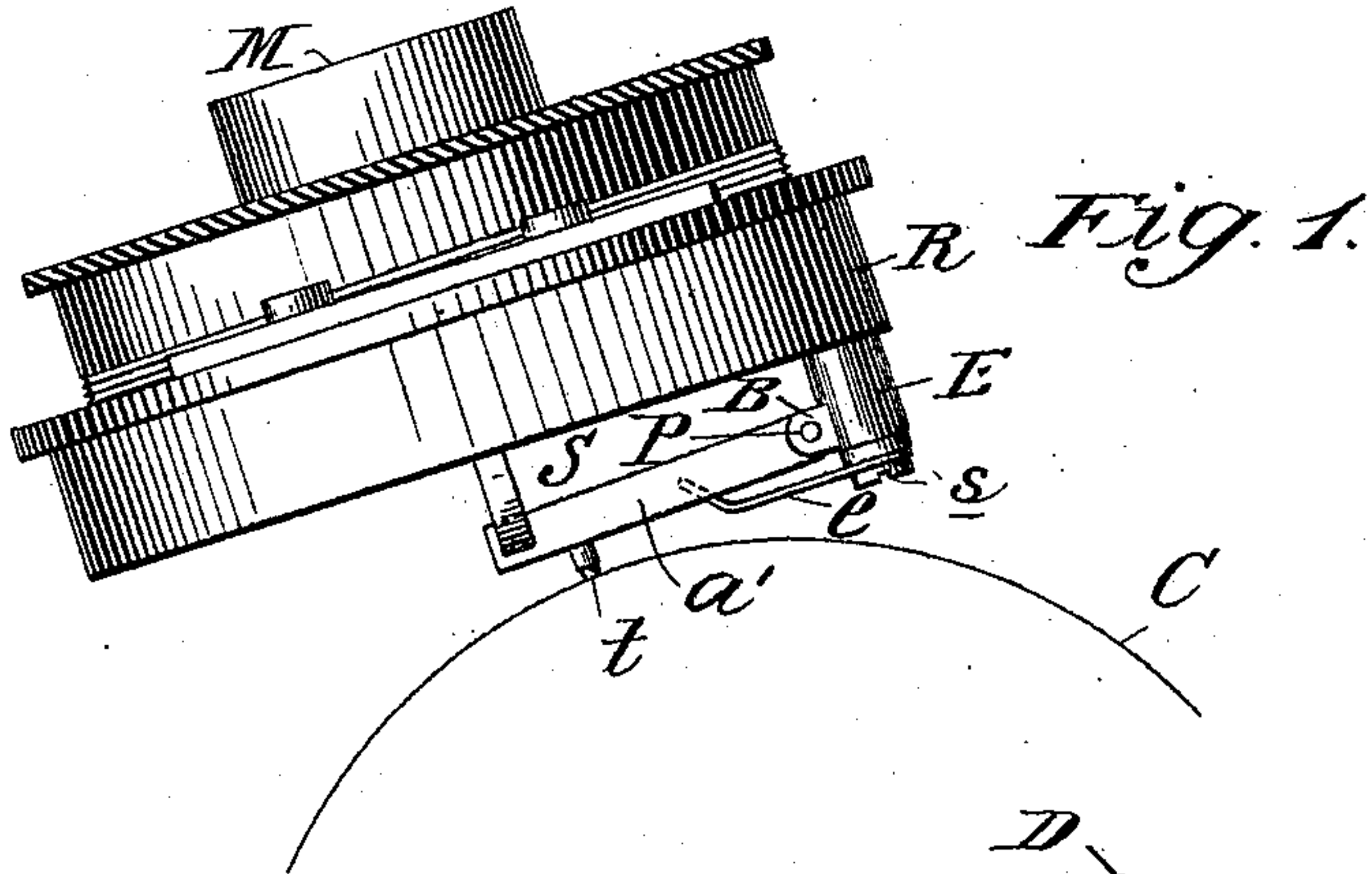


Fig. 2.

