

(No Model.)

4 Sheets—Sheet 1.

C. S. TAINTER.
GRAPHOPHONE.

No. 385,886.

Patented July 10, 1888.

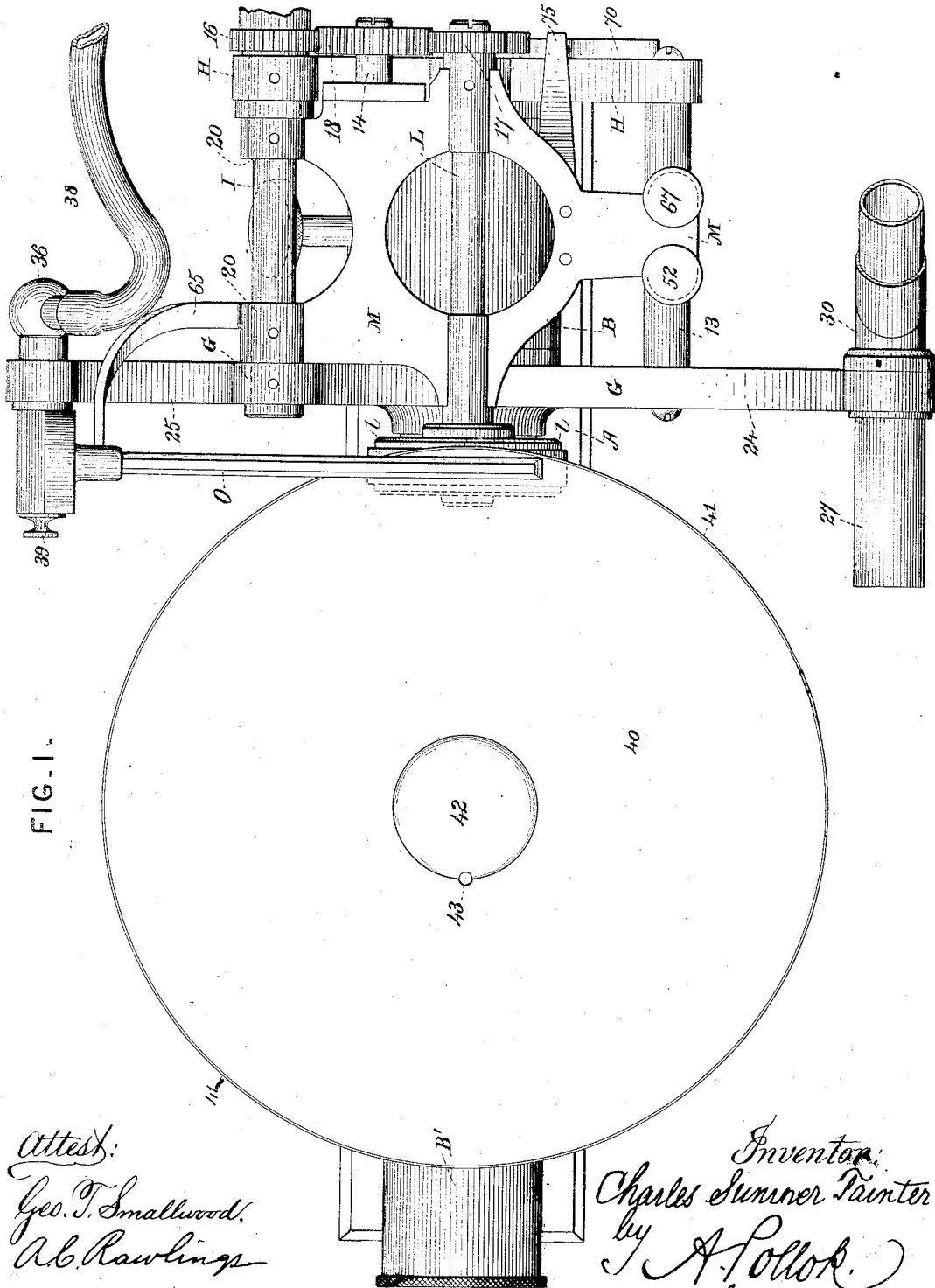


FIG. 1.

Attest:
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A. B. Rawlings

Inventor:
Charles Sumner Tainter
by A. Pollok,
his attorney.

(No Model.)

