

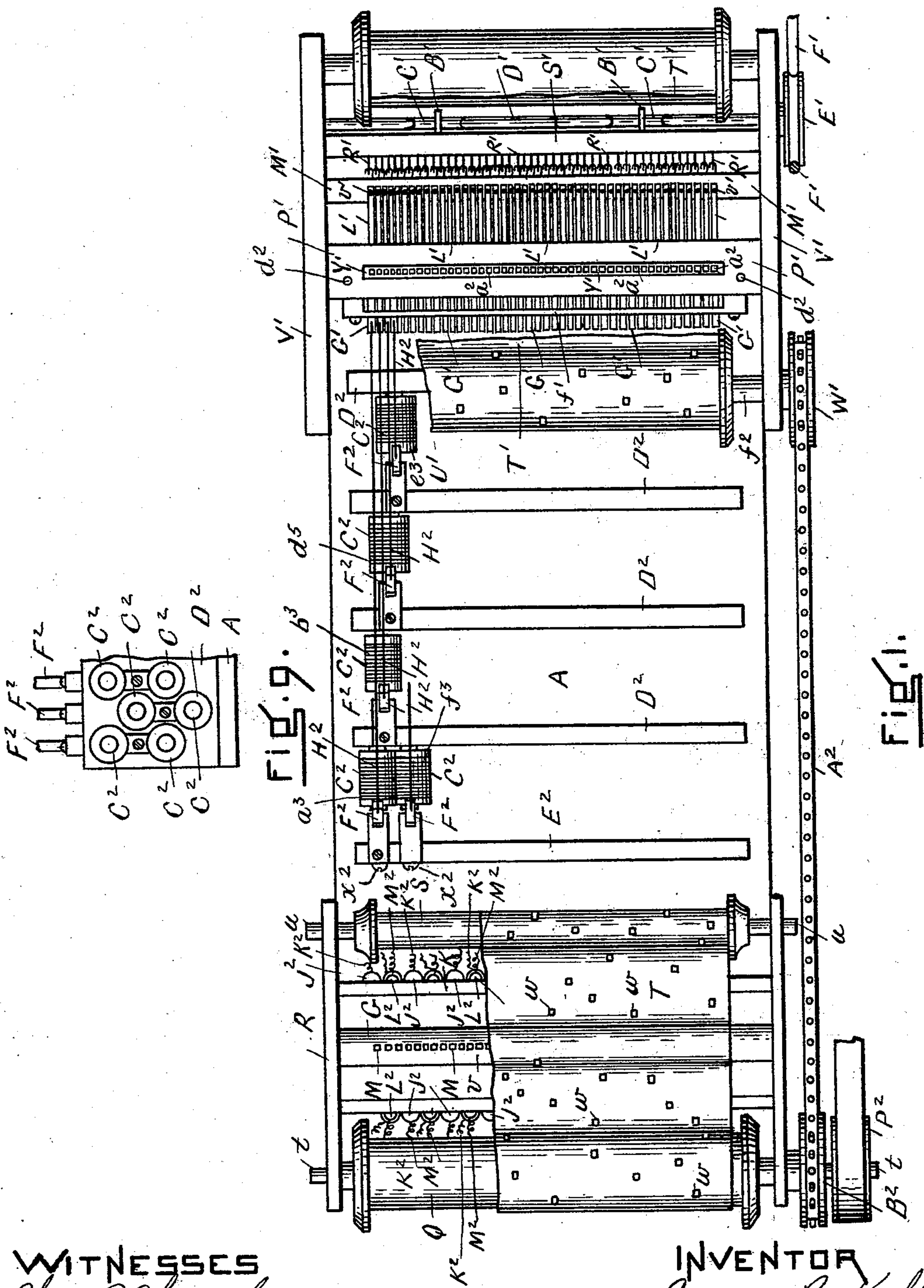
(No Model.)

5 Sheets—Sheet 1.

G. B. KELLY.
PERFORATING MACHINE.

No. 517,752.

Patented Apr. 3, 1894.



WITNESSES
H. B. Heworth
L. C. Ames

INVENTOR
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Atty.

(No Model.)

5 Sheets—Sheet 2.

G. B. KELLY.
PERFORATING MACHINE.

No. 517,752.

Patented Apr. 3, 1894.

