

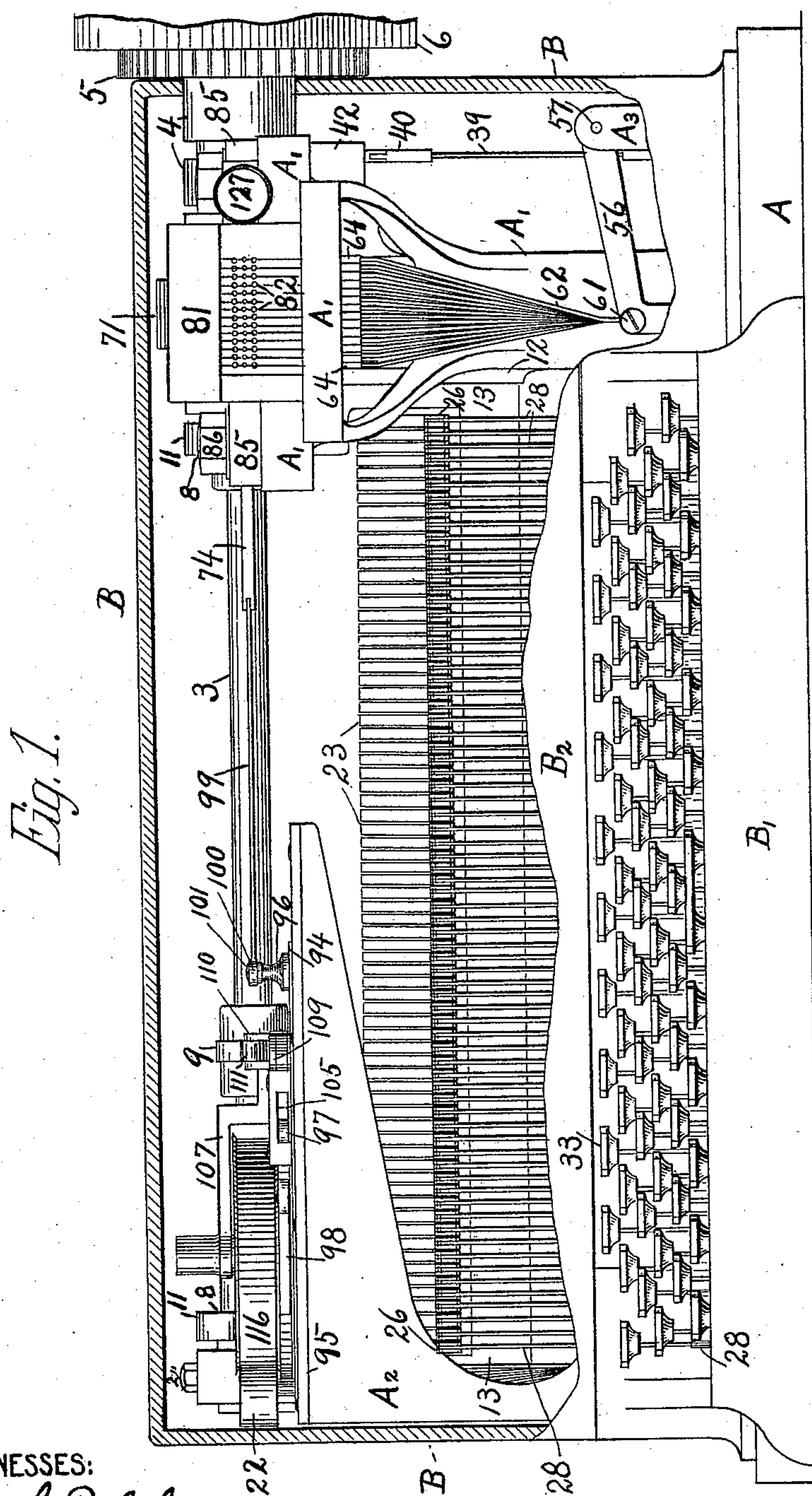
(No Model.)

5 Sheets—Sheet 1.

E. R. STORM.  
PERFORATOR.

No. 575,497.

Patented Jan. 19, 1897.



WITNESSES:

C. L. Belcher 12  
G. H. Stocking

INVENTOR

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BY *Charles M. Catlin*

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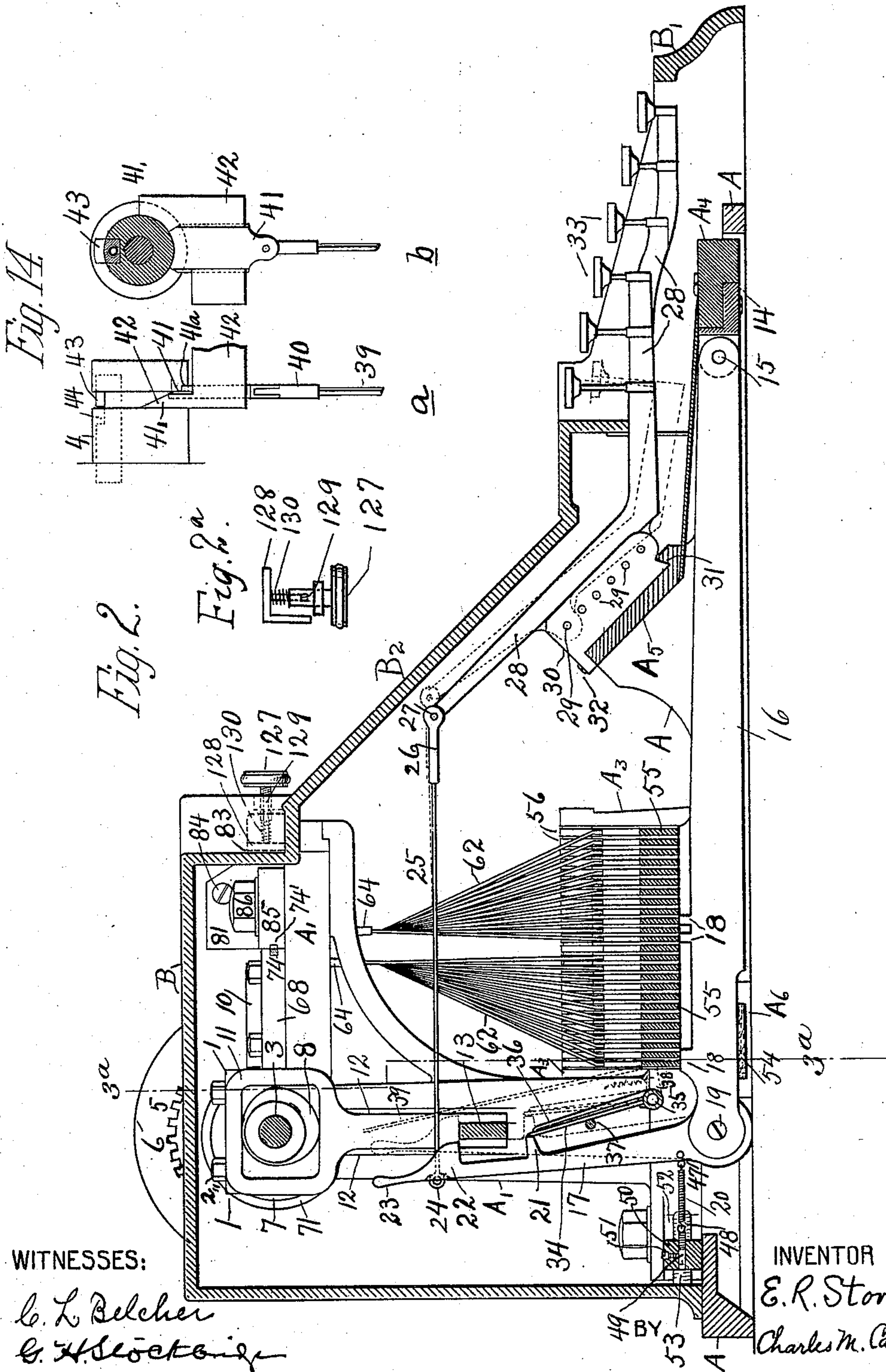
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5 Sheets—Sheet 2.

E. R. STORM.  
PERFORATOR.

No. 575,497.

Patented Jan. 19, 1897.



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(No Model.)

