(No Model.)

6 Sheets—Sheet 1.

C. S. & W. E. HASKELL.

ORGAN.

No. 488,559. Patented Dec. 27, 1892.

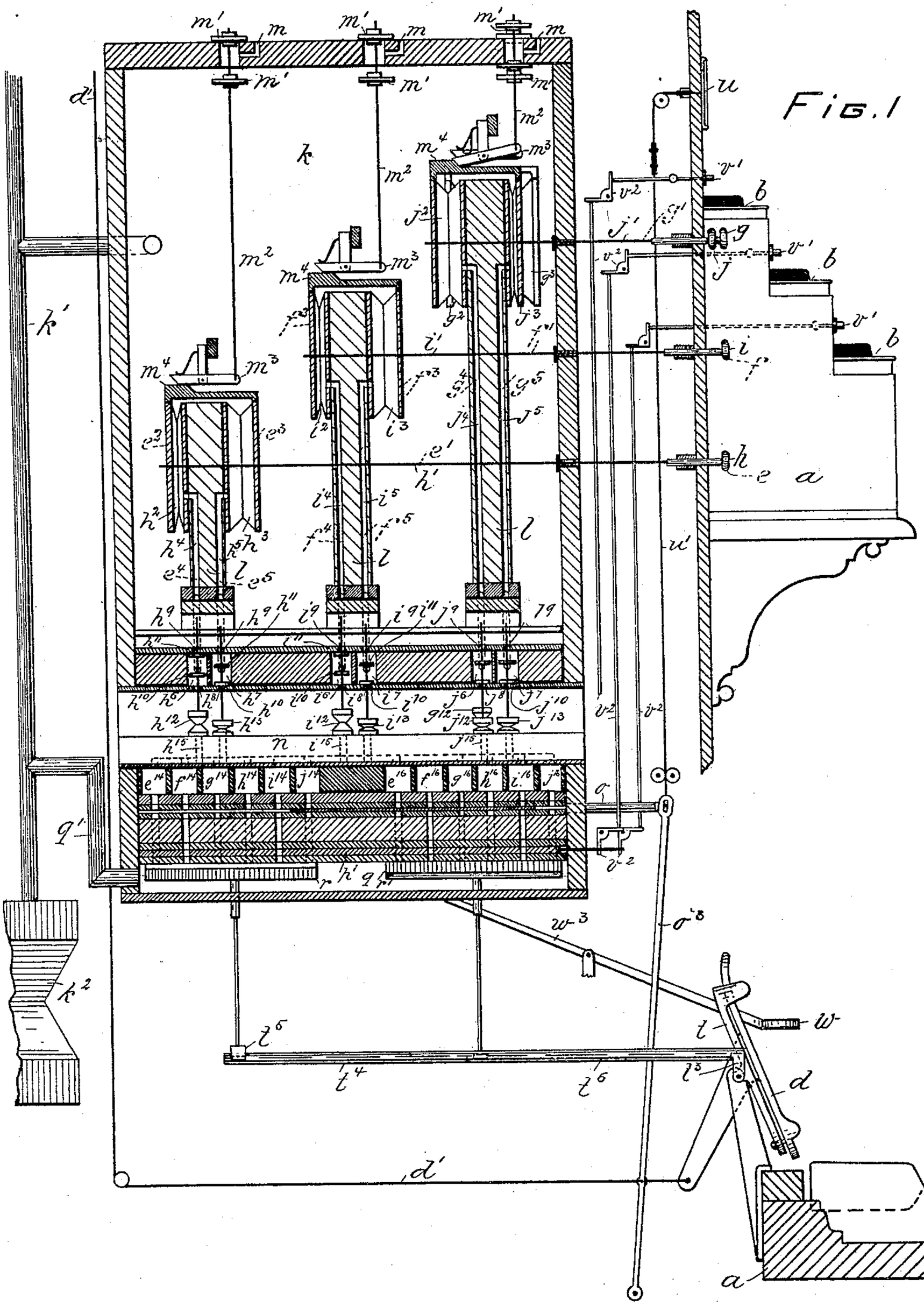


Fig. 1

WITNESSES:

Richard C. Maxwell.

Thomas M. Smith.

INVENTORS.

Charles S. Haskell and Wm. E. Haskell,

BY J. Walter Douglass

ATT'Y.

(No Model.) 6 Sheets—Sheet 2.

C. S. & W. E. HASKELL.

ORGAN.

No. 488,559. Patented Dec. 27, 1892.

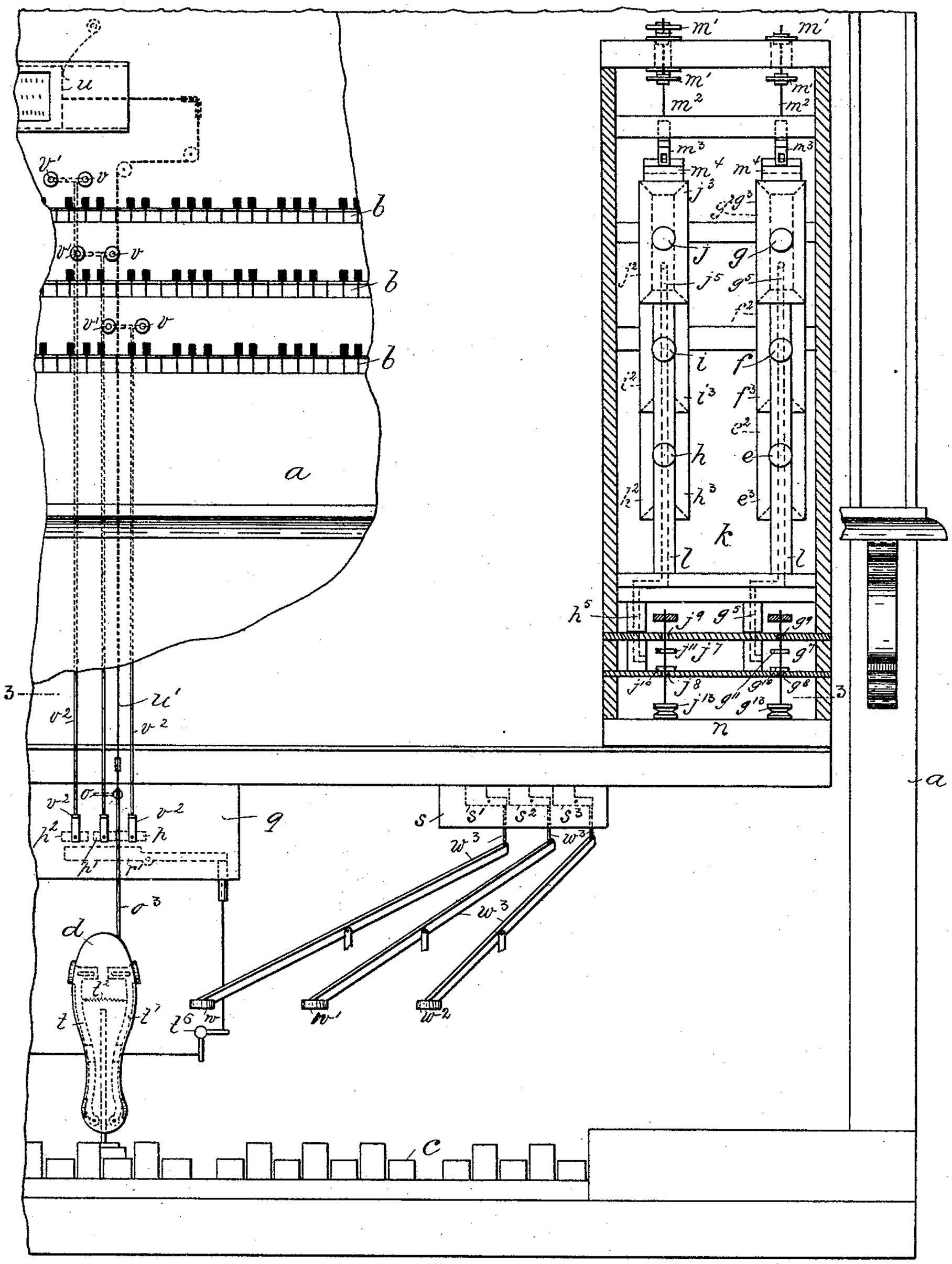


Fig. 2.

WITNESSES:
Richard C. Maxwell.
Thomas M. Smith.

INVENTORS.
Charles S. Haskell & Wm E. Haskell,
BY J. Walter Douglass
ATT'Y.

(No Model.) 6 Sheets—Sheet 3.

C. S. & W. E. HASKELL.

ORGAN.

No. 488,559. Patented Dec. 27, 1892.

Fig. 3.