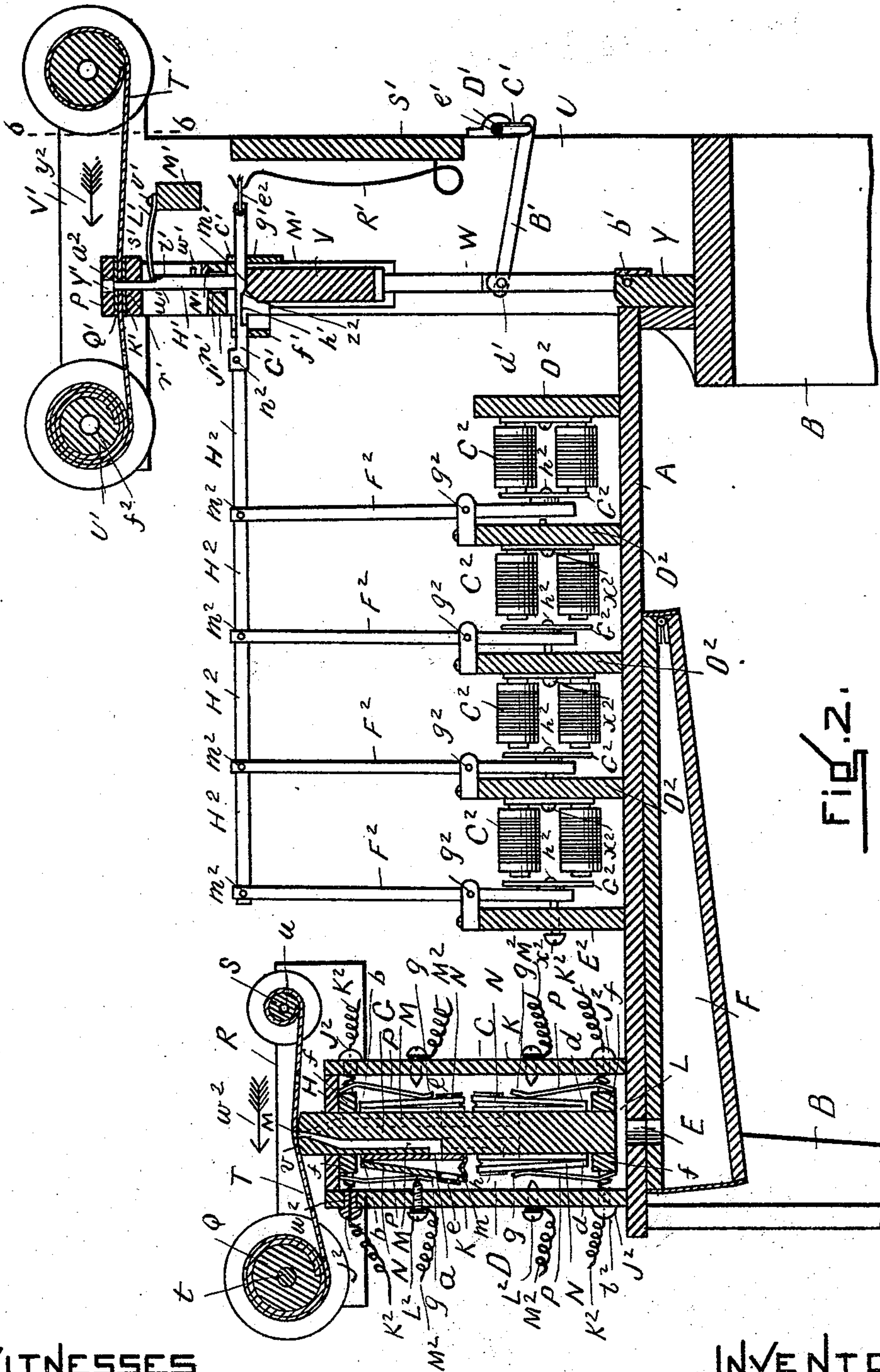


FIG. 2.

WITNESSES

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Per Edwin M. Brown
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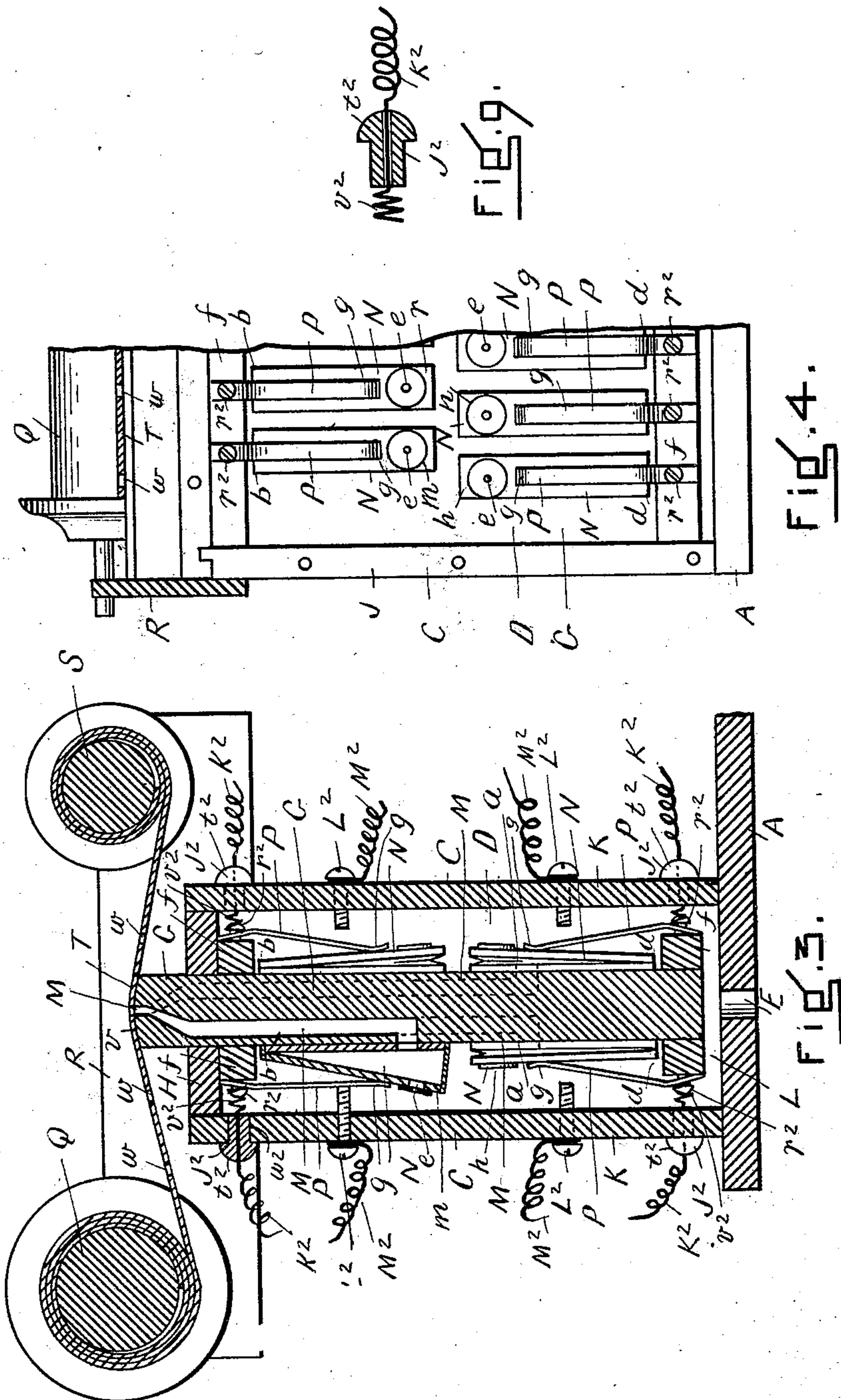
(No Model.)

