

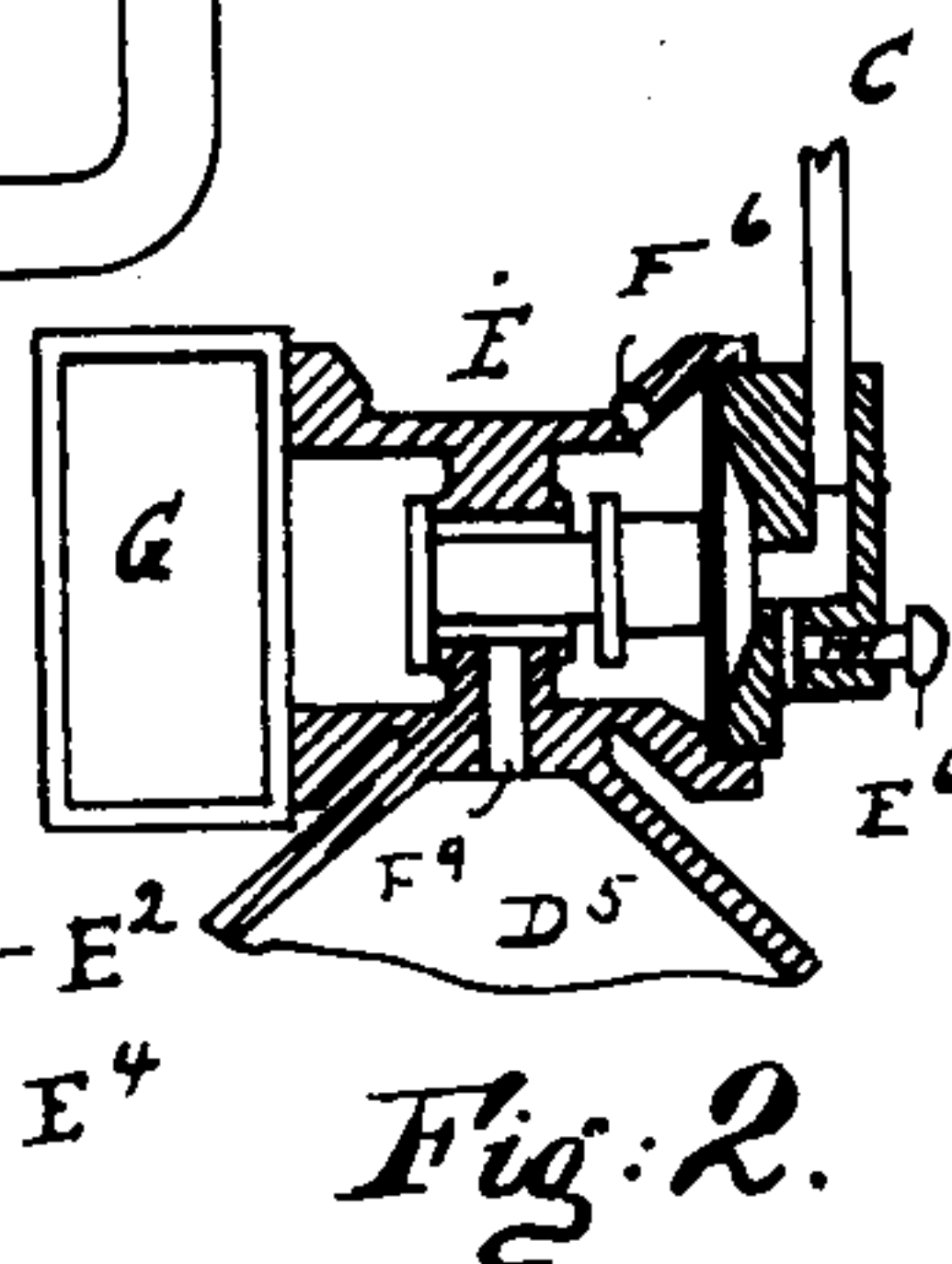
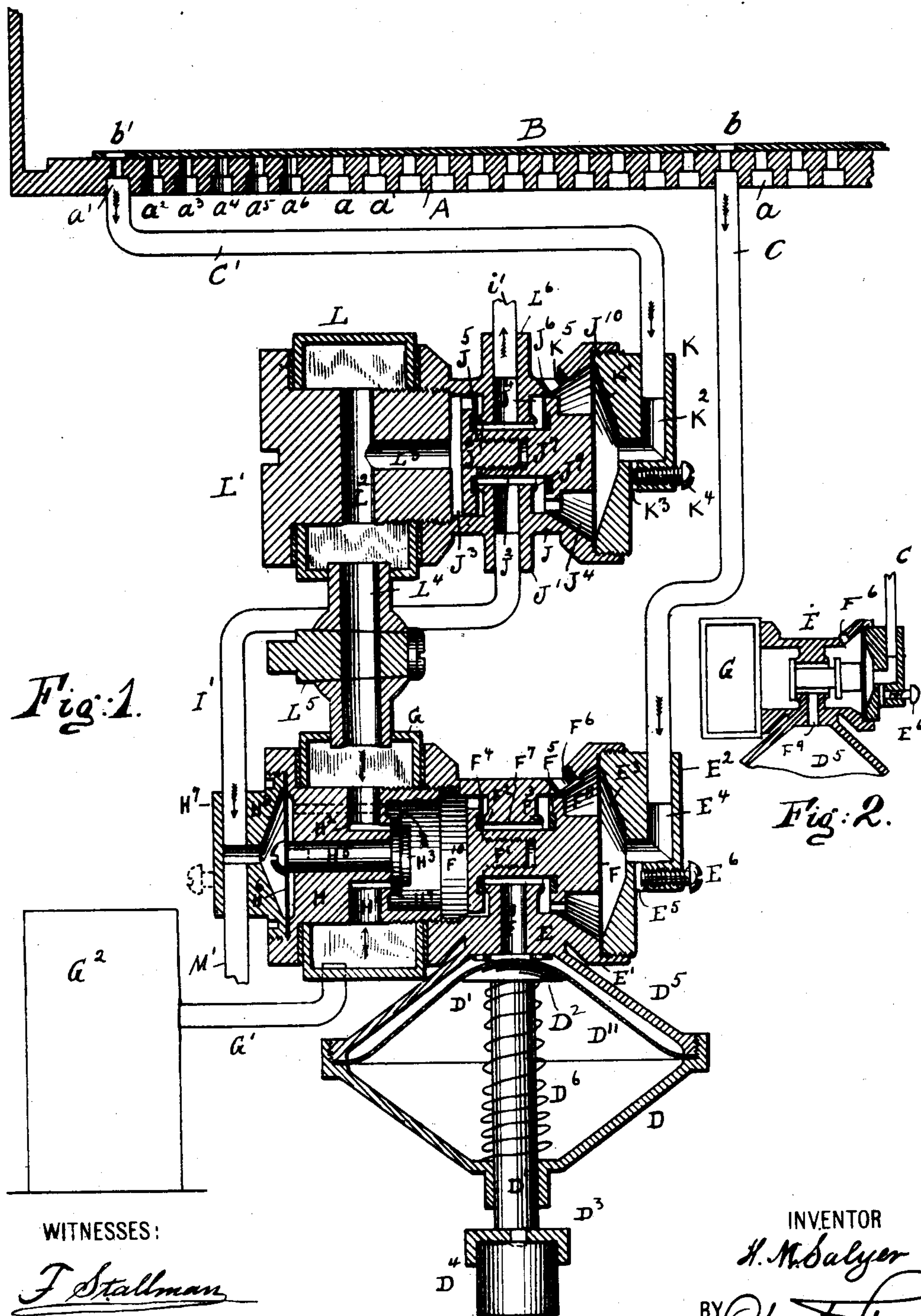
**H. M. SALYER.**

