

(No Model.)

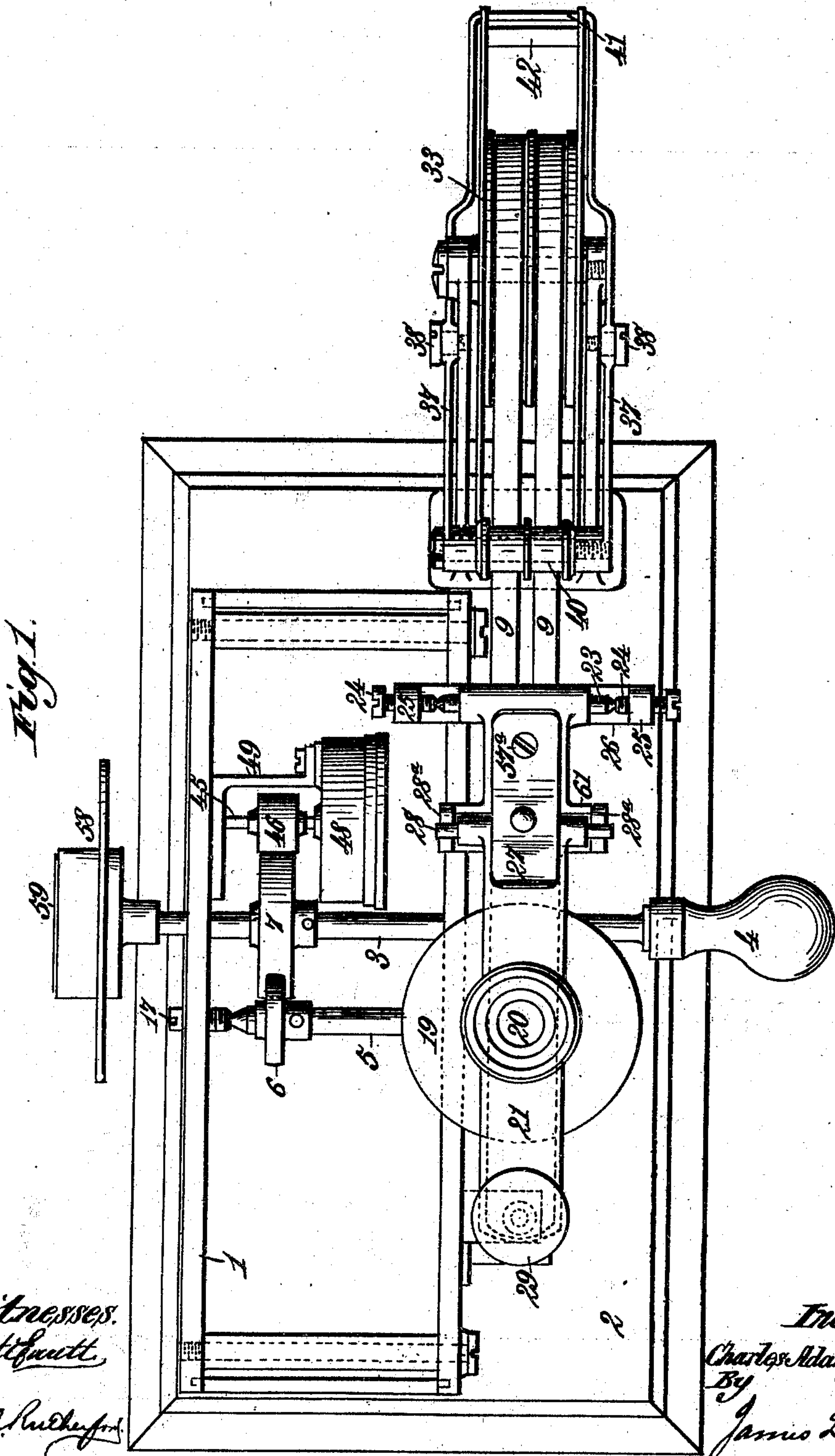
4 Sheets—Sheet 1.

C. A. RANDALL.

APPARATUS FOR RECORDING AND REPRODUCING SPEECH, &c.

No. 502,382.

Patented Aug. 1, 1893.



Witnesses.
Robert Smith.

J. A. Ruckelshaus.

Inventor.
Charles Adams Randall.
By
James L. Norris,
Atty.

(No Model.)

