

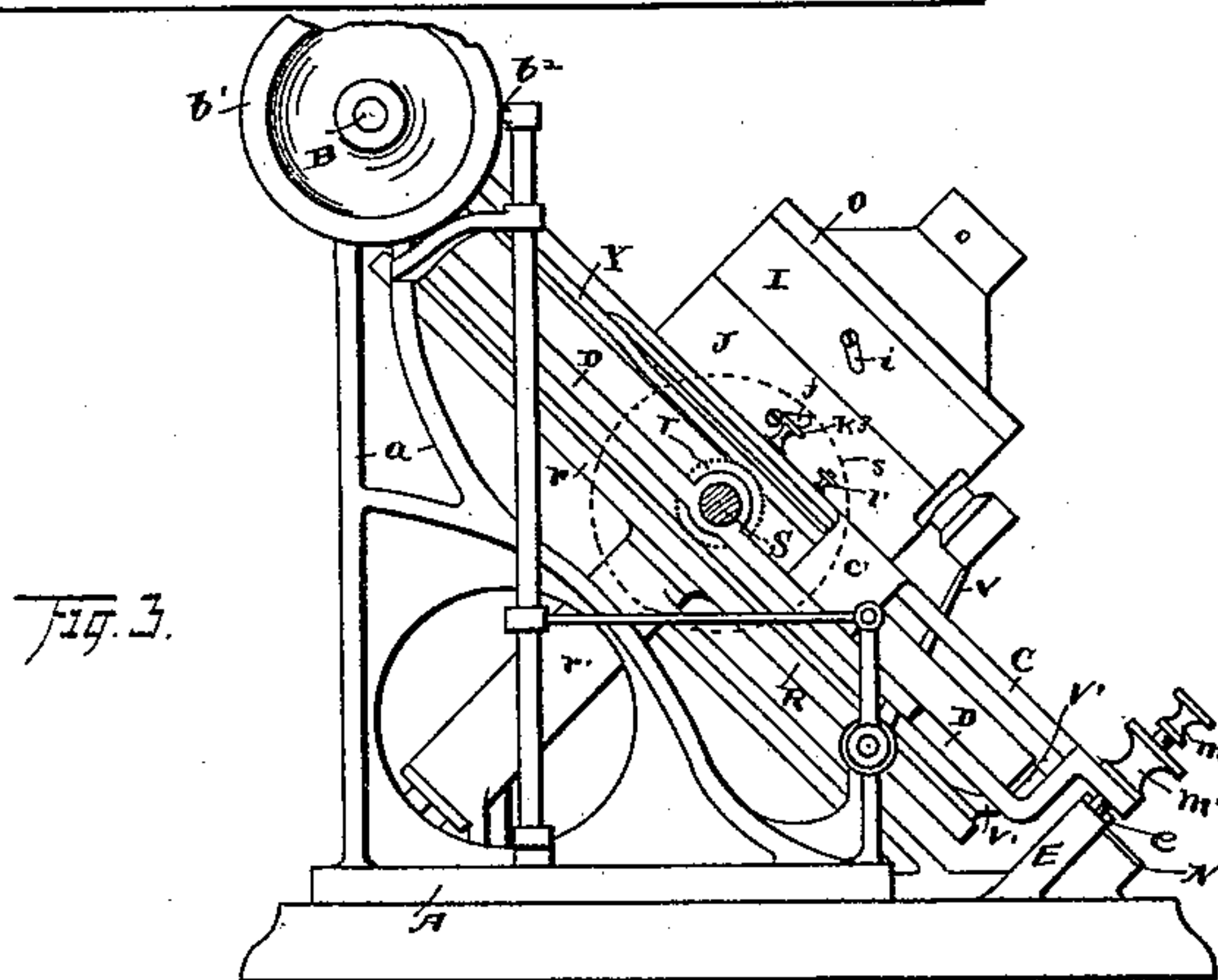
