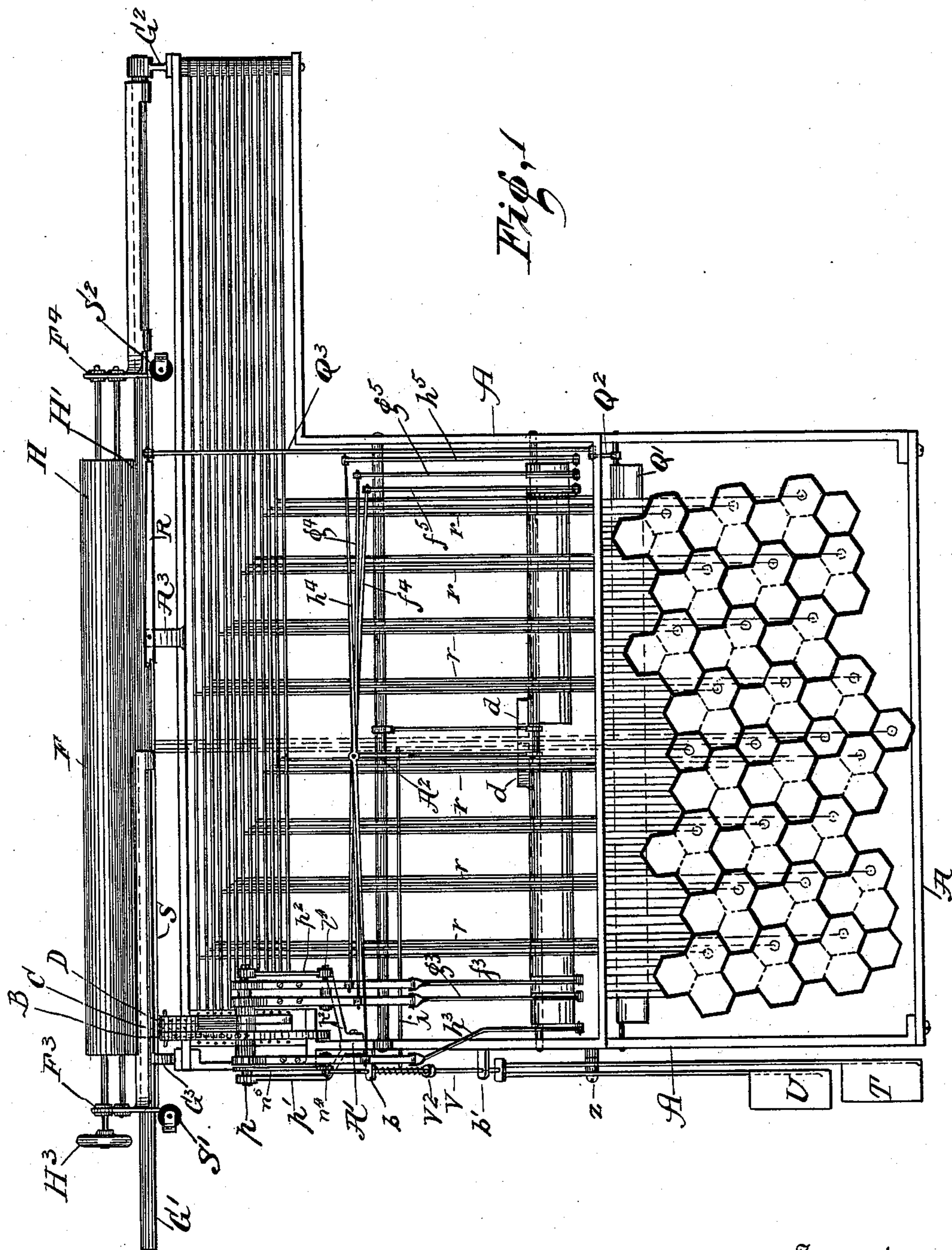


8 Sheets—Sheet 1.

Patented Jan. 5, 1892.