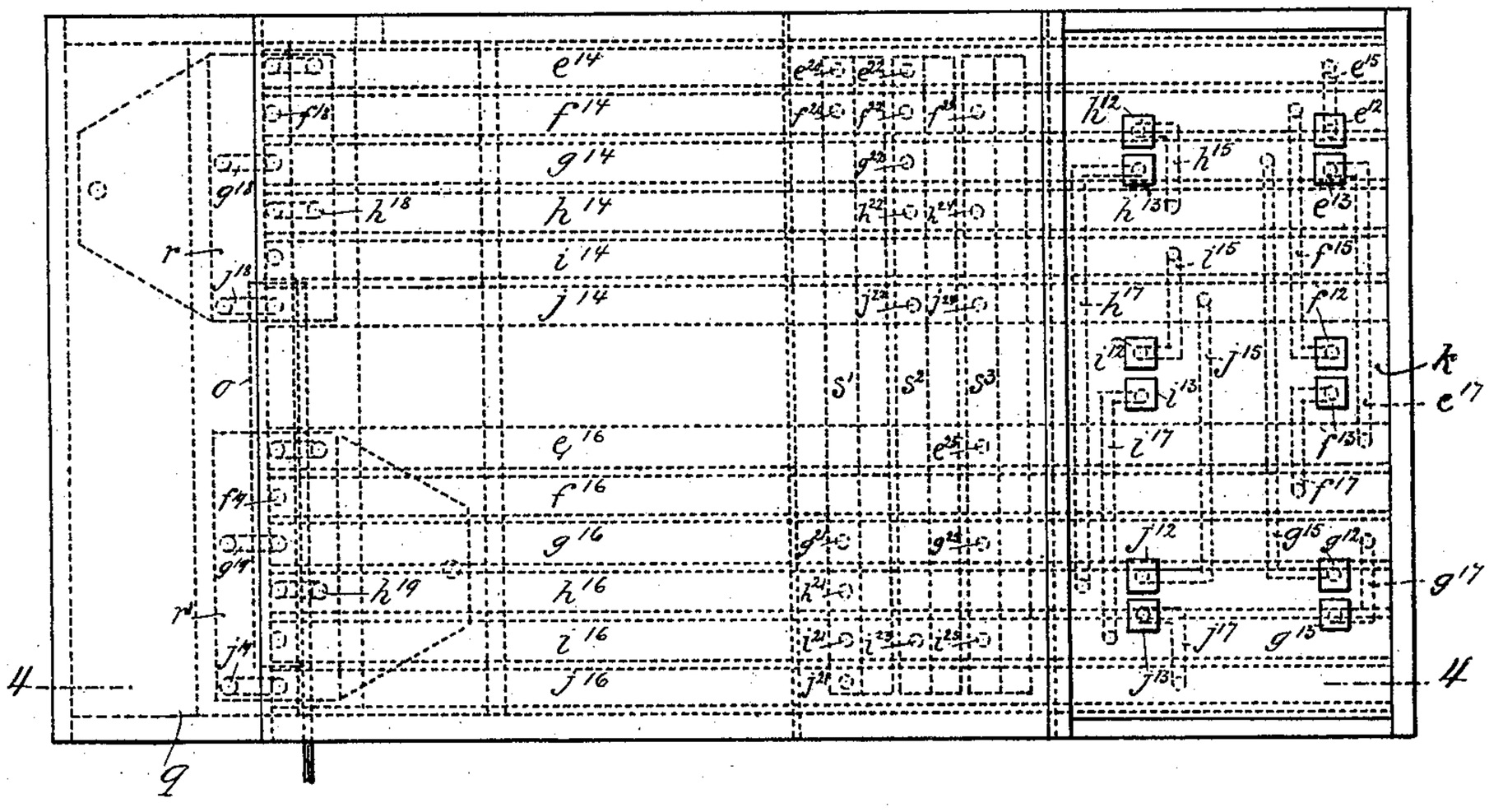
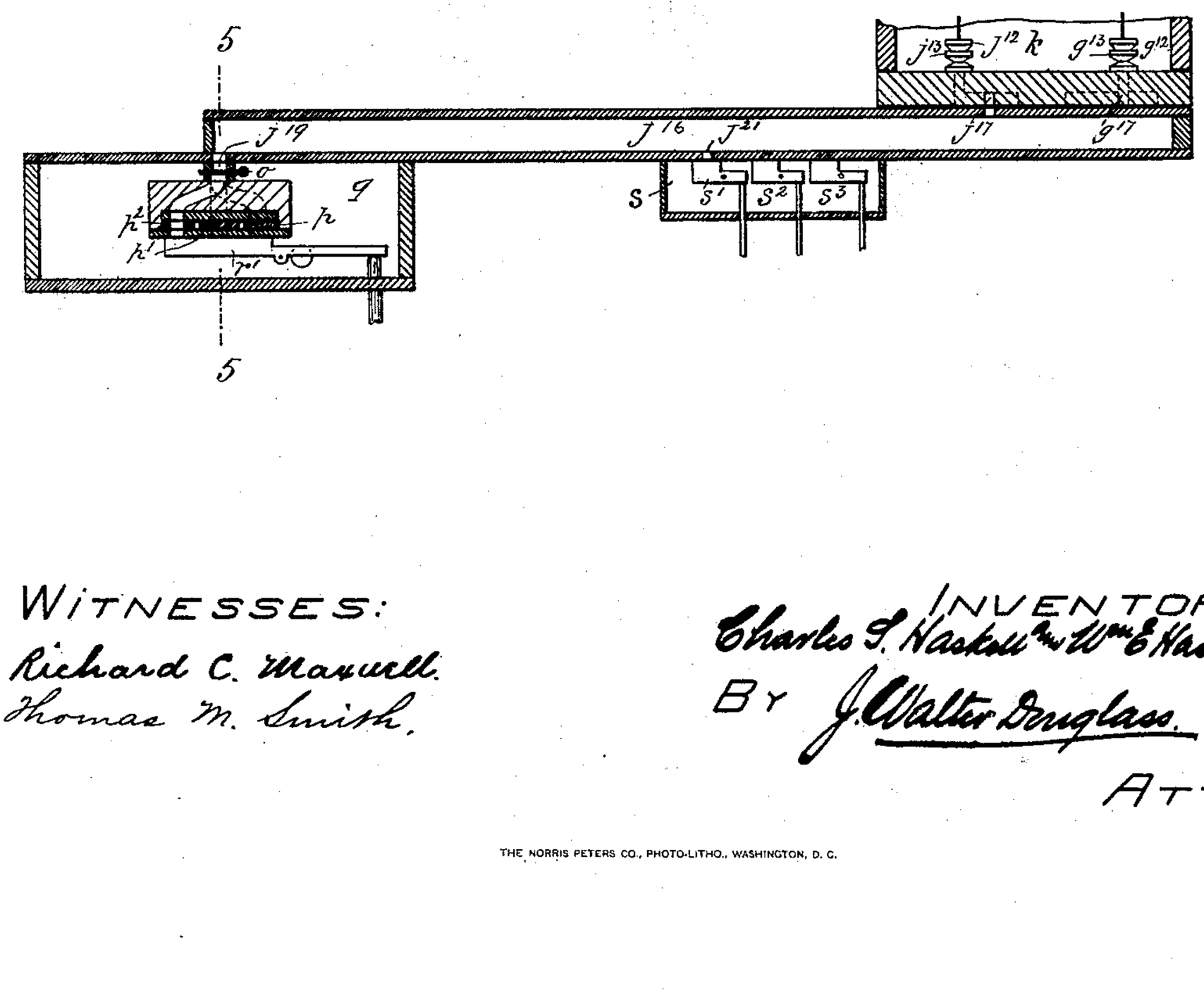


Fig. 4.



Witnesses:
Richard C. Maxwell.
Thomas M. Smith.

Inventors.
Charles S. Haskell and Wm E. Haskell,
By J. Walter Douglass.
Att'y.

(No Model.) 6 Sheets—Sheet 4.

C. S. & W. E. HASKELL.

ORGAN.

No. 488,559. Patented Dec. 27, 1892.

Fig. 5.

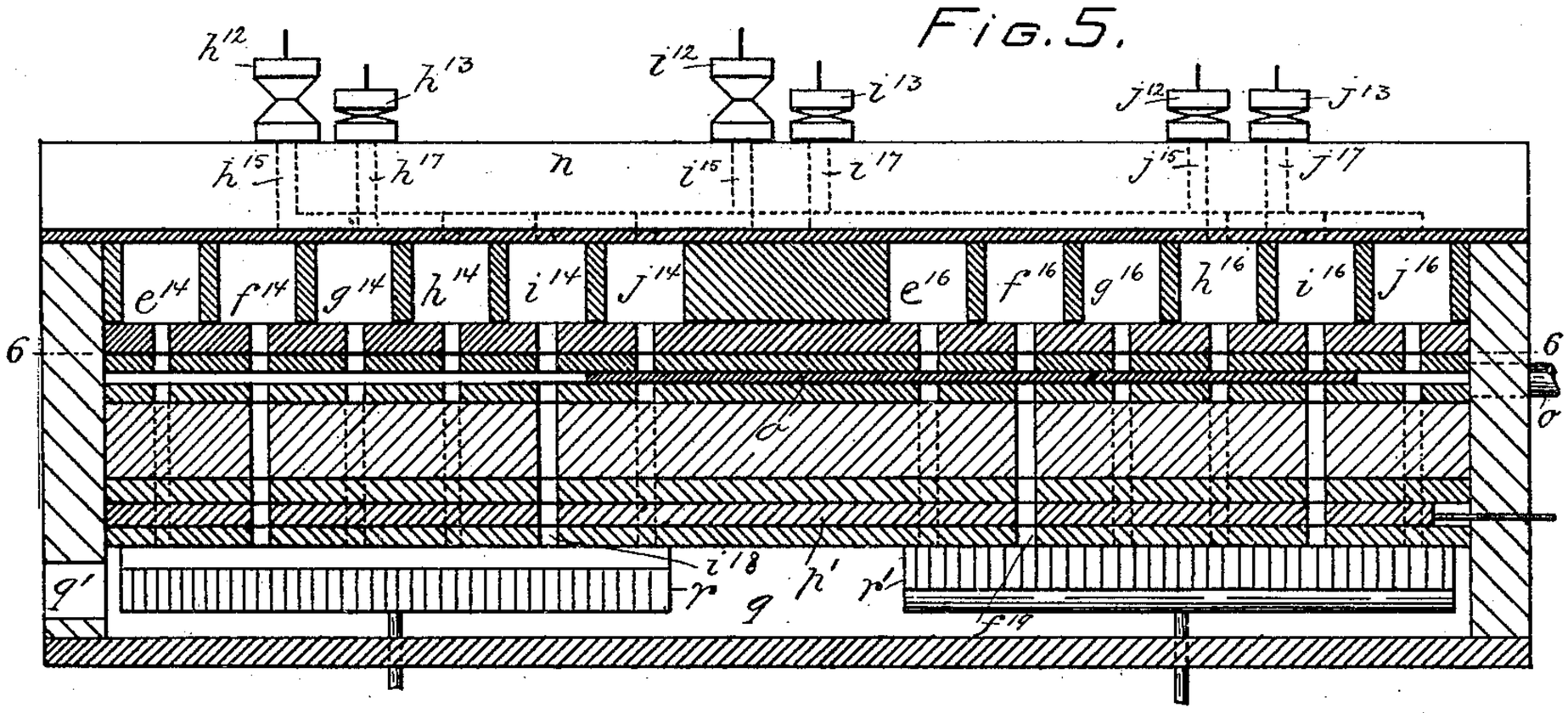


Fig. 6.