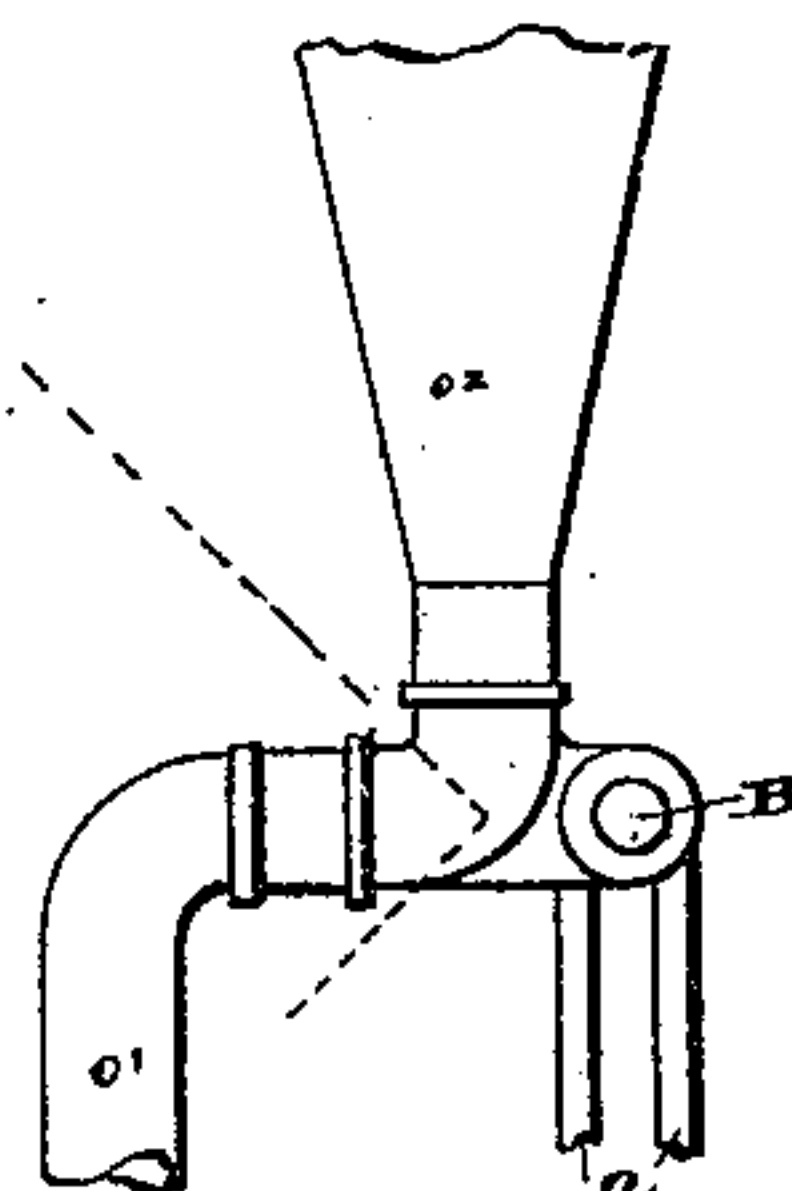
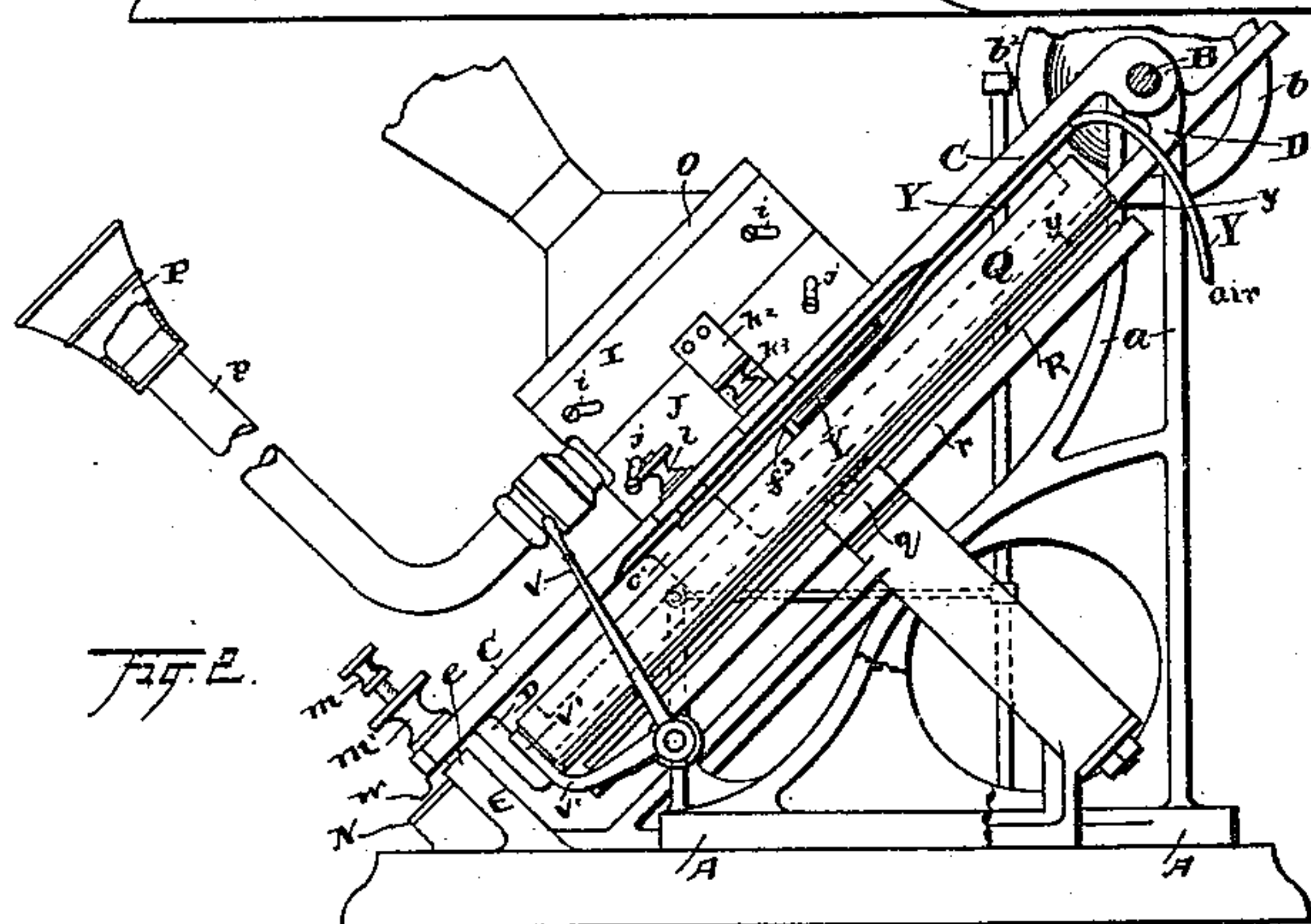