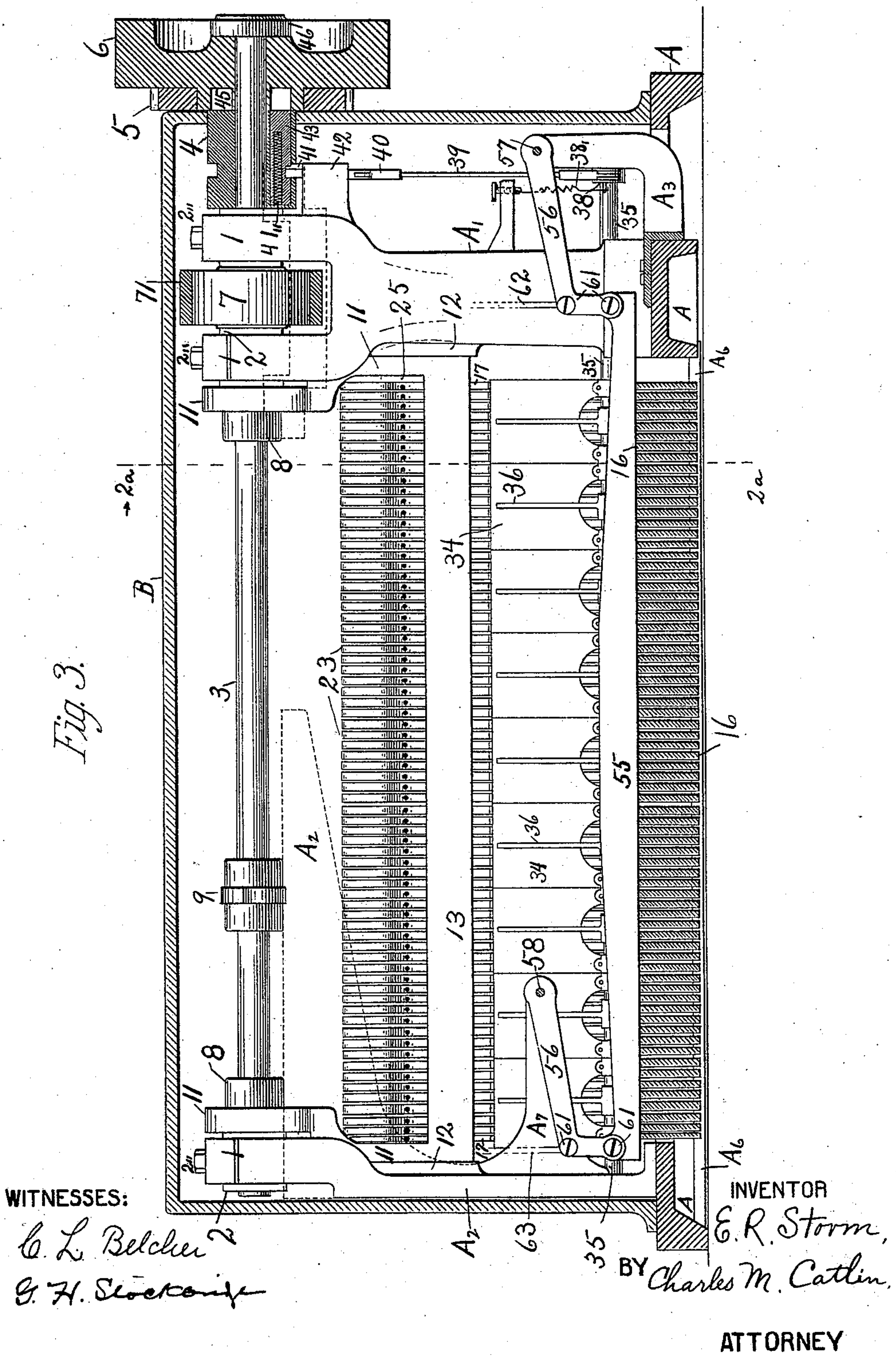
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Fig. 3.



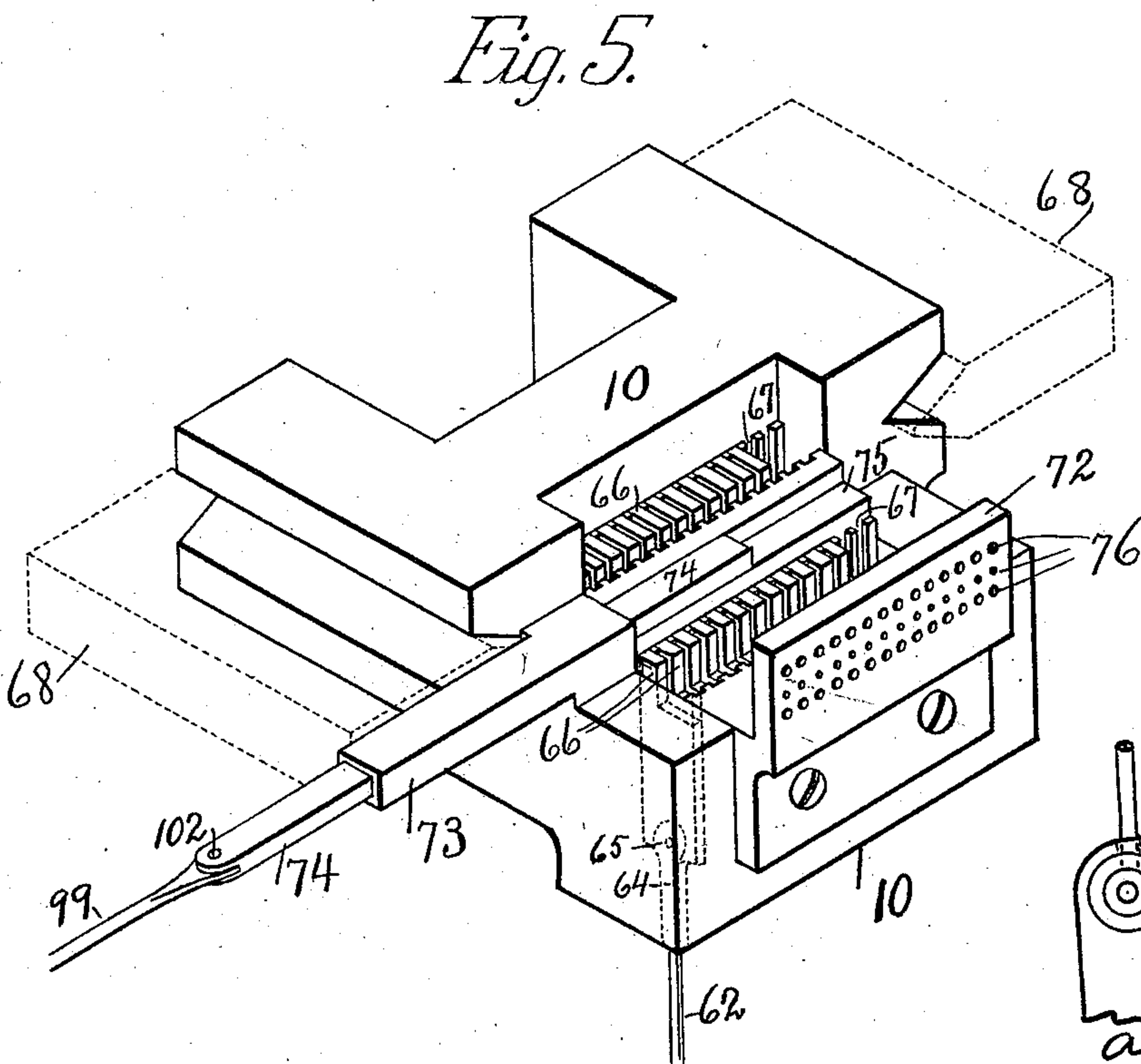
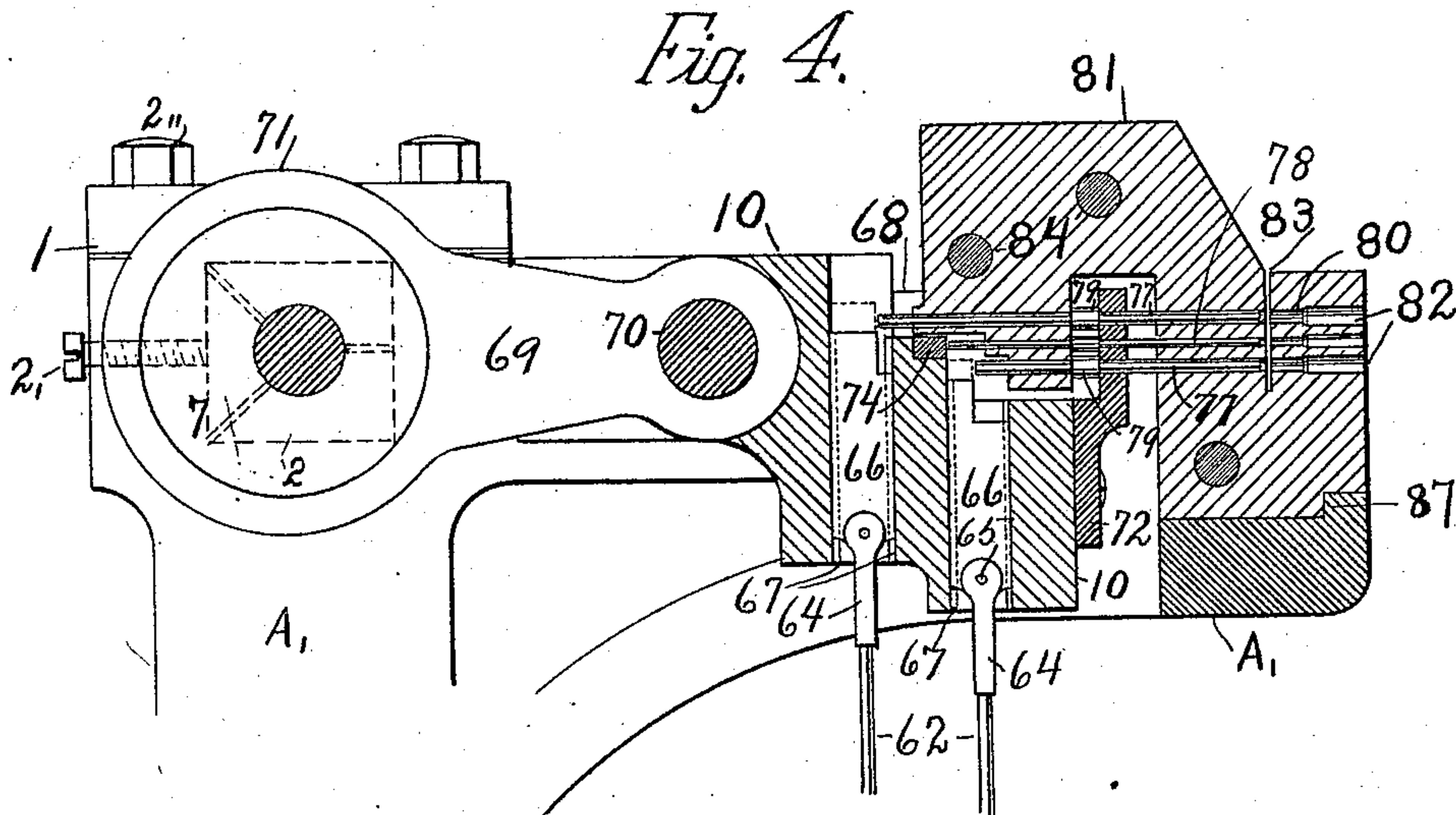
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5 Sheets—Sheet 4.