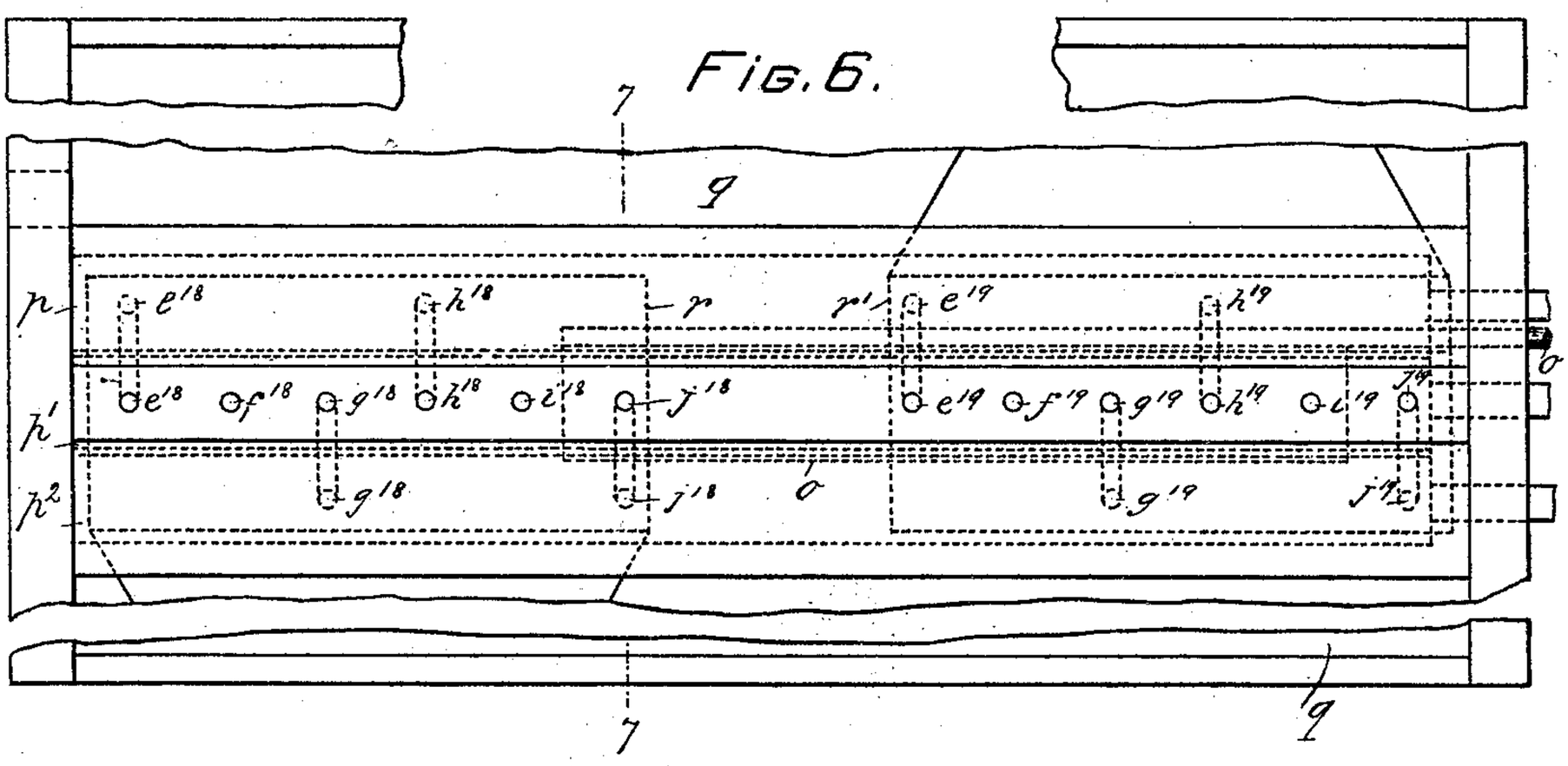
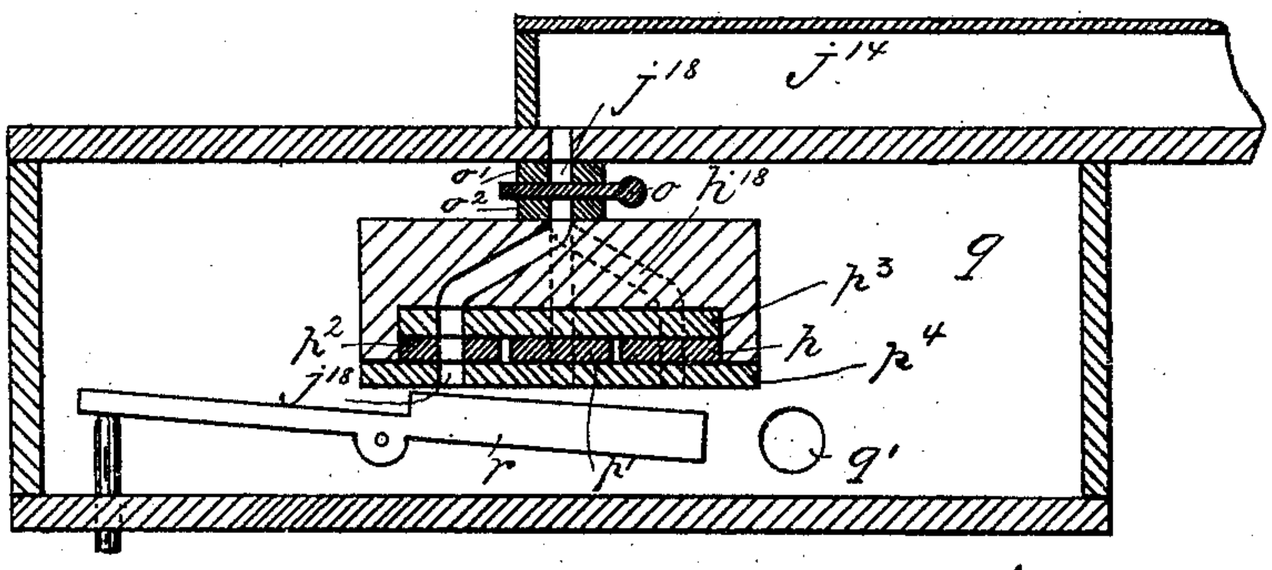


Fig. 7.



WITNESSES:
Richard C. Maxwell.
Thomas M. Smith.

INVENTORS.
Charles S. Haskell and Wm. E. Haskell,
By J. Walter Douglass.
Atty.

(No Model.) 6 Sheets—Sheet 5.

C. S. & W. E. HASKELL.

ORGAN.

No. 488,559. Patented Dec. 27, 1892.

Fig. 8.

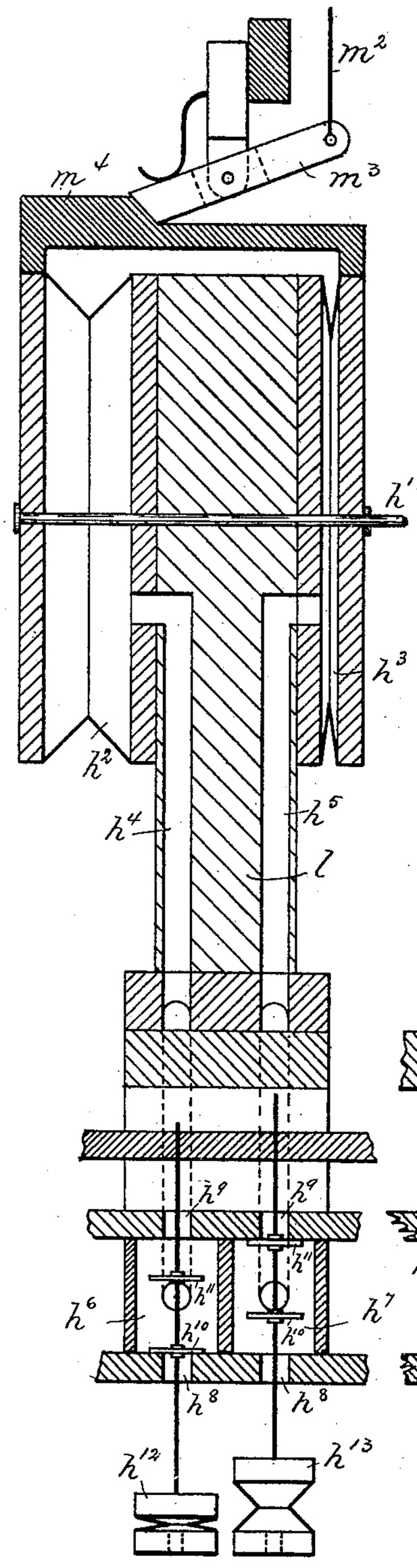


Fig. 9.