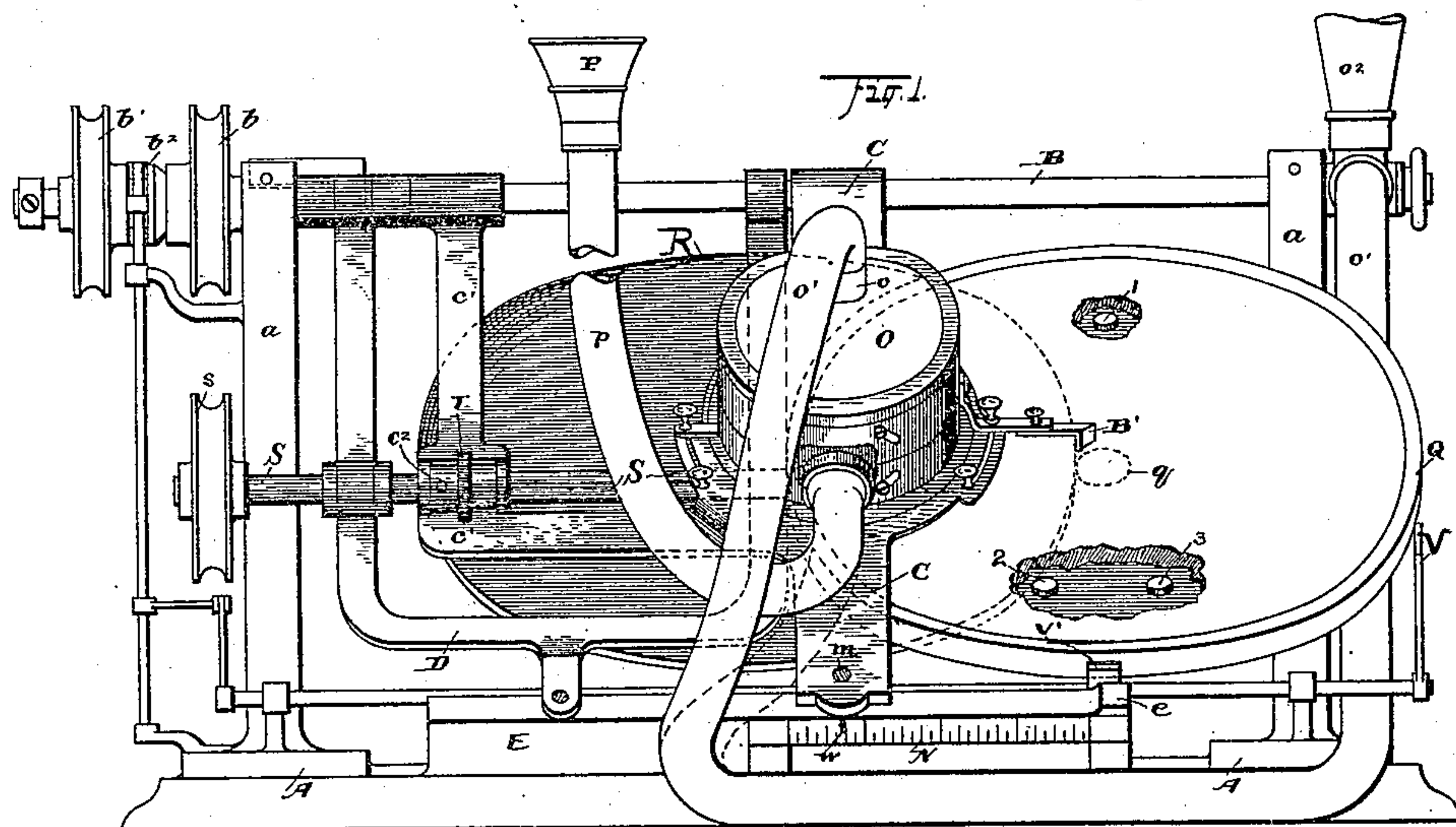
(No Model.)

