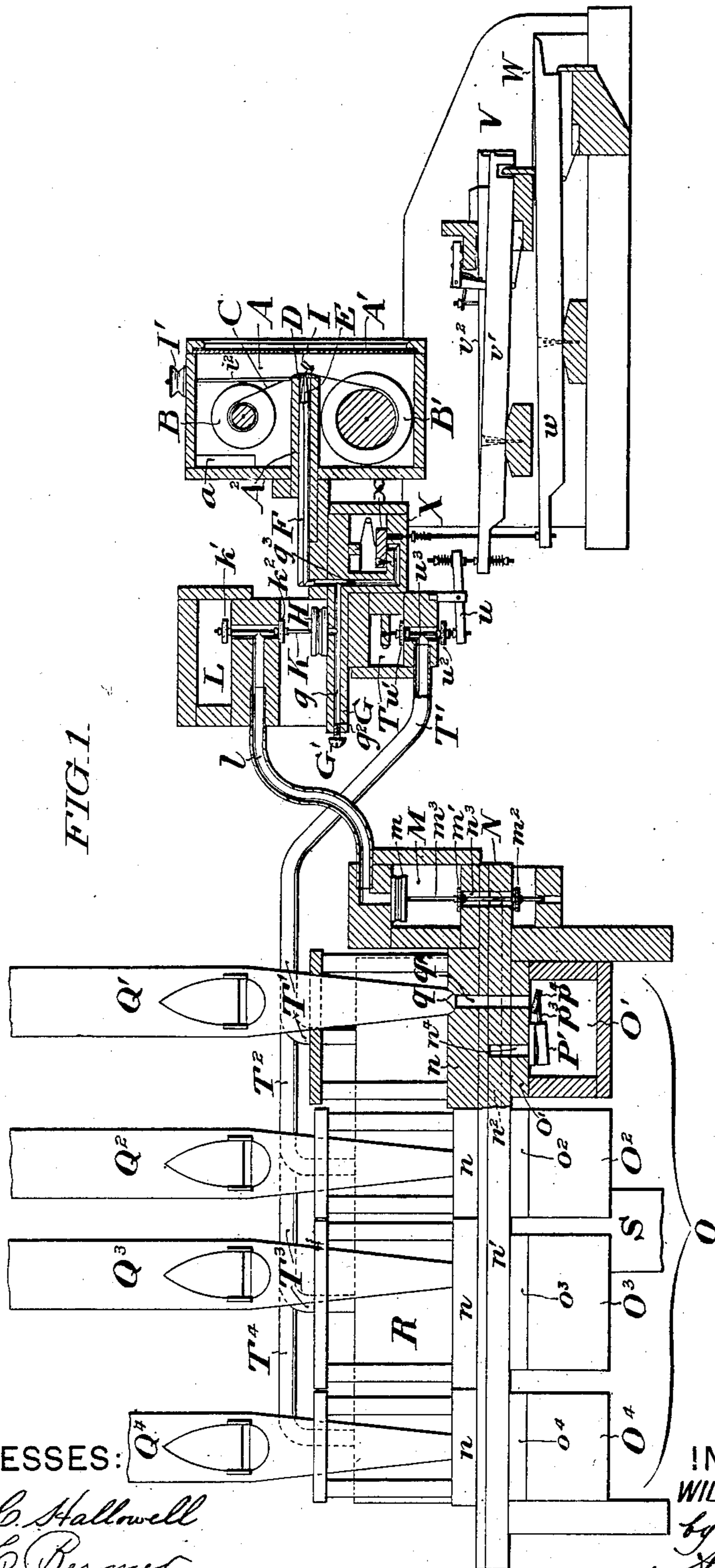


W. E. HASKELL.
MUSICAL INSTRUMENT.

APPLICATION FILED MAR. 28, 1901.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES:

Clifton C. Halliwell
John C. Bergner

INVENTOR:

