

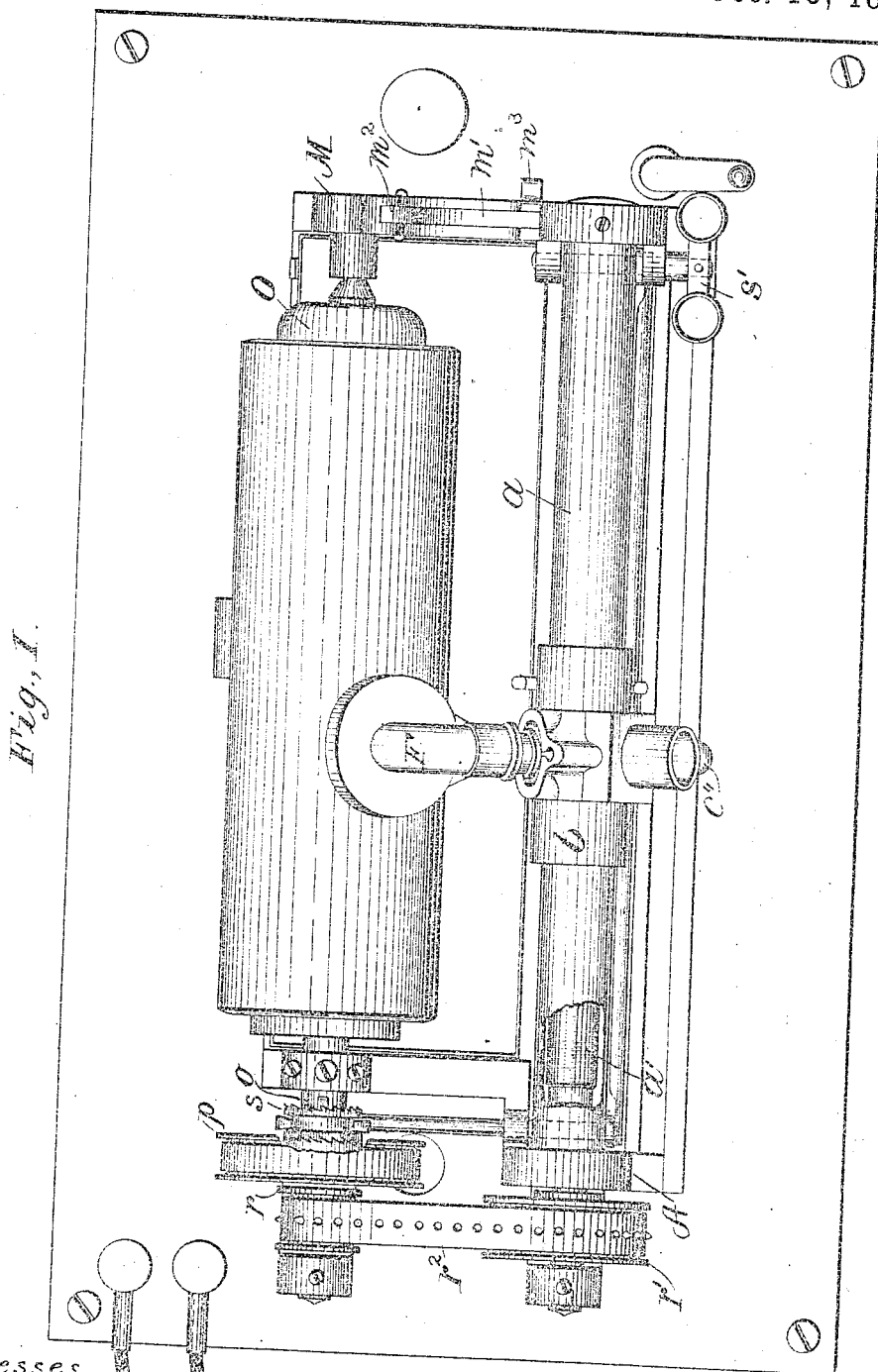
(No Model.)

T. H. MACDONALD.  
GRAPHOPHONE.

3. Sheets—Sheet 1.

No. 569,290.

Patented Oct. 13, 1896.



Witnesses.

W. Ross Edelen.

Peru Lewis

Inventor

Inventor  
Thomas H. Macdonald  
by J. A. Macdonald  
his attorney.