Fig. 3.

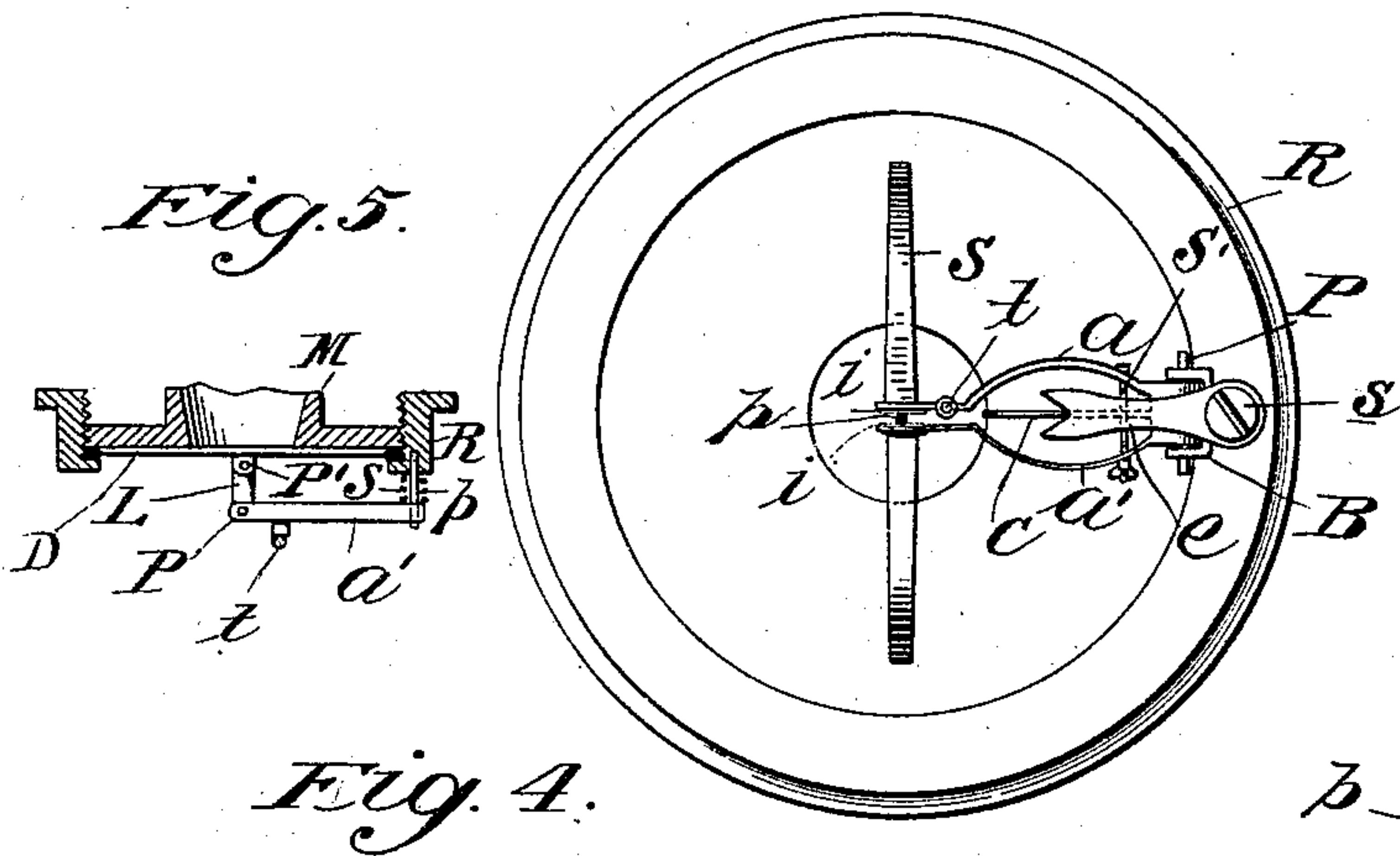
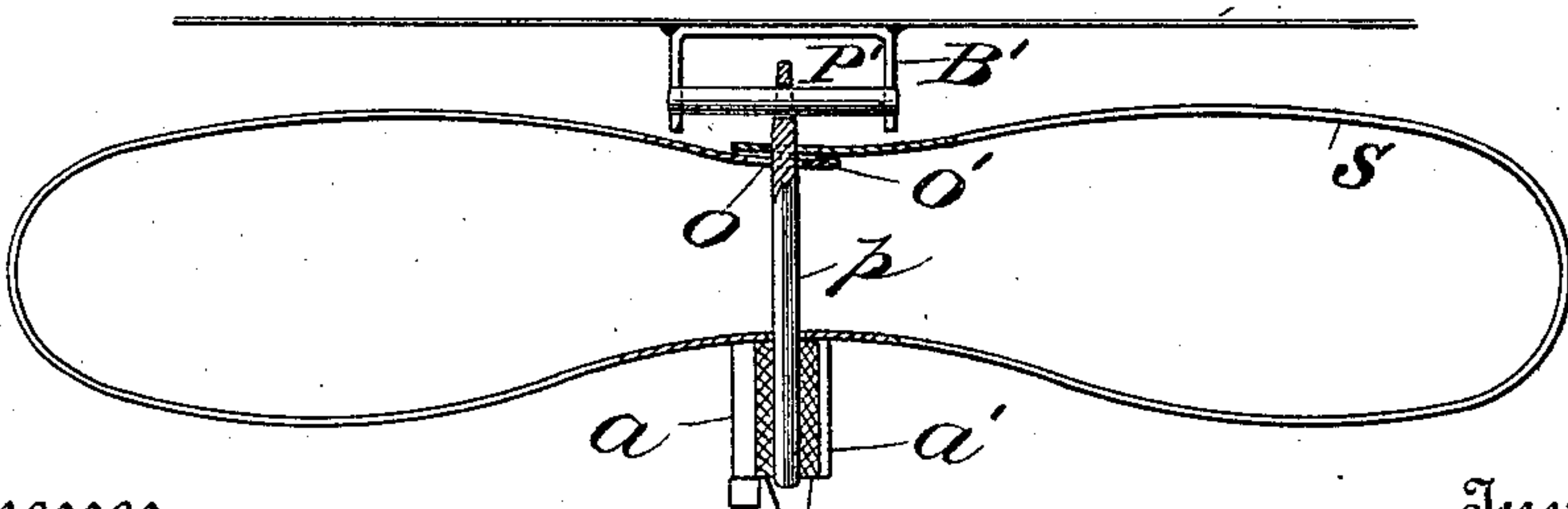