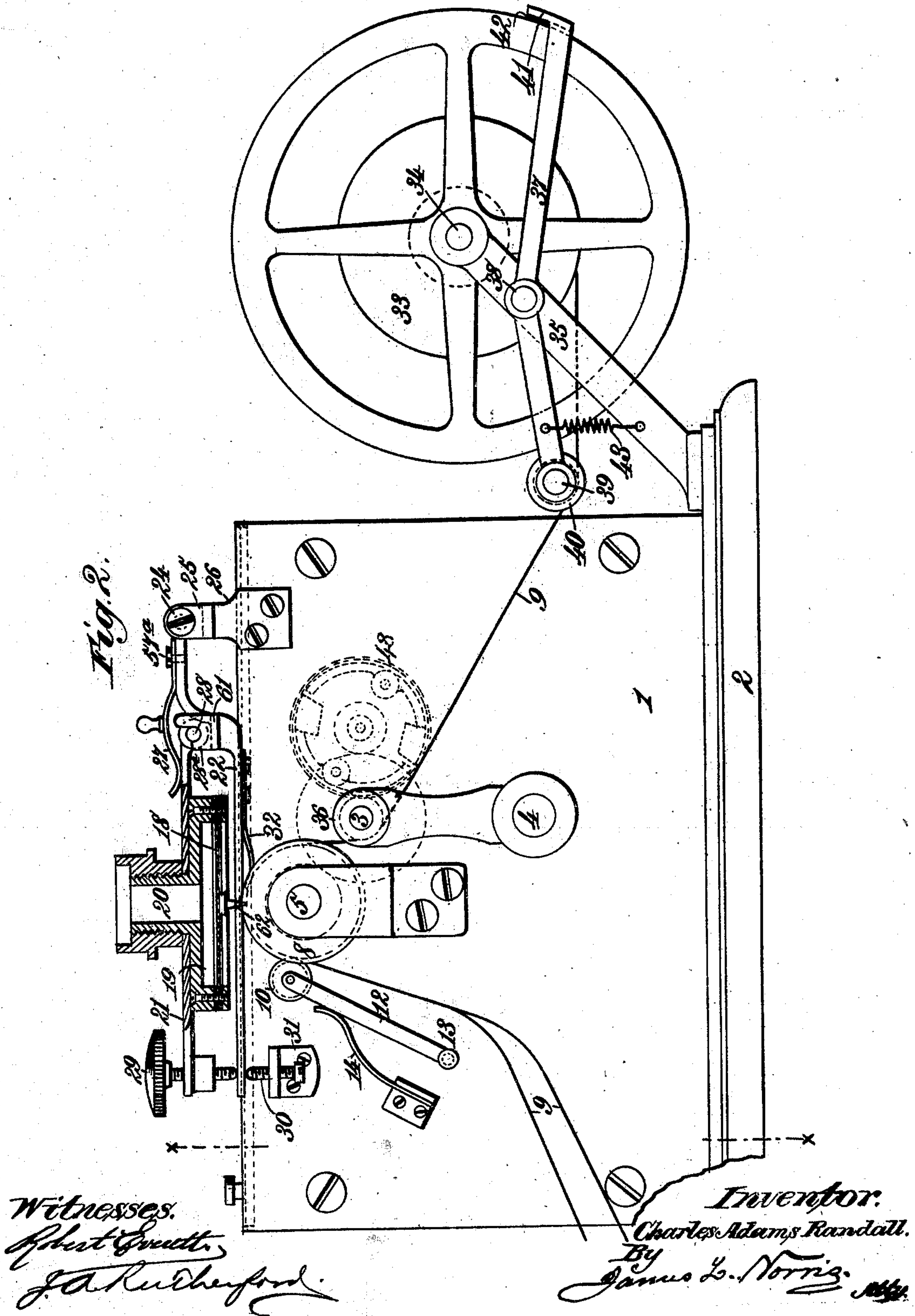
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