E. R. STORM.  
PERFORATOR.

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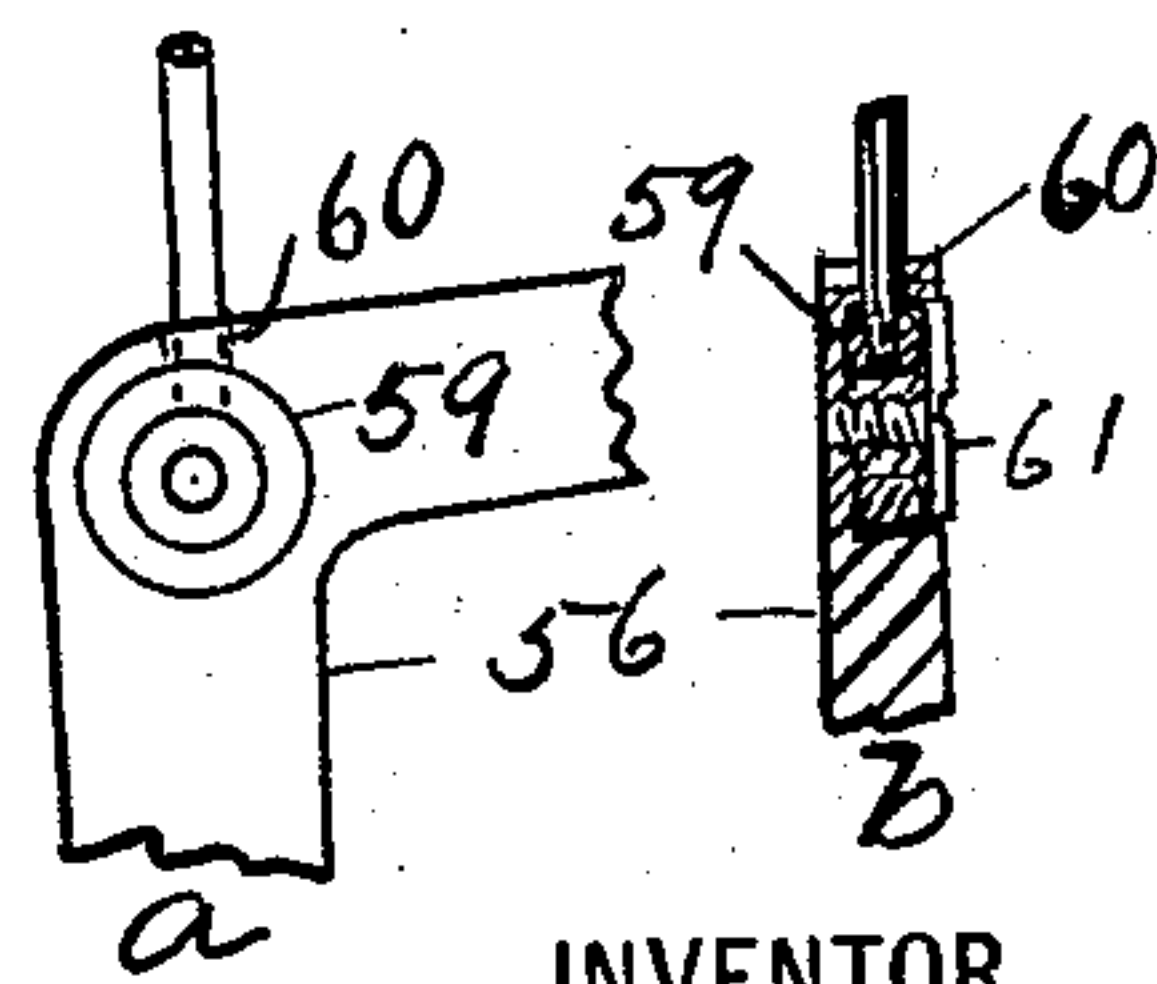
Patented Jan. 19, 1897.