Fig. 4.



Fig. 6.



Witnesses
Edward C. Rowland.
M. M. Robinson.

Inventor
Henry J. Hagen
By his Attorney
Charles J. Kimm

UNITED STATES PATENT OFFICE.

HENRY J. HAGEN, OF NEWARK, NEW JERSEY.

DEVICE FOR REPRODUCING SOUND.

SPECIFICATION forming part of Letters Patent No. 614,168, dated November 15, 1898.

Application filed January 14, 1898. Serial No. 666,589. (No model.)

To all whom it may concern:

Be it known that I, HENRY J. HAGEN, a citizen of the United States, residing at Orange, in the county of Essex and State of New Jersey, have made a new and useful invention in Devices for Reproducing Sound, of which the following is a specification.

My invention is directed especially to improvements in what are known as "phonographic reproducing devices;" and its objects are, first, to provide means whereby the diaphragm or sound-reproducing medium may be caused to assume a relatively-fixed relation to the record to be reproduced and the reproducing-stylus so connected thereto that it will follow the inequalities of the record and faithfully yieldingly transmit them to the diaphragm under all conditions of position and usage of the instrument, and, second, to provide means whereby the stylus of such instruments will readily automatically adjust itself to the record in such manner as to cause the diaphragm or sound-reproducing medium to correctly reproduce the sounds which originally effected such record.