**AUTOMATIC PLAYING ATTACHMENT FOR MUSICAL INSTRUMENTS.**

(Application filed Nov. 3, 1900.)

**3 Sheets—Sheet 1.**

(No Model.)



**WITNESSES:**

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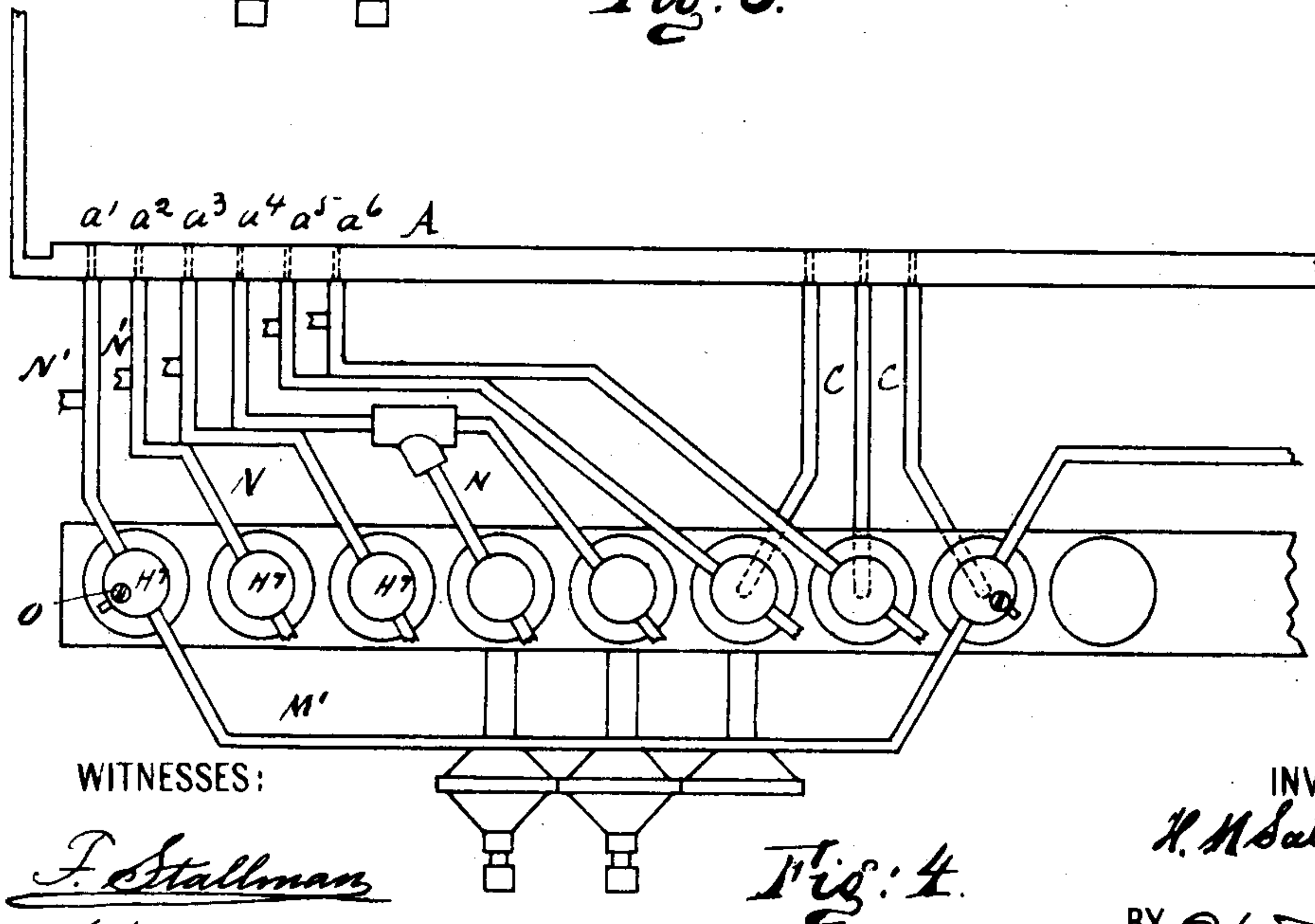
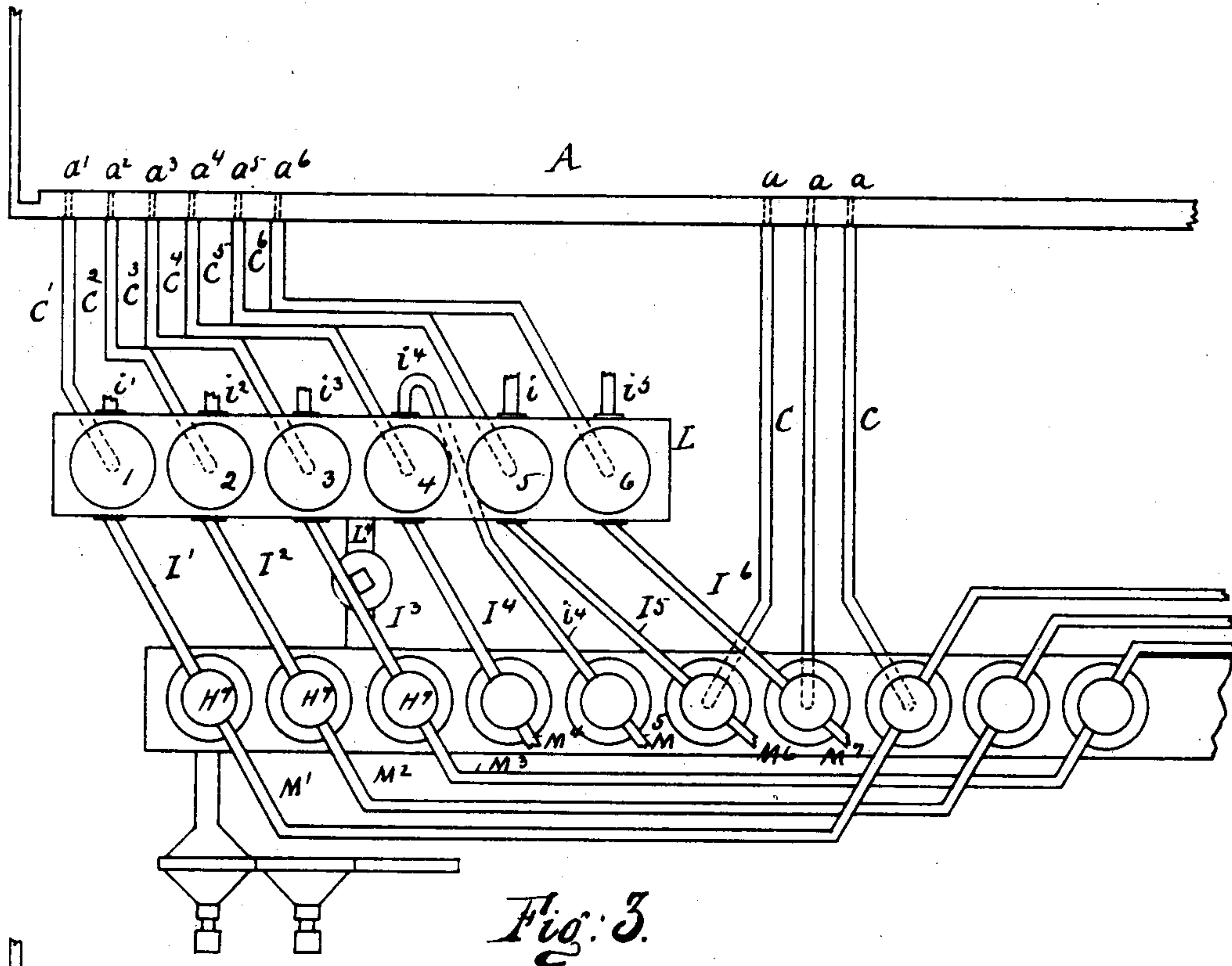
H. M. SALYER.

AUTOMATIC PLAYING ATTACHMENT FOR MUSICAL INSTRUMENTS.

(Application filed Nov. 3, 1900.)

(No Model.)

3 Sheets—Sheet 2.



WITNESSES:

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No. 711,004.

Patented Oct. 14, 1902.

H. M. SALYER.

AUTOMATIC PLAYING ATTACHMENT FOR MUSICAL INSTRUMENTS.

(Application filed Nov. 3, 1900.)

3 Sheets—Sheet 3

(No Model.)