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*Fig. 12.*



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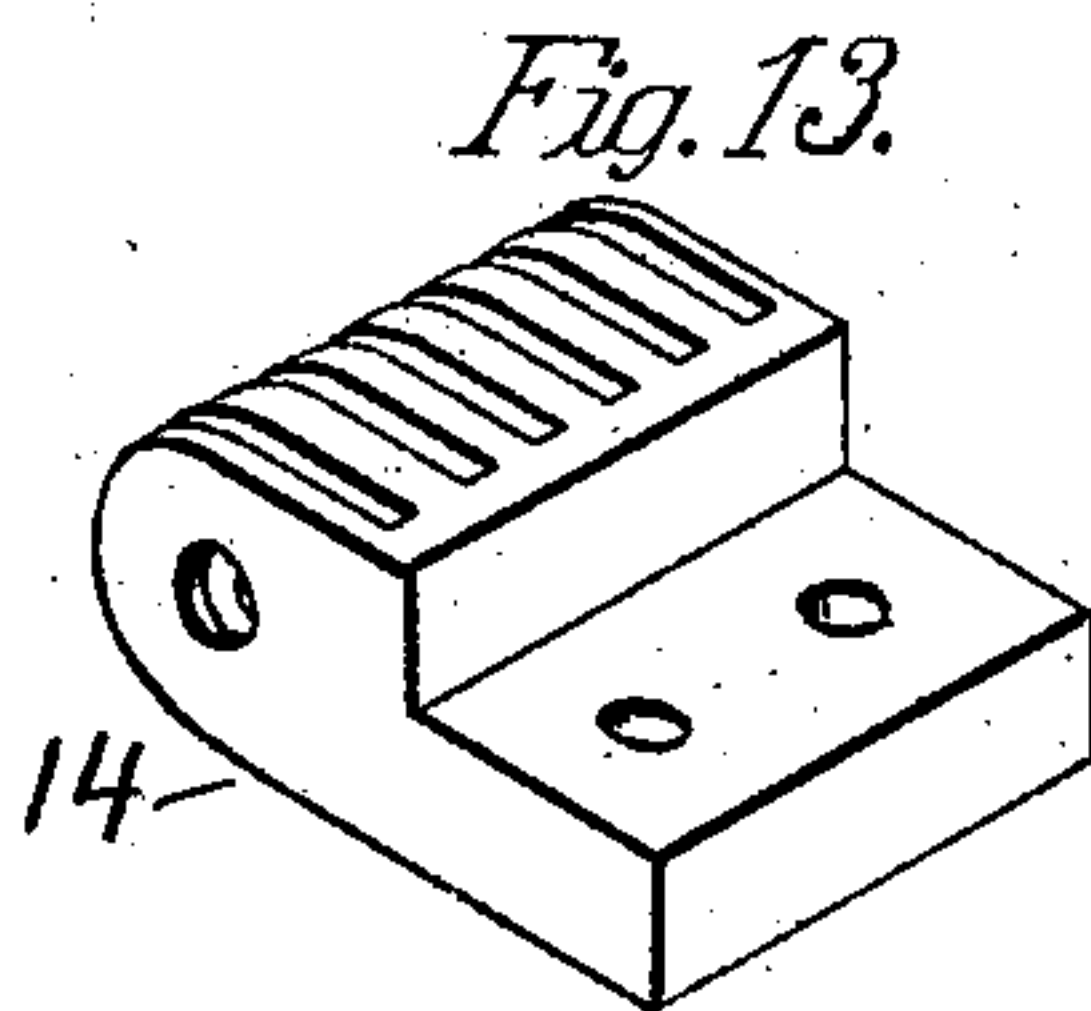
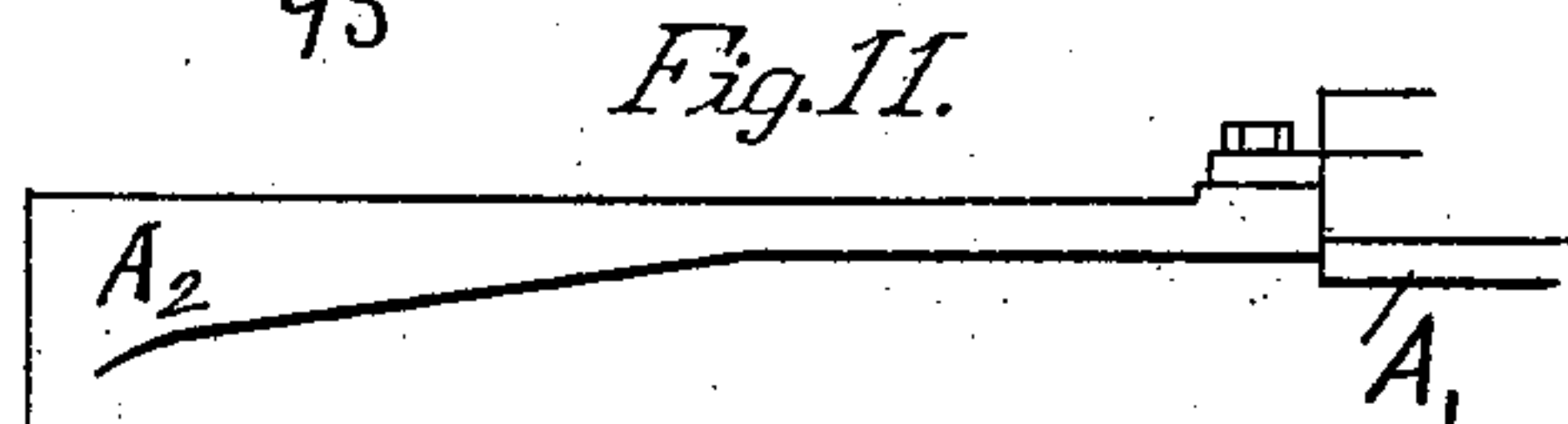
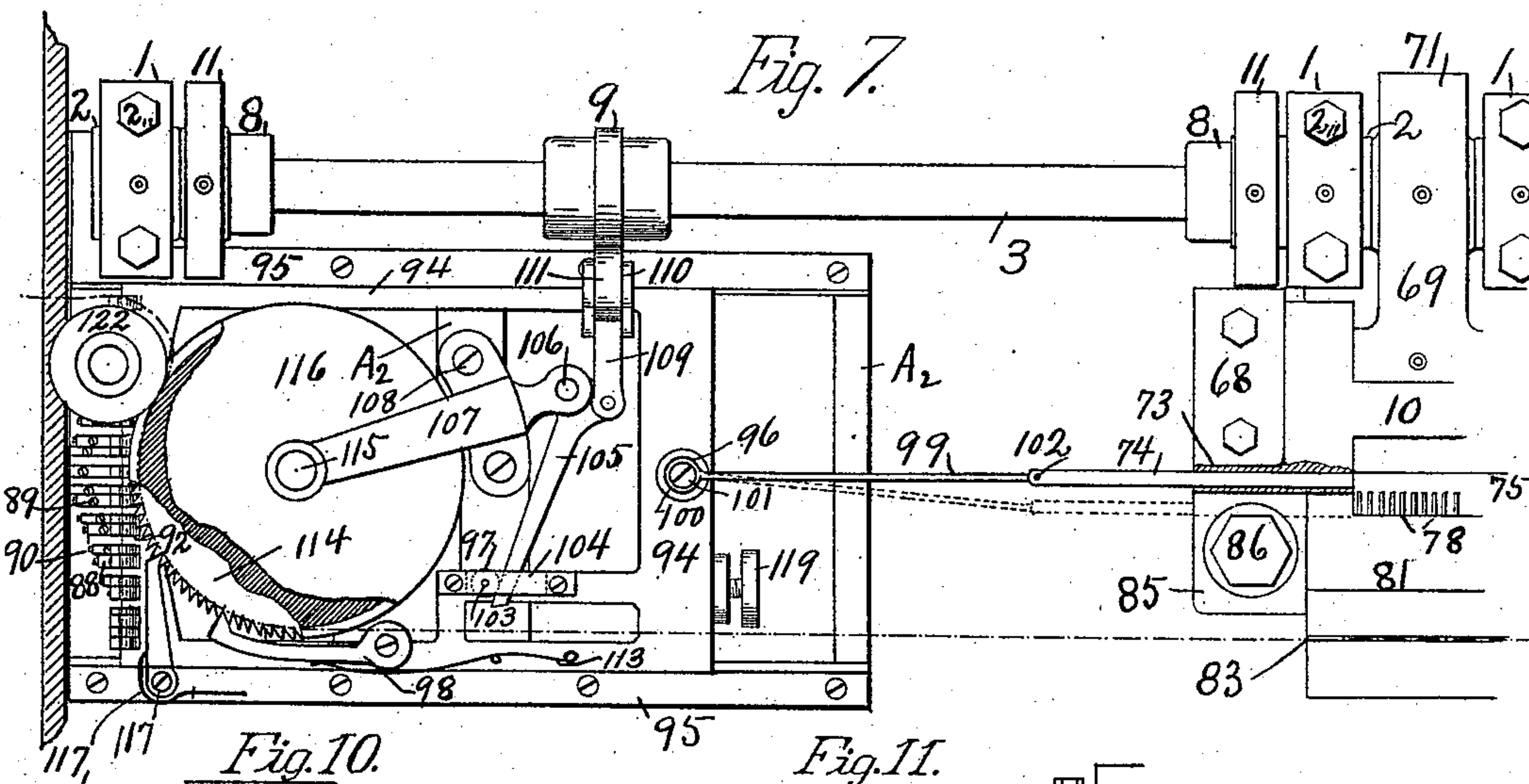
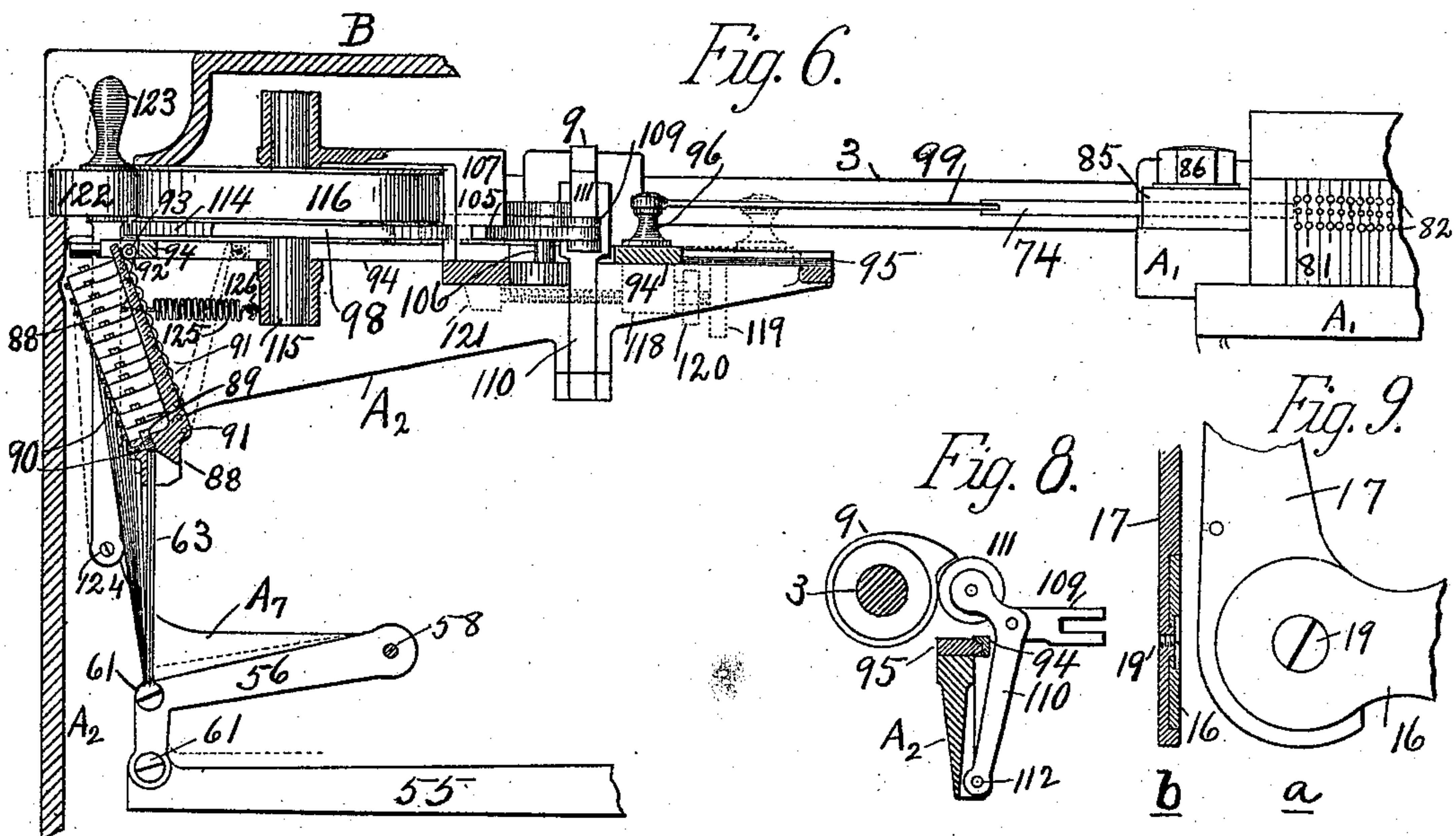
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# UNITED STATES PATENT OFFICE,

EDWIN R. STORM, OF NEW YORK, N. Y.

## PERFORATOR.

SPECIFICATION forming part of Letters Patent No. 575,497, dated January 19, 1897.

Application filed July 12, 1895. Serial No. 555,727. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN R. STORM, a citizen of the United States, and a resident of New York, county and State of New York, have  
5 invented certain new and useful Improvements in Perforators, of which the following is a specification.

This invention relates to perforating-machines.

10 The main object of the invention is to provide an improved machine for punching holes in ribbons of paper or other suitable material such as used for making and breaking a telegraph-circuit in certain forms of automatic  
15 telegraphs, the holes being suitably arranged relatively to each other in the ribbon so that when it is drawn through a suitable telegraph transmitting apparatus in circuit with a distant receiver the desired message will be sent.  
20 Each message will be composed of letters, characters, syllables, or words each of which is represented on the ribbon by a distinguishable combination of holes.