My invention will be fully understood by referring to the accompanying drawings, in which—

Figure 1 is a side elevational view of a well-known form of phonographic apparatus having my improvement attached thereto and illustrating also a portion of the record cylinder or blank. Fig. 2 is a plan view of the under side of the apparatus, illustrating my improvement. Fig. 3 is a detail sectional view illustrating the universal or pivotal attachment of my improvement to the diaphragm-supporting ring of the instrument, and Fig. 4 is an enlarged transverse sectional view taken through the diaphragm or sound-reproducing medium and illustrating the manner of attaching my improvement thereto. Fig. 5 is a transverse sectional view of a modified form of my improvement. Fig. 6 represents in detail view a part of the yielding connections between the diaphragm and the stylus.

With existing forms of sound-reproducing devices—such as the phonograph, graphophone, and gramophone—it is customary to cause the sound-reproducing medium, to which is attached directly the stylus, to act

by its own weight in such manner as to cause the stylus to follow the produced or indented record, so that instruments of this type are not always available in places where the downward action of the instrument may be affected—as, for instance, on board of steamers, railway-trains, or moving vehicles generally.

My improvement renders it possible to attach or secure the diaphragm-supporting ring in such manner that it (the diaphragm) will assume, once for all, a relatively permanent distance from the record as it moves thereover, while the stylus will follow correctly the record under all conditions of usage.

In the reproduction of sound from phonographic, gramophonic, and analogous records it has also been found that where the conditions between the reproducing apparatus and the record itself vary materially from those under which the record was produced there will not result a perfect or accurate reproduction of the sounds which originally produced such record. This is due to several causes, among which may be enumerated the following: First, in the use of instruments like the phonograph, wherein the record-reproducing mechanism is advanced by a screw, if the record be placed upon the recording cylinder or blank under a given condition of temperature, and if it be not reproduced under the same conditions the expansion or contraction, as the case may be, of such cylinder or blank will vary the pitch of the screw-like record to such an extent that the reproduced sounds will be materially affected; second, in instruments like the gramophone, in which the stylus is carried by a swinging arm, there is a variation in pressure between the stylus and the record at various positions of its movement as it (the arm) is caused to swing across or over the face of the record, such variations being most marked when the swinging arm is at its extreme or outer position, owing to the fact that one side of the record-line bears upon the stylus with more pressure than the other, it being a noticeable fact that when the stylus is in direct alinement with the record, so that it presses equally upon both sides thereof, the best results are attained. It was with a view of devising means for overcoming these inequalities of pressure between the record and the

usual rigidly-supported stylus of such instruments that I devised my present invention, which consists of a stylus designed for reproducing a record and so connected with the reproducing diaphragm or medium that it (the stylus) will automatically follow the record in a yielding manner and transmit its movements to the diaphragm in such manner as to give out a clear reproduction of all of the original sounds or tones which produced the record.

My invention contemplates the connecting of the stylus to the diaphragm or sound-reproducing medium in such manner that it (the stylus) will follow the record with the least possible friction and will yieldingly impart motion thereto under all conditions of usage and without utilizing gravity as an agent to that end.

Referring now to the drawings in detail for a full and clear understanding of my invention, such as will enable others skilled in the art to which it relates to manufacture and use the same, M represents the mouthpiece, D the diaphragm, and R the diaphragm-sustaining ring, of a well-known form of phonographic apparatus.

B' represents a yoke (see Fig. 4) rigidly secured to the under side of the diaphragm and having its free ends secured together by a pin P', which in instruments of the type herein illustrated is located parallel with an element of the phonogram blank or cylinder C.

p is a pin having an opening in its upper end adapted to move freely over the pin P'.