4 Sheets—Sheet 2.

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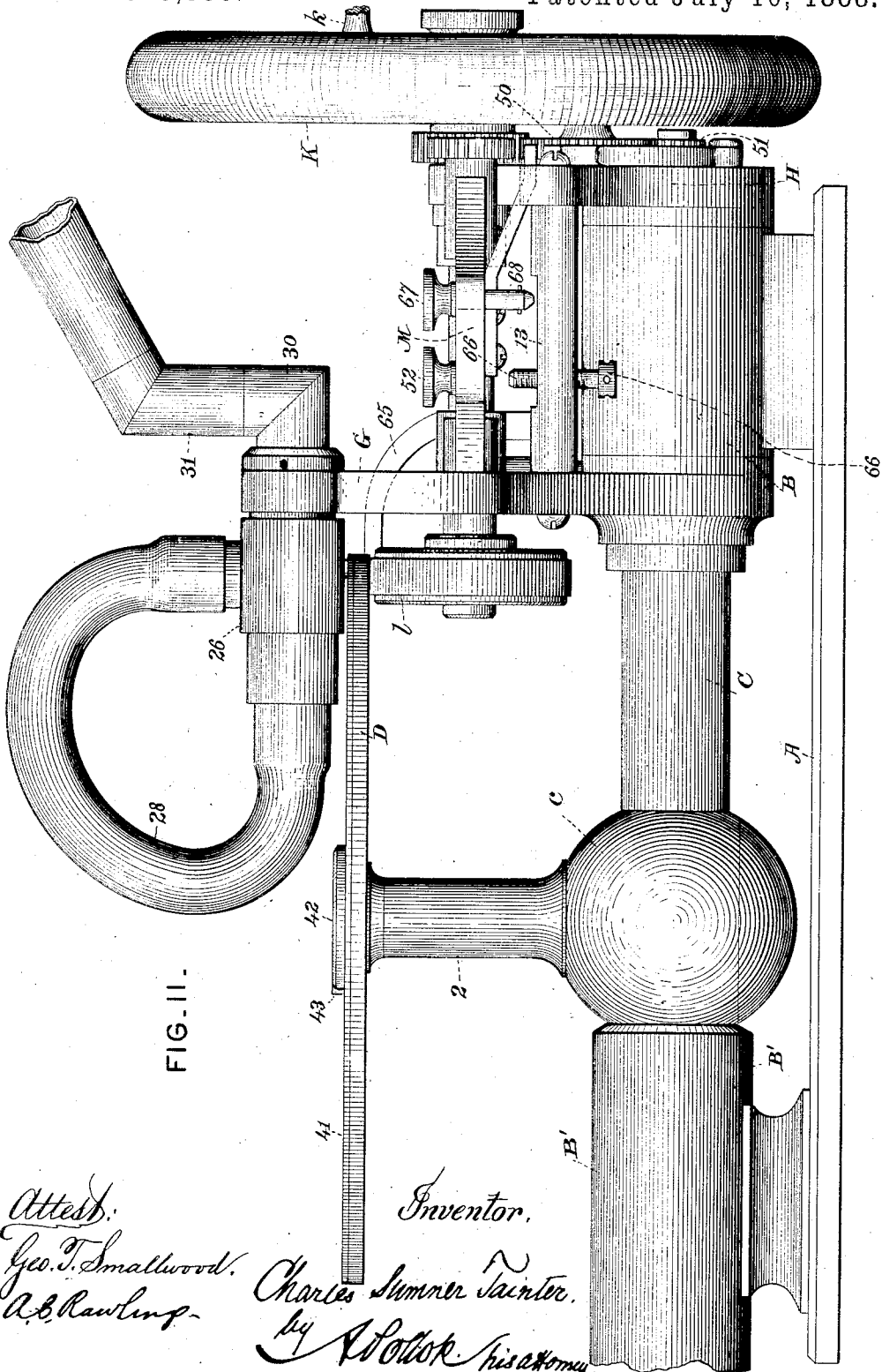


FIG. II.

Attest:
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A. B. Rawling.

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by A. S. Wood, his attorney.