(No Model.)

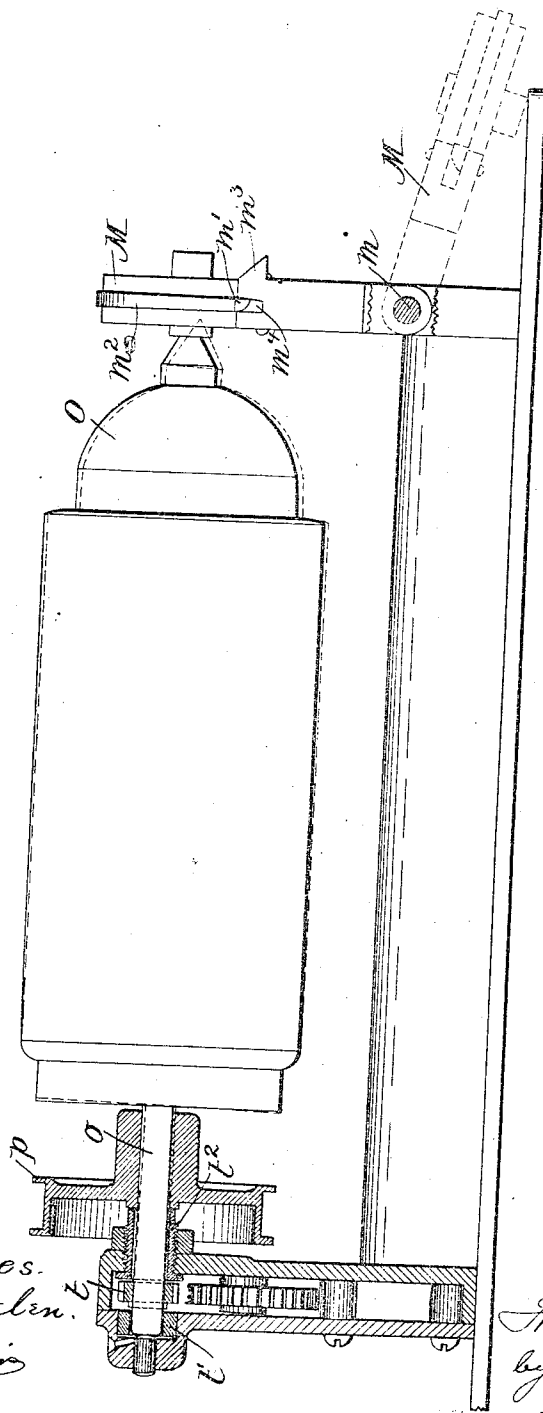
T. H. MACDONALD.  
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3 Sheets—Sheet 2.

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Fig. 2.



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(No Model.)