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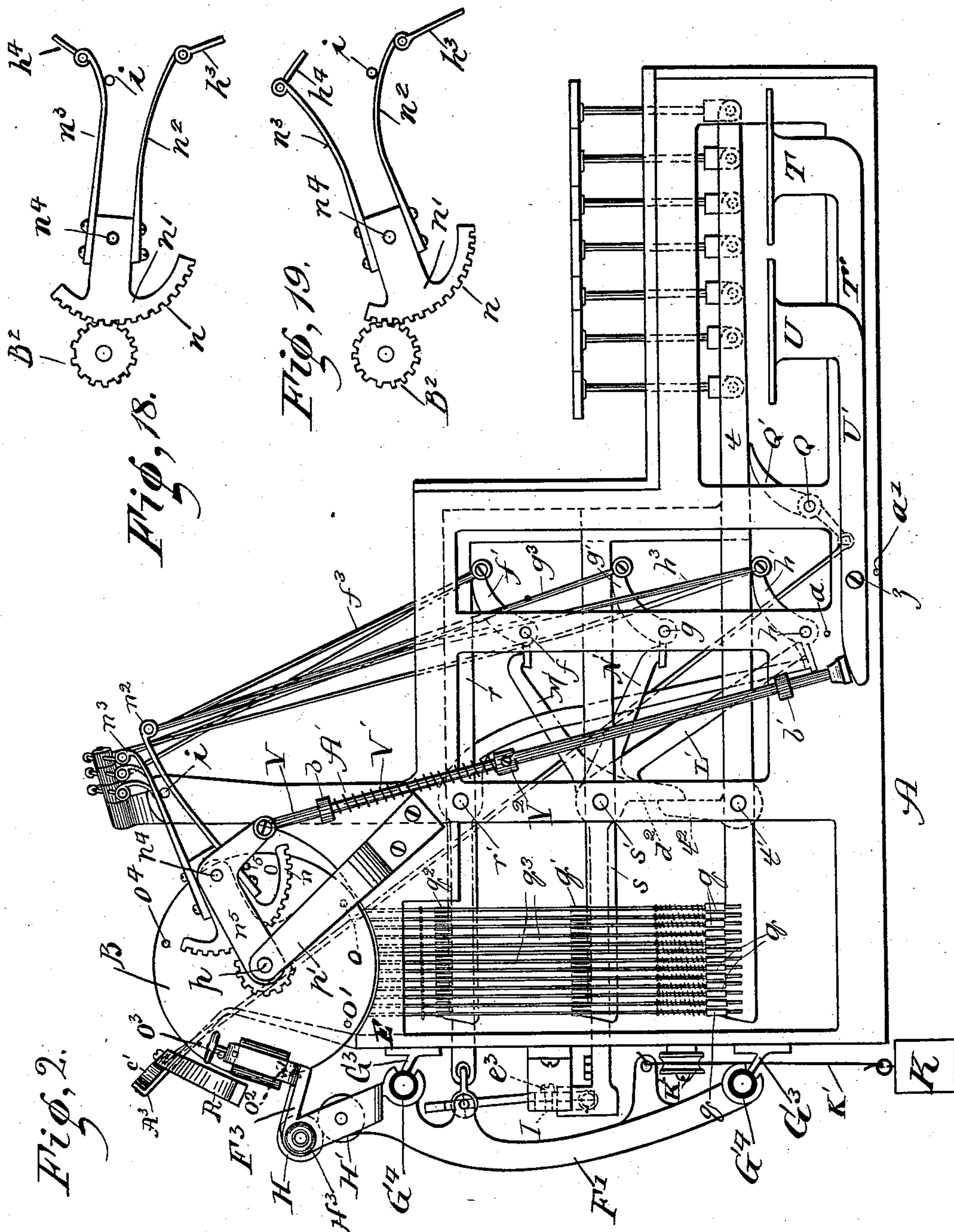
(No Model.)

8 Sheets—Sheet 2.

G. M. ECKELS.  
TYPE WRITING MACHINE.

No. 466,490.

Patented Jan. 5, 1892.



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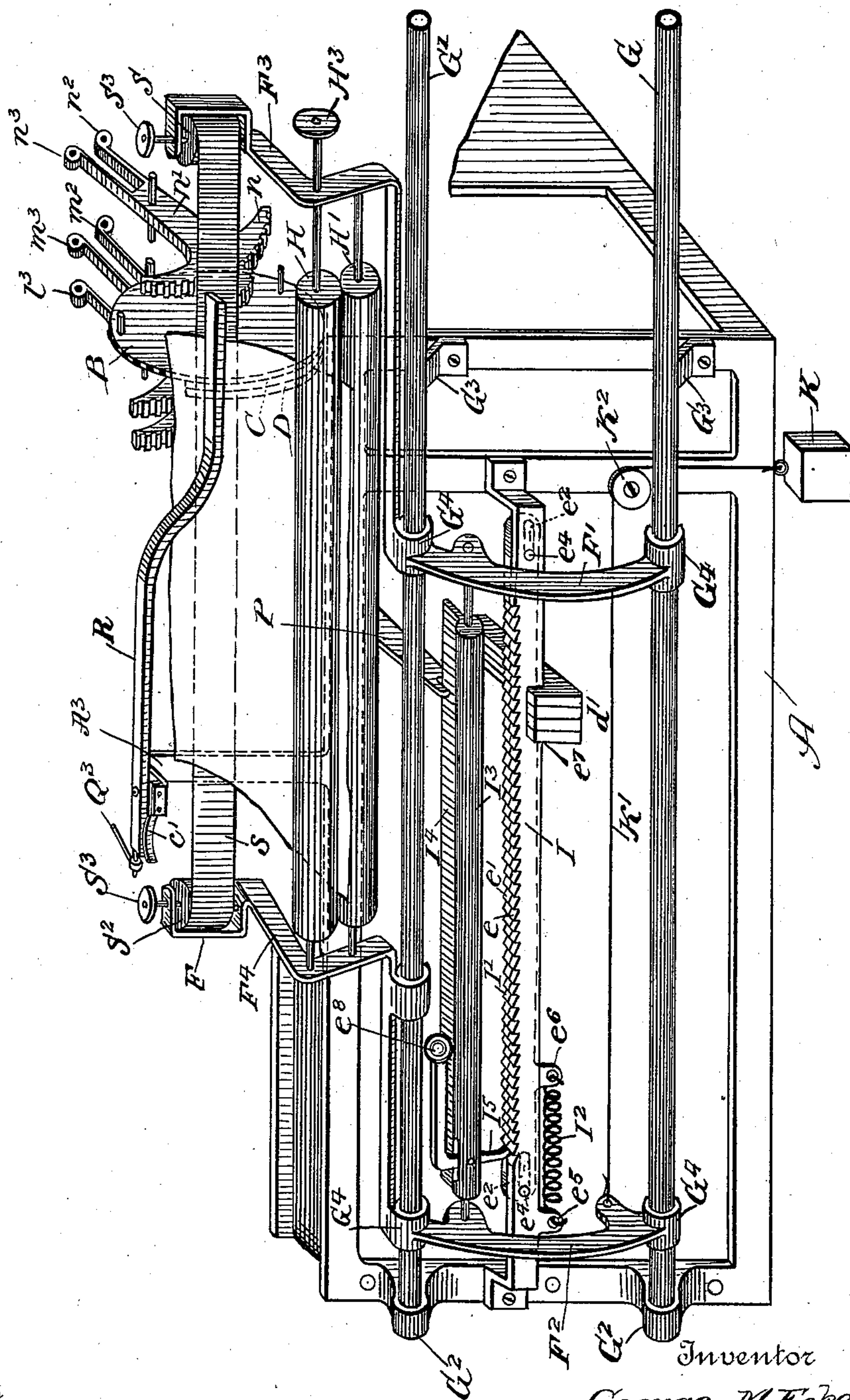