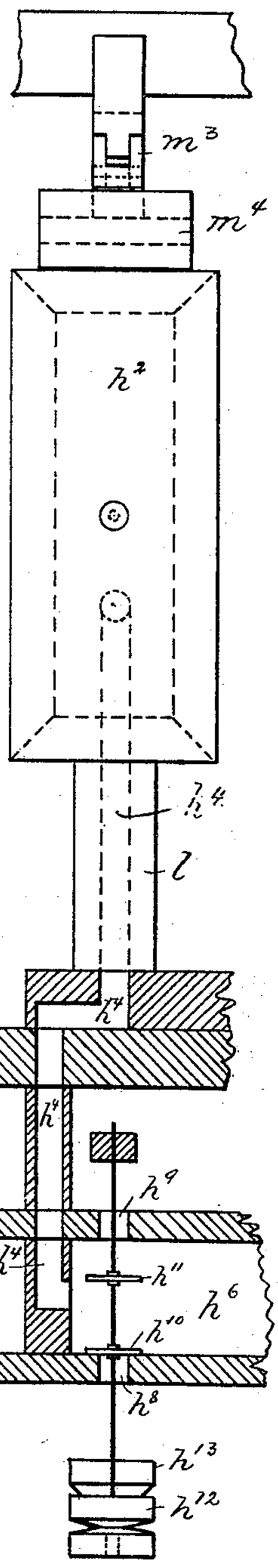
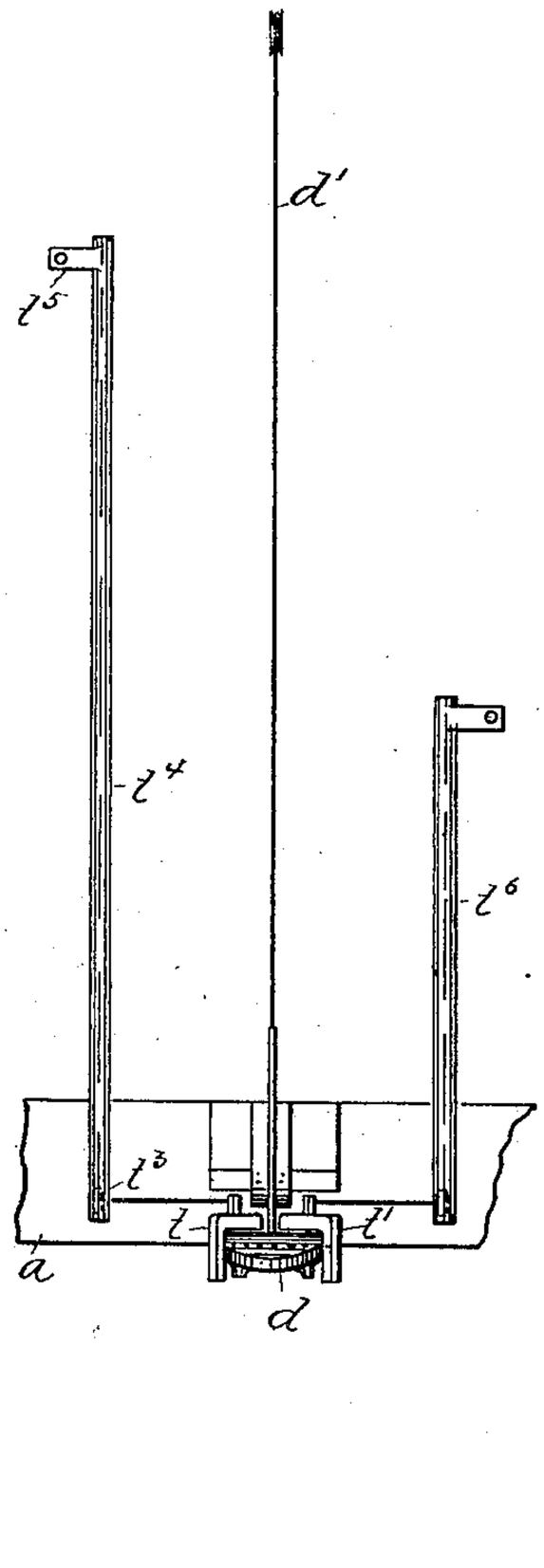


Fig. 10.



WITNESSES:

Richard C. Maxwell.
Thomas M. Smith

INVENTORS.
Charles S. Haskell and Wm. E. Haskell,
By J. Walter Douglass.
Att'y.

(No Model.) 6 Sheets—Sheet 6.

C. S. & W. E. HASKELL.

ORGAN.

No. 488,559. Patented Dec. 27, 1892.

FIG. 11.

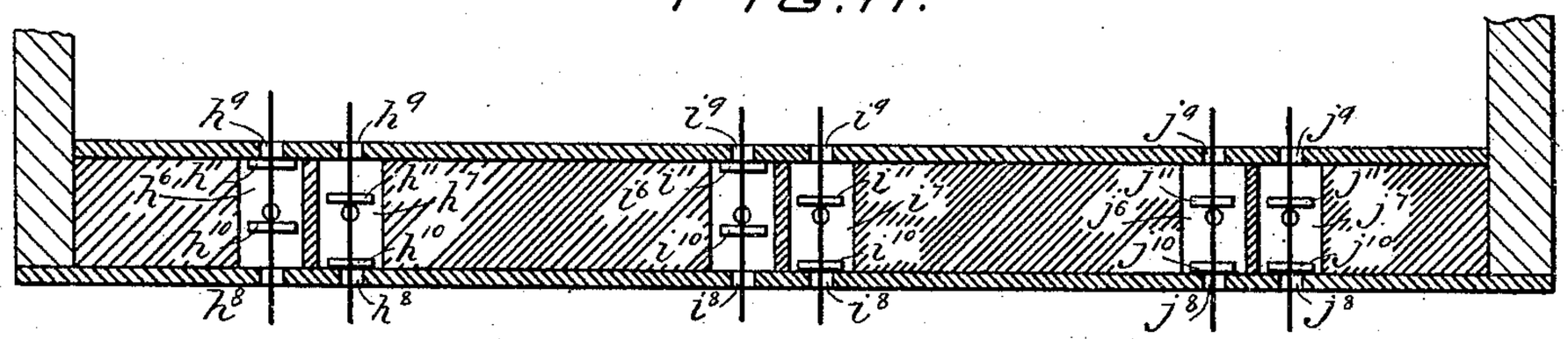


FIG. 12.

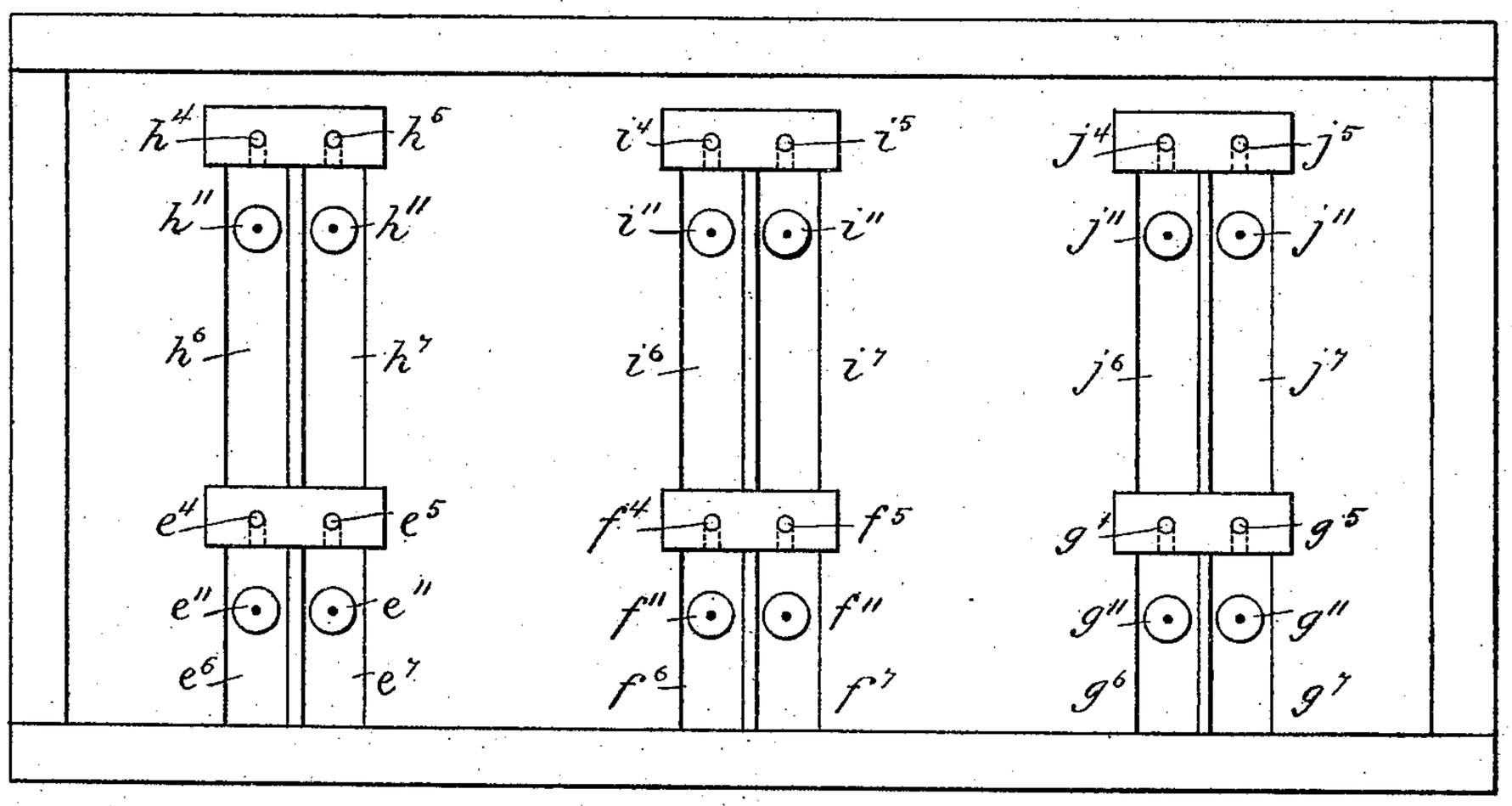
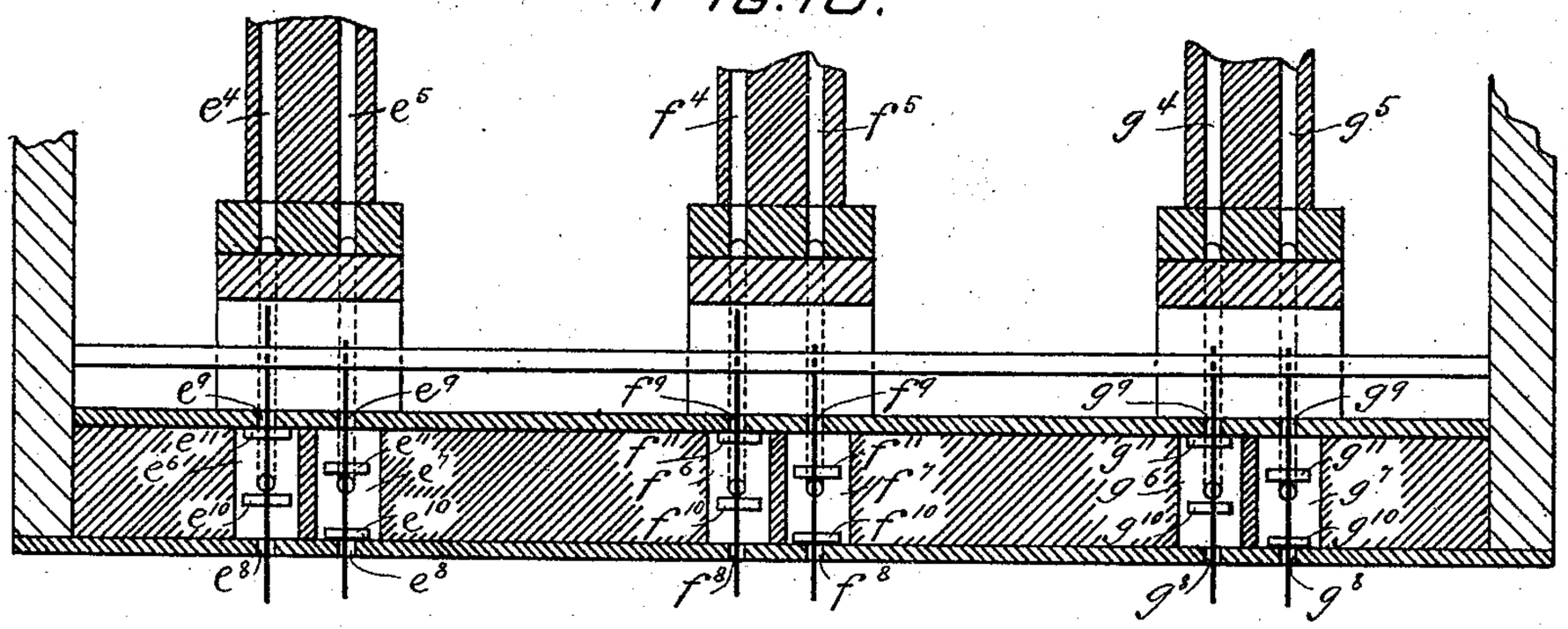


FIG. 13.