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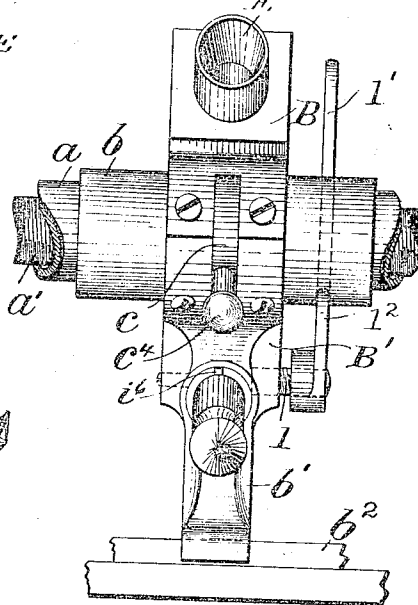
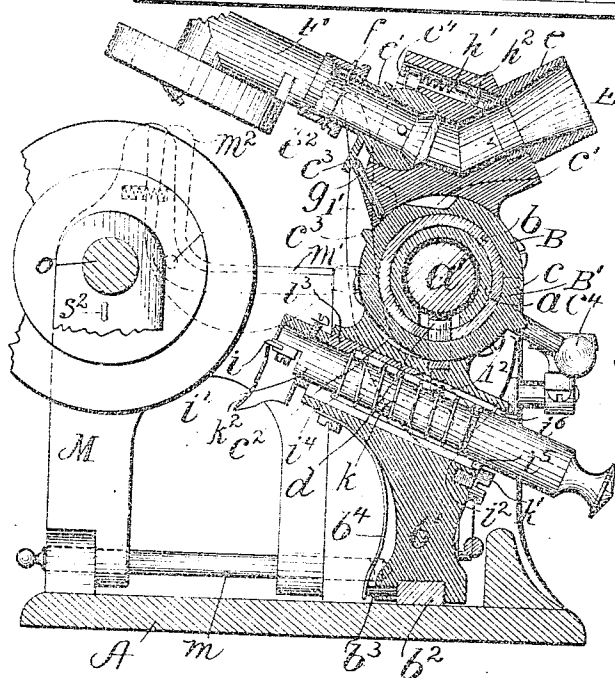
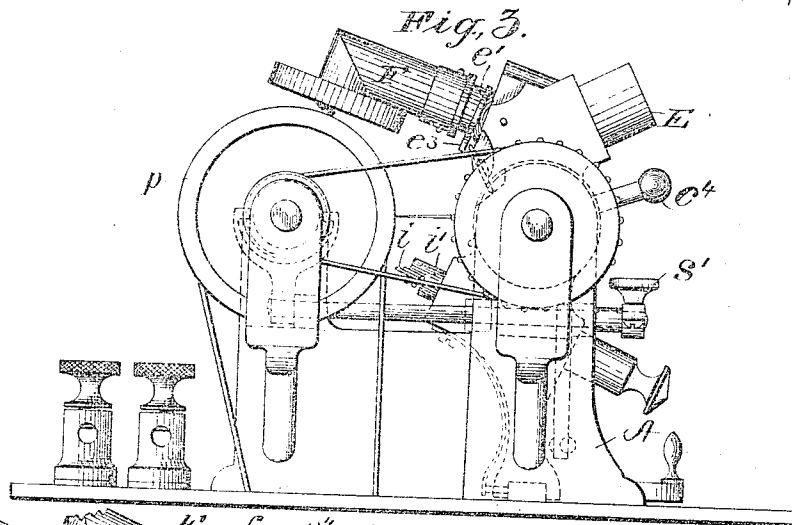


Fig. 4.

*Fig. 5.*

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# UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT; ASSIGNOR TO  
THE AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA

## GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 569,290, dated October 13, 1896.

Application filed November 2, 1895. Serial No. 567,729. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented new and useful Improvements in Graphophones, which are fully set forth in the following specification.

This invention relates to apparatus for recording and reproducing sounds, generally known as "graphophones," and its object is to improve such apparatus in point of efficiency and convenience in use.

The present improvements relate more particularly to the carriage which supports the recorder and reproducer, (and also the shaving-knife, when one is employed,) to the support of the mandrel or tablet-holder, and to the starting and stopping mechanism.

The carriage slides, as heretofore, on a tube fixed rigidly in the side frames and inclosing the feed-screw. A handle and a device (such as a cam) actuated thereby are provided, one movement of which both lifts the reproducer or recorder from contact with the record-cylinder and also disengages the feed-screw. This improvement has several advantages. It avoids the necessity of touching the recorder or reproducer for the purpose of putting them into and out of operative position, it provides a positive lock for the recorder or reproducer when out of position and permits them to be let down easily upon the record, (the pitch of the cam being gradual,) and it furnishes a handle by which the carriage and parts supported by it can be slid along the guide-tube.

Heretofore one bearing of the mandrel or tablet-holder has been carried by a vertically-pivoted swinging arm, and a locking device has been provided to lock this arm in place, two movements being required. Such swinging arm has a journal-bearing on one end only, and it has been found in course of time that through wear on this bearing the perfect alinement of the arm is disturbed, resulting in a corresponding alteration of alinement of the mandrel. This defect is avoided by the swinging gate hereinafter described. Furthermore, through carelessness or inattention the user of the instrument often fails to swing the arm completely around, and consequently in removing the fragile record-cylin-

der from the mandrel its end or side strikes the arm and is broken or marred. This has been a fruitful source of broken records. According to this invention the movable bearing of the tablet-holder is carried by an end gate, which when unlocked and partly turned will fall by its own weight down and which automatically locks itself when raised into position.

Special improvements in the construction of the latch are provided whereby a tight connection is insured and rattling prevented.