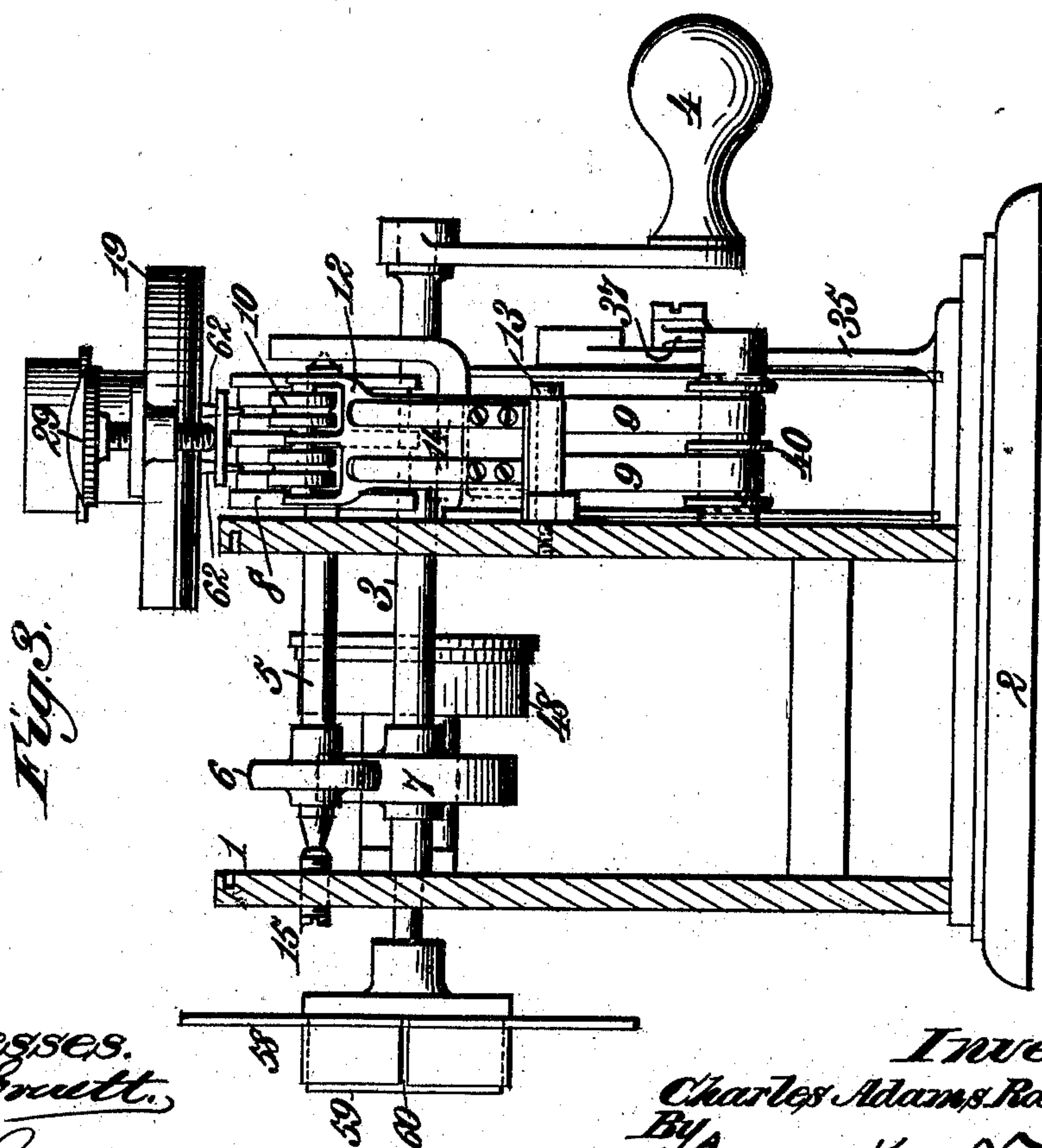
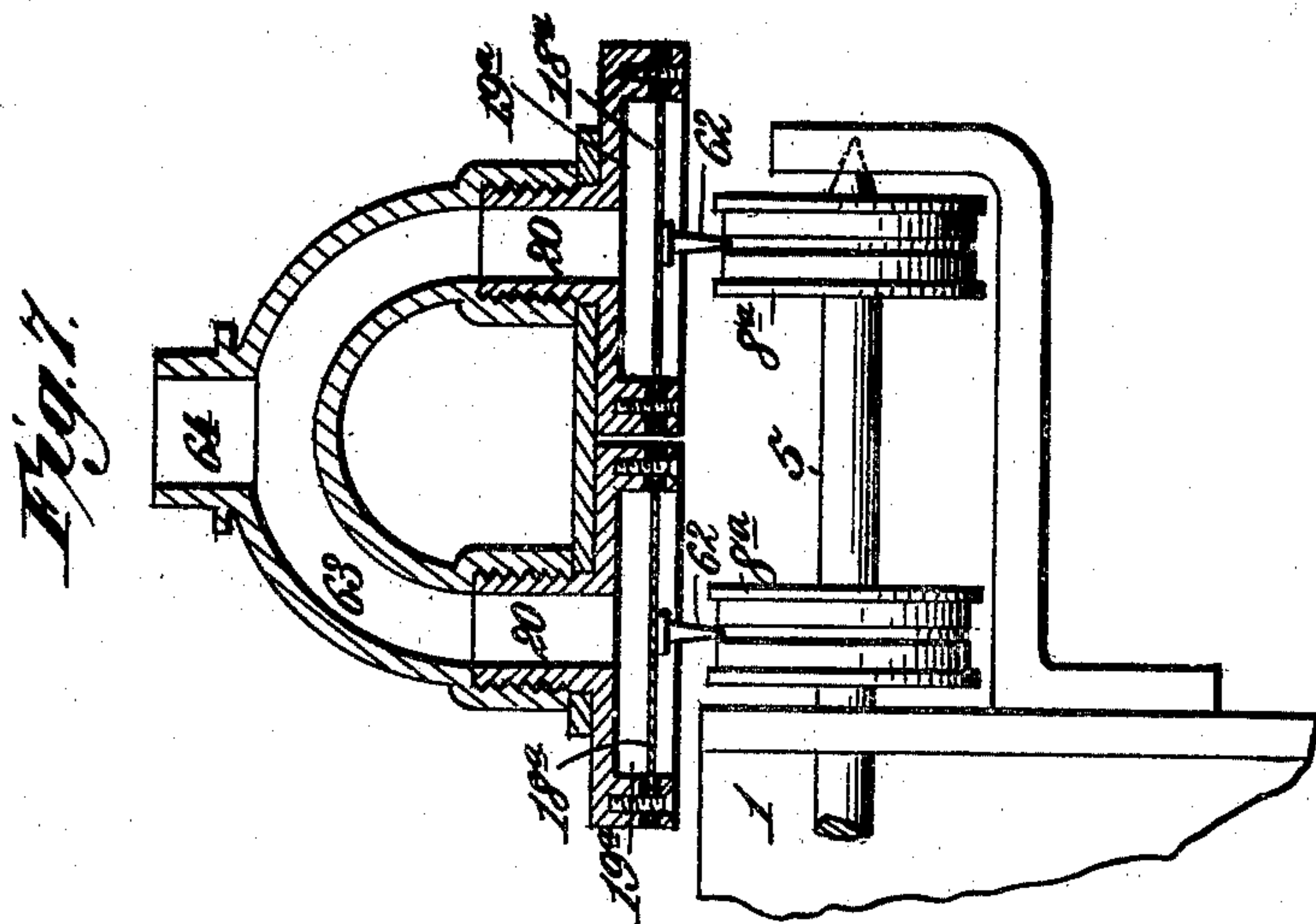
4 Sheets—Sheet 3.