WILLIAM E. HASKELL,

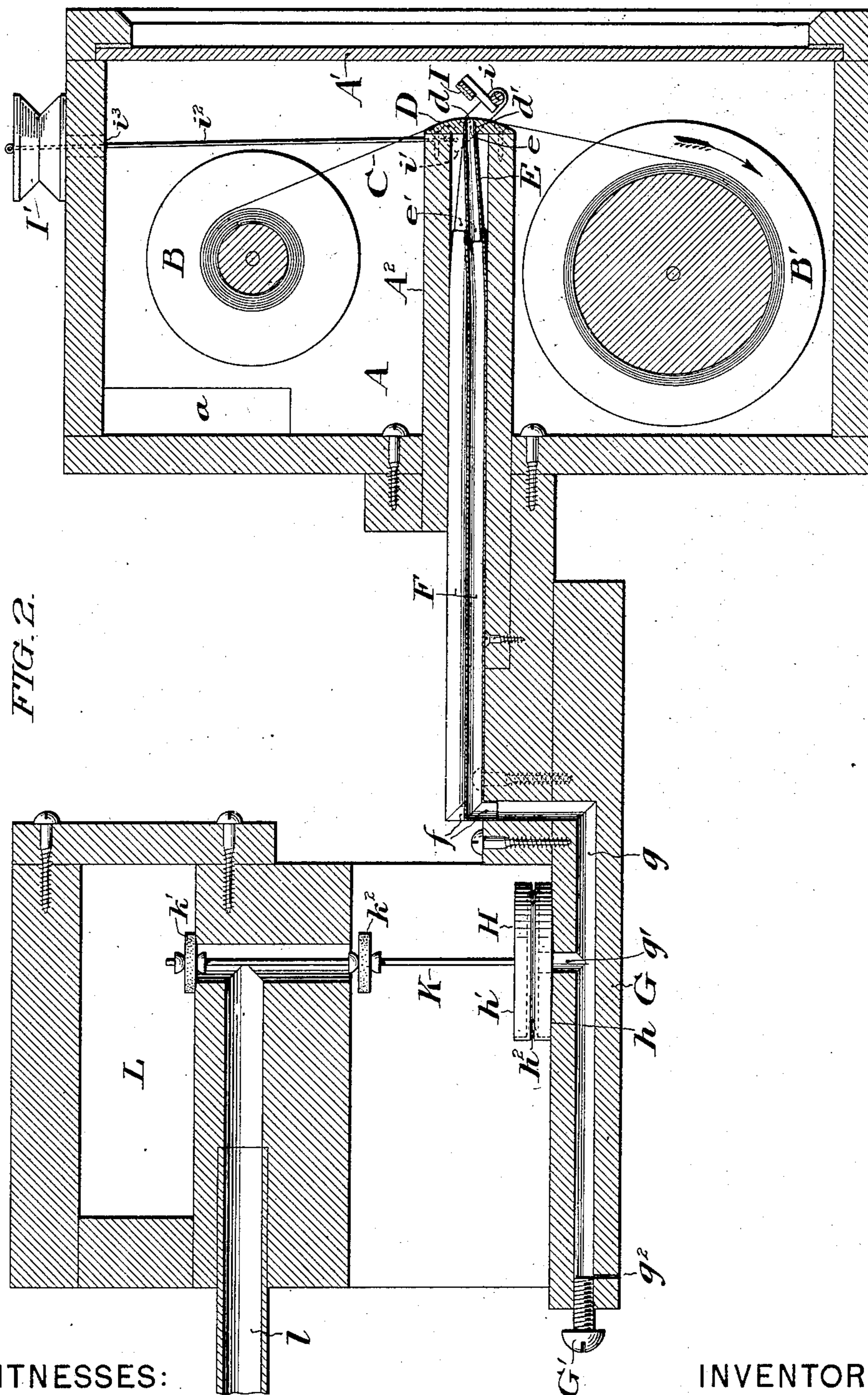
by Arthur E. Paige
Atty.

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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

FIG. 3.

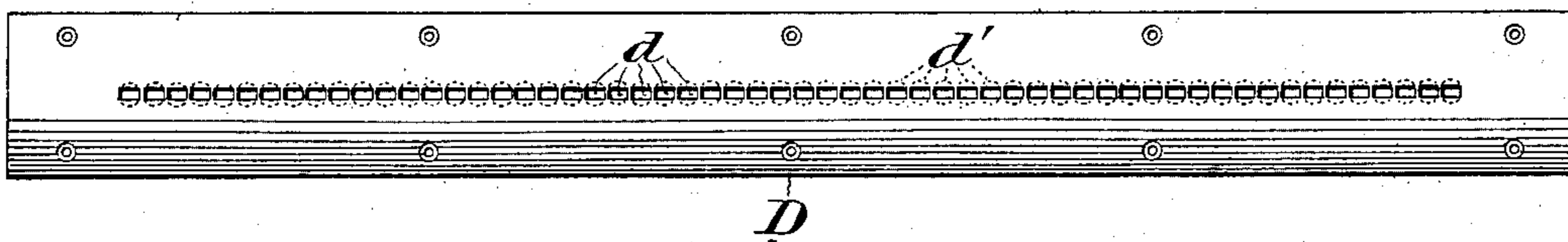


FIG. 4.