Another improvement consists in arranging a bearing close to the fixed end bearing of the mandrel, with which intermediate bearing the shaft of the mandrel is ordinarily not in contact. When, however, the end gate or support is removed and the mandrel is unsupported at that end, its shaft is brought by the weight of the mandrel into contact with the intermediate bearing, which thus acts as a brake and stops the shaft. Thus the withdrawal of the support at one end of the mandrel for the purpose of removing and replacing a cylinder automatically arrests the mandrel. This improvement is useful in small machines driven by spring-motors easily arrested by friction and would not be employed with electric motors.

The ordinary start and stop mechanism has been improved to give the clutch a double action, so that in one position it engages the mandrel with a running shaft and in the other not only disengages it, but positively stops and holds it. This improvement has been found advantageous because with heavy tablets the momentum would keep the tablet and cylinder in motion after disengagement of the same by the clutch.

In the accompanying drawings, illustrating what is deemed the best embodiment of my improvements in a practical machine, Figure 1 is a plan view; Fig. 2, a front elevation, partly in section, showing a different form of driving-gearing; Fig. 3, an end elevation from the left of Fig. 1. Fig. 4 is a transverse sectional view through the carriage, and Fig. 5 is a detail in elevation of the carriage.

Referring to the drawings, A represents the frame, supporting at its front the usual guide-tube a, longitudinally slotted on its under

side and inclosing the feed-screw  $a'$ . Sleeve  $b$ , constituting part of the carriage, encircles and slides upon tube  $a$ . To facilitate the assembly of the parts, the carriage proper is divided into an upper part B and a lower part B', each having a semicircular seat resting against and together surrounding the tube, to which they are fastened by suitable screws. A leg  $b'$  depends from the carriage and is forked at its lower extremity to embrace a rail  $b''$  on the frame A. To take up all wear and insure a close contact of the rail and leg  $b'$ , thereby preventing even the slightest oscillation of the carriage, which would be detrimental to the perfect operation of the recorder or reproducer carried thereby, a pin  $b''$ , pressed by a spring  $b'''$ , passes through an opening in the leg and bears against the side of the rail.

A ring  $c$ , having cam-surfaces  $c'$  and  $c''$  and a projection  $c'''$  on its periphery, is arranged concentrically about and bears against the sleeve  $b$  and has an operating-handle  $c''''$ . This ring is arranged at about the middle of the tube and works in suitable recesses or grooves in the parts B and B' of the carriage, as clearly shown in the drawings. A divided segmental nut  $d$  for communicating movement from the feed-screw  $a'$  to the carriage is located in a recess in the bottom of the semicircular seat on the lower part B' of the carriage and projects upwardly through the sleeve  $b$ , at the same time spanning the ring  $c$ , against which it is held by spring-pressure, said pressure also holding it in engagement with the feed-screw during the operation of the machine.

A sound-conducting passage E through part B of the carriage has at its front end a nozzle  $e$  for the rubber tube (not shown) and at its rear end a pivoted tubular joint  $e'$ , over which the recorder or reproducer F is adapted to slip in a definite position determined by cross-bar  $f$  and notches  $e''$ .

$g$  is a pintle sliding in a suitable way, bearing at one end against a projection  $e'''$  on the joint  $e'$  and at its other end against the peripheral surface of the ring  $c$ , whereby it is moved to lift the reproducer or recorder when desirable, as hereinafter described. An opening  $h$  is bored through the metal of the frame above and opening into the passage E at one end, in which is housed a very sensitive spring  $h'$ , secured to a plug  $h''$  at one end and at its other end connecting with a pin  $e''''$  on the joint  $e'$ , projecting into the opening. Such an arrangement is desirable when the weight of the recorder or reproducer is excessive, to regulate the pressure with which the instrument in use rests against the tablet.

In describing the operation of the improvements above referred to I will first call attention to the stop action of the projection  $c'''$ , limiting movement of the ring  $c$  by engagement with the parts B' and B of the carriage when in the positions shown in Figs. 3 and 4, respectively. In the latter position both the pintle  $e'''$  and the segmental nut  $d$  are in contact

with the peripheral surface of the thickest part of the ring  $c$ , thus holding and locking the recording or reproducing instrument in its elevated position (out of contact with the record-cylinder) and the segmental nut out of engagement with screw  $a'$ , leaving the carriage free to be moved along the tube  $a$  by grasping the handle  $c''''$ .