5 Sheets—Sheet 3.

G. B. KELLY.
PERFORATING MACHINE.

No. 517,752.

Patented Apr. 3, 1894.



WITNESSES

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(No Model.)

5 Sheets—Sheet 4.

G. B. KELLY.
PERFORATING MACHINE.

No. 517,752.

Patented Apr. 3, 1894.

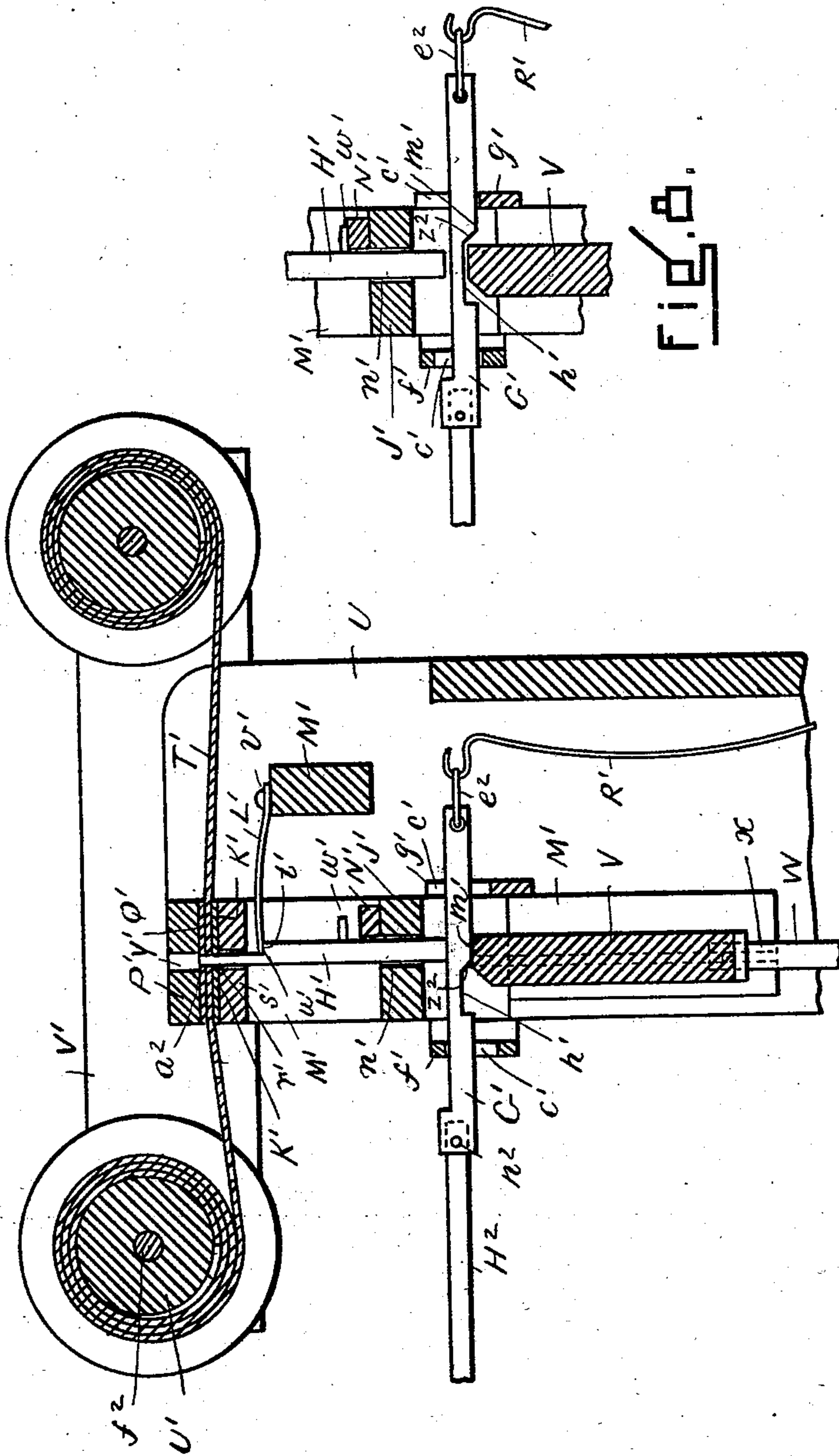
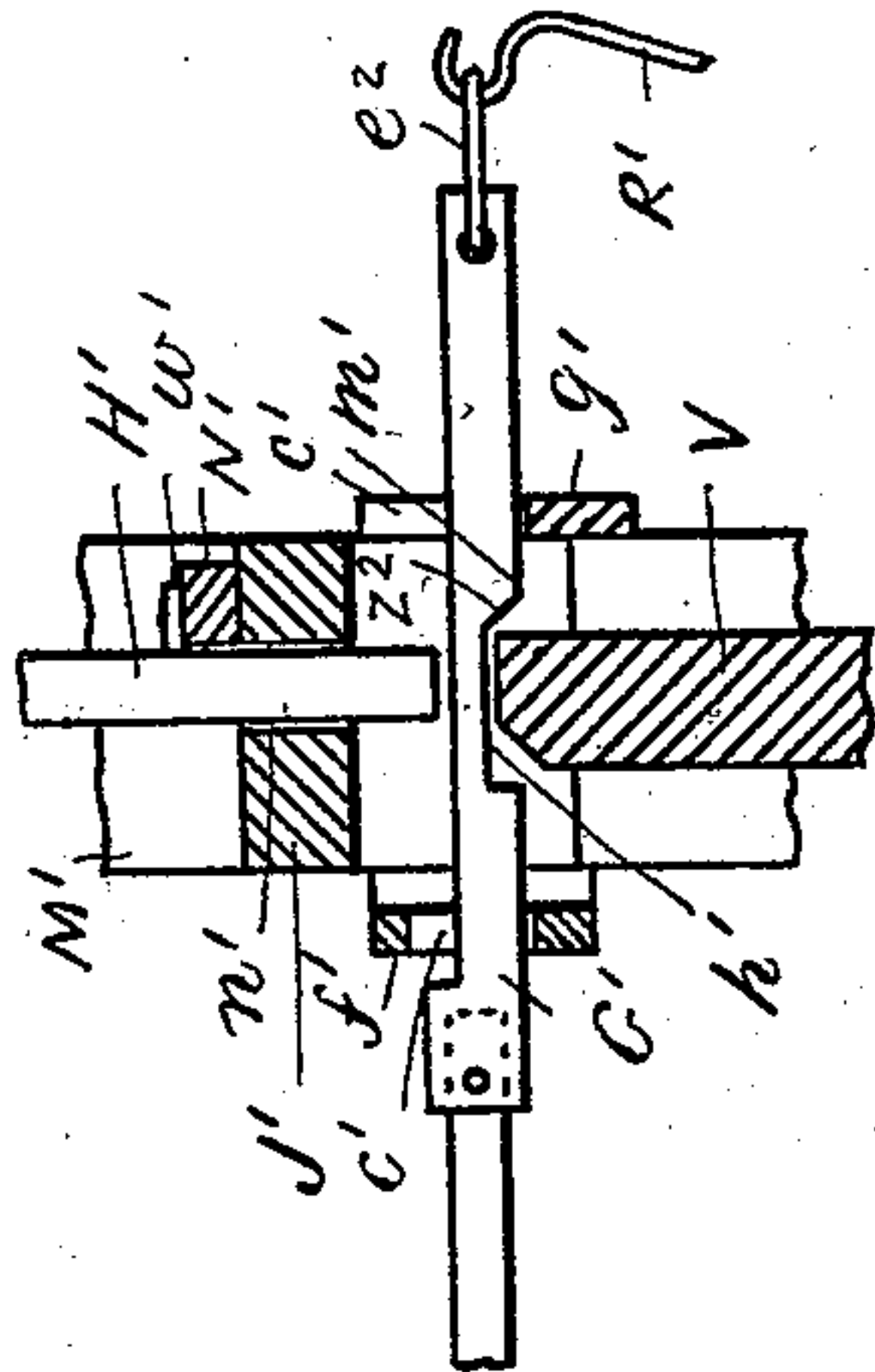