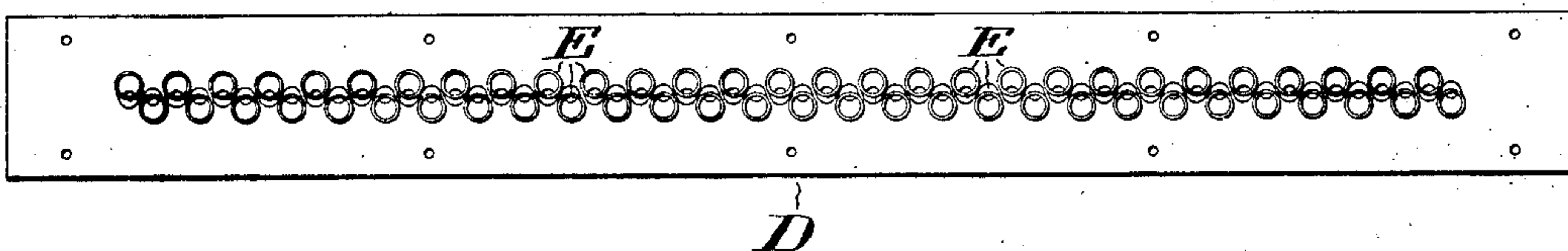
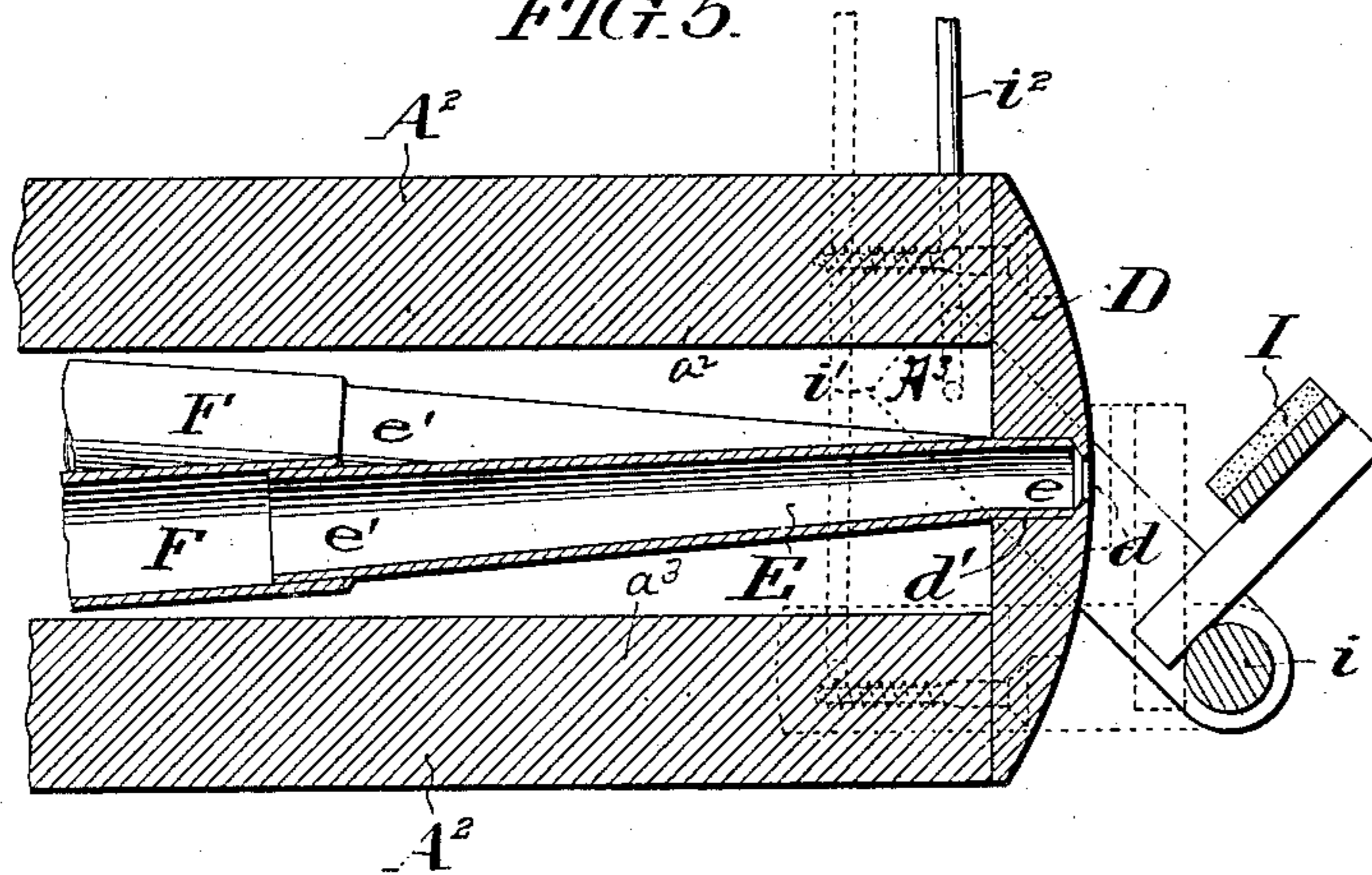