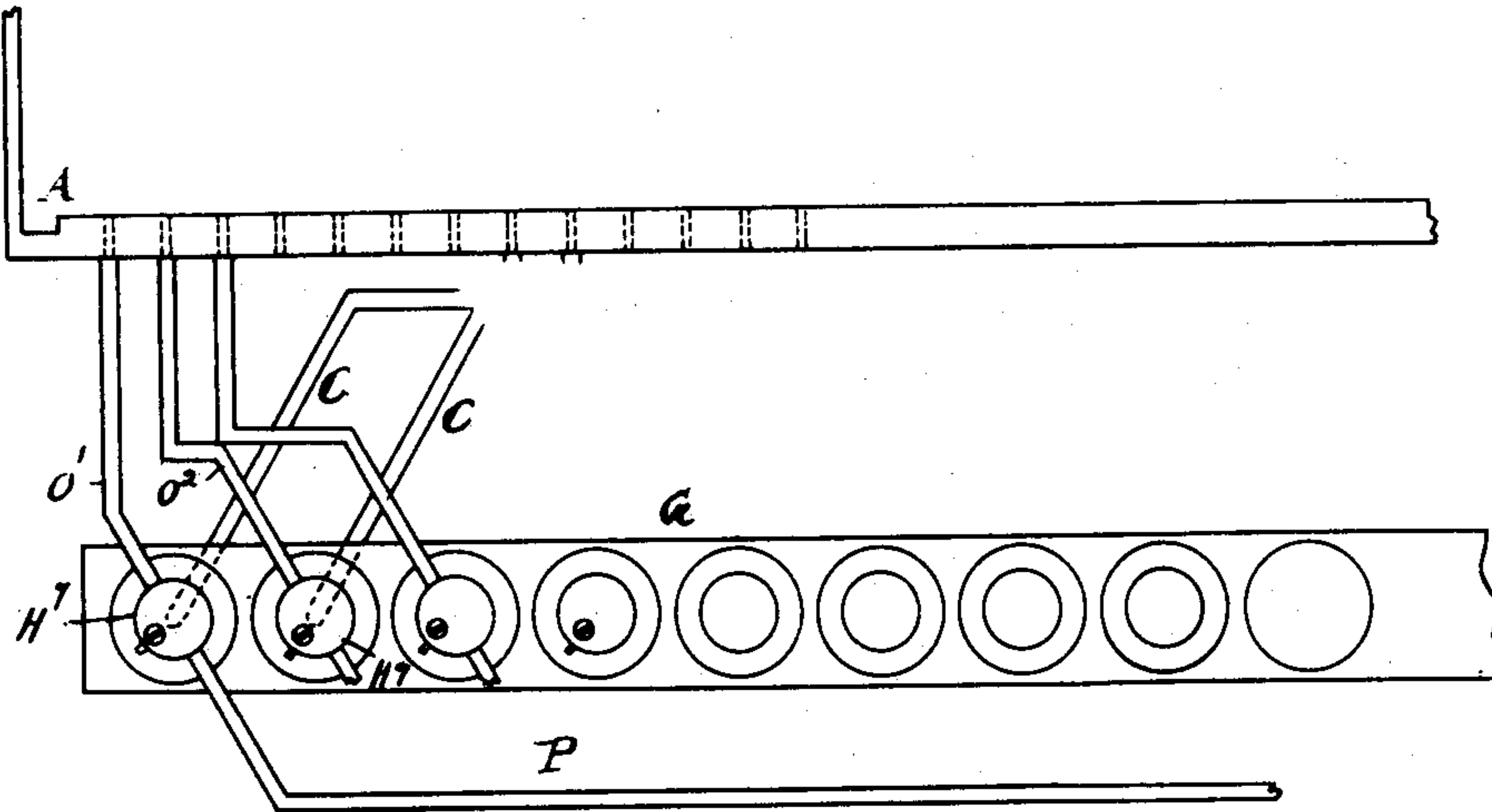
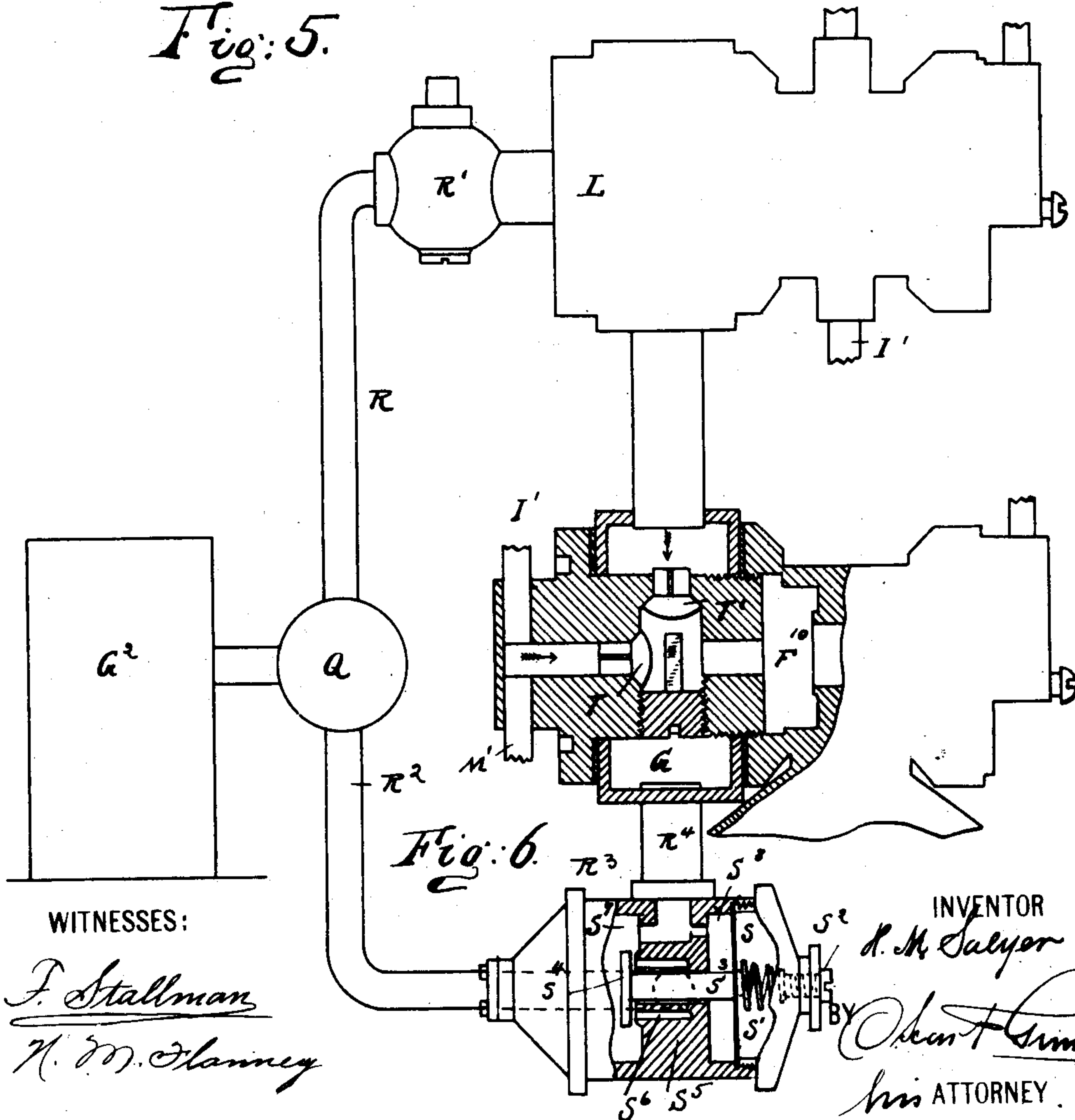