Fig. 5.

Fig. 5.



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(No Model.)

5 Sheets—Sheet 5.

G. B. KELLY.
PERFORATING MACHINE.

No. 517,752.

Patented Apr. 3, 1894.

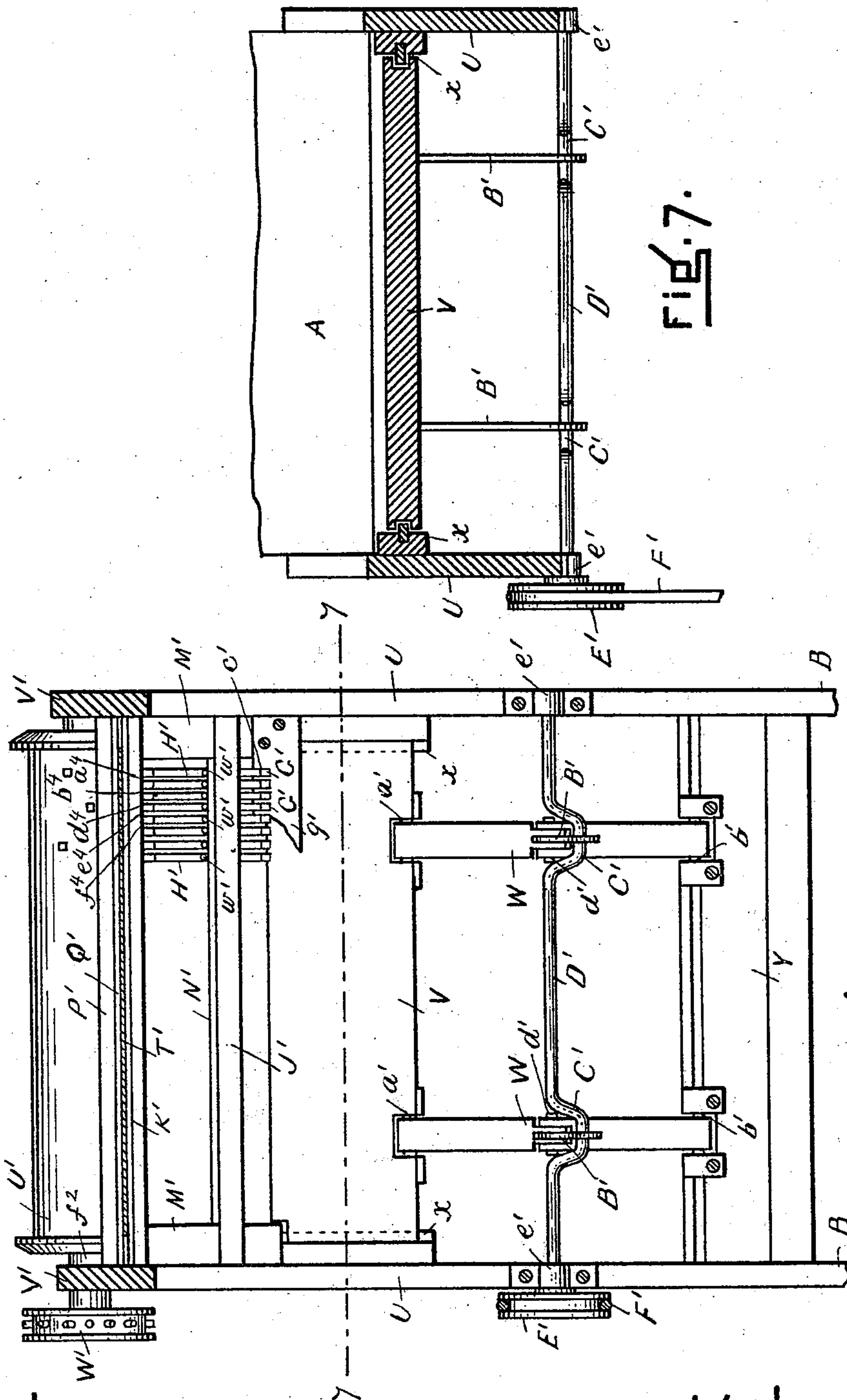


Fig. 6.

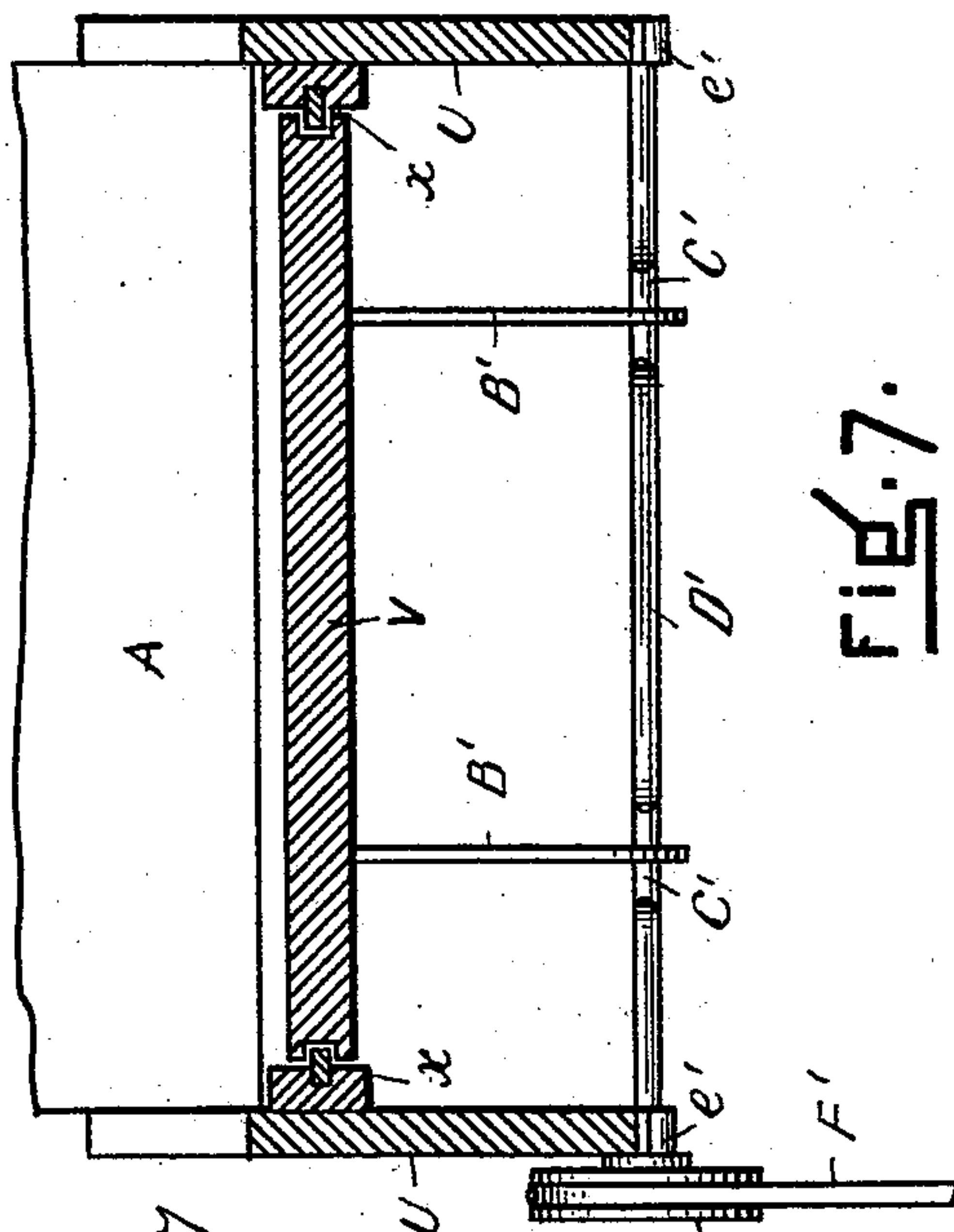


Fig. 7.

WITNESSES

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UNITED STATES PATENT OFFICE.

GEORGE B. KELLY, OF BOSTON, MASSACHUSETTS.

PERFORATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 517,752, dated April 3, 1894.

Application filed June 30, 1893. Serial No. 479,241. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. KELLY, of Boston; in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Perforating-Machines, of which the following is a full, clear, and exact description.