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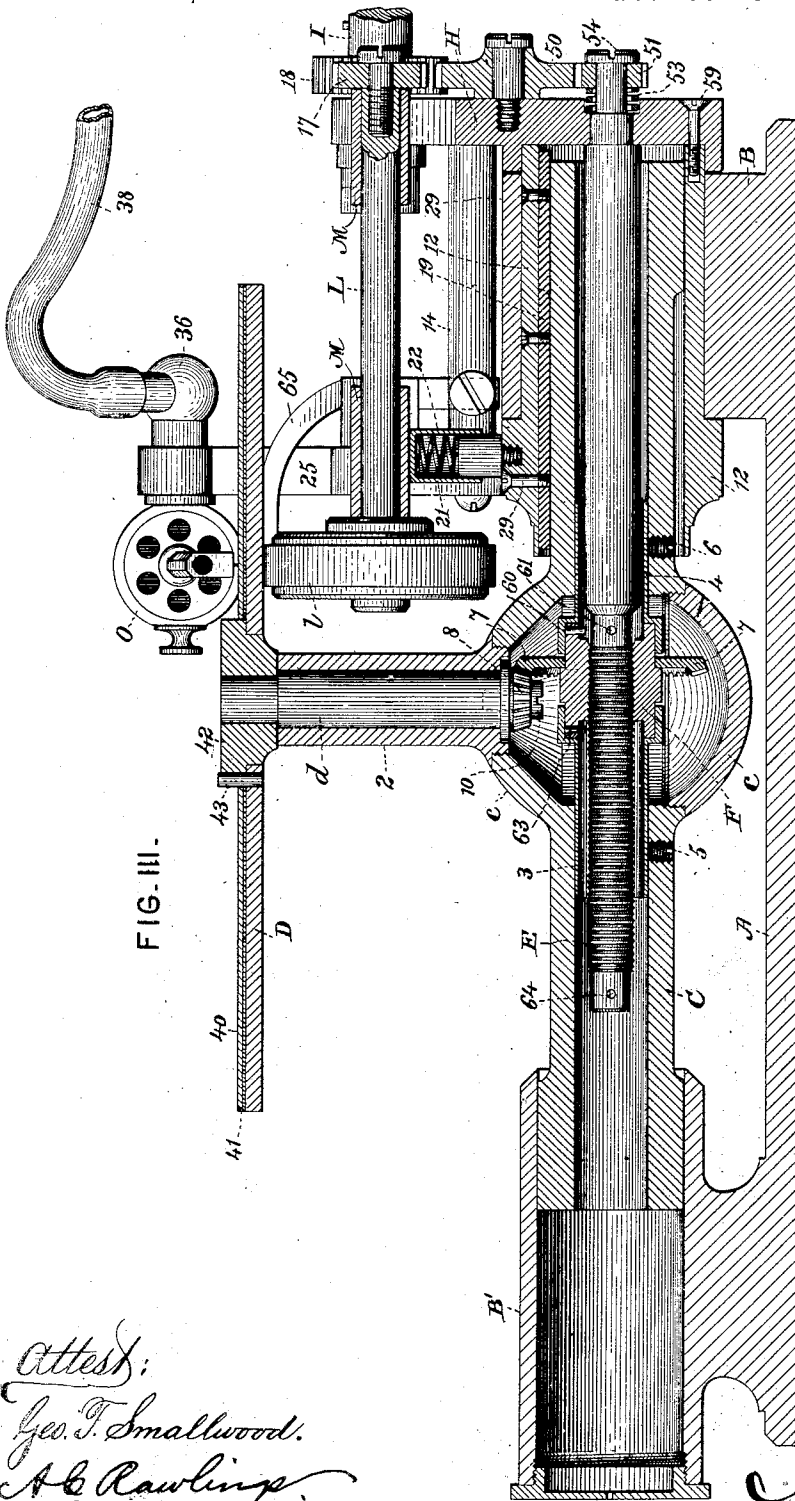


FIG. III.

Attest:
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Inventor:
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 by
 J. T. Lollar
 his Attorney