In the machine to be described the punches  
25 are not moved directly by the operator, but by suitable mechanism operated by a motor and brought into coöperation with the punches when the operator moves a finger-key. As many keys are provided as there are distinct  
30 characters, that is, one for each distinct combination of perforations representing a letter, syllable, or word to be made. The keys control the number and arrangement of punches which will be moved forward at a time, and  
35 consequently the number and arrangement of holes punched in the ribbon. Each character, or the holes representing the same, is completely punched automatically on the operation of the corresponding key, and after  
40 the holes are punched the ribbon is automatically moved forward a distance equal to the space occupied on the ribbon by that character plus the space between two consecutive characters.

45 Owing to the application of power to the assembling devices and punches, as described, I am able to punch more holes representing either a longer combination or several combinations at a single operation than heretofore, thus making it possible to form combinations representing characters, letters, syl-

lables, and words by a single depression of a key.

In this machine there are preferably three rows of punches, the central row being designed to form a central row of holes at regular distances apart in the ribbon being perforated, with which pins on the periphery of a feed-wheel in the telegraph-transmitter with which the ribbon is to be used engage  
55 to draw the ribbon along. The two outer rows of punches are designed to form character-holes, that is, holes in different combinations to represent and to transmit different characters. Evidently the relative positions  
60 of the rows of punches and the number of rows can be varied, and many features of the machine would be useful if the feed-hole punches were omitted and the feed-holes were separately punched.  
70

Other features of the machine will appear from the following description.

In the accompanying drawings, Figure 1 is a view showing the general arrangement of parts of the apparatus, the inclosing case being broken away. Fig. 2 is a section on line 2<sup>a</sup> 2<sup>a</sup> of Fig. 3. Fig. 2<sup>a</sup> is a plan view of the tension device detached from the machine. Fig. 3 is a transverse section on line 3<sup>a</sup> 3<sup>a</sup> of Fig. 2. Fig. 4 is a sectional view of the punch-head on a larger scale. Fig. 5 is a perspective view of the sliding head. Fig. 6 is a side view, partly in section, of the ribbon-moving device. Fig. 7 is a plan view of the same. Fig. 8 is a detail view of one of the  
75 cams and levers. Figs. 9, 9<sup>a</sup>, and 9<sup>b</sup> show, respectively, side and sectional views of the joint between arms 16 17. Fig. 10 is a detail of a shaft-bearing. Fig. 11 shows a modification to be described. Figs. 12, 12<sup>a</sup>, and 12<sup>b</sup>  
80 show, respectively, side and sectional views of a joint to be described. Fig. 13 is a perspective view of a socket-block, and Figs. 14, 14<sup>a</sup>, and 14<sup>b</sup> are respectively side and cross-sectional views of the clutch and trip.  
85

A represents a base, to which are secured upright frame-pieces A' and A<sup>2</sup>, arms A<sup>3</sup>, socket-bars A<sup>4</sup> and A<sup>5</sup>, and the cushion-piece A<sup>6</sup>, Figs. 2 and 3. The uprights are provided with boxes 1 1, which are fitted with brass  
90 segments 2, as shown in Fig. 10, to provide for wear by the thrust of the punches, wear  
100



being taken up by screws 2. The boxes form bearings for shaft 3, having a clutch 4, with a bifurcated trip hereinafter described, wheels 5 and 6, and cams 7, 8, and 9. Ordinarily the wear on a shaft-bearing is principally beneath the shaft, and by dividing the bearing-pieces horizontally all necessary adjustment is provided for; but in this machine the punches create a thrust against the side of the box or bearing opposite to the punches, which might in time render the machine inoperative through lost motion. To prevent this, the boxes are cut as shown in Fig. 10, and a set-screw 2' is placed back of the left-hand piece of the bearing, as indicated in Fig. 4. By adjustment of this screw the side wear on the bearing is compensated for. Cam 7 operates the sliding punch-head 10. The two cams 8 act upon straps 11, which slide vertically in ways 12 and raise and lower the lifting bar 13, to which they are connected. The cam 9 operates the paper or ribbon moving device.

To the bar  $a^4$  are secured blocks 14, which are halved on and fastened to the recessed bar  $A^4$  and are bored for pins 15 and have an edge channeled to receive the assembling-bars 16, one for each key, the other ends of the bars 16 being connected with catch-bars 17. Bars 16 are provided with projections 18, described hereinafter. The catch-bars are jointed to the assembling-bars in such manner as to allow them to move on a center 19, Figs. 2 and 9. Preferably bar 17 is formed with a circular depression into which the rounded end of bar 16 fits and in which it is held by a central screw 19. Bars 17, of which there is one for each assembling-bar 16, are provided with springs 20 and projections 21 22, the latter being made to fit over the lifting bar 13. Bars 17 terminate in handles 23 and at 24 have holes to receive the rods 25, the bars on their rear sides being provided with semicircular recesses or channels communicating with the holes to receive the eyes on the ends of the rods, as shown by dotted lines in Fig. 2. The rods 25 are threaded on one end and screwed into the ends of pieces 26, thus providing means of adjustment, the eye fitting into the channel and locking the rod, so that it cannot turn. Pieces 26 are jointed at 27 with finger-keys 28, which move on fulcrums 29 on block 30, which is fastened by the V projection 31 fitting into a corresponding groove in the bar  $A^5$  and by screws 32.

The several banks of keys are so pivoted as to equalize the leverage as nearly as possible, and consequently the force or touch required on each key. The first bank of keys at the left, Fig. 2, are pivoted at the left of block 30, and succeeding banks in regular order toward the lower end of said block. The pivots of the several banks not only vary in distances from the front of the machine, but in height also, and this is important because it places the pivots of all the key-levers on or very near the same level with the key-tips.

This gives the tips as nearly a straight up-and-down movement as an arc of a circle can have. If the key-tip of any lever were above the pivot, it would move forward, and if below the pivot backward, which would be unpleasant to the finger of the operator. The finger-keys are provided with finger plates or tips 33, upon which are shown the characters which it is desired to use. As shown, the finger-tips are rigidly fixed to the key-levers.

The projections 21 on the catch-bars 17 are made to come in contact with plates 34, which turn loosely on the spindle 35, preferably a tube, and when moved press against levers 36, which are fastened to the spindle 35. Behind plates 34 is a stop 37. Spindle 35, held by boxes or pivots, is provided with an arm 38, attached to rod 39, jointed at 40 to the trip-piece 41, Figs. 3 and 14, forming one member of a bifurcated trip which is made to slide in a fixed block 42 and to engage with the sliding bolt 43, which is adapted to slide in the clutch 4 and is provided with a transverse groove 44, into which fits the trip-piece 41 in such manner as to draw the sliding bolt backward or to release it, as required. Spring 41' tends to press the bolt forward into engagement with the driving-wheel, being compressed when the bolt is withdrawn, which is effected near the close of each revolution of shaft 3, thus disconnecting the shaft and drive-wheel. The other member of the bifurcated trip, which is the extension 41 of body 42, is wedge-shaped and fits into an annular groove in the clutch-body in such manner that as the clutch revolves it enters groove 44 in the bolt and nearly withdraws it. The completion of the withdrawal of said bolt is effected by the part 41'. The wedge-shaped part 41' is a little narrower than the groove, but the wedge end of piece 41 fills out the width of the groove, so as to act on the bolt when piece 41' leaves it. A shoulder 41<sup>a</sup> on piece 41 rides on the periphery of the clutch and keeps it from bearing on the bottom of the groove, where it might catch against bolt 43.

The revolution of the shaft 3 tends to push the fixed extension 41' downward, and if it were movable it would require a strong spring to hold it against said push, thus destroying the delicacy of action of the keys. By fixing this extension to form a fixed member of the bifurcated trip the push or thrust of the shaft, acting through the bolt, is taken by said extension and the frame supporting it until the thrust is no longer in the direction of the movement of the movable part of the bifurcated trip, but is across such direction, acting against the frame, but not against the spring which holds the movable member of the trip against the bolt. Hence a light spring will serve to hold said movable part in place and a light touch on the keys will withdraw it.

Holes 45 are sunk in the fly or balance wheel 6, loose on the shaft 3, but held in position between clutch 4 and nut 46. To the



fly-wheel is secured a pulley or gear wheel 5, to which power is applied from any suitable motor.

Springs 20, one for each bar 17, attached by means of swivels 47 to the bars 17, are held by means of swivels 48 and screws 49, with set-screws 51, to the tension-bar 50, which works in ways 52 and has regulating-screws 53, Fig. 2.

The assembling-bars 16 rest upon a bar A<sup>6</sup>, Figs. 2 and 3, channeled to receive the cushion 54, of felt, rubber, or other material. The projections 18 on the assembling-bars 16 are so arranged on each bar as to come in contact with the particular parallel bars 55 required to form the character corresponding to the key operated to cause such bar 16 to move. The parallel bars 55 are jointed to and held in place by links 56, those on one side attached by rod 57 to arms A<sup>3</sup>, the other set by the rod 58 to the arms A<sup>7</sup>. This construction causes bars 55 to continue parallel to their original positions when moved, so that rods 62 63 will be moved the same distance whichever key and assembling-bar is operated. Each link 56 for securing thereto rods 62 63 is preferably provided with a circular groove or channel 59, Fig. 12, a top hole or groove 60, and screw 61. Into the channels 59 are fitted the eyes of rods 62 63, the rods passing through the top hole 60. Rods 62 are screwed into end pieces 64, pivoted at 65 to blocks 66, adapted to slide in grooves 67 in the sliding head 10.