WITNESSES:
Richard C. Maxwell.
Thomas M. Smith.

INVENTORS.
Charles S. Haskell and Wm. E. Haskell,
By J. Walter Douglass.
ATT'Y.

UNITED STATES PATENT OFFICE.

CHARLES S. HASKELL AND WILLIAM E. HASKELL, OF PHILADELPHIA, PENNSYLVANIA.

ORGAN.

SPECIFICATION forming part of Letters Patent No. 488,559, dated December 27, 1892.

Application filed August 18, 1892. Serial No. 443,405. (No model.)

To all whom it may concern:

Be it known that we, CHARLES S. HASKELL and WILLIAM E. HASKELL, both citizens of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Organs, of which the following is a specification.

The principal objects of our invention are first, to provide the swell pedal with simple and efficient attachments which normally operate when the swell is being let on to pneumatically push out stops one after another until all the stops are out, and which normally operate when the swell is being let off to pneumatically push in stops in a similar manner, whereby the power, tone and quality of the swell are enhanced and perfected; second, to provide simple, durable and efficient pneumatic and mechanical draw-stop actuating apparatus and complemental devices accessible to the organist for controlling the same in such manner that the draw-stops may be automatically and pneumatically pushed out or in, collectively or singly, or in predetermined combinations or groups, or one after another as may be required; third, to construct and arrange the various parts of the mechanical and pneumatic draw stop actuating mechanism for operation in such manner that the draw-stop knobs are susceptible of the usual manipulations by the hand of the organist as soon as said apparatus is not in action; fourth, to provide means for enabling the organist to confine the operation of the draw-stop apparatus to certain groups of draw-stops; and fifth, to provide a visual signal or telltale for indicating the names of the draw-stops that have been brought into position by certain portions of the draw-stop actuating apparatus for being collectively pushed out or in by the subsequent operation of the other portions thereof.

Our invention consists of an organ provided with draw-stops, a swell pedal, pneumatic draw-stop actuating mechanism, and a slide operated by the swell pedal and adapted to control said pneumatic mechanism, the construction being such that the opening and closing of the swell causes the slide through the instrumentality of the pneumatic mechanism to let on and shut off draw-stops one after another, thereby enhancing and perfecting the power, tone and quality of the swell.

Our invention further consists of a pneumatic draw-stop action comprising a series of draw-stops, pneumatic mechanism for pushing each of said draw-stops out and in, throttle-valves for starting and stopping the pneumatic mechanism to effect the pushing out and in of stops, a slide for controlling the pneumatic mechanism to permit of the simultaneous and successive shifting of all the stops, and means accessible to the organist for operating the throttle-valves and slide.

Our invention further consists of a pneumatic draw-stop action comprising a series of draw-stops, pneumatic mechanism for pushing each of said draw-stops out and in, a slide for controlling the pneumatic mechanism, draw-plates for confining the action of the slide to certain sets or divisions of draw-stops, and means accessible to the organist for controlling the slide and draw-plates.

Our invention further consists of a pneumatic draw-stop action comprising a series of draw-stops, pneumatic mechanism for pushing each of said draw-stops out and in, combination valves respectively adapted to effect the pushing out of certain stops in predetermined combinations or groups, and means accessible to the organist for operating said combination valves; and

Our invention further consists of the improvements in draw-stop actions hereinafter described and claimed.

The nature, characteristic features and scope of our invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof; and in which

Figure 1, is a side elevational view partly in section of the desk of an organ showing a pneumatic draw-stop action and its accessories embodying features of our invention in application thereto. Fig. 2, is a front elevational view partly in section of the same showing all the draw-stops and their accessories disposed at the right side of the center line of the desk. Fig. 3, is a top or plan view taken on the line 3—3, of Fig. 2, and showing a series of longitudinally ranging main air chan-

nels and an auxiliary air chamber for supplying air thereto and also showing a series of transversely ranging distribution channels for conveying air from the main channels to the bellows that actuate the valves controlling the pushing in and out of stops. Fig. 4, is a section taken on the line 4—4, of Fig. 3. Fig. 5, is a transverse section drawn to an enlarged scale and taken on the line 5—5, of Fig. 4, showing the air pressure chamber broken away and also illustrating the detail construction of the auxiliary air chamber. Fig. 6, is a top or plan view taken on the line 6—6, of Fig. 5, and showing along the center line thereof the inlet apertures through which air is admitted to the main air channels. Fig. 7, is a section taken on the line 7—7, of Fig. 6. Fig. 8, is a central section drawn to an enlarged scale of one pair of draw-stop bellows and their complemental valve-bellows and accessories. Fig. 9, is a back view partly in section of the bellows illustrated in Fig. 8. Fig. 10, is a diagrammatic plan view illustrating the attachments of the swell pedal and their complemental tracker work; and Figs. 11, 12 and 13 are detail views drawn to an enlarged scale in order to illustrate certain portions of the valve chambers and their accessories which are partly or wholly concealed in Figs. 1 and 2.

In the drawings *a*, is the frame-work or housing of the desk of an organ. *b*, are manuals or banks of keys. *c*, is a bank of pedal keys. *d*, is the swell pedal. *d'*, is a cord or other connection that leads from the swell pedal *d* to the swell shades or shutters, not shown, and *e*, *f*, *g*, *h*, *i* and *j*, are draw-stops of which any number may be employed. These parts co-operate with the other parts of the organ, which are too well known to require illustration, in the usual manner, that is to say, the respective keys of the different banks of keys permit notes of different pitch to be sounded; the draw-stops when pulled out permit a corresponding stop of pipes to speak when the keys are depressed, and when pushed in prevent said stop of pipes from speaking even when the keys are depressed; and the swell pedal affords means for opening and closing the swell box, whereby the volume of sound is increased or diminished.

Having thus briefly designated so many and such parts of an ordinary pipe organ as are essential to a comprehension of our invention, we will now describe the construction and subsequently the mode of operation of the parts that embody features of the same.

Referring now to the drawings and more particularly to Figs. 1, 2, 3 and 4 thereof, *k* is an air pressure chamber or box to which a supply of air under pressure is admitted through a pipe *k'*, that communicates with a main reservoir k^2. This air pressure chamber *k*, is preferably located in rear of the draw-stop knobs and may be disposed in any convenient position, and more than one air pressure chamber or box may be employed. In the present instance this air pressure chamber *k*, is disposed at the right hand side of the organ and directly in rear of the draw-stop knobs, so that the draw-stop rods e', f', g', h', i' and j', extend directly backward through the front wall of the same. It may be remarked that the draw-stop rods e', f' and g', and certain of their connections are located directly in rear of and are concealed by the draw-stop rods h', i', and j', and their corresponding connections and consequently the concealed parts are designated upon the drawings by dotted reference letters. These draw-stop rods e', f', g', h', i' and j', are respectively connected with oppositely disposed bellows e^2 and e^3, f^2 and f^3, g^2 and g^3, h^2 and h^3, i^2 and i^3, and j^2 and j^3, located in the air pressure chamber *k*, and supported by means of suitable posts *l*. The posts *l*, are respectively provided with conduits e^4 and e^5, f^4 and f^5, g^4 and g^5, h^4 and h^5, i^4 and i^5, and j^4 and j^5, (Figs. 1, 2, 11, 12, and 13) that communicate with the bellows e^2 and e^3, f^2 and f^3, g^2 and g^3, h^2 and h^3, i^2 i^3, and j^2 and j^3, and with a series of valve chambers e^6 and e^7, f^6 and f^7, g^6 and g^7, h^6 and h^7, i^6 and i^7, and j^6 and j^7. Each of these valve chambers is provided with two ports e^8 and e^9, f^8 and f^9, g^8 and g^9, h^8 and h^9, i^8 and i^9, and j^8 and j^9. The ports e^8, f^8, g^8, h^8, i^8 and j^8, are adapted to communicate with the atmosphere and the ports e^9, f^9, g^9, h^9, i^9 and j^9, are adapted to communicate with the interior of the air pressure chamber *k*.

e^{10} and e^{11}, f^{10} and f^{11}, g^{10} and g^{11}, h^{10} and h^{11}, i^{10} and i^{11} and j^{10} and j^{11}, are valves adapted respectively to permit the conduits e^4 and e^5, f^4 and f^5, g^4 and g^5, h^4 and h^5, i^4 and i^5 and j^4 and j^5, to communicate with the atmosphere and with the interior of the air pressure chamber. If both of the conduits that appertain to one pair of bellows, or in other words, to one draw-stop, for example, the conduits h^4 and h^5, are in communication with the interior of the air pressure chamber *k*, which is their normal position, then the exterior and interior of the bellows h^2 and h^3, are subjected to the same pressure, to-wit:—the pressure of the air chamber *k*, and consequently are in equilibrium, so that the draw-stop knob *h* may be pushed in or pulled out manually and will remain in either position.