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No. 502,382.

Patented Aug. 1, 1893.



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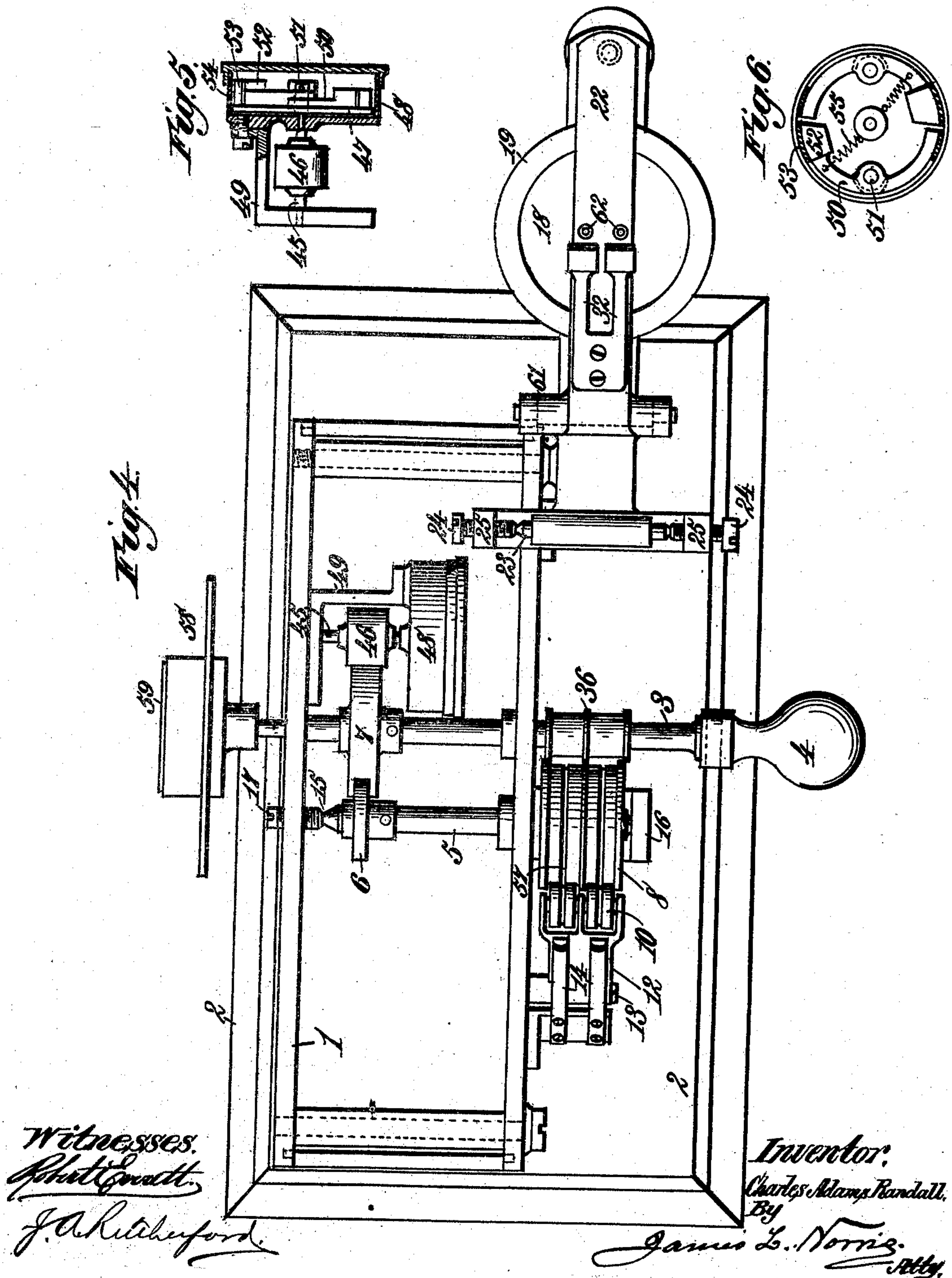
By James L. Norris.