Upon lifting the handle to the position shown in Fig. 3, after having moved the carriage to the desired position, the pintle  $g$  is allowed to ride down the cam-surface  $c'$  and the nut  $d$  down the cam-surface  $c''$ , permitting the recorder or reproducer to descend gradually to contact with the tablet and the nut to be elevated to engagement with the feed-screw.

A shaving knife or cutter  $i$  for cutting down the tablet to remove an old record and present a new surface to the recorder is mounted on the end of a stem  $i'$ , enlarged in diameter at its outer end, forming a shoulder  $i''$ . About this stem and fixed in a chamber extending transversely through the part B' of the carriage is a sleeve  $i'''$ , split along its upper side and for about half-way along its upper side and having an interior shoulder  $i''''$ . This sleeve has an interior diameter approximating that of the larger part of stem  $i'$ , which it slightly overlaps. A spring  $k$  surrounds the smaller part of stem  $i'$ , being confined between the shoulders  $i''$  and  $i''''$  and exerting its tension to force the stem to the right, as shown in Fig. 4, and hold the cutter away from contact with the tablet. To prevent rotation of the stem and consequent alteration in the position of the cutter, splines or lugs  $i''''$  thereon engage, respectively, in the slots formed by the splits in the sleeve  $i'''$ , lug  $i''''$  also making contact with a screw  $k'$  to limit the movement of the stem under the tension of the spring. A cap or deflector  $k''$ , through which the cutter projects, is secured on the inner end of stem  $i'$ .

When it is desired to bring the cutter to an operative position, the stem  $i'$  is pushed forward to contact with the tablet against the tension of the spring, in which position it is gripped and held through the action of a screw  $l$ , abutting against one side of sleeve  $i'''$  and adapted to be manipulated by a lever  $l'$ , carrying a stop-arm  $l''$ , which makes contact with sleeve  $b$  to compress the sleeve against the enlarged portion of the stem  $i'$ . During the operation of the shaving-knife it is preferable to remove the recorder or reproducer from the joint  $e'$  before raising the handle  $c''''$  to throw the carriage into gear, or a more rapid movement can be effected by hand.

I will next describe that part of my invention relating to the end-gate arrangement for one of the mandrel-bearings. As hereinbefore stated, one of the bearings has been carried by a swinging arm adapted to swing rearwardly in a horizontal plane and having a rocking lever swinging in a vertical plane, two movements being required to close and

secure the arm. According to the present invention a vertically-swinging gate *M*, carrying one bearing of the mandrel *O*, is hinged on a pivot-pin *m* to one end of the frame *A* and is adapted to be dropped to the position shown in dotted lines in Fig. 2. The end gate carries a vertically-moving spring-actuated pivoted latch *m'*, having an upwardly-extending lever *m''* and lying in a suitable recess in said gate. The latch projects beyond the side of the gate, said projecting end having a rounded under edge which rides up an incline *m'''* on the framework and drops into a notch *m''''* therein, automatically locking the gate when it is elevated to the position shown in full lines in Fig. 2. To insure a close engagement of the latch in the notch *m''''*, the latter is slightly flared, (one wall being inclined,) thereby preventing even the slightest movement and rattling of the gate, or an equivalent construction would be to employ a wedge-shaped latch with either a flaring or straight notch.

The driving mechanism and starting devices are illustrated in particular in Figs. 1, 2, and 3, wherein *o* is the mandrel-shaft, and *p* the pulley for driving the same. Referring to Figs. 1 and 3, pulley *p* is loose. *r* is a pulley fixed on shaft *o* and having peripheral pins. *r'* is a similar but larger pulley on screw-shaft *a'* and connected with pulley *r* by a perforated strap *r''*. To throw the shaft *o* in gear, a clutch *s*, having a double set of teeth and splined on said shaft, is adapted to be engaged with teeth on the side of the driving-pulley *p*. This clutch is manipulated from a key *s'* through suitable levers and connecting-rods. Upon throwing the clutch out of gear the momentum acquired will ordinarily prolong the rotation of the mandrel and tablet. To avoid this and stop the shaft immediately, a fixed lug or projection *s''* is arranged on the frame *A* in such position that when one set of the teeth of clutch *s* is thrown out of gear with wheel *p* one of the teeth of the other set will engage said lug. This is advantageous either in recording or reproducing when pauses are made.