The above description, of course, applies to the draw-stops *e*, *f*, *g*, *i* and *j*, and their complemental bellows and accessories. However, when any one of the bellows e^2, f^2, g^2, h^2, i^2 and j^2, is permitted to communicate with the atmosphere by the lifting of its complemental valves e^{10} and e^{11}, f^{10} and f^{11}, g^{10} and g^{11}, h^{10} and h^{11}, i^{10} and i^{11} and j^{10} and j^{11}, it collapses and thus causes its corresponding draw-stop to be pushed out. Similarly when any one of the bellows e^3, f^3, g^3, h^3, i^3 and j^3, is permitted to communicate with the atmosphere by the lifting of its complemental valves e^{10} and e^{11}, f^{10} and f^{11}, g^{10} and g^{11}, h^{10} and h^{11}, i^{10} and i^{11} and j^{10} and j^{11}, it collapses and thus causes its corresponding draw-stop to be

pushed in. It being understood that as soon as the valves e^{10} and e^{11}, f^{10} and f^{11}, g^{10} and g^{11}, h^{10} and h^{11}, i^{10} and i^{11} and j^{10} and j^{11}, are permitted to descend the equilibrium of the draw-stop bellows is re-established and the draw-stops are free to be be pushed in and pulled out manually in the usual manner. It may be remarked that the movements of the draw-stop rods e', f', g', h', i' and j', are availed of for operating the sliders that control the stops of pipes, not shown. Of course this result may be accomplished by means of many of the well known mechanical or pneumatic devices that are commonly employed for this purpose by organ builders and others skilled in the art. In the present instance this result is accomplished by means of bellows, (not shown,) or "pneumatics" as they are sometimes termed. These "pneumatics" are controlled by ports m and their complemental valves m', and the valves m', are actuated by means of spindles m^2 and centrally pivoted spring controlled levers m^3, which latter engage and are actuated by cams m^4, carried by each pair of complemental draw-stop bellows.

e^{12} and e^{13}, f^{12} and f^{13}, g^{12} and g^{13}, h^{12} and h^{13}, i^{12} and i^{13} and j^{12} and j^{13}, are valve bellows mounted upon a suitable board n, and adapted respectively to lift the valves e^{10} and e^{11}, f^{10} and f^{11}, g^{10} and g^{11}, h^{10} and h^{11}, i^{10} and i^{11} and j^{10} and j^{11}, and thus cause the draw-stops e, f, g, h, i, and j to be shifted. The valve bellows e^{12}, f^{12}, g^{12}, h^{12}, i^{12} and j^{12} operate to cause the draw-stops to be pushed out and are consequently referred to as the "on" bellows, and the valve bellows e^{13}, f^{13}, g^{13}, h^{13}, i^{13} and j^{13}, operate to cause the draw-stops to be pushed "in" and are consequently referred to as the "off" bellows.

e^{14}, f^{14}, g^{14}, h^{14}, i^{14} and j^{14}, Figs. 1 and 3, are main channels running transversely of the organ and adapted to convey a supply of air to the "on" bellows e^{12}, f^{12}, g^{12}, h^{12}, i^{12} and j^{12}. For this purpose grooves and complemental inlets and outlets e^{15}, f^{15}, g^{15}, h^{15}, i^{15} and j^{15}, Fig. 3, communicating with the main channels and with the "on" bellows are cut or otherwise formed in the board n.

e^{16}, f^{16}, g^{16}, h^{16}, i^{16} and j^{16}, are main channels adapted to convey a supply of air to the "off" bellows e^{13}, f^{13}, g^{13}, h^{13}, i^{13} and j^{13}. For this purpose grooves and complemental inlets and outlets e^{17}, f^{17}, g^{17}, h^{17}, i^{17} and j^{17}, communicating with the main channels and with the off bellows, are cut or otherwise formed in the board n. The channels e^{14}, f^{14}, g^{14}, h^{14}, i^{14} and j^{14}, are connected with the "on" bellows e^{12}, f^{12}, g^{12}, h^{12}, i^{12} and j^{12}, in such manner that when air is successively admitted to the channels e^{14}, f^{14}, g^{14}, h^{14}, i^{14} and j^{14}, the draw-stops are pushed out one after another in proper order or sequence for the production of a crescendo effect. Of course this order or sequence will depend upon the number and quality of the stops of the organ and upon the taste of the organ builder; the object being to bring on all the stops one after another in such order that the best crescendo effect is attained. In the present instance the draw-stops are pushed out in the following order e, f, g, h, i and j. The channels e^{16}, f^{16}, g^{16}, h^{16}, i^{16} and j^{16}, are connected with the "off" bellows e^{13}, f^{13}, g^{13}, h^{13}, i^{13} and j^{13} in such manner that when air is successively admitted to the channels e^{16}, f^{16}, g^{16}, h^{16}, i^{16} and j^{16}, the draw-stops are pushed in one after another in reverse order, and thus produce the reverse of the crescendo, *i. e.* a decrescendo effect. In the present instance the draw-stops are pushed in, in the following order—j, i, h, g, f and e. If a supply of air is admitted into all the channels e^{14}, f^{14}, g^{14}, h^{14}, i^{14} and j^{14} at the same time, the bellows e^{12}, f^{12}, g^{12}, h^{12}, i^{12} and j^{12}, are all expanded with the result that all of the draw-stops e, f, g, h, i and j, are pushed out at once. Similarly if a supply of air is admitted into all the channels e^{16}, f^{16}, g^{16}, h^{16} i^{16} and j^{16} at the same time, the bellows e^{13}, f^{13}, g^{13}, h^{13} i^{13} and j^{13}, are all expanded with the result that all of the draw-stops e, f, g, h, i and j are pushed in at the same time. If a supply of air is admitted to certain of the channels e^{14}, f^{14} g^{14}, h^{14}, i^{14} and j^{14}, for example, into the channels e^{14} and f^{14}, it follows that the stops e and f, will be pushed out either at the same time or successively according as the supply of air is admitted to both of the channels at the same time or first to one and then to the other of them. Similarly if a supply of air is admitted into certain of the channels e^{16}, f^{16}, g^{16} h^{16}, i^{16} and j^{16}, for example, into the channels g^{16}, h^{16}, i^{16} and j^{16}, it follows that the stops g, h, i and j, will be pushed in either at the same time or successively according as the supply of air is admitted to all of these channels at the same time or first to one and then to the other of them. The upper open portions of the apertures or ducts e^{18}, f^{18}, g^{18}, h^{18}, i^{18}, j^{18}, e^{19}, f^{19}, g^{19}, h^{19}, i^{19} and j^{19}, that serve to admit air to the main channels, are disposed in a straight line or row, Fig. 6. The upper open portions of the apertures or ducts e^{18}, f^{18}, g^{18}, h^{18}, i^{18} and j^{18}, that serve to admit air to push out stops, are disposed to one side of the center of said straight line or row and the upper open portions of the apertures or ducts e^{19}, f^{19}, g^{19}, h^{19}, i^{19} and j^{19}, that serve to admit air to push in stops, are disposed at the other side of the center of said straight line or row.

o, is a slide adapted to close the upper open portions of the apertures or ducts e^{18}, f^{18}, g^{18}, h^{18}, i^{18} and j^{18}, or the upper open portions of the apertures or ducts e^{19}, f^{18}, g^{19}, h^{19}, i^{19} and j^{19} and also to open certain of the former, for example, the inlets e^{18}, f^{18}, g^{18}, h^{18} and i^{18}, and to close the corresponding inlets e^{19}, f^{19}, g^{19}, h^{19} and i^{19}, of the latter. This slide o, affords means for opening or closing all or a portion of the inlet apertures e^{18}, f^{18}, g^{18}, i^{18} and j^{18} one after another, thus causing the draw-stops to be pushed out one after another and also for opening or closing all or a portion of the inlet apertures e^{19}, f^{19}, g^{19}, i^{19} and j^{19}, one after another, thus causing the draw-stops to be

pushed in one after another. Moreover this slide *o*, affords means for uncovering all or a portion of the inlet apertures e^{18}, f^{18}, g^{18}, i^{18} and j^{18} at the same time, thus causing all or a group of the draw-stops to be pushed out at the same time and also for uncovering all or a portion of the inlet apertures e^{19}, f^{19}, g^{19}, i^{19} and j^{19} at the same time, thus causing all or a group of the draw-stops to be pushed in at the same time. Certain of the apertures e^{18}, f^{18}, g^{18}, h^{18}, i^{18}, j^{18}, e^{19}, f^{19}, g^{19}, h^{19}, i^{19} and j^{19}, are curved and certain of them are straight, (Figs. 3, 4, 6 and 7) and the lower portions of them are disposed in three parallel lines or rows; in the present instance the lower portions of the apertures e^{18}, h^{18}, e^{19} and h^{19} are disposed in one straight line or row, the lower portions of the apertures f^{18}, i^{18}, f^{19} and i^{19}, are disposed in a second straight line or row, and the lower portions of the apertures g^{18}, j^{18}, g^{19} and j^{19}, are disposed in a third straight line or row.

p, p' and p^2, are three perforated draw-plates adapted respectively to open and close the apertures e^{18}, h^{18}, e^{19} and h^{19}, f^{18}, i^{18}, f^{19} and i^{19}, and g^{18}, j^{18}, g^{19} and j^{19}, in order to prevent the admission of air to the corresponding main channels even when the slide *o*, is in position for opening them. These draw-plates p, p' and p^2, thus afford means for excluding certain groups of draw-stops. In the present instance the groups comprising respectively the draw-stops *e*, *h*, *f* and *i* and *g* and *j* from the action of the slide *o*. It may be remarked that in most instances the stops controlled by each of the draw-plates would appertain to one of the organs into which the complete instrument is conventionally divided, so that the operation of the slide *o*, could be confined to one or more of the divisions of the instrument, for example, to the "swell organ." The lower open extremities of the apertures e^{18}, f^{18}, g^{18}, h^{18}, i^{18}, j^{18}, e^{19}, f^{19}, g^{19}, h^{19}, i^{19} and j^{19}, are adapted to communicate with the interior of an auxiliary air pressure chamber *q*, to which a supply of air is admitted through a pipe q', from the main air reservoir k^2.

r, is a throttle valve for controlling the admission of air to the apertures e^{18}, f^{18}, g^{18}, h^{18}, i^{18} and j^{18} that tend to operate to effect the pushing out of stops.

r', is a throttle-valve for controlling the admission of air to the apertures e^{19}, f^{19}, g^{19}, h^{19}, i^{19} and j^{19} that tend to operate to effect the pushing in of stops.