Atty.

(No Model.)

4 Sheets—Sheet 4.

C. A. RANDALL.
APPARATUS FOR RECORDING AND REPRODUCING SPEECH, &c.
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UNITED STATES PATENT OFFICE.

CHARLES ADAMS RANDALL, OF LONDON, ENGLAND.

APPARATUS FOR RECORDING AND REPRODUCING SPEECH, &c.

SPECIFICATION forming part of Letters Patent No. 502,382, dated August 1, 1893.

Application filed June 11, 1892. Serial No. 436,369. (No model.) Patented in England June 18, 1891, No. 10,357.

To all whom it may concern:

Be it known that I, CHARLES ADAMS RANDALL, a citizen of the United States, residing at London, England, have invented new and useful Improvements in Apparatus for Recording and Reproducing Articulate Speech and other Sounds, (for which I have obtained a patent in Great Britain, No. 10,357, dated June 18, 1891,) of which the following is a specification.

My invention relates to apparatus for recording and reproducing articulate speech, said apparatus being known, broadly, as the phonograph, graphophone, &c.

It is the purpose of my said invention to provide an apparatus of this character which shall be convenient, efficient, and simple, in the construction and operation and by which a plurality of records may be obtained simultaneously, and certainly.

It is an especial object of my said invention to provide for the easy, simple, and economical production of a plurality of records from the same series of phonetic vibrations, one or more of said records being preserved, or retained, while the other passes into the hands of third persons, as is customary, in the methods heretofore in use, in the preparation of business letters and papers, of which press, or carbon copies are formed for retention.

My invention also contemplates and includes the provision of automatic brake-mechanism acting upon the devices by which the record-receiving material is held, in order to prevent it from being paid off too rapidly, and to maintain a practically uniform tension.

It is my purpose, also, to simplify and improve the construction of parts, the organization thereof and the operation of the completed mechanism, and the said invention consists, to these ends, in the novel features of construction and in the new combinations of parts hereinafter fully set forth and then more particularly pointed out and defined in the claims appended to this specification.

To enable others skilled in the art to which my invention pertains to understand and to make, construct, and use the same, I will now proceed to describe said invention fully and

in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of a mechanism embodying my invention. Fig. 2 is a side elevation, partly in vertical section, the section plane being in the line $x-x$, in Fig. 1. Fig. 3 is a transverse vertical section upon the line $y-y$, Fig. 2. Fig. 4 is a plan view of that portion of the mechanism exposed to view by removing the top, or cover, of the housing, or casing, and turning back the diaphragm and its supporting-arm. Fig. 5 is a detail section of the speed-governor. Fig. 6 is a front elevation of the parts shown in Fig. 5, the face plate, or front of the casing, or housing, being removed. Fig. 7 is a sectional elevation showing a modified construction.

In the said drawings, the reference numeral 1 indicates the box, casing, or housing, inclosing the greater part of the operative elements of the mechanism, the housing being arranged upon any suitable base 2.