S is a spring bent in the conformation shown, its free ends being provided with oblong slots O O', through which the pin p passes. These slots O and O' are of such length as to admit of free lateral play of the pin p therethrough, as will be apparent upon inspection of Figs. 4 and 6, and said pin has its upper end flattened, as shown in Fig. 6, so as to afford a shoulder for the upper one of the free ends of the spring S.

a and a' are spring-arms secured at one end to a pivotal support consisting of a yoke B and a pin P, which yoke is in turn pivotally secured by an eye E, collar F, and screw s to the under side of the diaphragm-supporting ring R, e being a rigid arm secured also by the screw s, forked at its free end and adapted to bear firmly upon a central arm c, secured to the two arms a a'.

t is the stylus, carried by one of the arms a. i i are pieces of cork or other yielding material secured to the inner surfaces of the free ends of the arms a and a' and adapted to bear yieldingly against the lower or free end of the pin p.

S' is an adjusting-screw connecting the two arms a a' for varying the pressure between the free ends thereof and the pin p.

It will be apparent that by reason of the pivot-pin P, yoke B, eye E, and rigidly-supported collar F the two arms a and a' are

adapted to partake of universal movement and that the arm e prevents said arms from dropping below a given point and also that the spring S yieldingly connects the free ends of said arms with the diaphragm, while the pin p may partake of movement either to the right or left and the arms a and a' vertical movement with sufficient delicate frictional bearing thereon to impart correctly to the diaphragm D a reproduction of the movements of the stylus. It is apparent, therefore, that the reproducing-stylus t will correctly follow such record and with the least possible friction, at the same time correctly imparting to the diaphragm all of its movements.

In the modified form shown in Fig. 5 I have shown a reversal of the parts in which the arms a and a' are pivotally connected to the diaphragm by a link L and pivot-pins P and P', the pin p in this instance being rigidly secured to the diaphragm-supporting ring R and surrounded by a delicate compressible spring S, it being obvious that this form of the apparatus will as correctly reproduce the record as would the forms shown in Figs. 1 to 4, inclusive.

I do not limit myself to the use of such a device in connection with a sound-reproducing device, as it is obvious that the same might be applied to a sound-recording apparatus, it being only necessary in this event to apply the stylus t to the outer ends of one of the arms a a' in order to produce the best results.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a device for reproducing sound having a diaphragm, the combination of two spring-arms provided with universal connections at their opposite ends to the body of the instrument and the diaphragm respectively, and a stylus carried by one of said arms, substantially as described.

2. In a device for reproducing sound having a diaphragm, a pair of spring-arms connected by a universal joint at one end to the body of the instrument and a pin yieldingly connected with the diaphragm and the free ends of the arms, together with yielding means as a spring between the diaphragm and said arms, in combination with a stylus carried by one of said arms, substantially as described.

3. In a device for reproducing sound a diaphragm D provided with a yoke B' near its center and a pin P', a vertically-arranged pin p having movement upon the aforesaid pin, a pair of spring-arms a a' connected by a universal joint to the body of the instrument and grasping the lower end of the pin p yieldingly between their free ends, in combination with a spring S located between said arms and the yoke B' and a stylus t carried by one of said arms, all of said parts acting substantially as described.

4. In a device for reproducing sound a dia-

phragm D provided with a yoke B' near its center and a pin P', a vertically-arranged pin *p* having movement upon the aforesaid pin, a pair of spring-arms *a a'* connected by a universal joint to the body of the instrument and grasping the lower end of the pin *p* yieldingly between their free ends, a spring S located between said arms and the yoke B', and a stylus *t* carried by one of said arms, in combination with means as a screw S' for adjusting

the pressure between the free ends of the arms *a a'* and the pin *p*, substantially as described.

In testimony whereof I have hereunto subscribed my name this 12th day of January, 1898.

HENRY J. HAGEN.

Witnesses:

C. J. KINTNER,

M. M. ROBINSON.