2 Sheets—Sheet 1.

M. L. DEERING.
GRAPHOPHONE.

No. 428,273.

Patented May 20, 1890.



WITNESSES.

W.S. Amstutz.
William W. Salin.

INVENTOR.

M. L. Deering

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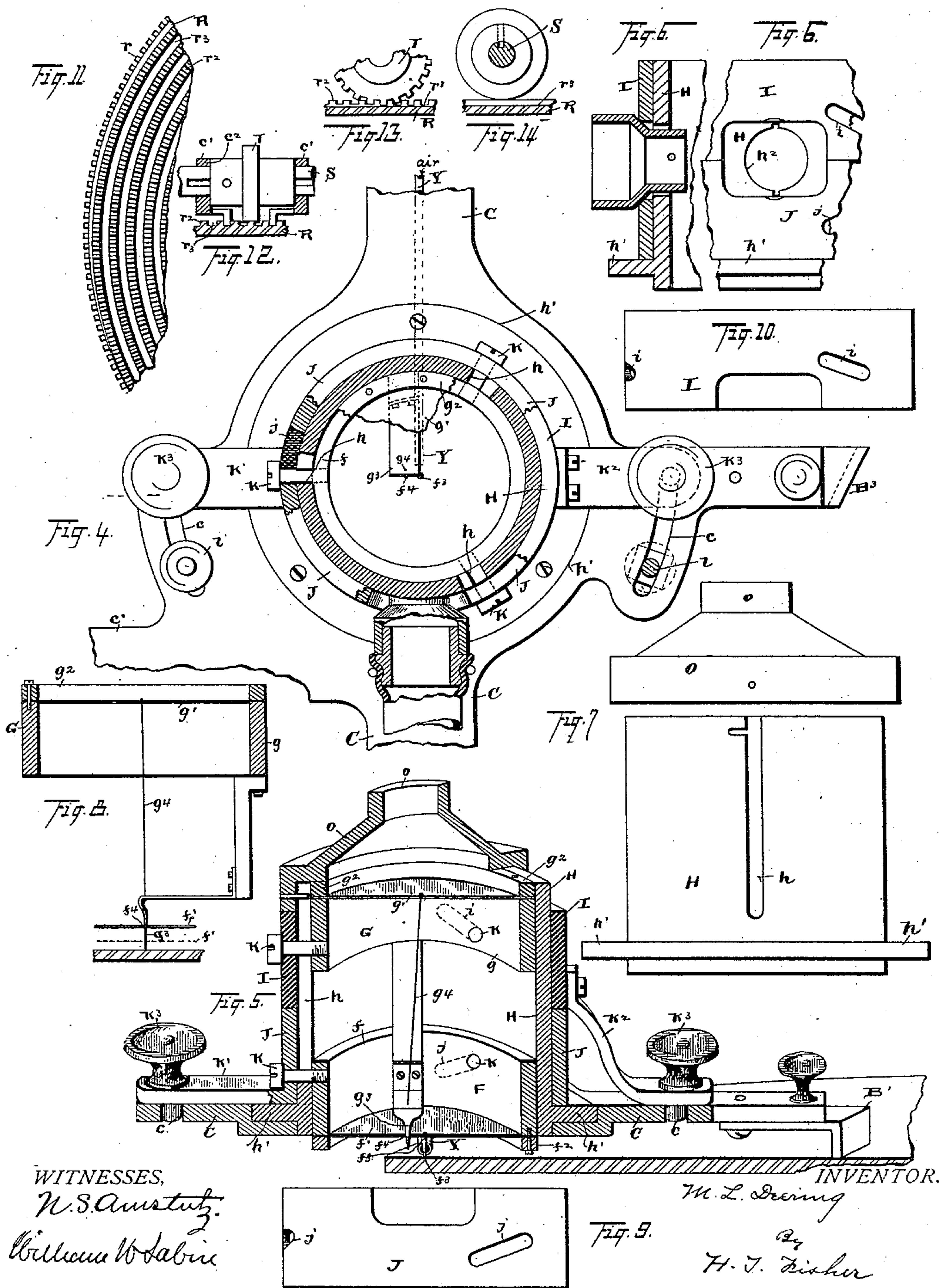
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2 Sheets—Sheet 2.

M. L. DEERING.
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WITNESSES,
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INVENTOR.
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UNITED STATES PATENT OFFICE.

MARK L. DEERING, OF CLEVELAND, OHIO.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 428,273, dated May 20, 1890.

Application filed December 20, 1888. Serial No. 294,210. (No model.)

To all whom it may concern:

Be it known that I, MARK L. DEERING, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Graphophones; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to improvements in graphophones, and has for its object to simplify the construction of graphophones, and to render them more practicable and convenient for every-day use, as well as to enhance their efficiency in the recording and reproduction of vocal and other sounds.