In Fig. 2 I have shown a stop mechanism which operates automatically upon dropping the gate *M*. As here shown, the pulley *p* is fast on shaft *o*, which also carries a pinion *t*, from which motion is communicated through gears to the screw-shaft. At this end the shaft has two bearings *t'* *t''* on each side, respectively, of the pinion *t* and necessarily arranged close together. In the normal position of the parts the shaft *o* runs in the bearing *t*, in which it has a slight play, not touching auxiliary or intermediate bearing *t'*, whose internal diameter is somewhat greater than that of the shaft. When, however, the gate is dropped, allowing the mandrel to descend to the position shown in dotted lines, Fig. 2, the shaft *o* makes contact with bearing *t'*. The friction generated by the contact

and inclination of the shaft in the two bearings is sufficient to automatically stop rotation when the machine is actuated by a spring-motor, or rotation due to the momentum of the parts.

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

1. In a graphophone the combination with the carriage and its actuating-screw, of a guide-tube inclosing said screw and upon which the carriage slides, an arm or support on the carriage for the recorder or reproducer a ring on the carriage arranged concentric to the tube, and a handle for manipulating said ring to both lift the reproducer or recorder from the record-cylinder and disengage the carriage from the feed-screw and for lowering the recorder or reproducer to the record and engaging the carriage with the feed-screw, by a reverse movement, substantially as described.

2. In a graphophone the combination with the feed-screw and its inclosing tube, of a carriage sliding on the latter, a nut for throwing the carriage into gear with the feed-screw, a ring having peripheral cam-surfaces thereon, one for disengaging the nut from the feed-screw and the other for lifting the recorder or reproducer off the record-cylinder, and arranged concentrically to the inclosing tube, and a handle or device for actuating said ring, substantially as described.

3. In a graphophone the combination with the carriage and a recorder or reproducer carried thereby, of a device—such as a cam—mounted on the carriage for lifting the recorder or reproducer and simultaneously locking it in its raised position, and a handle for actuating said cam and for manually moving the carriage, substantially as described.

4. The combination with the carriage, of a shaving knife or cutter carried by a spring-actuated stem adjustable in said carriage, and normally held out of contact with the record-cylinder, a split sleeve around said stem, a device—such as a screw—for compressing the sleeve to clamp and hold the stem in an adjusted position, and a lever for actuating said device, substantially as described.

5. In a graphophone, the combination with the carriage, of a shaving knife or cutter carried by a spring-actuated stem adjustable in said carriage, and normally held out of contact with the record-cylinder, a split tube around said stem forming a chamber about the same, in which chamber the actuating-spring is inclosed, and means for compressing said sleeve to clamp the stem in an adjusted position against the tension of said spring, substantially as described.

6. In a graphophone, the combination with the carriage, of a shaving knife or cutter carried by a stem adjustable in said carriage, a split sleeve around said stem, means for compressing said sleeve to clamp the stem in an adjusted position, and a spline on the stem

engaging in the slot or groove formed by the split in the sleeve, substantially as described.

7. In a graphophone, the combination with the mandrel, of a gate carrying one bearing thereof and adapted to drop on a horizontal axis when opened, and means for locking said gate in a closed position, substantially as described.

8. The combination with the mandrel, of a gate carrying one bearing thereof and adapted to drop on a horizontal axis when opened, and an automatically-operating latch on said gate for locking it in its closed position, substantially as described.

9. The combination with the mandrel, of a gate carrying one bearing thereof, a spring-actuated latch for automatically locking said gate in its closed position and adapted to engage in a flaring notch in the frame of the machine, substantially as described.

10. In a graphophone the combination with a mandrel and its shaft, of bearings one stationary and the other movable, upon which

said shaft normally rests, a gate carrying said movable bearing, and an auxiliary bearing in proximity to the stationary bearing and with which said shaft makes engagement to arrest and prevent rotation of the mandrel when said gate is open, substantially as described.

11. In a graphophone the combination with a tubular pivoted joint to which the recorder or reproducer is adapted to be connected, and through which the sound is communicated of a spring connected therewith, of a tension not sufficient to overcome but acting to diminish the force of gravity by which said instrument is held in contact with the record-cylinder, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

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G. L. HUBBELL.