There is a block 66 for each rod 62. These are shown in two parallel series on different levels, one series being in position to cooperate with the lower row of punches and the other series being in position to cooperate with the upper row of punches, Figs. 4 and 5.

The head 10 slides on ways 68 and is moved backward and forward by connecting-rod 69, attached to it by pin 70 and to cam 7 by the strap 71. The head is further provided with a draw-back plate 72 and with a socket 73, (see Figs. 5 and 7,) which receives and guides block 74, adapted to slide through the socket and along the rabbet 75, which is in a plane between the planes occupied by the upper ends of blocks 66 when they are moved forward to the position indicated in dotted lines in Fig. 4. The block 74 serves to fill the space between head 10 and the inner ends of the central row of punches, as blocks 66 fill the spaces between said head and the two outer rows of punches, but is differently controlled. Plate 72 has perforations 76 adapted to fit over punches 77 78, having collars 79 and working in holes 80, provided for them in the stationary sectional head 81. The holes 80 are enlarged at their outer ends 82, so that the punchings will readily escape. The laminations or sections of head 81 are held together by bolts 84, and the head is provided with a ribbon-receiving slot or way 83. The head is held in place by lugs 85, secured by bolts and cap-screws 86 to the frame-piece A', pro-

vided with the rabbet 87, Fig. 4, to insure the proper placing of the punch-head and to resist the shock or thrust of the punches.

Instead of making parts A<sup>2</sup> A' of the frame separate, they may be made integral or may be secured together as shown in Fig. 11.

The rods 63, Fig. 6, attached to links 56, are connected to levers 88, which have recessed ends to receive the rods 63 and adjusting-screws 89, with set-screws 90. The levers 88 are of varying lengths, as shown, the central one being longest and those on each side being shorter in regular order. Each lever has a fulcrum 91 on frame A<sup>2</sup>, and works against one of the rollers 92, which are fastened by pins 93 to the sliding frame 94, movable on ways 95 on the frame-piece A<sup>2</sup>. The frame 94 has a post 96, roller 97, and a pawl 98. To the post is connected a rod 99, which may be attached by a ring 100 and screw 101 and by pin 102 to the movable block 74. Roller 97 has a pivot 103 in the frame 94 and piece 104, and against the roller works the lever 105, fulcrumed at 106 to the arm 107, rising from the frame-piece A<sup>2</sup>, secured by screws 108. Lever 105 is connected by link 109 to lever 110, carrying a roller 111 and working on a fulcrum 112, so as to permit the roller to come in contact with cam 9. The pawl 98 is held by a spring 113 to the ratchet-wheel 114, fastened to shaft 115, working in the arm 107 and the frame A<sup>2</sup>. Secured to the shaft 115 and to the ratchet-wheel 114 is a grooved wheel 116. The ratchet-wheel also has a detent 117, secured to the frame A<sup>2</sup> and having a spring 117'. Secured to frame 94 is an adjustable stop consisting of block 118, having a hole to receive screw 119, on which is a lock-nut 120, and a stop 121, against which the end of the screw comes to rest.

Fitting into the groove of wheel 61 is a wheel 122 on lever 123, the end of which forms a handle and pivoted at 124. It will be seen that wheel 122 is located adjacent to wheel 61 at a considerable distance from the point in the periphery of wheel 61 at which the paper strip first touches, and is tangential to said wheel. This causes the paper strip to have greater frictional bearing on wheel 61 than it would have if wheel 122 should bear against it at said point of tangency, thus making it possible for a smooth feed-wheel to pull the strip along. Between lever 123 and the frame is a spring 125, which pulls wheel 122 toward wheel 116.

The working parts described, except the keys 33 and the drive-wheels, are protected by a cover B, formed so that a portion B' will guard the finger-keys and a portion B<sup>2</sup> will serve to hold copy. The ribbon, moved forward by the wheel 116 from a suitable reel, (not shown,) is held taut by the tension 127, Fig. 2, consisting of a plate 128, with a pin 129 and spring 130 pressing plate 128 against the ribbon, the pin 129 working in the tension-screw 127 to keep the plate 128 in position. The surface on the opposite side of the ribbon



is stationary and the spring-pressure on the ribbon holds it taut.

The operation of the described mechanism is as follows: An operator desiring to produce in a ribbon perforations corresponding to any particular character or combination of characters presses down the key on which that character or combination of characters appears, turning it on its fulcrum 29, which causes rod 25 and the corresponding catch-bar 17 to move, carrying projection 22 over bar 13, as shown in the dotted position in Fig. 2. The same movement carries projection 21 on the same bar 17 against one of the arms or plates 34 which is in front of it, there preferably being several narrow plates or arms 34, instead of one long plate extending in front of all the bars 17, to secure easier movement, although the latter construction may be used if desired. Plates or bodies 34 are loose on spindle 35 and when moved are carried against levers 36, secured to the spindle 35, causing the latter to turn, and this moves link 38 and pulls down rod 39 and trip-piece 41, which permits bolt 43, pressed out by spring 41', to move into engagement with the drive-wheel, locking it to the clutch. This is all that the touch on the key has to do, namely, to move one bar 17 to engage bar 13 and to pull down the trip to release bolt 43, connecting the drive-wheel and clutch. All other movements are produced automatically by the mechanism and driving-motor. The shaft 3 being thus put in motion turns cams 7, 8, and 9. The two cams 8 are made of such shape that, acting through straps 11, they cause the lifting or moving bar 13 to rise during the first quarter-revolution of the shaft, to remain stationary during the second quarter, to return to the first position during the third quarter, and to remain stationary the fourth quarter. The lifting bar being under projection 22 raises the catch-bar 17, which has been moved by depression of a key, lifting the corresponding assembling-bar 16. The projections 18 on the assembling-bar being so disposed as to engage with the particular parallel bars 55 necessary for the formation of the desired character press up and move those bars directly over the projections 18, leaving all others at rest. Each projection is formed to engage one or more bars 55. This movement moves the corresponding links 56, which raises rods 62 63. Rods 62 are attached to movable blocks 66 in the sliding head 10 and cause said blocks to move upward just back of the punches 77. The rods 63 in moving up act on the levers 88 through adjusting-screws 89, which are thus turned on their fulcrums 91, as indicated in dotted lines in Fig. 6. The levers working against rollers 92, move frame 94 forward, as indicated in dotted lines. This movement acts on rod 99, lever 105, and pawl 98, causing rod 99 and block 74 to move in the same direction and the same distance as the frame. Levers 88 are of varying lengths

and arranged with regard to the number of center or feed perforations required to be made in the ribbon being perforated for the character being formed. Several of these levers are moved at once when more than one hole is to be punched in the ribbon, but the longest lever moved always controls the length of movement of frame 94, rod 99, and block 74, bringing the latter just behind the required number of punches 78. The lever 105 being acted upon by roller 97 in frame 94 is moved forward with the frame and acts on rod 109, which acts on lever 110 and moves roller 111 toward cam 9. Pawl 98, secured to frame 94, slips over as many ratchet-teeth as there are punches 78 behind which block 74 has been moved, which will evidently be different for characters of different lengths. Shaft 3, which has been continuously rotated by wheel 5 since the clutch was engaged, causes cam 7, through rod 69, to move the head 10 and the punches 77 78 behind which the blocking 66 74 has been placed to perforate the ribbon previously placed in the slotted way 83. The continued revolution of cam 7, acting through strap 71 on the connecting rod or crank 69, pulls back the head 10, with draw-back plate 72, which, acting against collars 79, withdraws the punches. Cam 9 in the third quarter of its movement engages roller 111, moving it and lever 110, connecting-rod 109, and lever 105 to their original positions. Lever 105 in thus moving moves frame 94 to its original position and rod 99 withdraws block 74. Frame 94 in moving back acts on ratchet-wheel 114 through pawl 98, causing the wheel to move forward a distance corresponding to the length of the character just punched plus the space between two characters. Wheel 122 presses the ribbon against wheel 116, so that it is drawn forward into position to have another character punched therein by the next operation of the key. Handle 123 is for convenience in holding wheel 122 away from wheel 116 when a new ribbon is being inserted. Screw 119 controls the return of the sliding frame, so that it goes to its original position, but no farther. Detent 117 prevents wheel 116 moving backward when the pawl 98 moves forward with frame 94. Shaft 3 having nearly completed one revolution, the clutch-bolt 43 is engaged by the wedge-shaped projection 41' of the bifurcated trip, and, as the rotation continues, with the movable piece 41 of said trip, being thereby entirely withdrawn from the driving-wheel, allowing the shaft to come to rest. Projection 21 on catch-piece 17 slips off the plate 34, moved forward thereby, when said piece or bar is raised by bar 13. This allows plate 34 to pass under projection 21 and to return to its original position to permit trip-piece 41 to be in readiness to withdraw the bolt 43, so as to insure a positive stop after each single revolution of shaft 3, so that in case the operator forgets to remove the finger from the depressed key or is too slow in removing the



finger the machine will make but one revolution and will form but one combination of perforations representing a single complete character for each movement of a finger-key.

5 When it is desired to adjust any rod 25, it is disengaged from its catch-bar by forcing the eye out of its channel by moving the catch-bar forward, and said rod is screwed more or less into piece 26 and again connected  
10 to its catch-bar by engagement of the eye and channel, thus holding the rod in adjustment.

Springs 20 are separately adjusted to the same tension by screws 49, which are then locked by screws 51. All the springs can  
15 then be adjusted at once, when necessary, by moving bar 50 by screws 53.