FIG. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM E. HASKELL, OF PHILADELPHIA, PENNSYLVANIA.

MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 734,262, dated July 21, 1903.

Application filed March 28, 1901. Serial No. 53,194. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. HASKELL, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Musical Instruments, whereof the following is a specification, reference being had to the accompanying drawings.

My invention relates to musical instruments of the class wherein a perforated web is progressed with respect to a tracker-bar, which latter comprises a series of pneumatic orifices arranged to effect the independent operation of a series of pneumatic-motors, and thereby either directly or indirectly actuate a corresponding series of sound-producing devices.

My improvements are applicable to automatic organs wherein the operation of a series of sound pipes or reeds is directly effected by the pneumatic-motors, and also to that class of devices known as "piano-players" wherein the motors of the series respectively actuate individual hammers arranged in a similar series in registry with the manual-digits of a piano, organ, or similar instrument.

It is the object of my invention to so construct and arrange a device of the class specified as to secure a more accurate and rapid action of the motors and of the sounding devices connected therewith than has been hitherto attainable; and to this end my invention comprehends certain advantageous features of arrangement and construction hereinafter more definitely specified and claimed.

It is usual to form the air-ducts extending from the tracker-bar orifices in a grooved board comprising a number of pieces glued together, and the scale upon which the orifices are spaced in the standard tracker-bars being such that the partitions between the orifices and the ducts leading therefrom are necessarily very thin, leakage between the adjoining conduits results from the inevitable warping and cracking of the wooden partitions. I have discovered that the defect aforesaid may be overcome by providing a metallic tracker-bar with a series of independent metallic nozzles extending from the back thereof in communication with the respective orifices and connecting each of said nozzles with an independent metal conduit, the conduits being prolonged and diverged until they can be conveniently connected with grooved boards whose parti-

tions are of such thickness as to insure the prevention of cracks and consequent leaks.

I have chosen for illustration a pipe-organ arranged to be pneumatically operated, and as an instance of the accuracy and rapidity of operation attainable by my improvements it may be noted that said embodiment thereof has been found capable of rendering trills comprising sounds succeeding each other at the rate of thirty per second, each sound being sharply defined as to its beginning and termination.

In the accompanying drawings, Figure 1 is a sectional view of a partial organ conveniently embodying my invention. Fig. 2 is a fragmentary sectional view showing parts of Fig. 1 on an enlarged scale. Fig. 3 is a front elevation of the tracker-bar shown in section in Fig. 2. Fig. 4 is a rear elevation of said tracker-bar. Fig. 5 is an enlarged sectional view of the tracker-bar, showing the arrangement of the nozzles and conduits at the rear thereof.