The invention consists in the construction of parts, as hereinafter described, and fully pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of the machine. Fig. 2 is an end view looking from the right of Fig. 1, and Fig. 3 an end view looking from the left of Fig. 1. Fig. 4 is a horizontal section of the diaphragm-supporting mechanism, taken on line *x x*, Fig. 2, and shown on an enlarged scale. Fig. 5 is a vertical section of the recording and reproducing mechanism and showing the means for adjusting the same with respect to the tablet. Fig. 6 is a sectional view showing the attachment of the speaking-tube or mouth-piece to the inner cylindrical support, upon which the recorder and the reproducer, respectively, are mounted, said cylinder being shown in elevation in Fig. 7 with its cap removed and seen above said figure. Fig. 8 is a vertical section of the reproducer, showing one form of style and the manner of connecting same and diaphragm. Figs. 9 and 10, respectively, are elevations of the rings upon the outside of the main supporting-cylinder for controlling the recording and reproducing rings upon the inside of said cylinder or tube. Fig. 11 is a face view of a section of the driving disk or wheel. Fig. 12 is a sectional elevation of the driving-pinion, showing the guide-fingers therefor arranged to travel in the spiral grooves of the drive-wheel; also showing slot in the drive-shaft to guide the pinion longitudinally

thereon. Fig. 13 is a side view of a section of the driving-pinion and of the spirally-cut drive-wheel. Fig. 14 shows a drive pinion or wheel having a frictional contact with a section of the drive-wheel, and substituting the gear shown in the other figures. Fig. 15 is a detached end view of the trumpet, shown here as connected with the main frame.

A represents a supporting or main frame, which may be of any suitable design or construction. As here shown, said frame has two end standards *a a*, upon which is fixed a rod or bar B, having one end formed into a spindle to carry the pulleys *b b'*. This rod is fixed rigidly in the standards *a a*, and forms a support for the upper end of the arm C and the yoke-shaped frame D. The yoke D is adapted to rise in vertical lines on said bar, but does not move laterally, while the arm C both pivots and slides on the rod. At their lower ends both the yoke and arm are supported on the foot-bar E.

A specially novel feature of my invention is the arrangement and combination of the recorder F and reproducer G on a single arm, one above or over the other, so that when it is desired to change the machine from one use or function to another it is not necessary to make any attachment or detachment of said parts, but all the parts necessary to the performance of either function are constantly in position and require but the slightest movement or adjustment to put the machine to work or to change or stop its operation. Hitherto in all the machines with which I am acquainted the recorder and reproducer were entirely separate and distinct parts, one or the other of which was either wholly detached from the machine or swung away from the tablet when the other was at work, so that to make a change in the operation both parts had to be handled and their positions exchanged before the conversion of the machine to either reproduce or record was effected. This objection and manifest inconvenience I wholly avoid by employing a single arm which carries both recorder and reproducer in practically stationary position, and so arranged that by a slight raising or lowering of each the necessary change in position is accomplished, and either may be set to work at will. The special mechanism by which these re-

sults are worked out in the machine here shown is as follows: A single arm C, free to turn and slide on the rod or bar B, is employed, and on this arm I attach the recorder 5 and the reproducer, one over or above the other. These consist, respectively, in rings f g , having diaphragms f' g' , secured in position by small rings f^2 g^2 , and having styles or points f^3 g^3 . In these particulars the re- 10 corder and reproducer are practically alike, and the parts interchangeable for convenience of manufacture and use.

H represents a cylinder or tube which has three vertical slots h open at the top, and a 15 lateral flange h' at the bottom, which rests in a corresponding depression in the arm C, and through which it is secured to said arm.

Upon the outside of the cylinder H are two adjusting-rings I J, one for the recorder and 20 the other for the reproducer, and each provided with three diagonal slots i j , respectively, and corresponding to the open slots h . The rings F G are held in position by screw-slots k , which pass through the aforesaid slots 25 i j h into the said rings F G. Then to adjust the said rings, and thereby raise or lower either the recorder or the reproducer, I provide each outer ring I J with a lever or handle k' k^2 , respectively, each of which has a thumb-nut k^3 work- 30 ing in a segmental slot c in the main arm C. In operation this construction will be found very easy and convenient. If a record is to be made, the upper style is carried away from the tablet by turning the ring I by its lever 35 k^2 , the said ring raising the bolts k , extending therethrough into the ring G, and causing said bolts and the ring G to move up through slots h in a corresponding degree. A corresponding movement of the lever k' in 40 the opposite direction lowers the recorder to working position, and the thumb-nuts k^3 in each case serve to fasten said levers when adjustment is made. Each movement is the work of but an instant and requires no strength 45 or effort to perform. As a further convenience, after having ascertained the exact position to which each lever k' k^2 should be moved to get the best effects, both in recording and reproducing, the style-points in each case be- 50 ing down on the tablet for this purpose, I provide adjusting set-nuts l l' in the slots c , which are fixed to serve as stops for the movement of the said levers k' k^2 . These being set in the right places, the levers can be moved 55 and the parts brought into the best working position as the exchange is made from recording to reproducing, or vice versa, without any special care by the operator or liability to get wrong. It will be observed that each of these 60 parts has its own distinct mechanism for setting and for operation, while the construction and the operation in both are similar, thus lending simplicity thereto and leaving little to be learned, and avoiding complication and 65 liability to err in the manipulation of the machine. It may be more definitely stated that both the recorder and the reproducer