The finger-plate at the center of the lower row of keys, Fig. 1, is shown of greater width than the others and is used as a spacer to  
20 make spaces between words of a message. The bar 16 corresponding to this key will have but one projection 18 and that will raise the center bar 55, which, as shown in Fig. 2, has no rod 62 and will not, therefore, render any  
25 character-punch operative, but which has a rod 63, operating on lever 88, adapted to cause bar 74 to cover one feed-hole punch and also to advance the ribbon one space. It will be seen that block 74 is yieldingly connected to  
30 its operating-rod and has a compound movement, that is, a movement with head 10 and a movement across said head. To accommodate the former movement, a groove 74' is provided in lugs 85, as shown in Fig. 2.  
35 Blocks 66 also have a similar compound movement and are similarly connected to their operating-rods.

Arm 38 is provided with a spring 38' to normally hold trip 41 against the clutch and also  
40 to return spindle 35, arm 38, arms 36, and plates 34 after they have been moved forward.

The object of moving roller 111 more or less toward cam 9, as described, is to make the reverse movement given to said roller (to move  
45 the sliding frame 94 and the propelling-pawl 97) proportionate to the length of the character punched. The cam always throws the sliding frame back to its original position, so that the distance which the frame is moved  
50 by the cam depends on the distance it is moved forward by levers 88.

I claim—

1. The combination, in a perforator, of normally inoperative punches adapted to punch  
55 holes in different combinations in a ribbon to represent different characters, keys corresponding to such different characters, assembling-bars each having a different combination of projections corresponding to one of the  
60 characters, parts moved by said projections rendering selected punches operative, power devices for operating the perforator with its assembling-bars, and distinct from the keys but brought into coöperation with certain  
65 combinations of punches by operation of any key, whereby on the movement of a key a complete character, letter, syllable or word,

represented by a combination of holes, will be automatically formed.

2. The combination, in a perforator, for perforating a strip, of a series of punches adapted to punch holes in different combinations to represent different characters, which characters vary in length longitudinally on the strip, separate feed-hole punches occupying a line  
75 parallel with the direction of movement of the strip in front of the punches, operated simultaneously with the character-punches, keys corresponding to the different characters, devices for operating the perforator, controlled by the keys, means for operating more or less of the feed-hole punches to correspond to the length of character punched.

3. The combination in a perforator for punching a strip of a series of punches adapted  
85 to punch holes in different combinations to represent different characters, which characters vary in length longitudinally on the strip, separate feed-hole punches occupying a line parallel with the direction of movement of  
90 the strip in front of the punches operated simultaneously with the character-punches, keys corresponding to the different characters, power devices distinct from the keys but brought into operation by the keys for operating  
95 the perforator, and means for operating more or less of the feed-hole punches to correspond with the length of the character punched.

4. The combination in a perforator for perforating a strip, of a series of punches adapted to punch holes in different combinations to represent different characters, which characters vary in length longitudinally on the strip, separate feed-hole punches occupying a line  
105 parallel with the direction of movement of the strip in front of the punches, operated simultaneously with the character-punches, keys corresponding to the different characters, devices for operating the perforator controlled by the keys, means for operating more or less of the feed-hole punches to correspond to the length of character punched, and the strip or ribbon feeding mechanism.

5. The combination, in a perforator, of a plurality of punches movable in different combinations, keys corresponding to such combinations, separate feed-hole punches, means for operating more or less of the successive feed-hole punches, according to the number  
120 required by the length of the character formed, and power devices normally inoperative on the perforator, and a clutch between the power devices and the perforator mechanism, said clutch being controlled by operation of any key.

6. The combination with a rotating wheel, of a shaft normally at rest, carrying operating devices, a clutch thereon, carrying a bolt adapted to engage with the rotating wheel,  
130 and a bifurcated trip, substantially as described.

7. The combination with a rotating wheel, of a shaft normally at rest, carrying operat-



- ing devices, a clutch thereon carrying a bolt adapted to engage with the rotating wheel, a bifurcated trip one member of which is stationary and adapted to engage and partially withdraw the bolt, the other member of the trip being movable and adapted to complete the withdrawal of said bolt, and one or more keys operating said movable member of the trip, substantially as described.
8. The combination, in a perforator, with a rotating wheel of a shaft normally at rest, carrying operating devices, a clutch, the shaft carrying a bolt adapted to engage with the rotating wheel, a bifurcated trip one member of which is stationary and adapted to engage and partially withdraw the bolt, the other member of the trip being movable and adapted to complete the withdrawal of said bolt, several keys each of which is adapted to move said movable part of the trip, and punches rendered operative by said keys.
9. The combination, in a perforator, with a rotating wheel, of a shaft, a clutch thereon having a longitudinally-movable part 43, carried around by the shaft when it turns, a fixed trip-piece, 41', and a movable trip-piece 41, both trip-pieces being arranged to engage part 43.
10. The combination, in a perforator, with a rotating wheel of a shaft a clutch thereon having a longitudinally-movable part and fixed and movable trip-pieces, the fixed trip-piece having a groove or way in which the movable trip-piece moves.
11. The combination of a plurality of punches movable in different combinations, a key for each combination, a punch-operating block or head normally not operative on the punches, and longitudinally-movable blocks controlled by said keys and movable between the punches and the operating-block in the desired combinations, feed-hole punches, and means for operating more or less of the feed-hole punches in succession according to the length of the character formed, so that the movement of the operating-block will punch a corresponding combination of character-holes and feed-holes.
12. The combination of a plurality of punches normally inoperative, blocks movable behind the punches in different combinations to render them operative, a key corresponding to each combination, and assembling-bars operated by power independent of the keys brought into operation by the keys and acting to bring corresponding blocks behind the punches.
13. The combination of a plurality of punches normally inoperative, blocks movable behind the punches in different combinations, a key corresponding to each combination, assembling devices brought into operation by the keys and acting to bring corresponding blocks behind the punches, and a power-driven device for operating said punches and assembling devices independently of power applied to the keys.
14. The combination of a plurality of punches normally inoperative, blocks movable behind the punches in different combinations, a key corresponding to each combination, and adapted by suitable intermediate parts to connect an assembling-bar to power-driven devices, assembling-bars actuated by power independent of the keys, each having projections corresponding to one combination, and means operated thereby causing the corresponding blocks to be moved behind the corresponding punches.
15. The combination of punches normally inoperative, blocks movable in desired combinations to render punches operative, keys and assembling devices corresponding to such combinations, power-driven devices arranged to move the selected blocks and then to operate the corresponding punches, and means operated by the key moved to connect the selected assembling device to the power.
16. The combination of punches, blocks movable behind the same in different combinations, assembling devices, keys operatively connected to the assembling devices, means operative through the assembling devices for moving the corresponding blocks behind the punches, a moving or lifting device operated by suitable power, and means operated by the keys to connect the assembling devices and the moving or lifting device.
17. The combination of punches, means for rendering them operative in different combinations, including blocks, assembling devices and keys, a lifting or moving device operated by power, and catch or engaging devices operated by the keys for connecting the assembling and lifting or moving devices.
18. The combination of punches, means for rendering them operative in different combinations, including blocks, assembling-bars, parallel bars operated by the assembling-bars and rods movable with the parallel bars and blocks moved by said rods, whereby certain blocks are moved by each assembling-bar, catch-bars and keys corresponding to the assembling-bars, and a lifting-bar, the catch-bars being moved by the keys.
19. The combination of punches, means for rendering them operative in different combinations, including blocks, assembling-bars, parallel bars operated thereby, pivoted bars operated by the parallel bars, rods movable with the parallel and pivoted bars for actuating the blocks.
20. The combination, in a perforator, of punches, blocks movable in line with the punches to render them operative in different combinations, means for moving the punches, a power device normally disconnected from said means, a trip operation of which connects said means and power device, spindle having one or more arms fixed thereto, means for moving said arms to turn the spindle, and means operated by movement of the spindle to render the power operative on the perforator.



21. The combination, in a perforator, of a driven wheel, a shaft, and an intermediate clutch, a trip operation of which engages the clutch, spindle 35, having arms 36 fixed thereto, and plates 34 adapted to be moved against said arms to turn the spindle.

22. The combination, in a perforator operated by power, of punches, blocks movable behind them in different combinations, to render them operative, assembling, lifting and catch bars, keys for operating the latter, a spindle 35, arm 36, plate 34 adapted to be moved against arm 36, and a projection on the catch-bar in position to move against plate 34 and to release the latter when the catch is raised, and means for returning arm 36 and attached parts to the original positions when the plate is thus released, and a trip moved by said spindle.

23. The combination, in a perforator, of punches normally inoperative, controlling-keys, a shaft, a cam thereon, a lifting device moved by the cam, assembling-bars, means operated by the keys for connecting selected assembling-bars to the lifting device, and means operated by the assembling-bars for rendering selected punches operative.

24. The combination of punches normally inoperative and controlled by several keys, a shaft, a cam thereon, a lifting bar or device operated thereby, means operated by the lifting-bar to render selected punches operative, said cam being formed, as described, to first move said bar forward, then to hold it stationary, and then to return it.

25. The combination of punches normally inoperative, keys, a shaft, a cam thereon, a lifting bar or device operated thereby, and intermediate parts moved by the lifting bar to render some of the punches operative, said cam being formed as described to first advance said bar, then hold it stationary, and then to retract it, a punch-moving device, and a cam on the shaft for moving it.

26. The combination of punches normally inoperative, keys, a shaft, a cam thereon, a lifting bar or device operated thereby, and intermediate means operated thereby to render some of the punches operative, said cam being formed as described to first advance said bar, then hold it stationary, and then to retract it, a punch-moving device, a cam on the shaft for moving it, a paper-feeding device and a cam for moving it.