The reference numeral 3 indicates the driving-shaft of the apparatus, which is placed in suitable bearings and crosses the housing transversely to the length of the latter. In the present instance, the shaft is provided with a crank-handle 4, for manual rotation, but I do not confine myself to the use of any specific means for driving the same, as I may employ any mechanical or electrical mechanism suitable for the purpose. In bearings in said housing, near the driving-shaft 3, is a second shaft 5, parallel with the shaft 3, and having mounted thereon a feed-drum 6. Upon the driving-shaft 3, is fixed a friction-wheel, or pulley, 7, which has frictional engagement with the feed-drum 6. The frictionally engaged peripheries of the two parts last named may be, and preferably are, provided with a surfacing of india-rubber, leather, or other suitable material. Upon said shaft 5 is also rigidly mounted a drum, or roll 8, serving as a support for the strips, ribbons, or bands, 9, upon which the phonetic record is made, these strips being held between the drum 8 and independent rolls 10, which are journaled in the forked extremity of an arm 12, pivoted upon a stud 13, and held against the face of the drum by means of springs 14. The drum, or roll 8, has its shaft 5 supported

in suitable bearings, preferably of the type known as cone-bearings 15 one of which rests in a seat in a fixed bracket 16, the other extremity of said shaft being held by a set-screw 17, tapped through one wall of the casing, or housing 1. Over this drum, thus supported, is arranged the diaphragm 18, supported in any preferred and familiar manner in a diaphragm-housing, or chamber, 19, which is provided with a central tube 20, opening into said chamber just behind, or above, the central portion of the diaphragm. This tube passes through an opening in an arm, or bar, by which the diaphragm and its chamber are supported. This supporting arm or bar 21 is pivotally connected at one end to a separate arm 22, which is itself, pivotally mounted upon a shaft 23, having cone-shaped extremities which lie in seats formed in the ends of set-screws 24, tapped through lugs 25 which rise from the ends of a bracket-support 26, screwed to the housing. Upon the second arm 22, is mounted a spring 27, which extends beyond the point of pivotal connection 28, between the two arms, the free end of said spring resting upon the arm 21 and pressing the same downward, the free end of said arm, or bar, being supplied with an adjusting and sustaining set-screw 29, which is tapped through a boss on the arm. The point of this screw rests upon the arm 22, which, after dropping somewhat below the point of pivotal connection 28, is extended beneath, and in substantial parallelism with the diaphragm, to a point on the other side thereof, where its end lies beneath the point of the screw 29, (Fig. 2.)

Below the end of the bar 22, and substantially in line with the set-screw 29, is a second set-screw 30, tapped through a bracket 31 and presenting an upwardly turned, conical point, which engages the lower surface of the arm 22. These two set-screws act in unison in the support given to the arms, or bars 21 and 22, and by their reciprocal adjustment the diaphragm may be placed in any required relation to the surface of the drum 8. The bar 22 passes between the latter and the diaphragm, and out of contact with either. One function of said bar is to sustain leaf-springs 32, fastened by one end to the lower surface of the bar, and having their free ends resting upon the record-receiving material as the latter is fed by the drum. These spring-pads have comparatively light tension and by their action give stability and steadiness to the material they act upon.

The record-receiving material is formed, preferably, in the form of tapes, ribbons, or strips, and is wound upon reels, or spools 33, which are mounted upon a shaft 34, the journals of which lie in bearings in inclined brackets 35, mounted upon the base-piece 2. The tapes, strips, or ribbons, are taken from said spools and carried around a guide-roll 36, upon the driving shaft 3. From this roll they pass to the drum 8, and are carried over the top of

the latter and between its face and the two frictional feed-rolls 10.

To avoid too rapid pay-off, or unwinding, from the spools, or reels, 33, I provide a brake-lever 37, which is mounted upon a pivot 38 on the brackets, or arms, 35. The lever 37 consists, essentially, of a frame, the parallel arms of which lie close to the outer faces of the brackets 35, the ends which lie next the base-piece 2, being connected by a spindle, or shaft, 39, upon which is mounted a guide-roll 40, beneath which the record-receiving tapes, ribbons, or strips, are conducted in passing to the guide-roll 36. At their opposite ends, the lever-arms 37 are connected by a friction-plate 41, which lies close to, and in comparatively light frictional contact with, the periphery of the spool which carries and pays off the record-receiving material. The friction-surface of the plate 41 is preferably composed of a material 42, of any suitable kind, its choice being controlled, in a measure, by the particular effect desired; such, for example, as the production of a maximum resistance with the minimum of power expended on the lever, &c., the selection of such material being a matter which can be left to the judgment of those skilled in the art.

The brake-lever is actuated by a spring, or springs, 43, connected thereto and to the shaft-supporting brackets 35. The stress, or tension of this spring is quite light and it acts on the lever with a downward pull, or draft, thereby having a tendency to carry the guide-roll 40 downward. When the tension of the record-receiving strips, bands, or ribbons 9 is normal, which will be the case so long as the speed of revolution of the spools 33 is not excessive, the slight pull, or tension, under which the said strips are maintained, will have sufficient action upon the guide-roll 40 to overcome the stress of the spring 43, and the friction-plate 41 will, by the slight turn thus given to the lever, be drawn away from the periphery of the spool. Should the tension, or draft, exerted upon the ribbons, or strips 9, be relaxed, however, by the too rapid pay-off of the spools, the spring 43 will act and the lever 37 will be slightly turned upon its fulcrum, bringing the friction-plate down on the spool and checking, or retarding its movement, until the proper equilibrium is restored.