move only in vertical lines governed by the slots h , while the outside rings move rotarily according to the slots therein. A further ad- 70 justment of the arm C, which affects both the recorder and the reproducer alike, is provided by a thumb-nut m , which extends through the lower extremity of said arm and bears on the foot-bar E. Raising or lowering said arm 75 by means of this nut will give more or less depth of penetration to both of the styles. A lock-nut m' secures the thumb-nut m when adjustment has been made.

It will be seen that the style f^3 of the re- 80 corder is set centrally in its diaphragm, and that by its side is a perforation f^4 , through which extends the style f^3 of the reproducing-diaphragm. I have found that this per- 85 foration can be made without in any way endangering or impairing the efficiency of the recording-diaphragm, and in that fact found a solution of the problem of setting one part above the other and reaching the tablet with 90 both styles in permanent position at about the same point upon its surface. In operation either style not in use need only be sufficiently withdrawn to avoid the surface of the tablet, and one or the other is always out 95 of working position. As here shown, the two styles are side by side laterally to the operator and have a space between them corresponding, say, to one or more spaces on the scale N, so that either may be placed exactly 100 into the position of the other and their positions exchanged by making the adjustments above described and moving the arm the required number of points to right or left. It will be seen that by reason of having both 105 parts on the same arm, in the same support, and under the same mechanical conditions throughout, the two points will unerringly find exactly the same position on the tablet and the reproducer take the track of the re- 110 corder with the utmost precision. Such precision is essential to clearness and accuracy of reproduction and is much more difficult to obtain where the recorder and reproducer are on interchangeable arms and are otherwise 115 wholly independent parts. As here shown, the reproducing-style is attached to the ring G, and has a silken or other cord g^4 , by which it is connected with its diaphragm. Any suitable construction of these parts may be 120 used.

O is a cap which covers the tube H, and has an opening o in its top, through which the reproduced sound may be taken either di- 125 rectly or by attaching a trumpet or tube o' thereto or otherwise, as may be desired.

P is a mouth-piece, through which the sound is imparted to the recorder, and is secured to the tube H by bayonet-like connection or in 130 any suitable way. The rings I J are cut away sufficiently, as seen in Fig. 7, to allow the necessary adjustment without obstruction by said piece.

Q is a disk-shaped tablet-holder mounted in a suitable bearing in the main frame of the

machine, and provided with a pinion q about its spindle on the under side. Meshing with this pinion is a drive-wheel R, having gear r on its periphery for this purpose. This wheel likewise is disk-shaped or flat on its upper surface, and is supported in a suitable bearing r' in the main frame or attached thereto. Upon the surface of this wheel is cut a spiral gear r^2 , running from periphery to the center, and between the lines of the gear is a groove or open space r^3 .

S is the drive-shaft supported in bearings on the yoke D, which yoke is free to swing vertically on the rod B, but prevented from lateral movement on said rod by any suitable means. A lateral arm c' , rigid with the arm C, has a bearing at its end on the rod B and a recess c^2 , in which is located a wheel or pinion T. This pinion has a hub through which it is sleeved on the drive-shaft S, and is so connected therewith by a spline that it will turn with the said shaft when it is turned, but at the same time is free to slide longitudinally thereon, and thus travel inward or outward on the wheel R, over the spiral gear, with which it is arranged to mesh and operate.

Power is applied by band from pulley b to pulley s , and the machine may be promptly stopped or started by means of a lever V, connecting with the clutch b^2 , which engages the pulley b . A friction-brake v' is provided for bearing on the tablet-holder at the same time that the clutch is thrown out, so that the tablet-holder will not move from momentum after the power is thrown off, but stops instantly when the change is made. The said brake v' and the lever V are connected for conjoint action, thus locking and unlocking the tablet with each movement of clutch. Obviously this is only one of many ways in which the machine could be stopped and started, and the brake might be applied to the drive-wheel or other part of the moving mechanism.

It should have been stated that the shaft S passes freely through openings in the arms c' at either side of pinion T, so that through and by means of said shaft the arms C c' and the yoke D are so connected that one cannot be raised without also raising the other. This does not, however, interfere with the free lateral sliding movement of the arm C c' and its attached parts independently of the yoke D, as is necessary when the machine is at work and when either style or point is to be changed with respect to positions on the tablet.