Fig. 5.





# UNITED STATES PATENT OFFICE.

HARRY M. SALYER, OF NEW YORK, N. Y., ASSIGNOR TO LUDWIG & CO., OF  
NEW YORK, N. Y., A FIRM.

## AUTOMATIC PLAYING ATTACHMENT FOR MUSICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 711,004, dated October 14, 1902.

Application filed November 3, 1900. Serial No. 35,306. (No model.)

*To all whom it may concern:*

Be it known that I, HARRY M. SALYER, a citizen of the United States, and a resident of the city of New York, borough of the Bronx, in the county of New York and State of New York, have invented certain new and useful Improvements in Automatic Playing Attachments for Musical Instruments, of which the following is a specification.

This invention relates to improvements in automatic playing attachments for musical instruments.

The object of my invention is to provide a new and improved self-playing attachment of this kind which is simple in construction, can readily be applied on musical instruments, and by means of which any desired note can be automatically accentuated or played differently from other notes that are played at the time being or at other times.

In the accompanying drawings, in which like characters of reference indicate like parts in all the figures, Figure 1 is a diagrammatical sectional elevation of my improved pneumatic key-striking mechanism. Fig. 2 shows a modification. Fig. 3 is a diagrammatical elevation of a group of valves for strikers, showing the pneumatic connections. Figs. 4 and 5 are similar views showing modifications in the pneumatic connections. Fig. 6 is an outline view, partly in section, of a modification of the valve mechanism for the pneumatic striker.

A row of holes *a* is formed in the bottom of a compressed-air chamber, and over said row of holes a music-sheet *B* is passed, which has holes *b* that can register with the holes *a*. The compressed air presses the sheet *B* upon the bottom *A* of the chamber, and the compressed air can only escape when one or more holes *b* in the note or music sheet *B* register with one or more holes *a* in the bottom *A* of the chamber. All holes *a* but six in the construction shown in Fig. 1 are connected by a tube *C* with the valve mechanism of a pneumatic key-striker. As one such striker is provided for each key to be operated, of two, three, or four octaves or for each key on the keyboard, and these strikers are all alike, but one will be described. The funnel-shaped chamber *D* has a bottom neck for

guiding the striker-rod *D'*, provided at its upper inner end with a rounded head and at its lower end with the recessed head *D<sup>3</sup>* for receiving and holding a pad or button *D<sup>4</sup>*, of felt, cork, rubber, &c. A helical spring *D<sup>6</sup>*, surrounding the rod *D'*, presses the same upward. A diaphragm *D<sup>11</sup>*, of leather or other suitable material, is clamped at its edges between the upper edges of the chamber *D* and a cap-plate *D<sup>5</sup>*, preferably having the shape of a cone and having its bottom peripheral screw-threaded edge screwed into the inner screw-threaded peripheral edge of the chamber *D*, the diaphragm resting on the top head *D<sup>2</sup>* of the rod *D'*. A block *E* is made integral with the top of the cap *D<sup>5</sup>* and is provided with a flaring neck *E'*, into which a cap *E<sup>2</sup>* is screwed, which cap has a recess *E<sup>3</sup>* in its inner end, from which recess a duct *E<sup>4</sup>* leads to the outer surface of the cap, and the above-mentioned tube *C* is connected with the outer end of said duct *E<sup>4</sup>*. A vent-aperture *E<sup>5</sup>* extends from the duct *E<sup>4</sup>* to the outer surface of the cap, and the size of this vent-opening can readily be adjusted by means of a screw *E<sup>6</sup>*. A diaphragm *F* is clamped at its edges between the block *E* and cap *E<sup>2</sup>* and rests against or is secured to one end of a valve-stem *F'*, mounted to reciprocate in a bore *F<sup>7</sup>* in the block *E*, at the ends of which bore the valve-seats *F<sup>2</sup>* and *F<sup>3</sup>* are formed, against which the two valves *F<sup>4</sup>* and *F<sup>5</sup>* on the valve-stem *F'* can seat, one being always unseated while the other is seated. Adjacent to the diaphragm *F* the bore *F<sup>7</sup>* is enlarged into a chamber *F<sup>8</sup>*, from which a vent-opening *F<sup>6</sup>* extends to the outer air. A duct *F<sup>9</sup>* extends from the bore *F<sup>7</sup>* to the top of the cap *D<sup>5</sup>*, and the recess *F<sup>10</sup>* at that end of the bore *F<sup>7</sup>* opposite the chamber *F<sup>8</sup>* is in communication with the compressed-air chamber *G*. When it is not desired to have a mechanism for accentuating notes, this communication is direct, as shown in Fig. 2; but when such accentuating mechanism is to be provided the communication is established in the manner shown in Fig. 1, which accentuating mechanism will now be described.