In said figures, A is the wind-casing, supplied with compressed air through the opening *a* and provided with the door *A'*, affording access to the rollers *B B'*. Said rollers are arranged to progress any selected web *C* in such relation with the pneumatic tracker-bar *D* that designed perforations in said web register in predetermined sequence with the orifices *d*, which latter, as shown in Fig. 3, are narrow quadrangular slots arranged in the front of said bar *D* with their major axes aligned in a series extending at right angles to the direction of traverse of the web *C*. Said bar *D* is conveniently formed of metal wherein said orifices *d* merge into cylindrical recesses *d'*, in which the front ends *e* of the independent nozzles *E* are soldered. The opposite free ends *e'* of the nozzles *E* being of greater area than the front ends *e* are alternately diverged in staggered relation with the axis of the series, so as to be conveniently soldered to the respective independent metal conduits *F*, which extend rearwardly through the member *A²* of the casing *A*. Said casing member *A²* comprises an upper board *a²* and a lower board *a³*, forming a chamber *A³*, co-extensive with and common to the series of nozzles *E* shown in Fig. 4. The rear extremities *f* of said conduits *F* terminate in corre-

sponding ducts g in the grooved board G , which latter supports a series of independent pneumatic-motors H equal in number to the series of orifices d in the tracker-bar D and
 5 respectively connected therewith by said ducts and conduits. In the form shown each of said motors H comprises a pneumatic-bellows whose cheek-piece h is fixed in registry with the respective duct-port g' and whose
 10 opposite cheek-piece h' is connected to said cheek-piece h by a flexible inclosure h^2 . Said motors H are normally collapsed, as shown in Fig. 2, but are uplifted, as shown in Fig. 1, when compressed air is delivered to them
 15 from the casing A through the orifices d and the conduits connected therewith, each of said ducts g being provided with an exhaust-vent g^2 , whose area may be adjustably predetermined by means of the respective set-screw G' , which extend within the ducts g in
 20 threaded engagement therewith. The area of each vent g^2 is so proportioned with respect to the orifice d , connected therewith, that each motor H is instantly uplifted by the compressed air admitted to its duct g when its
 25 orifice d is opened and instantly collapsed by the escape of said air from said duct when the web C closes said orifice d and cuts off the supply of compressed air from the casing
 30 A . Each of the orifices d in said tracker-bar being in communication with the atmosphere through its respective exhaust-vent g^2 , the compressed air within the casing A serves to maintain the web C in intimate contact with
 35 the tracker-bar, so that there is no leakage of air between the web and bar, and consequently the motors H are actuated solely in the sequence predetermined by the perforated design in the web C , the opening and closing
 40 of the orifices d in the tracker-bar D being effected automatically by the progression of the web C from the roll B to the roll B' , the latter being rotated by any convenient means in the direction of the arrow shown in
 45 Fig. 2.

I find it convenient to enable the operator to close the orifices d independently of the automatic mechanism above described when it is desired to play the organ manually, and
 50 for this purpose I mount the valve I upon the rod i , whose opposite ends are journaled with respect to the casing A , so that said valve may be oscillated by the lever-arm i' from the position shown in Fig. 2 to close the orifices d
 55 and prevent ingress of the compressed air thereto. Said valve is operatively connected with the pneumatic-bellows I' by the rod i^2 , which extends from the arm i' through the port i^3 in the top of the casing. Said pneumatic I' is normally upheld by the compressed
 60 air admitted thereto by said port from the casing A ; but the valve I may be shifted to its closed position by compression of the pneumatic I' either manually or by any convenient
 65 mechanism.

The aforesaid rising and falling movement of the series of motors H may be utilized in

any convenient manner to either directly or indirectly actuate a corresponding series of sound-producing devices. In the embodiment of my invention shown in Fig. 1 each of the pneumatic-motors H is provided with a rod K , coupling a pressure-valve k' , and an exhaust-valve k^2 to control the admission of wind from the primary-valve box L through a conduit l to an intermediate pneumatic-bellows m . Said pneumatics m are each provided with a pressure-valve m' and an exhaust-valve m^2 , coupled by a rod m^3 to control the admission of wind from the intermediate-valve box M to the soundboard N . Said soundboard N comprises a series of parallel top slats n and a series of parallel bottom slats n' , fixed in right-angular latticed relation, the adjoining slats in each series being slightly separated to permit the independent contraction and expansion of the respective slats. The bottom slats n' are provided with internal wind-ducts n^2 , which each communicate with the valve-box M by an opening n^3 , and each comprises a branch n^4 , extending through the bottom of the sound board and the several pneumatic-bars o' o^2 o^3 o^4 . Said bars are fixed to the soundboard parallel with the top slats n and form the respective tops of the separate unit wind-boxes O' O^2 O^3 O^4 , which constitute the wind-chest O .