From the foregoing description the operation of the tablet-holder through the propelling mechanism will be clear. The speed of the tablet-holder as compared with the speed of the drive-wheel will depend on the size of pinion q . As here shown, the relative sizes are such that the tablet is given about ten revolutions to one of the drive-wheel. Of course the record on the tablet-holder will run in spiral lines, for the reason that the

style-point is fed inward toward the center gradually through the wheel T and the arm C; but these lines will be as ten to one of the spiral gear on the drive-wheel, thus making a very compact record and getting a great number of words into a small space. A more or less compact record can be made by using larger or smaller pinions q , and interchangeable pinions can be kept for this purpose.

The relative positions of the parts are easily and accurately determined. Suppose, for example, that it is desired to start a record—say half-way in—on the tablet. It is only necessary to carry arm C to the middle of scale E and place the pointer w over said middle line. This movement carries the wheel T inward toward the center of the drive-wheel to a position corresponding exactly to the position of the recording-style on the tablet. A movement bodily of the parts to any other position would have the same effect, and exact correspondence of position would be maintained between wheel T on the drive-wheel and the style-point on the tablet, and there is no movement, adjustment, or change which could make any difference in this particular.

Any suitable governor may be employed to give regularity and uniformity of speed to the actuating mechanism.

The machine as herein shown and described has a disk-shaped drive-wheel with spiral gear on its flat face. The shape or form of the said wheel is not material, provided it have spiral contact thereon which will mesh with a traveling pinion or other suitable wheel.

To deaden the sound of the machinery, I cover the backs of the drive-wheel and the tablet-holder with a coating of non-conducting material y . For this purpose paper pasted thereon with shellac serves very well, though any other suitable covering may be employed.

I do not wish to regard the invention as restricted to a disk-shaped tablet-holder, as obviously a cylindrical tablet would work as well with this machine.

In Fig. 1 I show three irregularly-set pins or studs 1 2 3 on the surface of the tablet-holder, with which three corresponding openings in the bottom of the tablet register. As all the tablet-holders and tablets will be made exactly alike in these particulars, there can be no mistakes made in placing the tablet in position, the irregular pins and holes admitting of but one position of the parts, and that position always being right.

As seen in Fig. 5, a sound-chamber is formed between the two diaphragms, the only opening to which is the circular opening h^2 for the mouth-piece P, and in Fig. 1 I show a flexible tube p , connected with the piece P. While this piece P is termed the "mouth-piece" in contradistinction to the opening o in cap O, through which only reproduced sound is received, it should be understood that I really need only a single tube p , connected with piece P and leading to the chamber between the two diaphragms, to both record and

receive sounds, and having made a record by speaking into tube *p*, I can transfer it to the ear and receive back the same message. This is a great convenience as compared with those machines which require handling of two separate and distinct apparatus, which have to be exchanged every time a change is made from recording to receiving, or the other way. Yet I find the opening in cap *O* useful for various purposes of reproduction—for example, as when the sound is to be delivered to a group of persons in a room—and have shown in Fig. 1 a tube *o* connected therewith and provided with a flaring trumpet *o*², which may be adjusted on its support at the end of rod *B* to deliver in one direction or another according to pleasure; or this tube may be attached at its inner extremity to the so-called "mouth-piece" *P*, as shown by dotted lines in Fig. 1, and used to both record and receive, as is done with tube *p*. The tube *o* would ordinarily be provided with a large flaring trumpet adapted to catch the sounds of vocal or instrumental music, or of speech by a person standing at a distance, as when delivering an address, while the trumpet on the tube *p* would be adapted more especially for use directly by the operator of the machine.

I have shown and described gear on the drive-wheel and its pinion or wheel for actuating the style-arm. Frictional or other positive contact could be employed between said wheels, and the gear thus be dispensed with; but gear-connection is deemed preferable.

Y is an air-tube connected with any suitable blower at its outer end and arranged with its inner end to deliver a steady stream of air under pressure upon the tablet about the style to blow away the scrapings produced by the style-point and to keep all the parts perfectly clean and clear. The same motor that runs the graphophone can run the blower, or they may be separately driven, according to convenience. A steady blast of air delivered about the recording-style when at work saves the trouble and annoyance of the operator blowing away the scrapings after the record is made, or, in fact, during its progress, for the reason that the style is liable to clog with accumulations in front of it unless frequent blowing is resorted to as it passes over the tablet.

On the bar *E*, I form an incline *e* for the style-arm to ride upon when the arm is carried to the extreme of its movement toward the center of the tablet, and thus lift the style out of contact with the tablet and permit all the parts to move without making a record.

B is a turn-tool, shown here as supported upon the style-arm and serving to turn down the surface of the tablet when such service is required. The special location or position of this tool is not important.

Having thus described my invention, what

I claim as new, and desire to secure by Letters Patent, is—

1. In a graphophone, a diaphragm having a style and a perforation, and a second diaphragm with a style extending through said perforation, substantially as set forth.

2. In a graphophone, a diaphragm to record sound and a diaphragm to reproduce sound, each adjustable in vertical lines on a common support, with a chamber between said diaphragms having an opening at its side, substantially as set forth.