A block *H* extends through the compressed-air chamber *G* and its inner open end is in communication with the recess *F<sup>10</sup>* of the



block E, and by means of the ducts H' H<sup>2</sup> the air-chamber G is brought into communication with the recess F<sup>10</sup> of the block E, which communication can be closed by the valve H<sup>3</sup>, adapted to seat on the seat H<sup>4</sup> on the inner end part of the block H, and which valve is fixed on one end of the valve-stem H<sup>5</sup>, mounted to reciprocate in a suitable bore in the block H and secured at its outer end to a diaphragm H<sup>6</sup>, clamped between the outer end of the block H and a cap H<sup>7</sup>, screwed into a threaded opening in said outer end. A recess H<sup>8</sup> in said cap is in communication with the tubes I' and M'. The air-chamber G is connected by the tube G' with a compressed-air-supply tank G<sup>2</sup>, in which a constant or nearly - constant pressure is maintained by some suitable contrivance. The tube M' leads to the cap H<sup>7</sup> of another striker mechanism corresponding to a white key and the tube I' leads to a neck J' of a block J, having a bore J<sup>2</sup> in communication with said neck and terminating in the opposite recesses J<sup>3</sup> and J<sup>4</sup>, containing the valves J<sup>5</sup> and J<sup>6</sup> on opposite ends of a stem J<sup>7</sup>, passing through the bore and adapted to seat on the seats J<sup>8</sup> and J<sup>9</sup>, and said valve-stem is connected with or rests against the diaphragm J<sup>10</sup>, clamped in one end of the block J by a cap K, having a recess K' and a duct K<sup>2</sup>, extending from the said recess K' to the outer surface of the cap K. A vent-aperture K<sup>3</sup> extends from the duct K<sup>2</sup> to the outer air and can be adjusted in size by the screw K<sup>4</sup>. A tube C' leads from the duct K<sup>2</sup> to one of six apertures a' a<sup>2</sup> a<sup>3</sup> a<sup>4</sup> a<sup>5</sup> a<sup>6</sup> in the row of apertures a for a purpose that will be set forth hereinafter. A vent K<sup>5</sup> extends from the recess J<sup>4</sup> to the outer air. A block L' extends through a second air-chamber L and is screwed into the block J and by means of ducts L<sup>2</sup> and L<sup>3</sup> establishes communication between said chamber L and the recess J<sup>3</sup>. A tube L<sup>4</sup>, provided with a stop-cock L<sup>5</sup>, connects the air-chambers G and L. A neck L<sup>6</sup>, communicating with the bore J<sup>2</sup>, is connected with a tube i', which extends to the valve mechanism of another key-striker, as will be explained hereinafter. The mechanism in block J will hereinafter be referred to as the "controller."

Assuming now for the present and for the purpose of illustration only that the entire mechanism is for but a single key and that the tubes i' and M' are closed, the operation is as follows: When a hole b in the note-sheet B registers with the upper end of the tube C, compressed air passes through said tube and, acting on the diaphragm F, which, as is seen, is of considerable area, moves the same and the valves F<sup>4</sup> and F<sup>5</sup> to the left, whereby the valve F<sup>5</sup> is seated and the valve F<sup>4</sup> unseated. The compressed air can now pass, Fig. 2, from the chamber G through the duct F<sup>9</sup> into the cap D<sup>5</sup> and forces the diaphragm D<sup>11</sup> and rod D' downward rapidly, whereby the key below the pad D<sup>4</sup> is struck. The parts remain in these positions as long as the

compressed air can pass from the chamber through the tube C. As soon as this communication is interrupted by the shifting of the note-sheet B the compressed air remaining in the tube C escapes through the vent E<sup>5</sup> and the air-pressure on the valve F<sup>4</sup> seats the same, at the same time unseating the valve F<sup>5</sup> and permitting the air in the cap D<sup>5</sup> to escape through the vent F<sup>6</sup>, the spring D<sup>6</sup> raising the striker-rod D' ready for the next stroke and in like manner every time a hole b registers with the upper end of the tube C. In case the accentuating mechanism is provided, as shown in Fig. 1, and the key is to be struck, but not accentuated, the operation is similar and as follows: When compressed air is admitted into the tube C, the valve F<sup>4</sup> is unseated and the compressed air in the recess F<sup>10</sup> immediately passes into the cap D<sup>5</sup>; but the consequent reduction of pressure in the recess F<sup>10</sup> permits the greater pressure in the chamber G to force the valve H<sup>3</sup> from its seat, whereby a sufficient quantity of compressed air is permitted to pass into the cap D<sup>5</sup> to force down the striker-rod D' suddenly and the desired object is obtained, and this operation is repeated every time compressed air is admitted into the tube C. When the valve F<sup>4</sup> is again seated, the pressure increases in the recess F<sup>10</sup> and assists the diaphragm H<sup>6</sup> in seating the valve H<sup>3</sup>. When the note is to be accentuated—that is, the corresponding key struck a harder blow—an extra hole b' in the note-sheet B must register with the hole a' and tube C' at the same time that the hole b in the note-sheet B registers with the hole a and tube C, as shown in Fig. 1, so that at the same time that compressed air passes from the chamber through the tube C compressed air also passes through the tube C' and, acting on the diaphragm J<sup>10</sup>, seats the valve J<sup>6</sup> and unseats the valve J<sup>5</sup>, permitting compressed air to pass from the chamber L and ducts L<sup>2</sup> L<sup>3</sup> through the tube I' into the recess H<sup>8</sup> in the cap H<sup>7</sup>. Thereby a pressure is exerted on the outside of the diaphragm H<sup>6</sup> and the valve H<sup>3</sup> is fully opened, permitting a much greater quantity of compressed air to pass from the chamber G into the cap D<sup>5</sup>, and in consequence the striker-rod is pressed down with greater force and strikes the key a much harder blow. It is very evident that if an accentuating-aperture would have to be provided for each key in addition to the aperture b for each key the note-sheet would have to be uncommonly wide and the mechanism very complicated and expensive. For that reason the accentuating mechanisms for all keys of the same denomination are connected. For example, a single accentuating controlling mechanism, such as block J and mechanism therein, is connected with the striking mechanism for the key F of each octave and likewise for the keys G, and so on. This would require seven accentuating-controllers for the seven white keys—namely, F G A B C D E—but thereby no provision would be made for