G. M. ECKELS.  
TYPE WRITING MACHINE.

No. 466,490.

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Fig. 3.



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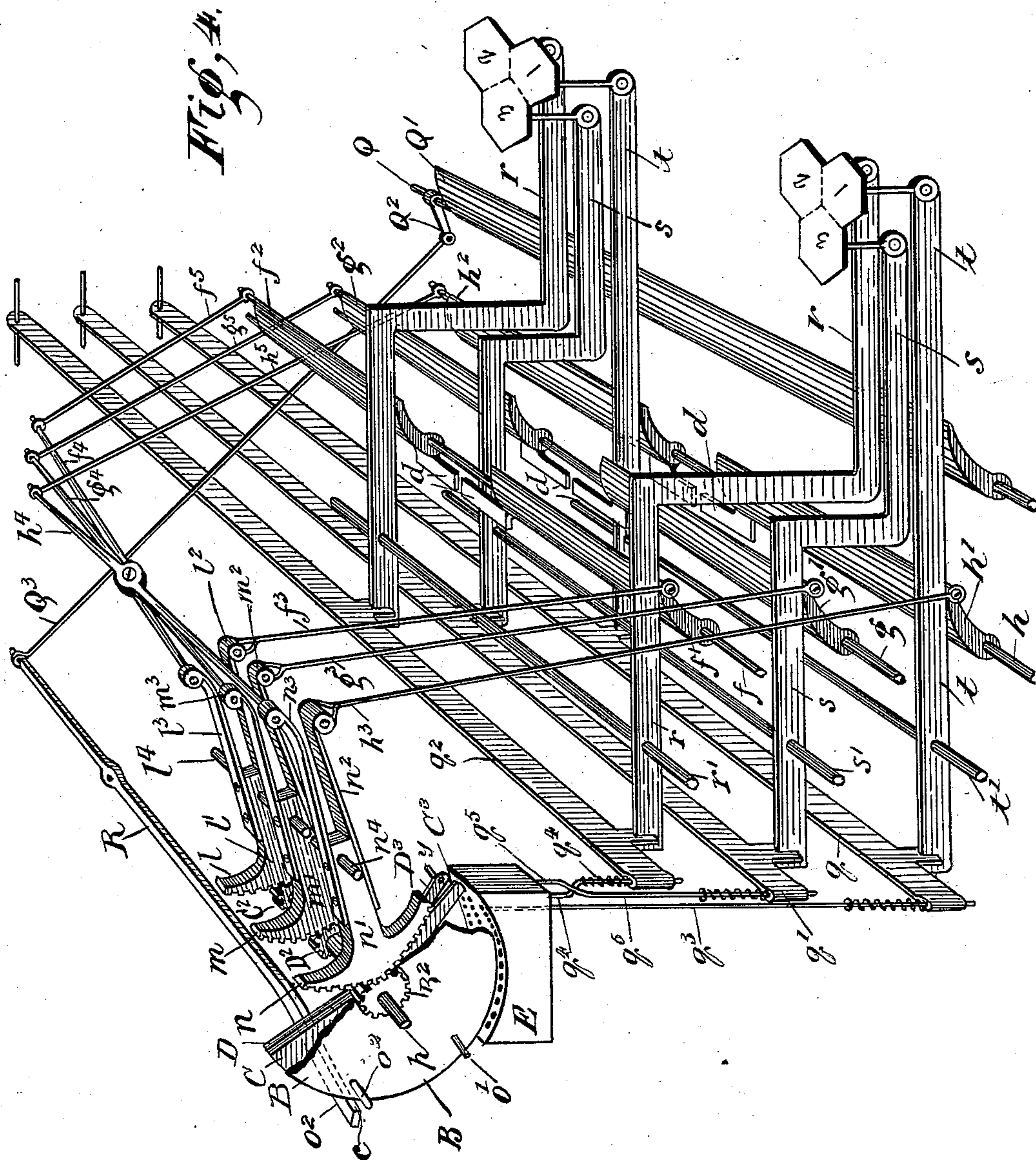
(No Model.)