This invention relates to a machine for perforating paper or other sheet material, and more particularly intended for perforating sheets or strips of paper to be used in mechanical musical instruments, which perforated music sheets are now perforated by a machine in which a series of dogs or points operating the punches, are controlled by a specially prepared strip or sheet, called a "stencil," which necessitates that such stencil shall be of a width and thickness much greater and of stronger material than the sheet or strip of paper to be perforated for the music sheet, making these "stencils" more or less bulky and cumbersome; and with a large number of such stencil sheets on hand requiring a great deal of room in which to store and keep them, whereas in the present machine any perforated sheet can be used for the stencil as for instance the perforated music sheet itself, and therefore not requiring special preservation for stencils, enabling the machine for perforating the strips or sheets to be made much smaller, more compact, taking up much less room and at much less expense, advantages in the preparation of such perforated music sheets as are obvious to parties interested in such manufacture.

The invention consists substantially in combination with means for perforating strips or sheets of paper or other suitable sheet material, of a suitable wind or exhaust bellows, a series of pneumatic bellows communicating therewith, and a series of electro magnets electrically connected therewith, and all constructed and arranged for operation on a sheet of paper or other suitable material all substantially as hereinafter described; and the invention also consists of the construction and arrangement of parts in such machine all substantially as hereinafter fully described.

In the accompanying sheets of drawings is illustrated a machine for perforating sheets of paper or other suitable material constructed

and arranged for operation in accordance to this invention in which—

Figure 1 is a plan view. Fig. 2 is a central vertical section. Fig. 3 is a detail central vertical section of a portion of Fig. 2, the part being enlarged. Fig. 4 is a detail front view of the interior of the portion shown in vertical section in Fig. 3. Fig. 5 is a detail central vertical section of another portion of Fig. 2 enlarged. Fig. 6, is an end elevation. Fig. 7 is a cross section on line 7—7 Fig. 6. Fig. 8 is a detail section of a portion of Fig. 5 but with the parts in different positions. Fig. 9 is a view of one of the parts enlarged.

In the drawings A represents a horizontal bed plate which rests on legs or uprights B which support the various parts of the machine. On this bed at the left, is secured on its upper side an upright box C having a chamber D, making a wind chest, similar to a wind chest of a reed organ, and communicating by a passage E, through the bed plate A with a bellows F, secured to the under side of the bed plate, and arranged to be operated in the usual manner of operating bellows for reed organs, and in such manner as preferably to exhaust the air from the wind chest chamber D, and needing no particular description herein. This wind chest extends transversely on the bed, and arranged centrally and vertically therein is a board G its upper part extending up through and a short distance above the top H, of the wind chest, and connected by its two ends to the ends of the wind chest and of a thickness to leave an air space between its sides and the side walls K of the wind chest and extending down nearly to the bottom of the bed leaving an air space L thereunder, between it and the bed, which has free communication with both sides, and into which the bellows passage E communicates. In this board G are a row of vertical air passages M, which open to the outside at its upper or surface edge as shown in section in Figs. 2 and 3, and in plan view in Fig. 1, which passages at their lower ends alternately extend to the right and left, through the side of the block as at a, and each opening into a separate pneumatic bellows N vertically secured to both sides of the board in two horizontal rows. The upper

rows of these pneumatic bellows have their movable boards, hinged at their upper ends as at *b*, and the lower rows at their lower ends as at *d*, and each movable board has the usual escape air passage *e*. Each pneumatic bellows has a separate spring *P* secured to a rail *f* of the board *G*, at its hinge end, the free ends *g* of the springs bearing upon the respective movable board of its pneumatic bellows to keep it closed and in its normal position. These pneumatic bellows are arranged on the board so that they will be alternately in different vertical planes transversely along the length of the board, one after the other, as shown, for one side of the board in Fig. 4, where *h*, is the first bellows, *m* the third bellows, *n* the fifth bellows, *r* the seventh bellows; the second, fourth, sixth and eighth bellows being on the other side of the board but on different transverse vertical planes, that is, the second on a transverse vertical plane between the first bellows and third bellows, the fourth bellows on a transverse vertical plane between the third bellows and the fifth bellows, and the sixth on a transverse vertical plane, between the fifth bellows and the seventh bellows, and so throughout the whole series. This arrangement of the pneumatic bellows allows the air passages to be close together, to occupy a small space, substantially so that four passages will occupy the space along the length of the board of a width of one bellows, whereas arranging the bellows all in one row would separate the air passages accordingly making the board much longer, and consequently the machine much wider.

Q is a roll adapted by its journals *t* to turn in bearings in two cross bars *R*, secured to the wind chest at each end, and *S* is another roll adapted by its journals *u* to turn in bearings in the cross bars *R*, and extending from one roll to the other is a sheet, or strip of paper *T*, its ends attached to the two rolls, and between the two it lays on and is arranged to pass over the upper surface *v* of the board *G*, over the open ends of the passages *M*, it having perforations *w* through it, and which sheet is the stencil, or pattern sheet for the present machine. This stencil sheet or pattern is perforated in accordance with the musical tune as desired, and can be of a width to have as many longitudinal rows of perforations as there are air passages *M* in the board *G*, the longitudinal rows of perforations being the same distance apart as the air passages *M*. At the opposite end of the bed plate are secured two uprights *U*, one each side of the same, and between the two, is a plate or bar *V* set up edgewise, arranged to slide up and down in guideways *x* on the inner side of each upright *U*. Pivoted to the under edge of this plate at *a'* are two toggle levers *W*, each near the end of the plate, which are pivoted by their lower ends at *b'* to a cross bar *Y* of the bed *A*. Pivoted by one end to the central pivot *d'* of each toggle

lever is a rod *B'*, which by its other end is pivoted to a crank arm *C'* of a horizontal shaft *D'* adapted to turn in bearings *e'* secured to the uprights. This shaft extends beyond the upright at one end and outside thereof has a pulley *E'* secured thereto having a belt *F'* which is arranged to be connected to any suitable driving power for operation thereof. Rotating the shaft *D'* the toggle levers *W* at their central joint are moved forward and backward of the central vertical plane of the bar *V* and in such movements the bar is moved up and down, it moving up and down twice to each revolution of the crank shaft. Above this movable bar are a series of bars or rods *G'* arranged in a horizontal plane, each arranged to slide back and forth in separate guideways or vertical slots *c'* in two plates *f'g'* arranged transversely of the bed and secured by their ends between and to the two uprights *U*.