27. The combination, in a machine having a ribbon to be advanced by steps of varying lengths, of a feed-wheel, a propelling pawl or device, a movable body carrying the same, a series of pivoted levers for determining the lengths of movement of said body, a series of rods operating said levers, a series of finger-keys, and means brought into use thereby to operate said rod and levers.

28. The combination, in a machine having a ribbon to be advanced by steps of varying lengths, of a feed-wheel, a propelling pawl or device, a movable body carrying the same, a

series of pivoted levers for determining the lengths of movement of said body, a series of rods operating said levers, a series of finger-keys, a series of parallel bars and pivoted links to which the rods are connected and intermediate devices between the keys and bars.

29. The combination of several punches, means for operating them in different combinations, keys for selecting the combinations, a frame, a pawl thereon, a ribbon-feed wheel engaged by said pawl, and several levers of different lengths operating on said frame to move it, and means connecting the keys and levers, whereby the levers moved and the length of movement of the frame depend upon the key operated.

30. The combination of frame 94, a pawl thereon, a ribbon-feeding wheel, levers of different lengths in position to operate on said frame to move it in one direction, keys and intermediate connections controlling the movement of the desired levers and hence the length of movement of the frame, and means for returning the frame, the pawl engaging the feeding-wheel and advancing it a distance corresponding to the movement of the frame.

31. The combination of frame 94, a pawl thereon, a ribbon-feeding wheel, means operating on said frame to move it the desired distance, keys and intermediate connections for controlling such movement, a lever in position to move said frame backward, and means for moving said lever.

32. The combination of frame 94, pawl 98, feed-wheel 116, means for moving the frame forward, lever 105, a part 111 moved by said lever, and a cam 9 adapted to operate on said part to return the frame and to turn the feed-wheel.

33. The combination of frame 94, pawl 98, feed-wheel 116, means for moving the frame forward, lever 105, a cam adapted to operate said lever to return the frame and to turn the feed-wheel, block 74 also moved with said frame, and punches rendered operative by said block.

34. The combination with a movable frame 94, of levers 88 of graduated lengths pivoted at 91 and recessed, and having adjusting-screws at the tops of the recesses, operating-rods extending into said recesses, bearing against the screws, means for operating the rods, said levers, 88, operating said movable frame a distance which depends on the length of the longest of said levers moved at any one time.

35. The combination of bars 55, pivoted links 56, rods 63, levers 88, and a ribbon-feed moved thereby.

36. The combination of bars 55, links 56, rods 63, levers 88, punches, block 74, and means moved by levers 88 for moving block 74 behind the punches.

37. The combination of bars 55, links 56, rods 63, levers 88, a ribbon-feed wheel, block 74, punches behind which said block is mov-



able, an intermediate device between levers 88 and the block 74 and the feed-wheel, keys, and means operated thereby moving bars 55 in desired combinations.

5 38. The combination with frame 94 a feed-wheel, means carried by the frame for moving the feed-wheel, keys and means brought into use by the keys for moving the frame different distances, of arm 110, roller 111, cam  
10 9, link 109, and lever 105 for returning the frame to its first position, thereby moving the feed-wheel the desired distance.

39. The combination of a stationary punch-head supporting both character and feed-hole punches, an operating punch-block and means for moving it, said block being not normally adapted to reach said punches, blocks movable between the punch-block and the character-punches in different combinations,  
20 a block movable between the punch-block and more or less of the feed-hole punches in regular succession, and a draw-back plate moved by the punch-block and operating both on the character and feed-hole punches to with-  
25 draw them.

40. The combination of character-forming punches, movable in different combinations, a row of punches for forming feed-holes, means for operating the desired combination  
30 of character-punches, and means for automatically operating a number of the feed-hole punches in regular order sufficient to make a row of feed-holes equal in length to the character formed plus the space between  
35 two characters.

41. The combination of character-punches, movable in different combinations, feed-hole punches, means whereby certain of the character-punches may be rendered operative,  
40 means for operating the required number of feed-hole punches in regular succession, and keys controlling the operation of the punches.

42. The combination of punches suitably supported, a head or block for moving the  
45 punches but normally not adapted to reach them, said head having openings in which fit blocks movable behind some of the punches to operatively connect the head and such punches, and a separate block moving at right  
50 angles to the other blocks and behind another series of punches.

43. A punch-operating head having openings therein, blocks, 66, therein, a way or socket 73, and a block 74 movable in said way,  
55 in combination with punches in position to be moved by said head.

44. A punch-operating head having openings therein, sliding blocks therein in two series adapted to extend to different heights, a  
60 sliding block in a plane between the planes of the tops of the first-mentioned blocks when they are moved forward, the latter block being movable at right angles to the first-mentioned blocks.

65 45. A punch-operating head having openings therein, blocks 66 therein, in two series adapted to extend to different heights, a block

74 on a level between the tops of blocks 66 when they are moved forward and movable at right angles to block 66, in combination with  
70 punches in position to be moved by said head.

46. In a machine having banks of keys, key-levers and parts operated thereby, as a perforator, the combination of key-tips in banks successively farther from the front  
75 of the machine, a block with pivot-bearings at different heights, means for holding said block in an inclined position, key-levers carrying said tips, the levers of the first bank of tips being pivoted at the lowest pivot-bear-  
80 ings, the key-levers of the second bank of tips being pivoted at the next higher pivot-bearings, and so on for the other banks and levers, each bank of tips having its lever-pivots at the same level with the tips, and  
85 means for securing said block to the machine.

47. The combination of punches, and means including power-operated assembling-bars controlled by keys, and means moved by the bars for rendering the punches operative in  
90 different combinations.

48. The combination of a stationary punch-head supporting character-punches and feed-hole punches, an operating punch-block containing movable blocks for the character-  
95 punches, and a single movable block for the feed-hole punches, said punch-block being incapable of reaching said punches until said movable blocks are moved between the punch-block and the punches.  
100

49. The combination of punches, a punch-block out of reach of the punches, frame 94, a block moved by said frame into the space between the punch-block and punches, means for moving said frame forward, an operating-  
105 cam for returning it, means moved more or less into the field of the cam by the forward movement of said frame for communicating movement of the cam to the frame to return it.

50. The combination of character-punches,  
110 blocks movable behind them in different combinations, a series of feed-hole punches, a movable block movable behind a greater or less number of successive punches in the feed-hole series and a punch-block, said movable  
115 block having a movement with the punch-block and also an independent movement.

51. The combination, in a perforator, with several catch-bars, of a separate retracting-spring for each bar, an adjusting device for  
120 each spring, whereby the springs can be adjusted separately, and means consisting of a bar with adjusting-screws, whereby the springs can be simultaneously adjusted.

52. The combination of a catch-bar with a  
125 semicircular channel in its rear side, and a hole from said semicircular channel through the bar, a rod 25 passing through the hole, said rod being threaded at one end for adjustment of its length, and having at the other  
130 end an eyelet or circular head fitting into the semicircular channel and working therein as a bearing, said semicircular channel serving also as a lock to prevent the loss of adjust-



ment of the rod by turning, a piece 26 with which the screw-threaded end of rod 25 makes connection, and a controlling-key.

53. The combination of catch-bars, having 5 engaging hooks and trip projections, a power-operated moving device therefor, means normally holding the catch-bars out of engagement with the moving device, keys for putting the catch-bars in engagement with the 10 moving device, and means operated by each key to render the power device operative to advance and then to return the moving device, carrying with it the catch-bar.

54. The combination of a power-shaft, a 15 clutch normally out of engagement, a trip for throwing the clutch in engagement, keys, catch-bars thrown into engagement by the keys, a moving device operated from the power-shaft and in position to be engaged by 20 the catch-bars when the latter are moved by the keys, a spindle carrying a body against which the catch-bars bear when moved forward, thereby turning the spindle, a connection between said spindle and the trip, where- 25 by the trip is withdrawn when the spindle is turned, projections on the catch-bars against which said body on the spindle rests when in normal position, said projections on the catch-bars occupying such positions that the said 30 body on the spindle will fall beneath them when the catch-bars are moved by the moving device, allowing the trip to go to its normal position whether the finger-key is released or not.

35 55. The combination of catch-bars, a power-operated moving device therefor, means for normally holding the catch-bars out of engagement with the moving device, keys for putting the catch-bars in engagement with

the moving device, and means operated by 40 each key to render the moving device operative to advance and then to return the moving device.

56. The combination, in a perforator, having several punches, and power-operating de- 45 vices, of bars 55 so movable that the edges thereof shall remain parallel to their original positions, assembling or selecting devices acting on said bars, and means moved by bars 55 rendering corresponding punches operative. 50

57. The combination of punches, block 74, means for moving it forward a greater or less distance according to the number of punches to be operated, and means, as cam 9, and parts moved thereby, for returning said block. 55

58. The combination with a feed-wheel, of an operating pawl or device, a reciprocatory body carrying the same, keys, means operated by power independent of the keys but brought into operation by them for moving the pawl 60 and body forward a greater or less distance according to the amount of feed required, and means, as cam 9, and parts moved thereby, for returning the pawl and body to their original positions. 65

59. The combination with a ribbon-feeding device, of a ribbon-tension device consisting of a plate 128, which is adapted to rest against the ribbon, and having a pin 129 extending therefrom into a hollow screw 127, a spring 70 pressing said plate forward, and a fixed surface against which the ribbon is pressed by said plate and spring.

Signed this 8th day of July, 1895.

EDWIN R. STORM.

Witnesses:

CHARLES M. CATLIN,  
C. L. BELCHER.