8 Sheets—Sheet 4.

G. M. ECKELS.  
TYPE WRITING MACHINE.

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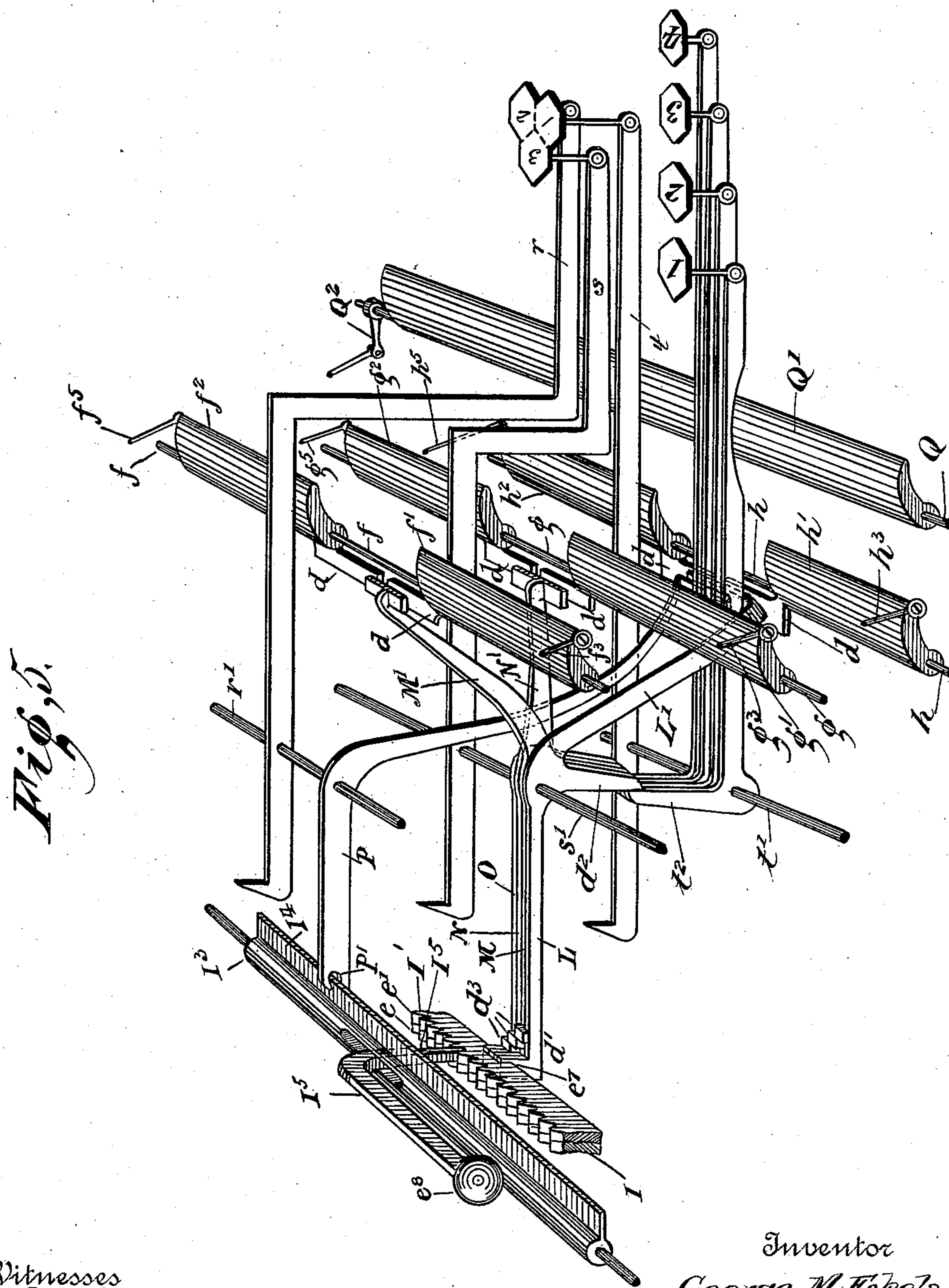
(No Model.)