C. S. TAINTER.

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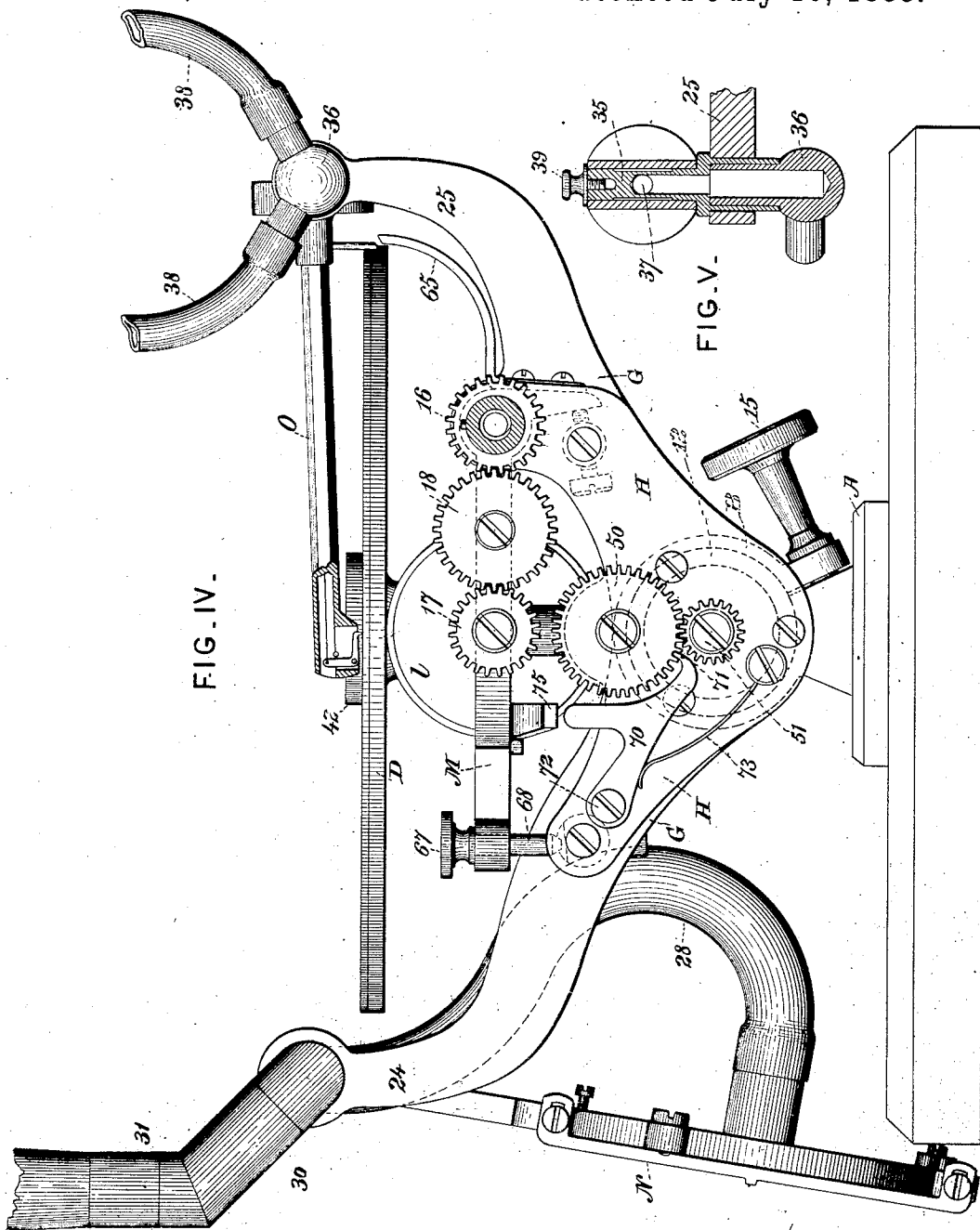


FIG. IV.

FIG. V.

Attest:
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Inventor:
 Charles Sumner Tainter.
 by A. H. H. [Signature]
 his attorney

UNITED STATES PATENT OFFICE.

CHARLES SUMNER TAINTER, OF WASHINGTON, DISTRICT OF COLUMBIA.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 385,886, dated July 10, 1888.

Application filed December 24, 1887. Serial No. 258,874. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SUMNER TAINTER, of Washington, in the District of Columbia, have invented a new and useful Improvement in Graphophones, which improvement is fully set forth in the following specification.

This invention relates to apparatus for recording and reproducing speech, known as "graphophones," and has more particular reference to that class or type of graphophones in which the sound-record is made on a flat tablet. Such an apparatus is described in Letters Patent No. 341,214, granted May 4, 1886, to Chichester A. Bell and myself.

The invention has for its object, generally, to improve the construction of machines of this type and render them better available for practical use than they are in the forms known at present.