In the under side or edge of each slide bar *G'* is a notch *h'* through its thickness which is longer than the thickness of the movable bar *V*, and when these slide bars *G'* are in their normal positions the notches are just above the upper edge of the movable bar, and the notches are of such depth that if the bar is moved up to its highest point it will enter the notch, but be free of and not touch the slide bar, as shown in section in Fig. 8, but if this slide bar is moved forward into the position shown in Fig. 5, and the bar is then raised the part *m'* of the slide bar beyond the notch then being over the bar *V*, it will cause the slide bar to rise with it.

Attached to the rear end of each slide *G'* by a link *e²* is the free end of a separate spring *R'* secured by its other end to cross bar *S'* of the uprights. Above each of these slide bars is an upright punch or die *H'* each of which is arranged to move freely up and down in a separate slot or guideway *n'* in a cross bar *J'* of the uprights.

The upper portion of each punch is smaller in cross section and extends up into a socket or opening *r'* in a horizontal plate *K'* secured to the cross bars *s'* which smaller portion leaves on one side a shoulder *t'* on which rests the free end *u'* of a flat spring *L'* secured at *v'* to a cross bar *M'* of the uprights, which bears and presses the punch down to its normal position which is when a projecting pin *w'* of the punch rests on a cross bar *N'*, and in such position the punch is a slight distance above the sliding bar *G'* as shown in side view in Fig. 8, so it will not touch or rest thereon. Resting on top of the plate *K'* is a cross bar *P'* having a central longitudinal slot *Y'* through it, and a plate *Q'* on its under side provided with a series of openings *a²* there-through, which are just over or vertically coincident with the openings *r'* in the under plate *K'*. This plate *Q'* is the die plate and it and its bar *P'* have two vertical holes which fit over vertical pins *d²* on the plate *K'* by which the upper bar with its die plate is

placed in proper position over the lower bar. Between these two plates K' Q' is arranged to travel in the direction of the arrow y^2 the paper sheet T' which is to be perforated which passes to and winds upon a roll U' turning in bearings in the cross bars V' . This roll has its journal f^2 extend beyond the cross head and on its outer end has a sprocket wheel W' with which engages a sprocket chain A^2 which chain engages with another sprocket wheel B^2 secured to the journal t of the roll U' at the other end of the machine, carrying the stencil or pattern sheet.

C^2 are electro magnets and they are secured respectively to the one side, Fig. 2, of four separate transverse upright boards D^2 of the bed A .

In the drawings there are only five electro magnets shown, but in the practical operation of the machine there are as many as there are air passages M in the board G , but only five are deemed necessary to show in the drawings, more would only be duplicates.

Pivoted at g^2 respectively to three of the upright boards D^2 and another upright board E^2 are vertical arms or levers F^2 to the lower part of each of which is secured centrally at h^2 an armature G^2 which is located in proper position for the electro magnet in front of it. The upper end of each lever F^2 is connected by a pin m^2 to one end of a strip or rod H^2 , which is connected by its other end by a pin n^2 to the end of a slide bar G' . This connecting strip is of a length, that when connected to an armature lever F^2 and a slide bar G' , the slide bar spring R' will hold the slide bar back and the lever so that its armature will be away or disconnected from its electro magnet, which is its normal position, as shown in Fig. 2, and in such position the notch of the slide bar will be directly above the plate V as shown in Fig. 8.

Opposite each screw r^2 securing the pneumatic bellows spring P as shown, in Figs. 2 and 3, is a plug J^2 having a head t^2 which closely fits in a socket v^2 in the side board of the wind chest, and extends a short distance therein and passing through it is an electric wire K^2 the end being coiled a little as at v^2 , and when the plug is in place, bearing upon the head of the spring screw r^2 .

L^2 is a screw screwing through the wind chest side board in to the chamber and in line vertically with a pneumatic bellows spring P and opposite to its free end as shown in section in Figs. 2 and 3. To each of these screws L^2 is connected a separate electric wire M^2 , and these screws with the springs P , are the electrodes, and the separate wires are connected with an electric battery to make an electric circuit.

With the stencil strip T upon the roll S and connected by one end to the other roll Q and the strip T' of paper on its proper rolls to be perforated in accordance with the stencil strip, and with the electric circuit all complete, the machine is ready for operation.