8 Sheets—Sheet 5.

G. M. ECKELS.  
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Patented Jan. 5, 1892.



Witnesses  
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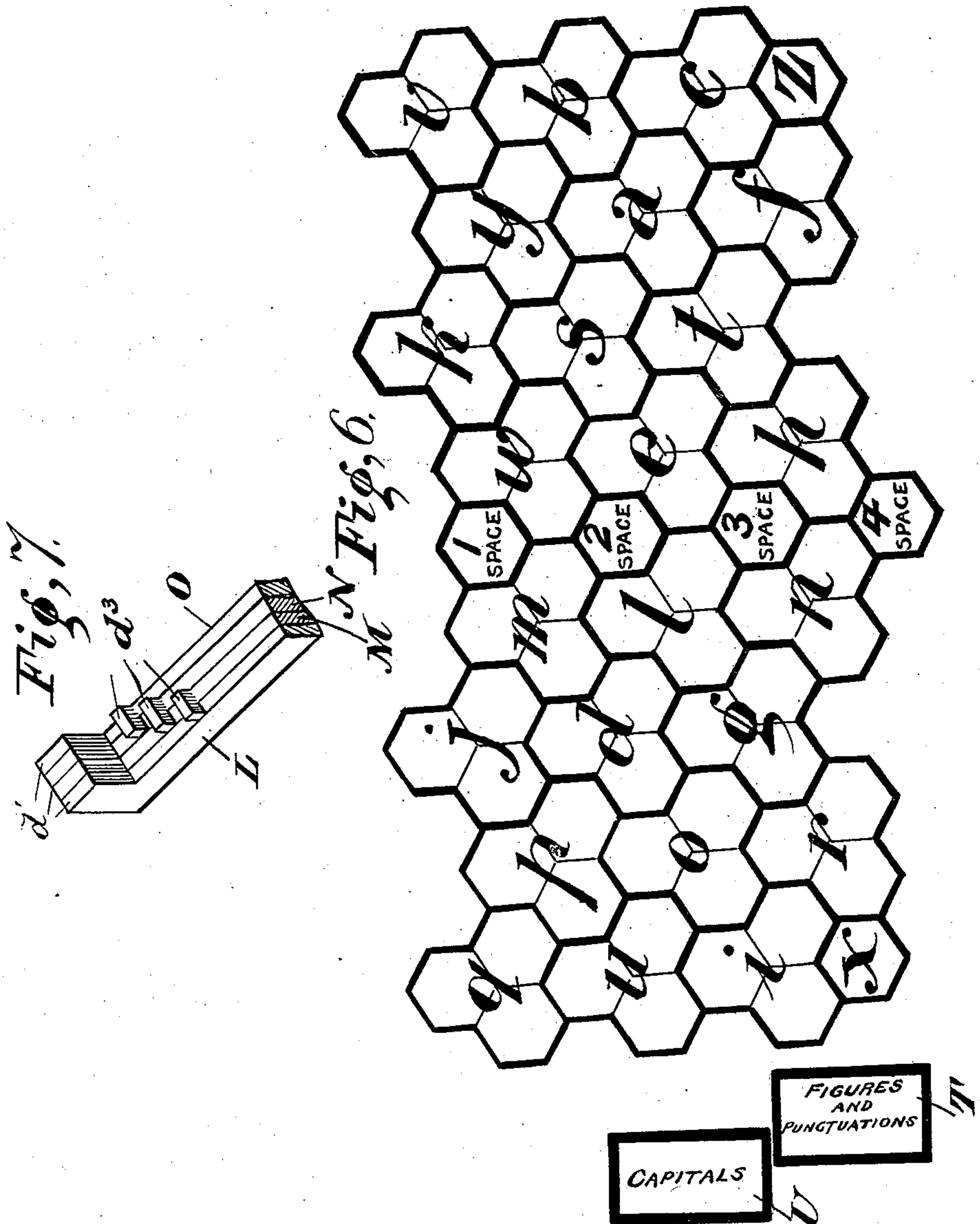
(No Model.)

8 Sheets—Sheet 6.

G. M. ECKELS.  
TYPE WRITING MACHINE.

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(No Model.)

8 Sheets—Sheet 7.

G. M. ECKELS.  
TYPE WRITING MACHINE.

No. 466,490.

Patented Jan. 5, 1892.

Fig. 8.

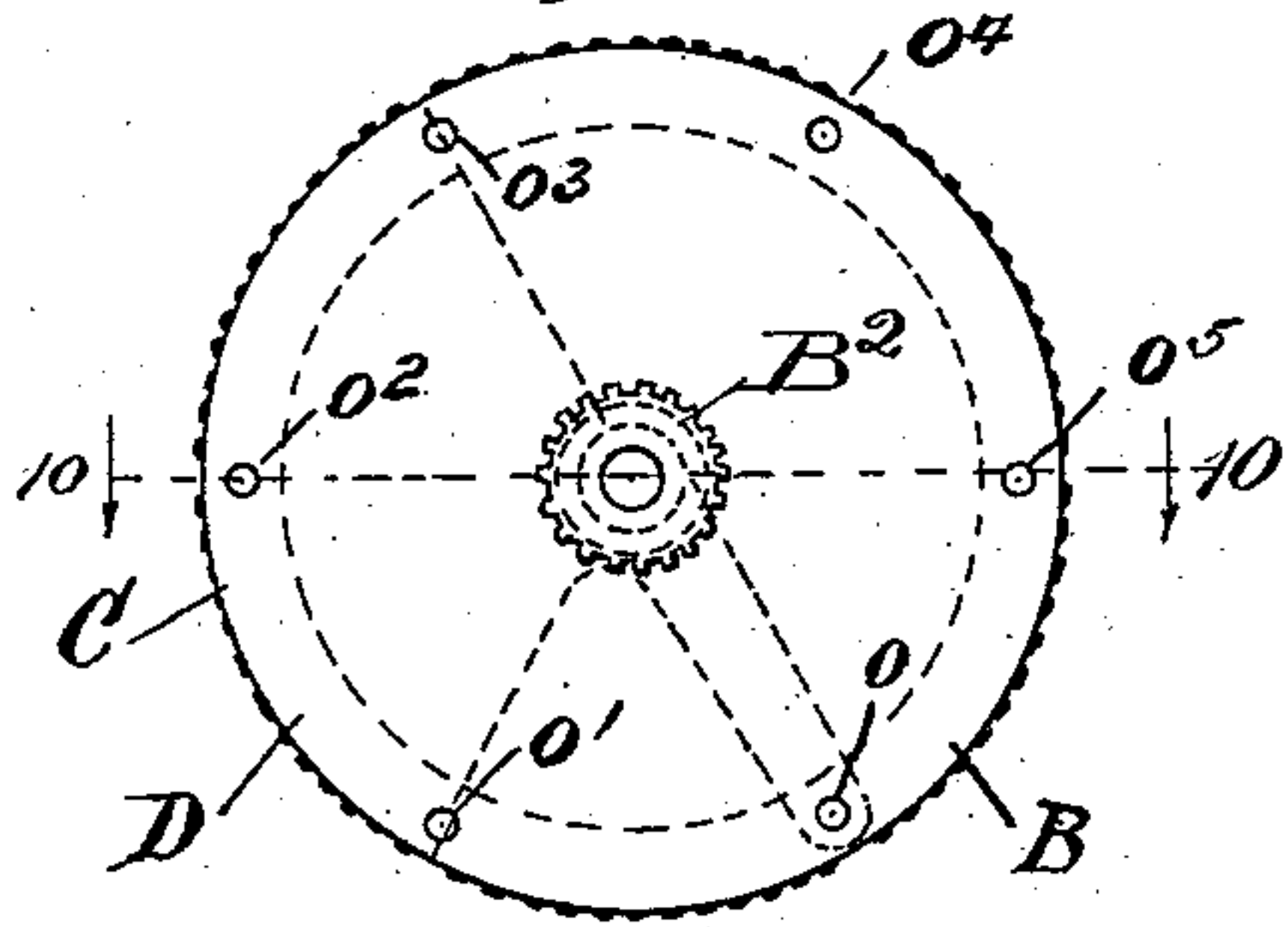


Fig. 9.