the black keys, representing F-sharp, G-sharp, A-sharp, C-sharp, D-sharp, and to provide for these keys five more accentuating-controllers would be required, or twelve in all; but as none of these keys and the corresponding sharps are struck at the same time the sharps can be combined with the same controllers. As shown in Fig. 3, I have six controllers 1, 2, 3, 4, 5, and 6, all connected with a common air-chamber L. The tubes  $C^1 C^2 C^3 C^4 C^5 C^6$  extend from the apertures  $a^1 a^2 a^3 a^4 a^5 a^6$  to the several controllers, and the tubes  $I^1 I^2 I^3 I^4 I^5 I^6$  extend from the controllers to the striking mechanisms for the keys of one octave, excepting the striker for the key C, which is omitted. The tubes  $i^1 i^2 i^3 i^4 i^5 i^6$  extend to the striking mechanism of the corresponding black keys F-sharp, G-sharp, A-sharp, C-sharp, and D-sharp, and the tube  $i^4$  to the striking mechanism of the white key C, which was omitted, as stated above, the tubes  $M^1 M^2 M^3 M^4 M^5 M^6 M^7$  connecting the corresponding striking mechanisms for the white keys in octaves, and in like manner the black-key striking mechanisms are to be connected. Each controller thus controls two striking mechanisms in each octave, and six controllers suffice for the entire keyboard. When the striking mechanism for any F key is accentuated, all F-key-striking mechanisms as well as all F-sharp-key-striking mechanisms are capable of accentuation, but of course the accentuating mechanism operates only in the striking mechanism of that key to which compressed air has been admitted at the same time through its tube C. As shown in Fig. 4, the tubes N pass direct to the caps  $H^7$  of the striking mechanisms and the controllers are omitted, but each octave has a controlling-screw O in the compressed-air-supply tube, and from each tube N a branch tube  $N^1$  extends to the valve mechanism of the striker for the corresponding black key, as previously explained. As shown in Fig. 5, I do not couple the white and black key mechanisms for accentuating purposes, but couple all the valve mechanisms of all strikers for the F keys by a tube P and extend a tube  $O^1$  from one valve mechanism to an accentuating-hole in the bottom of the chamber A. In a like manner all valve mechanisms for F-sharp keys are united and one of the same is connected by a tube  $O^2$  with an accentuating-hole, and so on, so that in place of six accentuating air-holes in the bottom A of the chamber I have twelve, and must necessarily have twelve corresponding rows of holes  $b$  in the note-sheet B, thus requiring a wider note-sheet.

In Fig. 6 a somewhat-modified construction of the valve mechanism is shown. The compressed air passes from the tank  $G^2$  into a supply-tube Q, and from the same through the tube R, having the stop-cock  $R^1$ , into the chamber L, and through the tube  $R^2$  into the pressure-reducing valve  $R^3$ , and from the

same through the tube  $R^4$  to the chamber G. The pressure-reducing valve has a diaphragm S, on which a spring  $S^1$  presses, which can be adjusted by a screw  $S^2$ . A valve-stem  $S^3$ , attached to the diaphragm S, carries a valve  $S^4$ , seating on a transverse partition  $S^5$  in the reducing-valve casing. The tube  $R^2$  terminates in a recess  $S^6$  in said partition, which recess communicates with the compartment  $S^7$  of the casing, and this compartment is in communication with the compartment  $S^8$  and with the tube  $R^4$ . The spring  $S^1$  is set according to the desired pressure and holds the valve  $S^4$  a determined distance from its seat. If the pressure in the tube  $R^2$  increases, this increased pressure acts on the diaphragm S in opposition to the spring  $S^1$  and moves the valve  $S^4$  nearer its seat, thus permitting less compressed air to pass to the chamber G. When the pressure in the tube  $R^2$  decreases, the spring  $S^1$  can move the valve  $S^4$  away from its seat correspondingly. A puppet-valve T controls communication between the recess  $F^{10}$  and the tubes  $I^1$  and  $M^1$ , and a puppet-valve  $T^1$  controls communication between the air-chambers G and L. When the accentuating mechanism is not required, the cock  $R^1$  is closed. When the accentuating-controller is not operated and only the valve  $F^4$  and  $F^5$  shifted in the manner described hereinbefore, the reduced pressure in the recess  $F^{10}$  permits the pressure in the chamber G to force down the valve  $T^1$ , and compressed air is admitted from the chamber G into the striking mechanism. When the accentuating mechanism is operated, the pressure of air in the tube  $I^1$  opens the valve T also, and thus a greater quantity of compressed air is at once admitted into the striking mechanism and a more powerful blow is delivered on the key.

I have only shown the mechanism as adapted for operation by compressed air, but it is very evident that without departing from the spirit of the invention and merely by reversing certain parts and making slight mechanical changes the apparatus will work as well with rarefied air as with compressed air. For example, in Fig. 2 the chamber G would only need be connected with the space below the diaphragm  $D^{11}$  and the tube C connected with the space at the opposite side of the diaphragm F, and the same holds good for the other constructions shown.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a striker for musical instruments, of a pneumatic mechanism for operating the striker, a valve mechanism for governing the actuation of said striker-operating mechanism by a variation of the air-pressure on parts of said striker-operating mechanism, additional means for governing the actuation of said striker-actuating mechanism, by a variation of the air-pressure on said striker-actuating mechanism, which



second means act only in conjunction with the valve mechanism, substantially as herein shown and described.