The sound-pipes in the registers Q' Q^2 Q^3 Q^4 are provided with individual seats q in the top slats n of the soundboard N , and said pipes are respectively connected with the wind-boxes by the ports q' , &c., which extend from said seats through the top and bottom slats n n' and pneumatic-bars o' , &c., into the respective wind-boxes O' , &c. The pneumatic-bars o' , &c., respectively, support pneumatic-levers P' , &c., in horizontal position on the under side of the soundboard N within the respective wind-boxes O' , &c. Each of said levers comprises a pneumatic-bellows fixed in registry with the respective duct branches n^4 and carrying an arm p^3 , provided at its extremity with a valve p^4 in registry with the respective valve-ports q' , &c.

The wind-chest O supports the register stop-box R , which is connected with the supply of compressed air by the wind-trunk S . The admission of wind from said stop-box R to the respective units O' O^2 O^3 O^4 of the wind-chest is separately effected in any convenient manner by respective stop-pneumatics independently connected with the primary stop-valve box T by means of the respective wind-conduits T' T^2 T^3 T^4 . The admission of wind to said conduits T' , &c., is effected by respective valve-levers u , each provided with a pressure-valve u' and an exhaust-valve u^2 , coupled by a valve-rod u^3 , said levers u being arranged to be independently controlled by the respective digitals v' v^2 , &c., of the stop-manual V .

The operation of the device above described is as follows: It being desired to use the register of sound-pipes Q' , the digital v' of the

stop-manual V is depressed, as indicated in Fig. 1, which movement, through the intermediate mechanism, admits the wind from the trunk S to the wind-chest box O', common to said register Q'. The pneumatic pressure thus produced in the box O', being external to the pneumatic-bellows lever P', is balanced by the pneumatic pressure within said bellows, which is in communication with the wind-box M by the duct n^2 , &c. However, if any one of the orifices d in the tracker-bar D is opened by the registry therewith of a perforation in the web C the corresponding motor H is uplifted, and its valve k^2 being thereby closed and its valve k' opened wind is admitted from the primary-valve box L to the respective intermediate pneumatic m , thereby closing its valve m' and opening its valve m^2 , which opens the corresponding duct n^2 to the atmosphere, so that the bellows of the respective lever P' is instantly collapsed and opens the respective port q' , leading to the particular pipe of the register Q' corresponding to the open orifice d , thereby causing that pipe to speak. Said pipe ceases to speak when the orifice d is covered by the web C, for thereupon the compressed air within the motor H escapes through the exhaust-vent g^2 and said motor being collapsed by its own weight and the pressure upon the valve k' within the box L said valve k' is closed and the valve k^2 simultaneously opened. Said valve k^2 being opened permits the wind in the intermediate pneumatic m to escape, and said pneumatic m is collapsed by the pressure within the intermediate-valve box M, thereby opening the valve m' and simultaneously closing the valve m^2 , so that pressure is admitted to the bellows of the lever P' and the latter gravitates to its normal position, wherein its valve p^4 closes the port q' , leading to said sound-pipe.

The organ which I have illustrated also comprises a manual W, whose digitals w are respectively connected with the manual-action valves x to control the admission of wind from the manual-action box X through the branch g^3 in the duct g to the respective motors H, so that the organ may be played either automatically or manually, at the will of the operator. However, I do not desire to limit myself to the particular embodiment of my invention which I have illustrated, as it is obvious that various modifications may be made therein without departing from the essential features of my invention.

I claim—

1. In a musical instrument, the combination with a pneumatic tracker-bar comprising the metal plate D; of means to progress a perforated web with respect to said metal plate D; a series of orifices d , in the front of said metal plate D; a series of metal conduits F; a series of metal nozzles E, whose rear ends are respectively connected to the metal conduits F, and form continuations thereof, and whose

front ends are seated in the metal plate D, in respective communication with said orifices d ; each of said metal nozzles E, being of greater area at its rear extremity than at its junction with said metal plate D, and the rear extremities of said metal nozzles E, being alternately divergent in staggered relation with the axis of the series; and, a casing member comprising upper and lower boards secured at their front edges to said tracker-bar and forming a chamber coextensive with and inclosing said series of nozzles, substantially as set forth.