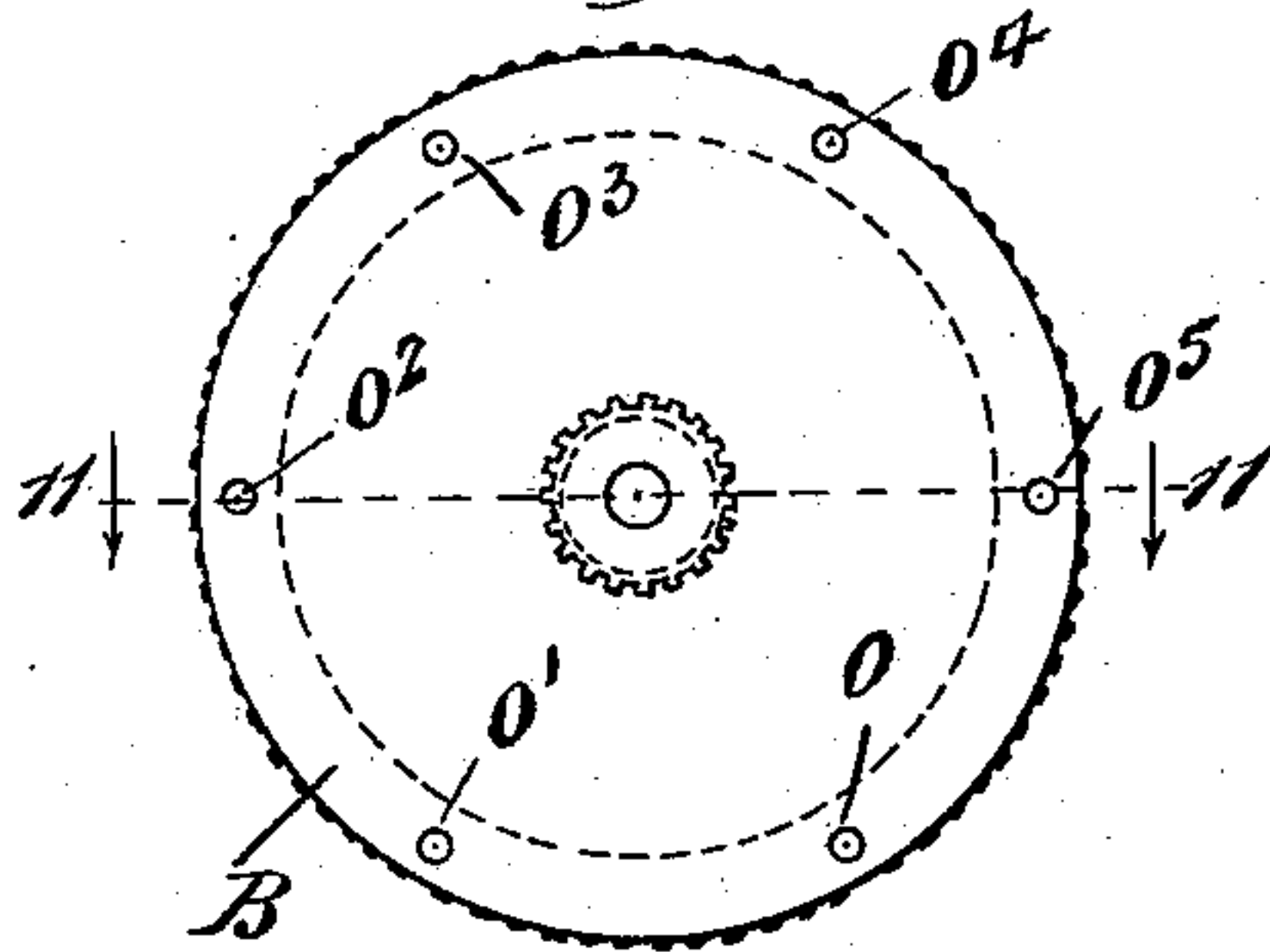


Fig. 10.