3. In a graphophone, a recording-diaphragm and a reproducing-diaphragm, one above the other, the style of the upper diaphragm passing through the lower diaphragm, substantially as described.

4. In a graphophone, an arm carrying a recorder and a reproducer, a tablet, a wheel to move the arm across the tablet, and a drive-wheel having spiral contact with said wheel, by which said wheel is moved forward, substantially as set forth.

5. In a graphophone, a drive-wheel with a flat surface divided by spiral lines, a tablet, a style-supporting arm, and a wheel for moving said arm driven by contact with the drive-wheel, substantially as set forth.

6. In a graphophone, a tablet-holder and a drive-wheel in fixed bearings, a style-supporting arm, and a wheel to move said arm rotated and moved axially by the drive-wheel, substantially as set forth.

7. In a graphophone, a wheel with spiral gear, a shaft having a pinion or wheel free to turn and travel longitudinally on the shaft, a tablet, and an arm carrying recording and reproducing devices, substantially as set forth.

8. In a graphophone, a disk-shaped drive-wheel having a spiral gear and a spiral groove upon its face, and a wheel to move the style-arm meshing with said gear and carried forward by a guide in the groove, substantially as set forth.

9. In a graphophone, a drive-wheel having spiral gear upon its side and gear in its periphery, in combination with a wheel meshing with the spiral gear, a style-arm moved thereby, and a tablet-holder with a pinion meshing with the gear on the periphery of the drive-wheel, substantially as set forth.

10. In a graphophone, a recorder-diaphragm and a reproducer-diaphragm, one over the other, and provided with separate styles, and a single movable support for said parts, substantially as set forth.

11. In a graphophone, a recorder and a reproducer provided with diaphragms, and a movable support on which said diaphragms are held one above the other, substantially as set forth.

12. In a graphophone, separate recording and reproducing diaphragms having separate styles and a sound-chamber between them, and an opening to said chamber at the side, substantially as set forth.

13. In a graphophone, a recorder and a re-
producer located one above the other on a
common supporting-arm and having inde-
pendently-adjustable diaphragms with styles
5 attached, substantially as set forth.

14. In a graphophone, separate recording
and reproducing diaphragms, a chamber be-
tween said diaphragms having a side opening,
and a chamber above the outer diaphragm
10 having an opening, substantially as set forth.

15. In a graphophone, a supporting-arm
and separate recorders and reproducers on
said arm, one above the other, and having sep-
arate styles, a tablet, and single adjusting
15 mechanism to fix the elevation of the recorder
and reproducer with respect to the tablet to
increase or diminish the distance between
said parts, substantially as set forth.

16. In a graphophone, a diaphragm with a
20 style and a perforation at one side of the style,
in combination with a superposed diaphragm
having a style extending through said perfo-
ration, and a single arm supporting said parts,
substantially as set forth.

25 17. In a graphophone, a tablet supported in
stationary bearings, and an arm carrying two
diaphragms, one over the other, and two style-
points connected with said diaphragms, sub-
stantially as set forth.

30 18. In a graphophone, a tablet supported in
stationary bearings, and an arm carrying a
recorder and a reproducer having separate
styles, situated substantially side by side and
connected with different diaphragms, one
35 above the other, substantially as set forth.

19. In a graphophone, a drive-wheel having
a spirally-divided bearing-surface on its top,
and a wheel to actuate the style-supporting
arm working in contact with said spirally-di-

vided surface and said style-supporting arm, 40
substantially as set forth.

20. In a graphophone, a drive-shaft and a
style-supporting arm and a wheel to move said
arm on said shaft, in combination with a drive-
wheel and a tablet, substantially as set forth. 45

21. In a graphophone, a drive-wheel with a
flat surface having spiral gear cut thereon, a
wheel meshing with the drive-wheel and
moved longitudinally on its shaft by the drive-
wheel, and a style-supporting arm moved by 50
said wheel, substantially as set forth.

22. In a graphophone, a trumpet fixed ad-
justably upon the frame and a tube leading
therefrom and adapted to be connected with
the recorder and reproducer, respectively, in 55
combination with a single arm having a re-
corder and a reproducer thereon, one above
the other, substantially as set forth.

23. In a graphophone, a drive-wheel having
a flat contact-surface, a tablet-holder having 60
a wheel rigid therewith and in contact with
the periphery of the said drive-wheel, an arm
carrying a style, and a wheel to move said
arm actuated by the surface of the drive-
wheel, substantially as set forth. 65

24. In a graphophone, a drive-wheel having
a spiral contact-surface on its side to impel
the style-arm, in combination with the style-
arm, a tablet-holder, and a pinion or wheel
rigid therewith and driven by the drive-wheel, 70
substantially as set forth.

In testimony whereof I hereunto set my
hand this 18th day of December, 1888.

MARK L. DEERING.

Witnesses:

H. T. FISHER,
I. L. COREY.