The slide *o*, throttle valves *r* and r', and draw-plates p, p' and p^2, afford means whereby all or a portion of the draw-stops *e*, *f*, *g*, *h*, *i* and *j*, may be pushed out or in successively or collectively or in predetermined groups. In practice it is frequently necessary or desirable to push out draw-stops in groups other than those above referred to and commonly designated "combinations" by organists, organ builders and others. This result is accomplished by the employment of an ancillary air pressure chamber *s*, supplied with compressed air from the main air reservoir k^2, and provided with complemental valves, hereinafter designated combination valves, and of which three s', s^2 and s^3 are shown.

e^{20} and f^{20} are holes bored in the bottom wall of the channels e^{14} and f^{14} and g^{21}, h^{21}, i^{21} and j^{21}, are holes bored in the bottom walls of the channels g^{16}, h^{16}, i^{16} and j^{16}. These holes e^{20}, f^{20}, g^{21}, h^{21}, i^{21} and j^{21}, are all adapted to be brought into communication with the interior of the ancillary air pressure chamber, by the opening of the valve s', so that when the valve s', is opened the stops *e* and *f*, are pushed out and the stops *g*, *h*, *i* and *j*, are pushed in.

e^{22}, f^{22}, g^{22}, h^{22} and j^{22}, are holes bored in the bottom walls of the channels e^{14}, f^{14}, g^{14}, h^{14} and j^{14} and i^{23} is a hole bored in the bottom wall of the channel i^{16}. These holes e^{22}, f^{22}, g^{22}, h^{22}, j^{22} and i^{23}, are all adapted to be brought into communication with the interior of the ancillary air pressure chamber *s*, by the opening of the valve s^2, so that when the valve s^2, is opened the stops *e*, *f*, *g*, *h* and *j* are all pushed out and the stop *i*, is pushed in.

f^{24}, h^{24} and j^{24}, are holes bored in the bottom walls of the channels f^{14}, h^{14} and j^{14}, and e^{25}, g^{25} and i^{25}, are holes bored in the bottom walls of the channels e^{16}, g^{16} and i^{16}. These holes f^{24}, h^{24}, j^{24}, e^{25}, g^{25} and i^{25}, are all adapted to be brought into communication with the interior of the ancillary air pressure chamber *s*, so that when the valve s^3, is opened the draw-stops *f*, *h* and *j*, are pushed out and the draw-stops *e*, *g*, and *i* are pushed in.

We have described means for pushing out three "combinations of stops," to-wit:—*e* and *f*; *e*, *f*, *g*, *h* and *j*; and *f*, *h* and *j*. However, it must be borne in mind that any number of different combinations may be had by employing additional valves and their accessories similar to the valves s', s^2 and s^3 and their accessories. The valves s', s^2 and s^3, serve to push out draw-stops as has been already explained and these draw-stops may be subsequently pushed in either by hand in the usual manner or by means of the throttle valve r' and its accessories. The slide *o*, is preferably composed of celluloid or other similar material, and works between two sheets of leather o' and o^2, Fig. 7, which serve to prevent undue leakage. The draw-plates p, p' and p^2, also work between sheets of leather p^3 and p^4, Fig. 7, or analogous material in order to avoid undue leakage.

The slide, draw-plates, throttle-valves and combination valves may be operated through the instrumentality of any suitable mechanism under the control of the organist. In the present instance the throttle valves *r* and r', are controlled by the sidewise motion of the foot of the organist as the same rests upon the swell pedal *d*. This result is accomplished by the employment of lugs *t* and t', pivotally attached to the swell pedal *d*, in range of the toe of the organist, and connected together by means of a spiral spring t^2. The movement of

the lug t, toward the left in Fig. 2, imparts a rocking motion to the arm t^3 of the roller t^4, and the rocking motion of the roller t^4, causes the arm t^5 thereof to open the throttle valve r. Similarly the motion of the lug t' toward the right in said figure, acting through the instrumentality of the roller t^6 and its complemental arms, causes the throttle valve r', to be opened. The slide o, is connected with the swell pedal d, through the instrumentality of suitable tracker-work o^3, and is shifted toward the right in Fig. 1, when the toe of the swell pedal is pushed forward in order to open the swell shutters or shades, thereby opening the channels e^{14}, f^{14}, g^{14}, h^{14}, i^{14} and j^{14}, and thus pushing out the draw-stops one after another. When the toe of the swell pedal is released in order to close the swell shades or shutters, the slide o, is shifted toward the left in Fig. 1, thus opening the channels e^{16}, f^{16}, g^{16}, h^{16}, i^{16} and j^{16} and permitting the draw-stops to be pushed in one after another and in reverse order.

u, is a spring controlled indicator or telltale that has the names of the stops printed or painted upon it and disposed in the same order in which the draw-stops are pushed out or in by the normal operation of the slide o. This telltale or indicator is located behind a suitable window in sight of the organist and is connected and caused to move with the slide o, through the intervention of a suitable flexible connection u', in such manner that the names of the stops that correspond with the apertures that are uncovered by the slide are visible through the window for purposes to be presently described. The draw-plates p, p' and p^2, are respectively controlled by sets of complemental push buttons v and v', which operate through the instrumentality of suitable tracker work v^2, to effect the required movements of the draw-plates in the direction of their lengths. The combination valves s', s^2 and s^3, are opened and closed through the instrumentality of combination pedals w, w' and w^2 accessible to the organist and their complemental tracker work w^3.

The mode of operation of the hereinabove described draw-stop action is as follows:—The organist may play upon the banks of manuals b and pedal keys c and may shift the draw-stops e, f, g, h, i and j in and out and operate the swell pedal d, in the usual manner. However, the organist may enhance, perfect and complete the tone, power and quality of the swell pedal by turning his toe toward the left in Fig. 2, thus effecting the opening of the throttle-valve r, and then pushing his toe forward thus effecting the movement of the slide o toward the right in Fig. 1. The result of these movements is two-fold, the shutter or shade of the swell-box is opened and the draw-stops are pushed out one after another in proper order for the production of a grand crescendo. It being understood that the draw-plates p, p' and p^2, are in "on" position. Similarly the organist may turn his toe toward the right in Fig. 2, thus effecting the opening of the throttle-valve r', and then release the pedal d, thus effecting the movement of the slide o, toward the left in Fig. 2; the result of these movements is also two fold, the shutter or shade of the swell-box is closed and the draw-stops are pushed in one after another in reverse order for the production of a diminuendo or decrescendo effect. The organist may push all the draw-stops out at the same time by first shifting the slide o, toward the right in Fig. 1, by pushing his toe forward and then turning his foot toward the left in Fig. 2, in order to open the valve r. Similarly the organist may push all the draw-stops in at the same time by first shifting the slide o, toward the left in Fig. 1, by releasing the pedal d, and then opening the valve r' by turning his toe toward the right in Fig. 2. In some instances it is necessary or desirable to confine the operation of the slide o, to certain groups of stops, for example, to the stops of the great, pedal or swell organs. The organist may accomplish this result by pressing upon one or more of the buttons v or v', which serve to shift the corresponding draw-plate or plates into position for excluding or admitting a supply of compressed air to the main channels which appertain to the required group of stops, for example, the stops of the great, pedal and swell organs.

The organist in playing is frequently required to pull out stops in certain groups which are often availed of in musical compositions and are commonly designated "combinations" and to push in all the other stops. This result is accomplished by means of the combination pedals w, w' and w^2.

It may be remarked that as soon as the supply of compressed air is cut off from the valve bellows that appertains to any of the respective draw-stops, the latter will remain in the positions that they occupied when the supply of air was cut off, and are perfectly free to be pushed in or drawn out by hand, and the supply of air is normally cut off from the valve bellows, because the valves r and r' and s', s^2 and s^3, are normally closed and are always returned to the closed position either by gravity or by the influence of springs as soon as the lugs t and t', and pedals w, w' and w^2, are released by the organist. Obviously this result is very important and of great practical value, because it enables the organist to push out draw-stops pneumatically and to then operate them manually without causing them first to be pneumatically returned to their initial positions. Before the organist turns his foot either to the left or to the right in order to actuate the valves r and r', it is important that he should know the position of the slide o, and consequently the names of the draw-stops that would be actuated by such movement of the foot. This information may be had at a glance by reference to the indicator or telltale u, and if the slide o, is thus found to be in incorrect posi-

tion it may be properly adjusted by shifting the swell pedal *d*, as may be required, before the foot is turned sidewise.

It will be obvious to those skilled in the art to which our invention appertains that some of our improvements may be employed without the others and that modifications may be made in details of construction and in the disposition of parts without departing from the spirit of the invention, hence we do not limit ourselves to the precise arrangement hereinabove set forth and illustrated in the accompanying drawings; but

Having thus described the nature and objects of our invention, what we claim as new and desire to secure by Letters Patent is:—

1. An organ provided with draw-stops, a swell pedal, pneumatic draw-stop actuating mechanism and a slide connected with the swell pedal and adapted to control said pneumatic mechanism, the construction being such that the opening and closing of the swell causes the slide through the instrumentality of the pneumatic mechanism to shift the draw-stops out and in one after another thereby enhancing and perfecting the tone, quality and power of the swell.

2. An organ provided with draw-stops, pneumatic mechanism adapted to be brought into action for pushing each of said draw-stops out and in, throttle-valves for the pneumatic mechanism, a slide for controlling the pneumatic mechanism to permit of the simultaneous and successive shifting of the draw-stops, and means accessible to the organist for operating the throttle-valves and slide.

3. An organ provided with draw-stops, pneumatic mechanism adapted to be brought into action for pushing each of said draw-stops out and in, throttle-valves for said pneumatic mechanism, a slide for controlling the pneumatic mechanism, draw-plates for confining the action of the slide to the pneumatic mechanism appertaining to certain sets or divisions of draw-stops, and means accessible to the organist for controlling the slide, draw-plates and throttle-valves.

4. An organ provided with draw-stops, pneumatic mechanism for shifting each of said draw-stops out and in, a slide adapted to control said mechanism and combination valves respectively adapted to simultaneously effect the pushing out of draw-stops in predetermined combinations or groups and the pushing in of the remaining draw-stops, and means accessible to the organist for operating said valves.

5. An organ provided with draw-stops, an air pressure chamber, a pair of bellows respectively connected with each of the draw-stops, air-conduits leading from the interior of each bellows and adapted to normally communicate with the interior of the air pressure chamber to maintain said bellows in equilibrium and permit of the pushing in and out of stops by hand, valves for permitting said conduits to communicate with the atmosphere to pneumatically effect the movement of the draw-stops, and means accessible to the organist for actuating said valves, substantially as and for the purposes set forth.