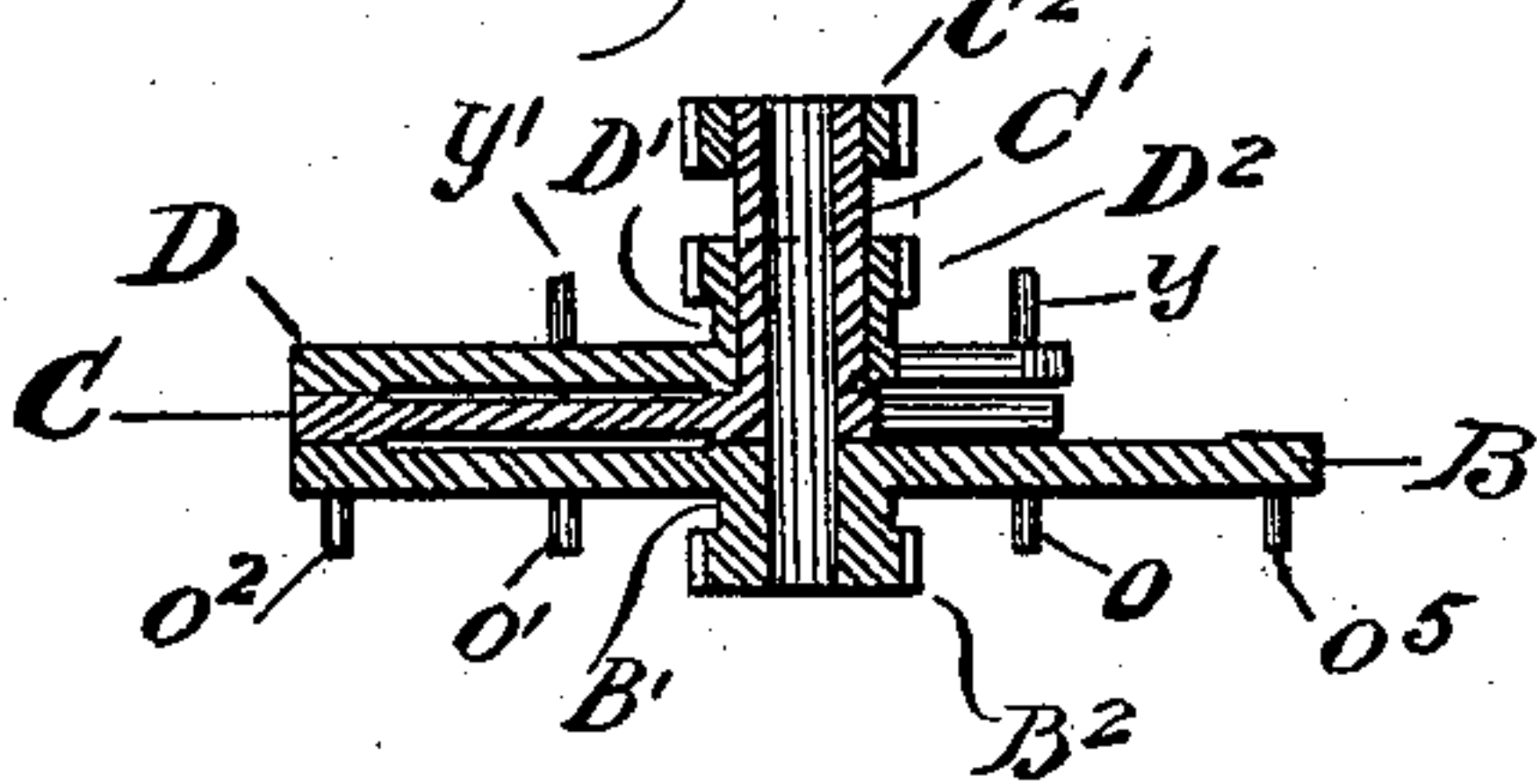


Fig. 11.

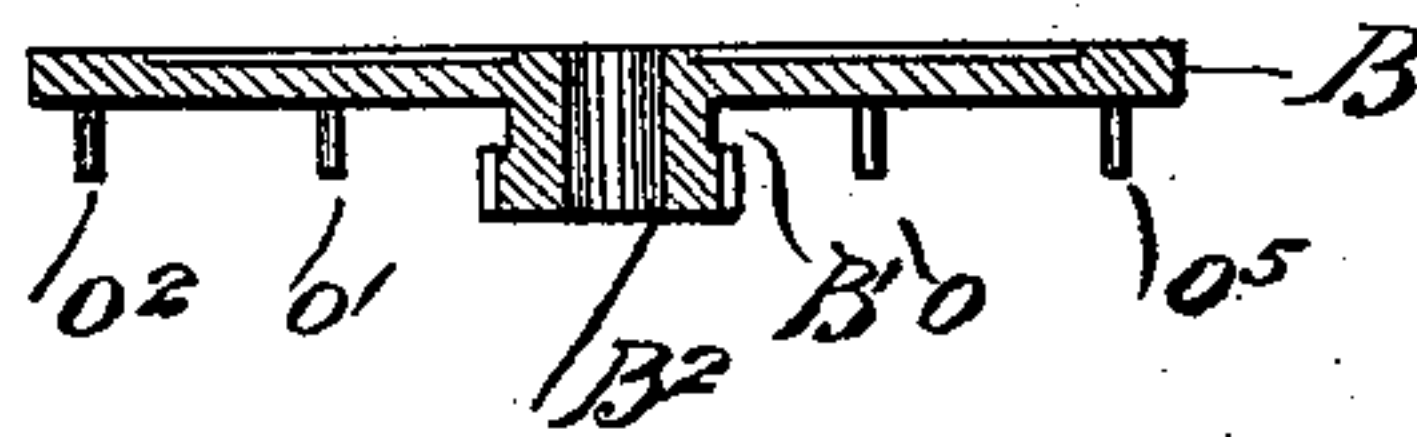


Fig. 12.