The tablet is preferably a thin layer of wax or a wax-like composition on a base of sheet metal or other suitable material. It rests on a disk-shaped tablet-holder supported on a vertical shaft, said tablet-holder being driven by a friction-wheel making contact with its under surface. The tablet-holder and its shaft are so supported and connected with the driving mechanism that they are advanced slowly as the tablet rotates. The recorder therefore traces a spiral line upon the tablet. On a tablet of wax the lines of the spiral can be made very close together—say one one hundred and fiftieth ($\frac{1}{500}$) part of an inch or less apart. The longitudinal movement of the tablet and its holder is effected by means of a feed-screw and nut, as will be hereinafter fully described. The recorder and reproducer are pivoted, respectively, on opposite sides of the tablet, so that when not in use either instrument can simply be turned on its pivot out of the way. This arrangement adds to the convenience in use of the machine, as it obviates the necessity of removing the recorder and substituting the reproducer, or vice versa.

When in operation, the point of the recording-style rests just above the friction-wheel that rotates the tablet, and the position of the reproducer on the opposite side of the tablet is such that when lowered into position its

style will rest upon the same point on the surface of the tablet. As the longitudinal travel of the tablet holder is very slow, it would require considerable time to set it back to the starting point if the mere reversal of the main shaft were relied on for that operation. Consequently means have been provided whereby a rapid return of the tablet can be effected. To this end the arbor of the friction driving-wheel is supported in bearings on a frame swiveled on the main shaft and upheld by spring-pressure. By depressing this frame the friction-wheel is removed from contact with the tablet-holder, and at the same time the main shaft is thrown into gear with the feed screw (which in operation is stationary, the nut traveling with the tablet-holder) and imparts to said screw a rapid rotation, whereby the feed-nut, and with it the tablet-holder, is quickly moved back to the starting-point. Means are also provided whereby, when the starting-point is reached, the screw is automatically arrested, though the main shaft may continue to rotate; and by similar means the nut is arrested at the farther limit of its travel, which is of course determined by the diameter of the tablet designed to be used. A partial depression of the swiveled frame disconnects the friction-wheel and tablet-holder, arresting the latter without setting the reversing mechanism into operation. An arm carried by said swiveled frame lifts the reproducer from the tablet (should that instrument be in its operative position) when said frame is completely depressed.

The frame supporting all the operative parts of the apparatus is swiveled in bearings of the base or bed plate, so that it can be tilted to a greater or less angle with the horizontal, when its use may be thereby facilitated, and for the same purpose of adding to the convenience of the user the mouth-piece is connected with the recorder through a universal joint, so that said mouth-piece can be turned in any direction.

The invention comprises the new improvements above indicated as well as certain special features of construction and combinations and arrangement of parts, as hereinafter fully described.

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In the accompanying drawings, which form a part of this specification, Figure I is a plan view of a machine constructed in accordance with the invention; Fig. II, a front elevation thereof; Fig. III, a vertical longitudinal section; Fig. IV, a side elevation with the fly-wheel removed, and Fig. V a partial vertical section through the support of the reproducer.

A is the base or bed plate, and B B' are tubular ways thereof in which the ends of the slide C are supported. Said slide has a bulb, c, intermediate between its ends, in the top of which is screwed the hollow standard 2, in which turns the shaft d of the tablet-holder D. The latter is in the form of a flat disk. Inside the tubular slide C is the feed-screw E, which in the operation of recording and reproducing is stationary. The feed-nut F, which engages said screw, is inclosed in the bulb c. It turns in bearings formed by the sleeves 3 4, which are connected to the slide C by screws 5 6. Feed-nut F carries a beveled gear, 7, which engages a beveled gear, 8, on the lower end of shaft d, the gear 8 being connected with said shaft by a screw, 10, tapped into the end thereof. When the tablet-holder rotates, it turns the nut F through gears 7 and 8, and the screw E being stationary the nut moves slowly lengthwise thereof, carrying with it the slide C and all the parts carried thereby.

G and H are standards or uprights. They are connected by a sleeve, 12, passing through tube B and adapted to turn therein. The sleeve 12 is in one piece with standard G, and is connected with standard H by screws 5 9 and tie-rods 13 and 14. Tube B is disconnected from the base A at the rear side, and is provided with a clamp screw, 15, whereby it can be tightened around the sleeve 12, and thus hold the frame and all the operative parts rigidly in one position. By loosening said screw the machine can be tilted forward and backward and clamped in the position that may be most convenient for the user. To prevent the slide C from tipping in its bearings, the end of said slide which enters the bearing B is grooved, and a spline, 19, which is attached to sleeve 12 by screws 29, enters said groove and prevents the slide C from turning independently of said sleeve 12.