Upon a shaft 45, mounted in suitable bearings in the casing, or housing, 1, is fixed a pulley 46 to revolve the shaft and operate a speed-governor. The latter consists of a disk 47, revolving in a cylindrical shell, or housing 48, which is rigid upon a supporting bracket 49, and forms a support for one end of the shaft 45. Upon the flat face of the disk 47 are pivotally mounted curved lever-arms 50, extending upon opposite sides of their pivotal attachments 51, and provided with weights 52, which are, in each lever, attached to one arm thereof. It will readily be seen that, by the rotation of the disk 47, the weights 52 will

be thrown outward by centrifugal force, and as they are provided upon their faces with pads 53, of leather, or other suitable material, these will be pressed against the flanges 54 of the casing with a frictional contact proportioned to the centrifugal force exerted. The weights 52 simply increase the effects produced, and may, or may not be used.

In some instances it may be desirable to exert some force upon the frictional pads 53, or on the arms carrying them, to draw said pads away from the flange 54. This may be accomplished in different ways, but one simple method is to connect the ends of the curved arms 50 by means of light springs 55, which may be made adjustable to vary the force exerted. I have indicated this elastic connection, in Fig. 6, by means of dotted lines, but I do not, in any particular, restrict my invention to the use thereof, or to any specific feature of the same.

The automatic speed governor is operated by the frictional engagement of the pulley 46 with a larger friction-gear 7 upon the driving-shaft. As this speed-governor is a separate invention, relatively to the subject-matter of this application, I make no claim thereto, herein, my rights, in this respect, being relegated to a future and separate application for Letters-Patent.

I find it, in practice, advantageous to form circumferential channels 57 in the drum 8, one of said channels being provided for each strip of record-receiving material. Channels or grooves of the same kind are also formed in the spring-pressed rolls 10, as shown in Figs. 2, 3 and 4, said channels, as well as those in the drum 8, being in the vertical plane of the recording-styles, whereby the lines of record are not subjected to surface-contact, or pressure. In the absence of such channels, I preferably cover the drum with a composition of soft rubber and other suitable materials, so that the strip will be supported during the process of recording. Many compounds and some materials are well known to those skilled in the art, which will answer the purpose proposed, without offering any material resistance to the action of the recording stylus. The strips, or ribbons 9, after receiving the record, may be wound spirally, either for transmission by mail, or otherwise, or for filing as retained copies. To facilitate this winding, I provide a flanged reel 58, which may be mounted upon a reel-holder 59, mounted on the prolonged extremity of the driving-shaft, outside the housing 1. This reel-holder consists of a simple cylindrical body, upon which the reel 58 is slipped, a dividing cut 60 being formed therein, to enable it to expand somewhat and grasp the reel-holder, as seen in Fig. 3.

As it may, in some cases, be desirable to provide interchangeable diaphragms, I mount the pivotal connection 28, by which the two supporting-arms 21 and 22 are united, in open seats, or bearings, 28^a, of V-shape. These

seats are formed in upwardly turned lugs 61, upon the end of the supporting arm 22, and the pivotal bearing is held in said seats by the leaf-spring 27. The arm 21, together with the diaphragm, its housing, or chamber, and the other adjuncts of said arm, may be readily and instantaneously detached by simply turning the spring 27 upon its pivotal attachment 57^a. This will enable the operator to substitute for the diaphragm and stylus used in recording, a different and more sensitive diaphragm, for purposes of reproduction. In many instances, also, the form of stylus used in reproducing is somewhat modified, as compared with the recording-stylus, as many persons consider the use of a special form of reproducing stylus to be advantageous. In such cases, the required form may be substituted for the recorder quickly and accurately, by the construction I have set forth.

I have shown in the drawings a single diaphragm 18, having two styles 62, of any suitable form. I propose, however, to use, in some instances, two independent diaphragms 18^a, (Fig. 7,) each having its own, independent housing, or chamber 19^a. These parts are mounted upon the supporting arm 21, in the same, or in substantially the same manner as the single diaphragm, the chief difference being that the said supporting-arm is of greater width, in order to accommodate two diaphragms instead of one. The tubes 20 are united by a curved, or yoke-shaped tube 63, with a single sound-conveying tube 64, for attaching the concentrator, not shown in the drawings, these being of the ordinary form. In this or similar forms of construction I use the same diaphragms or vibrators and their respective styles or points both for recording and for reproducing, and they may be used simultaneously for recording in duplicate, or for reproducing from the same or different records at the same time, or one only for recording and simultaneously therewith one for reproducing from the record as it is being made or from a separate record, or in various other ways.