6. An organ provided with draw-stops, pneumatic mechanism for pushing each of said draw-stops out and in, two sets of air channels or passages whereof one set effects the pushing in and the other the pushing out of stops throttle valves for admitting a supply of air to the respective sets of channels, a slide for opening and closing all the air channels of each set and for simultaneously opening one and closing the other of the corresponding channels that appertain to the same draw-stop, and means accessible to the organist for operating the throttle-valves and slide, substantially as and for the purposes set forth.

7. An organ provided with draw-stops, pneumatic mechanism for pushing each of said draw-stops out and in, two sets of air channels, whereof one set operate to effect the pushing out and the other set to effect the pushing in of draw-stops, throttle valves for admitting a supply of air into the respective sets of channels, a slide for opening and closing all the air channels of each set and for simultaneously opening one and closing the other of the corresponding channels that appertain to the same draw-stop, draw-plates for opening and closing all the channels appertaining to certain groups of stops, and means accessible to the organist for operating the throttle valves, slide and draw-plates, substantially as and for the purposes set forth.

8. An organ provided with draw-stops, pneumatic mechanism for pushing each of said draw-stops in and out, two sets of air channels and their accessories, whereof one set operate to effect the pushing out and the other set the pushing in of draw stops, sets of ancillary openings for admitting air to said channels to simultaneously effect the pushing out of certain stops in combinations or groups and the pushing in of the remaining stops, combination valves for each of said sets of openings, and means accessible to the organist for operating said valves, substantially as and for the purposes set forth.

9. In an organ, a series of draw-stops, pneumatic mechanism for pushing each of the draw-stops in and out, two sets of valves and their complemental bellows, whereof one set effects the pushing out and the other the pushing in of draw stops, two sets of air channels, and two sets of grooves whereof one set communicates with one set of channels and bellows and whereof the other set communicates with the other set of channels and bellows, substantially as and for the purposes set forth.

10. An organ provided with pneumatic draw-stop actuating mechanism comprising draw-stops, an air pressure chamber, pairs of bellows respectively connected with each of the draw-stop rods, air-conduits leading from each of the bellows and provided respectively

with ports adapted for communication with the atmosphere and with the air pressure chamber, valves for controlling said ports, valve-bellows for operating said valves, an auxiliary compressed air chamber, two sets of air channels from the auxiliary chamber to the valve-bellows, a throttle-valve for each set of channels, a slide for opening and closing said channels, perforated draw-plates for closing the channels appertaining to certain groups of draw-stops, and pedal devices for actuating the throttle-valves and slide, substantially as and for the purposes set forth.

11. In an organ, draw-stops, a series of pairs of bellows provided with valves and adapted to operate the draw-stops, an auxiliary compressed air chamber, two sets of air channels for supplying air to effect the reversal of the valves of said bellows, a throttle-valve appertaining to each set of air channels, and pedal attachments accessible to the organist for operating said throttle-valves, substantially as and for the purposes set forth.

12. In an organ, draw-stops, a series of pairs of bellows for operating the draw-stops, an air pressure chamber inclosing said bellows, conduits leading to each of the bellows and respectively adapted for communication with the atmosphere and with the air pressure chamber, valves and their complemental valve-bellows for said conduits, an auxiliary compressed air chamber, two sets of channels for actuating the valve-bellows, a throttle-valve appertaining to each set of channels and pedal attachments accessible to the organist for operating said throttle-valves, substantially as and for the purposes set forth.

13. In an organ, draw-stops, a series of pairs of draw-stop bellows for operating the draw-stops, two sets of valves and their complemental valve bellows for reversing the position of the draw-stop bellows, an auxiliary compressed air chamber, two sets of air channels communicating with the auxiliary compressed air chamber and with the respective sets of valve bellows, a throttle-valve appertaining to each set of air channels and pedal devices accessible to the organist for operating said valves, substantially as and for the purposes set forth.

14. In an organ, a series of pairs of bellows tending to counter balance each other and adapted to operate the draw-stops, an auxiliary compressed air chamber, two sets of air channels for supplying air to effect the reversal of said bellows, a throttle-valve appertaining to each set of channels and means accessible to the organist for operating said throttle-valves, substantially as and for the purposes set forth.

15. In an organ, draw-stops, a series of pairs of bellows adapted to operate the draw-stops, an auxiliary compressed air-chamber, two sets of air channels for reversing the position of said bellows, a throttle-valve appertaining to each set of channels and a slide for opening and closing the channels of either set simultaneously and successively, substantially as and for the purposes set forth.

16. In an organ, draw-stops, a series of pairs of bellows for operating the draw-stops, an air pressure chamber inclosing said bellows, conduits leading to each of the bellows and respectively adapted for communication with the atmosphere and with the air pressure chamber, valves and their complemental valve bellows for each of said conduits, an auxiliary compressed air chamber, two sets of air channels for actuating the valve-bellows, a throttle-valve appertaining to each set of air channels, and a slide for opening and closing the channels of either set simultaneously and successively, substantially as and for the purposes set forth.

17. In an organ, draw-stops, a series of pairs of draw-stop bellows for operating the draw-stops, two sets of valves and their complemental valve bellows for reversing the position of the draw-stop bellows, an auxiliary compressed air chamber, two sets of air channels communicating with the auxiliary compressed air chamber and with the respective sets of valve-bellows, a throttle-valve appertaining to each set of air channels, and a slide for opening and closing the channels of either set successively and simultaneously, substantially as and for the purposes set forth.

18. In an organ, draw-stops, a series of pairs of bellows provided with valves and adapted to operate the draw-stops, an auxiliary compressed air-chamber, two set of air channels for supplying air to effect the reversal of the valves of said bellows, a throttle-valve appertaining to each set of channels, a slide for opening and closing said channels, and a pedal accessible to the organist for operating said throttle-valves and slide, substantially as and for the purposes set forth.

19. In an organ, draw-stops, a series of pairs of draw-stop bellows adapted to operate the draw-stops, an auxiliary compressed air-chamber, two sets of air channels for supplying air to effect the reversal of the draw-stop bellows, a throttle-valve appertaining to each set of air channels, a slide for opening and closing said air channels, perforated draw-plates for closing certain of the air channels, and means accessible to the organist for actuating said slide, draw-plates and throttle-valves, substantially as and for the purposes set forth.

20. In an organ, draw-stops, a series of pairs of bellows for operating the draw-stops, an air pressure chamber inclosing said bellows, conduits leading to each of the bellows and adapted for communication with the atmosphere and with the air pressure chamber, valves and their complemental valve bellows for said conduits, an auxiliary compressed air chamber two series of air channels for actuating the valve bellows, a throttle-valve appertaining to each set of air channels, a slide for opening and closing said air channels, draw-plates for closing certain of the air channels, and means accessible to the organist for

perating said slide, throttle-valves and draw-plates, substantially as and for the purposes set forth.

21. In an organ, draw-stops, a series of pairs of draw-stop bellows connected with the draw-stop rods, two sets of valves and their complemental valve bellows for reversing the position of the draw-stop bellows, an auxiliary compressed air chamber, two sets of air channels communicating with the auxiliary compressed air chamber and with the respective sets of valve-bellows, a throttle-valve appertaining to each set of air channels, a slide for opening and closing said air channels, draw-plates for closing certain of said air channels and means accessible to the organist for actuating said slide, throttle-valves and draw-plates, substantially as and for the purposes set forth.

22. In an organ, a series of draw-stops, pneumatic apparatus for actuating said draw-stops, two sets of air channels for controlling the admission and exhaust valves of said pneumatic apparatus, throttle-valves controlling the respective sets of air channels and means accessible to the organist for actuating said throttle-valves, substantially as and for the purposes set forth.

23. In an organ, draw-stops, pneumatic draw-stop operating apparatus and a pedal and its accessories susceptible of four movements, one for causing draw-stops to be pushed out, a second causing draw-stops to be pushed in, a third for causing the draw-stops to be pushed out successively and collectively and a fourth for causing the draw-stops to be pushed in successively and collectively, substantially as and for the purposes set forth.

24. In an organ, draw-stops, pneumatic draw-stop operating apparatus and its complemental throttle-valves and slide, a pivotal pedal, connections between the pedal and slide, lugs movable transversely of the pedal, and connections between the throttle-valve and lugs, substantially as and for the purposes set forth.

25. In an organ, draw-stops, pneumatic draw-stop operating apparatus and its complemental slide, a visual indicator or telltale, a pedal for operating said slide, and connections between said slide and indicator, substantially as and for the purposes set forth.

26. In an organ, draw-stops, pneumatic draw-stop operating apparatus and its complemental slide, a visual indicator or telltale and link work interposed between the slide and indicator, substantially as and for the purposes set forth.

27. In an organ, draw-stops, pneumatic draw-stop actuating apparatus, perforated draw-plates for throwing the pneumatic apparatus appertaining to certain groups or divisions of draw-stops out of action, buttons accessible from the key-board, and link-work connected with the buttons and draw-plates, substantially as and for the purposes set forth.

28. In an organ, draw-stops, two sets of draw-stop bellows, whereof one set is adapted to push out draw-stops and the other set is adapted to push in draw-stops, two sets of air channels appertaining respectively to the sets of draw-stop bellows, an ancillary air chamber, openings from said chamber into certain of the channels that operate to push out stops and to the channels that operate to push in the remaining stops, valves for controlling said openings, and means accessible to the organist for operating said valves, substantially as and for the purposes set forth.

29. An organ provided with a series of draw-stops, a swell pedal provided with pivotal lugs, pneumatic mechanism for pushing each of said draw-stops out and in, two sets of air channels whereof one set operate to effect the pushing out and the other set to effect the pushing in of the draw-stops, throttle-valves, a slide, connections between the throttle valves and pivotal lugs, connections between the swell pedal and slide, a visual indicator, connections between the indicator and slide, draw-plates, push buttons connections between the push buttons and draw-plates, and combination pedals and their accessories, substantially as and for the purposes set forth.

In witness whereof we have hereunto set our signatures in the presence of two subscribing witnesses.

CHARLES S. HASKELL.
WILLIAM E. HASKELL.

Witnesses:
THOMAS M. SMITH,
RICHARD C. MAXWELL.