The main shaft I has bearings in the uprights G H, and it carries a fly-wheel, K, and a crank-handle, l, for turning. Shaft I has bearings in a frame, M, and it is rotated from the main shaft through spur-gears 16 and 17 and intermediary 18, the latter being mounted on a stud tapped into said frame. At the left end of shaft I is a friction-wheel, l, which bears on the under side of tablet-holder D and turns the same on its shaft d.

The frame M is swiveled on the main shaft at 20 (see Fig. I) and can be lowered, so as to throw the friction-gear l out of contact with the tablet-holder D, and thus arrest the motion of the latter. The frame is normally held up by the pressure of spring 21, which bears

at its lower end against upright G. The spring is surrounded by a tube, 22, which presses against frame M.

Upright G has arms 24 and 25 projecting toward the front and rear, respectively, and these constitute the supports for the recorder N and reproducer O.

The frame of recorder N has at its end a sleeve, 26, which slips on the tubular support 27, which is carried by the arm 24. Sleeve 26 is connected by a flexible tube, 28, with the sound-chamber of the recorder. On the right side of arm 24 is a bent tube, 30, which can turn in said arm, and another angular tube, 31, is connected with and can turn on the tube 30. The tubes 30 and 31 constitute a universal joint or socket for the mouth-piece of the recorder, which is adapted to be connected with the end of tube 31. The mouth-piece can thus be turned in any direction to suit the position of the user. It will be seen that a continuous sound-passage from mouth-piece to the diaphragm of the recorder is formed by the tubes 30, 31, and 27, sleeve 26, and flexible tube 28.

Heretofore flexible tubes have been employed to convey sound-waves to a diaphragm; but these require to be held to the lips by hand. In the use of a graphophone it is often desirable that the hands should be free for other purposes. By the construction described a rigid connection between the diaphragm and mouth-piece is provided, while at the same time the latter can be turned in any desired direction without disturbing the position of the style.

The recorder can be turned bodily on sleeve 27 as a center to bring its style into contact with the tablet, as shown in Fig. II, or to turn it out of the way, as in Fig. IV. When in its operative position, the point of the style rests on the tablet just above the friction-wheel l.

The reproducer O is mounted similarly to the recorder on a tubular support, 35, carried by arm 25, and is held in place by a screw, 39. A bifurcated socket-piece, 36, conveys the sonorous vibrations to suitable hearing-tubes, 38. Tubular support 35 has a perforation, 37, (see Fig. V,) through which it communicates with the hollow standard of the reproducer when the latter is in its operative position. When not in use and turned out of the way, this communication is cut off. The point of the reproducing-style, when in use, likewise rests just above the friction-wheel l. The relative positions of the recorder and reproducer are such that if the former be raised and the latter lowered into position its style will touch the same point on the tablet where that of the recorder rested.

The recording-tablet consists of a thin layer, 40, of wax or a wax-like composition upon a base or support, 41. (Shown as a disk.) It is preferred to make the base 41 of sheet metal, as other materials are more or less likely to warp. The edge of the disk 41 is turned up

all around, and the wax melted and poured into the dish thus formed. The center of the tablet is cut out to fit over the hub 42 of the tablet-holder D, and the latter has a projection, 43, which takes into a notch in the edge of the disk 41 and prevents the latter from slipping. While it is preferred to use a tablet of this description and to form the record by cutting or engraving therein, as described in the patent aforesaid, it is obvious that the machine is also adapted to operate in connection with a recorder that produces a record by indenting in a pliable substance or by removing part of a thin film of lamp-black, or in any other practical way.

The construction of the recorder and reproducer is or may be such as described in previous patents, and therefore needs no particular description here.