2. The combination with a series of strikers for the keys of a musical instrument, of a pneumatic mechanism for each striker, for operating the same by a variation of air-pressure, means for governing this variation of air-pressure, additional means for governing the variation of air-pressure for each striker-operating mechanism, these latter means for two or more striker-operating mechanisms being pneumatically coupled, substantially as herein shown and described.

3. The combination with a series of strikers for the keys of a musical instrument, of a pneumatic mechanism for each striker, for operating the same, by a variation of air-pressure in the mechanism, means for governing the variation of air-pressure in said striker-operating mechanism, additional means for governing the variation of the air-pressure in said striker-operating mechanism, these latter means in two or more octaves being connected pneumatically with each other, substantially as herein shown and described.

4. The combination with a series of strikers for the keys of a musical instrument, of a pneumatic mechanism for each striker for operating the same by a variation of the air-pressure on said striker-operating mechanism, means for governing the variation of air-pressure in said striker-operating mechanism, additional means for governing the variation of such air-pressure for each striker-operating mechanism, which additional means for the striker-operating mechanism of two adjacent keys, in one and the same octave, are coupled pneumatically, substantially as herein shown and described.

5. The combination with a series of key-strikers for the keys of a musical instrument, of a pneumatic mechanism for each striker, operating the same by a variation of the air-pressure, means for governing such variation of air-pressure in said striker-operating mechanism, additional means for governing the variation of such air-pressure for each striker-operating mechanism, which additional means for the pneumatic striker-operating mechanism for two adjacent keys in one and the same octave and the corresponding keys in other octaves are coupled pneumatically, substantially as herein shown and described.

6. The combination with a series of strikers for the keys of a musical instrument, of pneumatic mechanisms for operating the same by a variation of air-pressure on said striker-operating mechanisms, means for governing such variations of air-pressure for said striker-operating mechanisms, an additional means for each pneumatic striker-operating mechanism for governing this variation in air-pressure, a series of pneumatically-operated controllers for the additional governing means, each controller being pneumatically connected with a series of such additional

governing means, substantially as herein shown and described.

7. The combination with a plate, having a series of wind-openings, of a series of strikers for the keys of a musical instrument, a pneumatic mechanism for each striker for operating it by a variation of air-pressure on parts of the striker-operating mechanism, a means pertaining to each pneumatic striker-operating mechanism for governing such variation in air-pressure, a tube extending from each of such means to a wind-opening in said plate, additional means pertaining to each pneumatic striker-operating mechanism for affecting such variation in air-pressure, a controller with which the additional means of the pneumatic striker mechanism is pneumatically connected and a tube connecting each controller with a wind-opening in said plate, substantially as herein shown and described.

8. The combination with a plate having a series of wind-openings, of a series of strikers for the keys of a musical instrument, a pneumatic mechanism for operating each striker by a variation in air-pressure, means for governing such variations in air-pressure, a tube for connecting such governing means of each striker-operating mechanism with a wind-opening in said plate, an additional means pertaining to each striker-operating mechanism for governing such variation in air-pressure, six controllers for such additional means, each controller being pneumatically connected with the additional governing means of the pneumatic operating mechanism of the strikers for two corresponding keys in each octave of the keyboard, and a tube connecting each controller with a wind-opening in said plate, substantially as herein shown and described.

9. The combination with a striker for a musical-instrument key, of a pneumatic mechanism for operating the striker, a valve mechanism for governing the admission of air under pressure to said pneumatic striker-operating mechanism, and an additional valve mechanism for governing the admission of air under pressure, which second valve mechanism operates effectively, only in conjunction with first valve mechanism, of the pneumatic striker-operating mechanism to which both said valve mechanisms pertain, substantially as herein shown and described.

10. The combination with a striker for the key of a musical instrument, of a pneumatic mechanism for operating the striker, a valve mechanism for governing the passage of air under pressure, to the pneumatic striker-operating mechanism, an additional valve mechanism pertaining to said pneumatic striker-operating mechanism, for governing the passage of air to the pneumatic striker-operating mechanism, in conjunction with the first valve mechanism only, and a controlling-valve mechanism affecting the above-mentioned additional valve mechanism only, substantially as herein shown and described.



11. The combination with a striker, for the key of a musical instrument, of a pneumatic mechanism for operating the striker, a valve mechanism for governing the admission of air under pressure into said pneumatic striker-operating mechanism, an additional valve mechanism pertaining to said pneumatic striker-operating mechanism for controlling the admission of air under pressure to said pneumatic striker-operating mechanism, each valve mechanism pertaining only to the one pneumatic striker-operating mechanism to which it is attached and the additional valve mechanism being dependent for the effect of its actuation upon the actuation of the first-mentioned valve mechanism, substantially as herein shown and described.

12. In an automatic playing attachment for musical instruments, the combination with a series of strikers, each serving independently of all others, for operating a single sound-producing mechanism of the musical instrument, a pneumatic mechanism for each striker for operating the same, a valve mechanism pertaining to each pneumatic striker-operat-

ing mechanism for governing the admission of air under pressure to said pneumatic striker-operating mechanism, and each valve mechanism connected with and pertaining to only one pneumatic striker-operating mechanism, an additional valve mechanism pertaining to each pneumatic striker-operating mechanism for governing the admission of air under pressure to said pneumatic striker-operating mechanism, each additional valve mechanism pertaining to only one pneumatic striker-operating mechanism and operating effectively only in conjunction with the first-mentioned valve mechanism of the pneumatic striker-operating mechanism to which both said valve mechanisms pertain, substantially as herein shown and described.

Signed at New York city, in the county of New York and State of New York, this 1st day of November, A. D. 1900.

HARRY M. SALYER.

Witnesses:

OSCAR A. GUNZ,  
N. M. FLANNERY.