The main bellows F are operated in the usual manner which exhausts air from the wind chest, causing all the pneumatic bellows to close. Motion is then communicated to the pulley P^2 causing the roll Q to turn which draws the stencil strip over the upper surface of the board G in the direction of the arrow w^2 Fig. 2 and winds it upon the roll Q ; at the same time through the sprocket wheel B^2 , chain A^2 and sprocket wheel W' of the roll U' motion is communicated to it in the direction of the arrow y^2 Fig. 2, which causes the paper strip to travel between the plates K' Q' over the perforations in the lower plate, and which moves with the same speed that the stencil sheet does over the air passages, the two rolls and their sprocket wheels, being of corresponding diameters. The crank shaft D' is also revolved at the same time which causes the board to reciprocate vertically and preferably quite rapidly. As the stencil strip travels over the board G , and a perforation w , therein, comes over an air passage M , air passes quickly down through it into the pneumatic bellows N , with which it communicates, opening the same, which presses its spring P back against the screw L^2 making electric circuit, by which the electro magnet in such circuit attracts its armature, swinging its lever F^2 on its pivot, the upper arm of the lever pulling upon and moving the slide bar G' forward against its spring until its notch h' is moved away from, and its thick portion m' over, the movable reciprocating plate U which in the next upward movement of the board U pushes the notched bar upward and forces the punch H' up and through the paper sheet T' making a perforation therein; as soon as the perforation w in the stencil sheet passes by the air passage and the unperforated portion of the stencil sheet comes thereover, air is cut off from entering the passage which allows the spring P to move away from contact with the screw L^2 , breaking the electric circuit, closing its bellows and releasing the armature to the electro magnet, allowing the spring of the slide bar to return it to its normal position, with its notch over the movable board so that the next upward movement of the board, if a perforation w , is not over the air passage, will not operate upon the punch, but when the next perforation w , comes over the air passage as before, the parts are again operated as described and another perforation made in the paper sheet T' and so on. Thus whenever a perforation in the stencil sheet comes over an air passage in the board G , a corresponding perforation is made in the paper sheet T' as described.

In the upright board of each armature is a screw x^2 projecting therethrough against the end of which the armature lever abuts, when away from the magnet to limit its backward movement, and by which such movement can be regulated by turning the screw in or out.

The spring to each pneumatic bellows is

bent so that when its free end is bearing upon the bellows, its other end, back of its securing screw will bear upon the cross bar, the part where the screw passes through it being bent so that it is raised from the bar, so that by turning the screw in or out the pressure of the spring can be increased or diminished as desired upon the bellows, and when desirous of regulating the spring, pulling out the plug J² it can easily be reached by a screw driver, and when turned as desired, the plug is inserted again and electric connection made with the spring as before. This is advantageous, as it makes an easy and convenient way of regulating the pneumatic bellows springs.

The rear end of the notch in each slide bar is beveled as at z² so that if the slide bar is pulled forward when the bar is moving upward, it will easily ride up over its edge in its forward movement, so the bar can operate upon it.

In order to use a narrow stencil sheet, or the perforated music sheet which is quite narrow, and therefore reduce the width of the machine, the pneumatic bellows are arranged in two horizontal rows on both sides of the air passage board, and in the order stated, and the electromagnets are arranged in four rows on four separate supports, and their armature levers correspondingly, which brings them all compactly together laterally, and all connections between the air passages and the punches in parallel lines, or substantially so. Each electro magnet is connected electrically to a separate pneumatic bellows, substantially as follows; looking at Figs. 1 and 6 more particularly; the first magnet a³ in the first row with the first pneumatic bellows m, and its lever with the first punch a⁴; the first magnet b³ of the second row, with the second bellows, and its lever with the second punch b⁴; the first magnet d³ of the third row with the third bellows n and its lever with the third punch d⁴; the first magnet e³ of the fourth row with the fourth bellows, and its lever with the fourth punch e⁴; the second magnet f³ of the first row with the fifth bellows r, and its lever with the fifth punch f⁴; so on with the second magnet of the second, third, and fourth rows, the third magnet of the first row, and so on throughout the whole series, there being as many magnets in the four rows as there are air passages in the board.

If desired the pneumatic bellows can be arranged in a larger number of rows, also the electro magnets, which would obviously reduce the width of the stencil, but the arrangement described and shown is satisfactory in its results.

The cross bar P' having the die plate Q' is held firmly in any suitable manner from upward movement so that it will hold the paper T' against the punch in its operation.

Having thus described my invention, what I claim is—

1. In a machine for perforating sheet material, in combination, a wind chest, a board within said wind chest, an air passage therein opening to its upper surface outside of said wind chest, a pneumatic bellows secured to the side of said board within said wind chest communicating with said air passage, an electric magnet, a pivoted lever carrying an armature for said magnet, a slide bar arranged to move back and forth in suitable guideways and connected to said lever for operation thereof, a notch in said slide bar, a punch or die, in suitable guideways, a spring bearing on said punch and a plate or bar adapted to move up and down in suitable guideways for operation on said slide bar for the purpose specified.

2. In a machine for perforating sheet material, in combination, a wind chest, a board within said wind chest, an air passage therein opening to its upper surface outside of said wind chest, a pneumatic bellows secured to the side of said board within said wind chest communicating with said air passage, an electro magnet, a pivoted lever carrying an armature for said magnet, a slide bar arranged to move back and forth in suitable guideways and connected to said lever for operation thereof, a notch in said slide bar, a punch or die in suitable guideways, a spring bearing on said punch, a plate or bar adapted to move up and down in suitable guideways, toggle levers connected to said plate and a support, a rotary shaft, and crank arms thereon connected to said toggle levers for the purpose specified.

3. A wind chest, a board therein having a vertical air passage opening to the outside of said wind chest, a pneumatic bellows secured to the side of said board within said wind chest communicating with said air passage, a spring secured to a support by a screw and bearing on said bellows, an opening in the wall of said wind chest opposite to said screw, and a plug adapted to fit in said opening.

4. A wind chest, a board therein having a vertical air passage, opening to the outside of said wind chest, a pneumatic bellows secured to the side of said board within said wind chest communicating with said air passage, a spring secured to a support by a screw and bearing on said bellows, an opening in the wall of said wind chest opposite to said screw, and a plug adapted to fit in said opening, and having an electric wire extending through the same and bearing on said screw.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

GEORGE B. KELLY.

Witnesses:

EDWIN W. BROWN,
LEONA C. ARNO.