When the slide C has reached the farther limit of its motion, as shown in Fig. II, it can be quickly set back to the starting-point by reversing mechanism which will now be described. An intermediary, 50, turns on a stud carried by upright H and gears with a pinion, 51, on the end of feed-screw E. By depressing frame M, by pressing on button 52, the gear 17 is thrown into engagement with gear 50, and at the same time friction-wheel *l* is removed from tablet-holder D. Now, by turning the main shaft in the same direction as before the feed-screw E is driven at a high speed, and as the nut F is stationary, owing to the disconnection of wheel *l* and tablet-holder D, the said nut is rapidly moved to the right, carrying with it the slide C and all the parts supported thereby. Pinion 51 is connected with the feed-screw only by friction produced by a spring-washer, 53, pressing it against screw 54. This is sufficient to insure rotation of the feed-screw; but when the nut F reaches the limit of its return movement a pin, 60, carried thereby strikes a pin, 61, on said screw and stops the rotation of the latter, the pinion 50 now turning against the pressure of washer 53 independently of the screw. When the nut F reaches the limit of its travel to the left, a pin, 63, strikes a pin, 64, on the feed-screw E, and the latter then turns with the former. The slide C is thus automatically arrested at both limits of its travel.

Frame M has a backwardly and upwardly extending arm, 65, the end of which approaches close to the under side of the reproducer. If the latter be in its operative position when the frame M is depressed to operate the reversing mechanism, it will be lifted by arm 65 clear of the record. Frame M is, as shown, provided with two buttons, 52 and 67, for pressing with the finger. If it be desired simply to stop the tablet without setting the reversing mechanism into operation, button 67 is used. By pressing on button 52 the frame is completely depressed. Button 67 is on the end of a shank, 68, which passes loosely through a hole in the frame M, and its motion

is limited by contact with the tie-rod 13. By pressing button 52, however, the frame continues to descend after the end of shank 68 strikes the tie-rod, because said shank is not connected rigidly with the frame, but passes loosely through the same, as already stated. A stop-screw, 66, passes through tie-rod 13 and limits the movement of frame M when pressed down by button 52.

As has been stated, in the operation of recording and reproducing the feed-screw is stationary; but unless positively held it would be liable to be turned in its bearings by the friction of the feed-nut F. To prevent this a locking-lever, 70, is pivoted at 72 to the upright H, (see Fig. IV,) and has a point, 71, which engages the teeth of wheel 50 and holds it stationary. The locking device 70 is held in this position by a spring, 73. Since pinion 51 on the feed-screw E is engaged by wheel 50, the feed-screw is thus prevented from rotating. When, however, frame M is depressed to operate the reversing mechanism, an arm, 75, carried by said frame strikes the pivoted locking device 70 and releases the gear 50, so that when the latter is engaged by gear 17 it is free to rotate.

In operation, the slide being at the right-hand limit of its motion, as in Fig. III, the recorder is lowered until it rests upon the wax surface of the tablet. The main shaft being rotated, tablet-holder D is driven by friction-wheel *l*, and in turn rotates the feed-nut F, which is thus caused to advance slowly lengthwise of feed-screw E, which is held stationary by the engagement of locking-lever 70 with gear 50. The point of the recorder therefore traces a volute or spiral line on the surface of the tablet. As the tablet-holder D continues to advance, the point of contact with it of the friction wheel *l* gradually approaches its outer edge. Consequently the tablet-holder revolves more and more slowly; but the surface-speed under the point of the recorder (or reproducer) is uniform. This construction and its advantages are fully set forth in the patent hereinbefore referred to.

It is obvious that modifications may be made in details of construction, and that parts of the invention may be used without the whole without in either case departing from the spirit of the invention.

The flat tablet herein shown and described forms the subject-matter of my application No. 269,465, filed April 3, 1888, and is not claimed herein.

Having now fully described my said invention and the manner in which the same is or may be carried into effect, what I claim is—

1. In a graphophone, the combination, with the tablet holder and means for rotating and advancing the same longitudinally, of the recorder and reproducer, each pivoted on suitable supports and adapted to be turned into and out of operative position, substantially as described.