The record-receiving material may consist of waxed paper, tin-foil, or other material suitable for the purpose, but I prefer to employ paper, silk, or some similar material for the base, and coat the same with wax, with or without one or more longitudinal grooves, or crimps, formed therein and faced with highly burnished tin-foil. This strip of metal, when combined with waxed paper or other fibrous material, is very useful for the purposes mentioned, the tin-foil at the parts above the said groove, or crimp, being very easily indented by the recording stylus, while the paper, or other base, serves to support and strengthen the tin-foil, and thus diminish the liability of folding, or breaking, the same. The groove, or crimp, one or more, may, if preferred, be formed in the coating of wax, on the strip of paper, or other material, or the base may be

smooth and without any groove, or crimp, whatever.

It is evident that the record-receiving strip may, if necessary, be used singly, upon the mechanism described, or it may be used in duplicate, two or even more of such strips being employed.

What I claim as my invention is—

1. In an apparatus for recording and reproducing articulate speech and other sounds, the combination with a plurality of recording styles, of a corresponding number of independent, flexible strips, ribbons, or bands, of record-receiving material, a pulley supporting the said material and having a plurality of grooves or channels lying in the planes of the recording styles, means for rotating said pulley to feed the strips simultaneously to the recording styles, and spring-pressed rolls holding the said strips, or ribbons upon said supporting pulley, said rolls being provided with peripheral grooves, or channels, lying in the plane of the recording styles, whereby said strips are free from surface-contact, or pressure, along the lines of record, substantially as described.

2. In an apparatus for recording and reproducing articulate speech and other sounds, the combination with a plurality of independent recording styles of a single diaphragm operating the same means for supporting and simultaneously feeding a plurality of record-receiving strips, or ribbons, a pulley having a plurality of grooves or channels lying in the vertical planes of said styles to support the strips and give feed-movement thereto, and spring-pressed rolls bearing upon said strips after they have passed beneath the styles said rolls being provided with channels or grooves lying in the vertical planes of the styles, whereby the lines of record are free from surface-contact, or pressure, substantially as described.

3. In an apparatus for recording and reproducing articulate speech and other sounds, the combination with one or more rotating drums, supporting a plurality of strips, bands, or ribbons each adapted to receive a record, simultaneously, of a plurality of recording styles, a pay-off roll, from which said strips, bands, or ribbons, are taken, a lever fulcrumed between its ends and bearing upon one extremity a guide-roll, or rolls, pressed by the paid-off strips in one direction and by a spring in the other direction, and provided at its other extremity with a friction-plate lying near the periphery of the reel, with which it is engaged by the action of the spring, when the tension of the record-receiving strips is relaxed, substantially as described.

4. In an apparatus for recording and repro-

ducing articulate speech and other sounds, the combination with the recording devices of means for supporting and feeding the record-receiving material, a spool from which said material is paid off, an automatic friction-brake, consisting of a spring-engaged lever having a friction-plate on one end and a guide-roll on the other end, engaged by the paid-off strip or strips of material, and an automatic speed-governor on a driving-shaft, consisting of a disk, rigid on said shaft, lever-arms fulcrumed thereon, and a fixed flange against which friction-pads on said arms are projected with a bearing proportioned to the centrifugal force developed, substantially as described.

5. In an apparatus for recording and reproducing articulate speech and other sounds, the combination with means for supporting and feeding the record-receiving material, of a diaphragm having a chamber, and having a removable and interchangeable supporting-arm, having a pivotal connection, and a permanently pivoted arm having seats for said connection, substantially as described.

6. In an apparatus for recording and reproducing articulate speech and other sounds, the combination with means for supporting and feeding the record-receiving material, of an interchangeable supporting arm carrying the diaphragm and style, and an arm supporting the interchangeable arm, the latter of said arms having pivotal hinged connection with the frame of the machine, and the former of said arms being pivotally connected with or hinged to the latter arm, substantially as described.

7. In an apparatus for recording and reproducing articulate speech and other sounds the combination of one or more rotating drums or rollers, over which the material in ribbon-form is fed by the aid of friction-rollers, means for holding and guiding the material, and means for recording the sounds thereon or reproducing the sounds therefrom in duplicate or otherwise, substantially as described.

8. In an apparatus for recording and reproducing articulate speech and other sounds, a rotating support over which the material is frictionally carried, provided with a circumferential groove or channel substantially as shown.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES ADAMS RANDALL.

Witnesses:

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