2. In a musical instrument, the combination with a pneumatic tracker-bar comprising the metal plate D; of means to progress a perforated web with respect to said metal plate D; a series of orifices d , in the front of said metal plate D; a series of metal conduits F; a series of separate metal nozzles E, whose rear ends are respectively connected to the metal conduits F, and form continuations thereof, and whose front ends are seated in the metal plate D, in respective communication with said orifices d ; each of said metal nozzles E, being of greater area at its rear extremity than at its junction with said metal plate D; and, a casing member comprising upper and lower boards secured at their front edges to said tracker-bar and forming a chamber coextensive with and inclosing said series of nozzles, substantially as set forth.

3. In a musical instrument, the combination with a pneumatic tracker-bar, comprising a metal plate D; of means to progress a perforated web with respect to said metal plate D; a series of orifices d , in the front of said metal plate D, arranged transversely with respect to said web; each of said orifices being of less extent in the direction of traverse of said web than in the direction at right angles thereto, and merging respectively into cylindrical recesses in the back of said metal plate D; a series of metal conduits F; a series of separate metal nozzles E, whose rear ends are respectively connected to the metal conduits F, and form continuations thereof, and whose front ends are respectively seated in said cylindrical recesses d' , in the metal plate D; and, a casing member comprising upper and lower boards secured at their front edges to said tracker-bar and forming a chamber coextensive with and inclosing said series of nozzles, substantially as set forth.

4. In a musical instrument, the combination with a pneumatic tracker-bar comprising a metal plate D; of means to progress a perforated web with respect to said metal plate D; a series of orifices d , in the front of said metal plate D; a series of metal conduits F; a series of separate metal nozzles E, whose rear ends are respectively connected to said metal conduits F, and form continuations thereof, and whose front ends are connected to the metal plate D, in respective communication with said orifices d ; and, a casing member comprising upper and lower boards secured at their

front edges to said tracker-bar and forming a chamber coextensive with and inclosing said series of nozzles, substantially as set forth.

5 In a musical instrument, the combination with a pneumatic tracker-bar, comprising a metal plate D; of means to progress a perforated web with respect to said metal plate D; a series of orifices d , in the front of said metal plate D, arranged transversely with respect to said web and merging respectively into cylindrical recesses d' , in the back of said metal plate D; a series of metal conduits F; a series of separate metal nozzles E, whose rear ends are respectively connected to the metal conduits F, and form continuations thereof, and whose front ends are respectively seated in said cylindrical recesses d' , in the metal plate D; and, a casing member comprising upper and lower boards secured at their front edges to said tracker-bar and forming a chamber coextensive with and inclosing said series of nozzles, substantially as set forth.

6 In a musical instrument, the combination with a pneumatic tracker-bar comprising the metal plate D; of means to progress a perforated web with respect to said metal plate D; a series of orifices d , in the front of said metal plate D, arranged to register with the perforations in said web, and to be automatically opened and closed by the latter; a valve adapted to open and close said orifices d , at the will of the operator; and, a pneumatic motor arranged to normally hold said valve off its seat, automatically, substantially as set forth.

7 In a musical instrument, the combination with a metallic pneumatic tracker-bar having a series of rectangular orifices in its front face; of a series of circular recesses, in the rear face of said bar, larger in cross-sectional area than said orifices and in communication there-

with; a series of conical metal nozzles having their smaller ends supported in said circular recesses; a casing member comprising upper and lower boards secured at their front edges to said tracker-bar and forming a chamber coextensive with and inclosing said series of nozzles; a series of metal conduits arranged in staggered relation to each other vertically and having their front ends fitted over the larger ends of said nozzles; a series of independent air-valves respectively connected to the rear ends of said conduits; and, means to progress a perforated web across the front face of said tracker-bar, substantially as set forth.

8 In a musical instrument, the combination with a pneumatic tracker-bar having a series of orifices in its front face; of a valve arranged in front of said tracker-bar to open and close said orifices; and, means to normally hold said valve away from said bar, comprising a pneumatic-bellows motor and a rod connecting said bellows to said valve, the latter being arranged to be manually operated by pressure applied to the exterior of said bellows, substantially as set forth.

9 In a musical instrument, the combination with a pneumatic tracker-bar having a series of orifices in its front face; of a valve arranged in front of said tracker-bar to open and close said orifices; and means to automatically open said valve, comprising a motor operatively connected therewith, substantially as set forth.

In testimony whereof I have hereunto signed my name, at Philadelphia, Pennsylvania, this 27th day of March, 1901.

WILLIAM E. HASKELL.

Witnesses:

ARTHUR E. PAIGE,
E. L. FULLERTON.