2. The combination of the slide, the tablet-holder mounted on a shaft having bearings in said slide, means for rotating said shaft and advancing said slide, a recorder pivoted on one side of the tablet-holder, and a reproducer pivoted on the opposite side thereof, their relative positions being such that the recording and reproducing styles touch the tablet at the same point, substantially as described.
3. In a graphophone, the combination, with the rotatory tablet-holder, the friction-wheel for driving the same, and means for advancing said tablet-holder longitudinally, of a recorder pivoted to the frame and a reproducer also pivoted to the frame, said recorder and reproducer being so disposed that when either is in operative position its style will rest on the tablet just above said friction-wheel, substantially as described.
4. In a graphophone, the combination, with the rotatory tablet-holder, of the friction-wheel for driving the same and a tilting frame in which the arbor of said friction-wheel is journaled, substantially as and for the purpose described.
5. In a graphophone, the combination, with the tablet-holder and means for rotating the same, of the feed-nut, the feed-screw, and means for disconnecting said nut from the driving-shaft and simultaneously connecting said screw therewith, substantially as described.
6. In a graphophone, the combination of the slide, the rotatory tablet-holder carried thereby, the feed-screw, normally stationary, the feed-nut connected to be advanced lengthwise of said screw by the rotation of said holder, and means for disconnecting said tablet-holder from the driving-shaft and connecting the feed-screw therewith so as to reverse the movement of said nut, substantially as described.
7. The combination of the slide, the tablet-holder, the friction-wheel for rotating the same, the tilting frame in which the arbor of said friction-wheel is journaled, gearing for driving the latter from the main shaft, the feed-screw normally stationary, the feed-nut carried by said slide and connected by gearing with said tablet-holder, and gearing for connecting said feed-screw with said main shaft when said frame is moved to disengage the tablet-holder and friction-wheel, substantially as described.
8. In a graphophone, the combination of the slide, the tablet-holder carried thereby, the feed-nut and feed-screw, the driving mechanism, and stop-pins on said feed nut and screw, whereby the slide is automatically arrested at the limits of its travel, substantially as described.
9. The combination of the slide, the rotatory tablet-holder, the reproducer, the feed nut and screw, mechanism for reversing the movement of said slide, the tilting frame for operating said reversing mechanism, and an arm carried by said slide and adapted to lift the reproducer from the tablet when said frame is tilted, substantially as described.
10. The combination of the slide, the tablet-holder, the feed-screw, the feed-nut connected by gearing with said tablet-holder, a pinion loosely mounted on said feed-screw, a spring-washer for effecting a frictional connection between said screw and pinion, and stop-pins on said nut and screw by engagement of which the screw and nut are connected together, substantially as described.
11. The combination of the slide, the tablet-holder, the feed-screw supported in bearings in the frame, the feed-nut connected by gearing with said tablet-holder, and the locking device for holding said feed-screw stationary, substantially as described.
12. The combination of the slide, the tablet-holder, the feed-screw supported in bearings, the feed-nut rotated from said tablet-holder, the locking device for holding said screw stationary, the tilting frame for disengaging said tablet-holder from the main shaft and connecting the feed-screw therewith, and an arm or projection adapted on the depression of said frame to disengage said locking device, substantially as described.
13. The combination of the rotatory tablet-holder, the feed-screw and nut for moving said tablet-holder longitudinally, a tilting frame, a friction-wheel on an arbor having bearings in said frame for rotating said tablet-holder, and reversing-gears adapted to be connected with the main shaft by said frame, all constructed and arranged as set forth, so that the frame can be tilted to disconnect said friction-wheel and tablet-holder without connecting said reversing-gear and main shaft, substantially as described.
14. The combination of the tablet-holder, the feed-nut connected by gearing with said tablet-holder, the feed-screw normally stationary, the tilting frame, the friction-gear for rotating said tablet-holder, carried on an arbor having bearings in said frame, reversing-gears adapted to connect said screw and the main shaft when said frame is tilted, a button on said frame for tilting the same, and a second button on a shank passing loosely through said frame and having its end in close proximity to a fixed part of the apparatus, so that on pressing the latter button the frame will move only far enough to disengage the tablet-holder and friction-gear without connecting in the reversing mechanism, substantially as described.
15. The combination, with the frame and recorder, of the rigid sound-conveying tube having several bent or angular sections jointed together, constituting in effect a universal joint, whereby the position of a mouth-piece attached to said tube can be shifted vertically or laterally without disturbing the position of the style, substantially as described.
16. In a graphophone, the combination.

with a supporting frame, and the tablet-
holder, recorder, and operative mechanism
carried by said frame, of the base or bed plate
to which said frame is pivotally connected, so
5 that the entire apparatus can be tipped to any
angle, and means, as specified, for holding
the apparatus at the angle to which it may be
adjusted, substantially as described.

In testimony whereof I have signed this
specification in the presence of two subscrib- 10
ing witnesses.

CHARLES SUMNER TAINTER.

Witnesses:

PHILIP MAURO,
C. E. HADLEY.