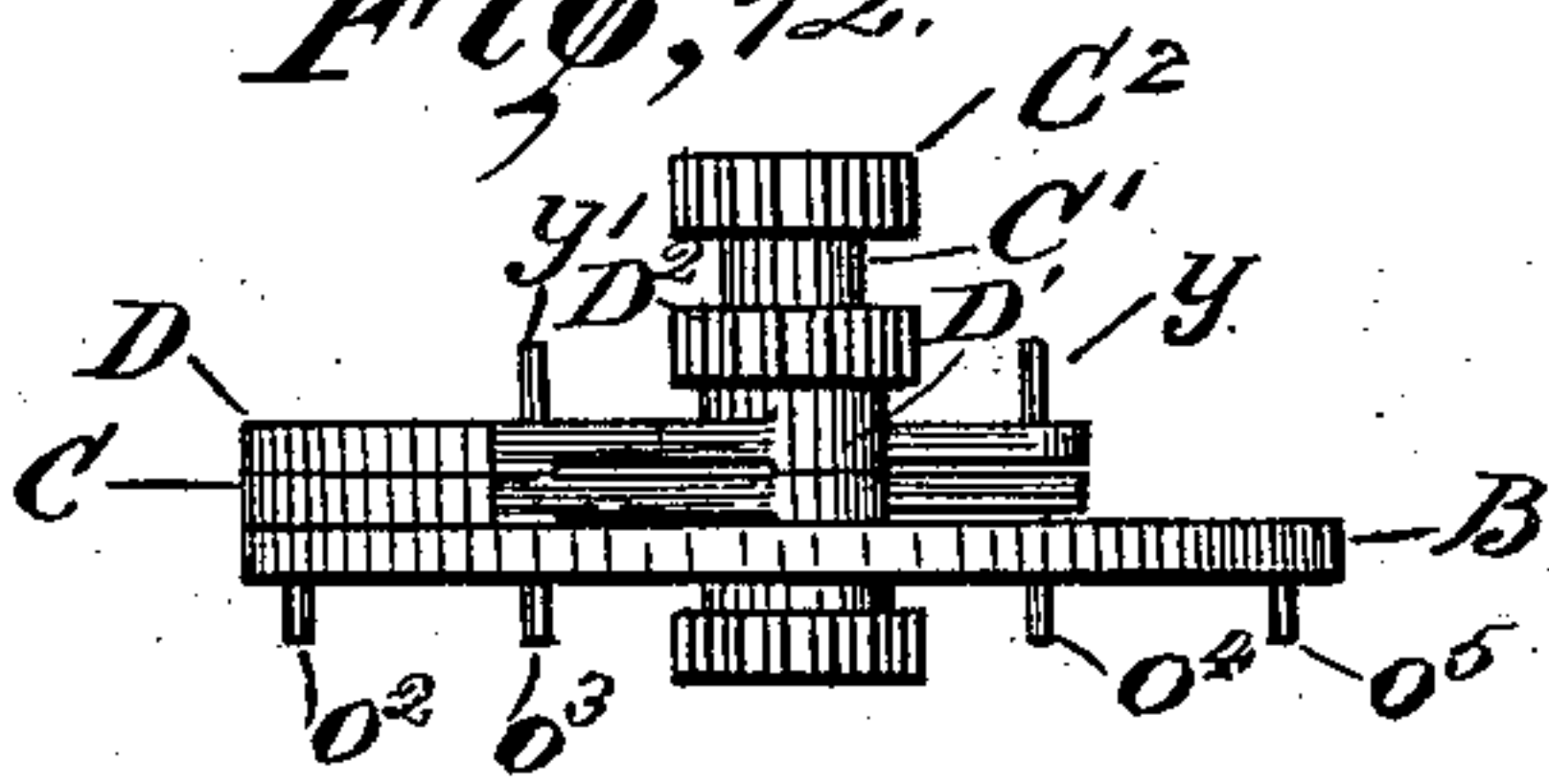


Fig. 13.

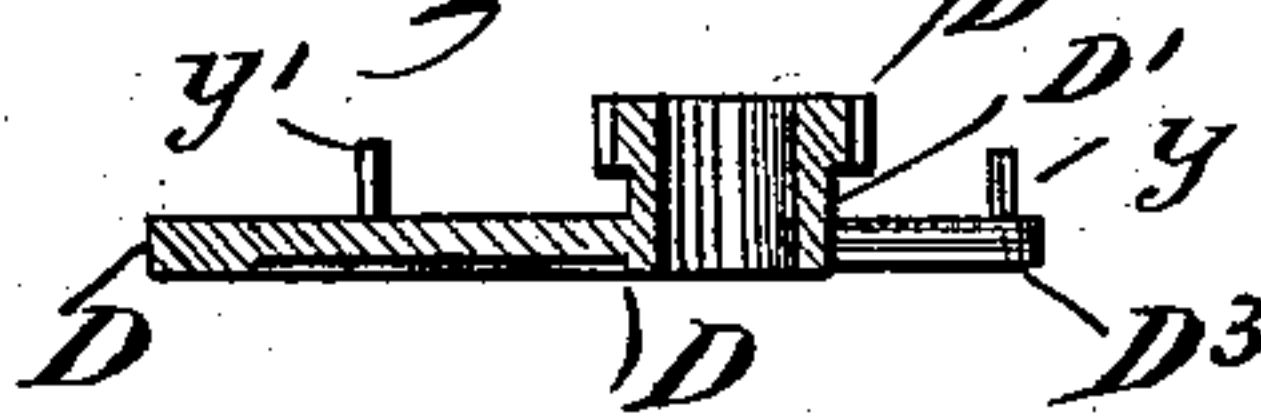


Fig. 14.

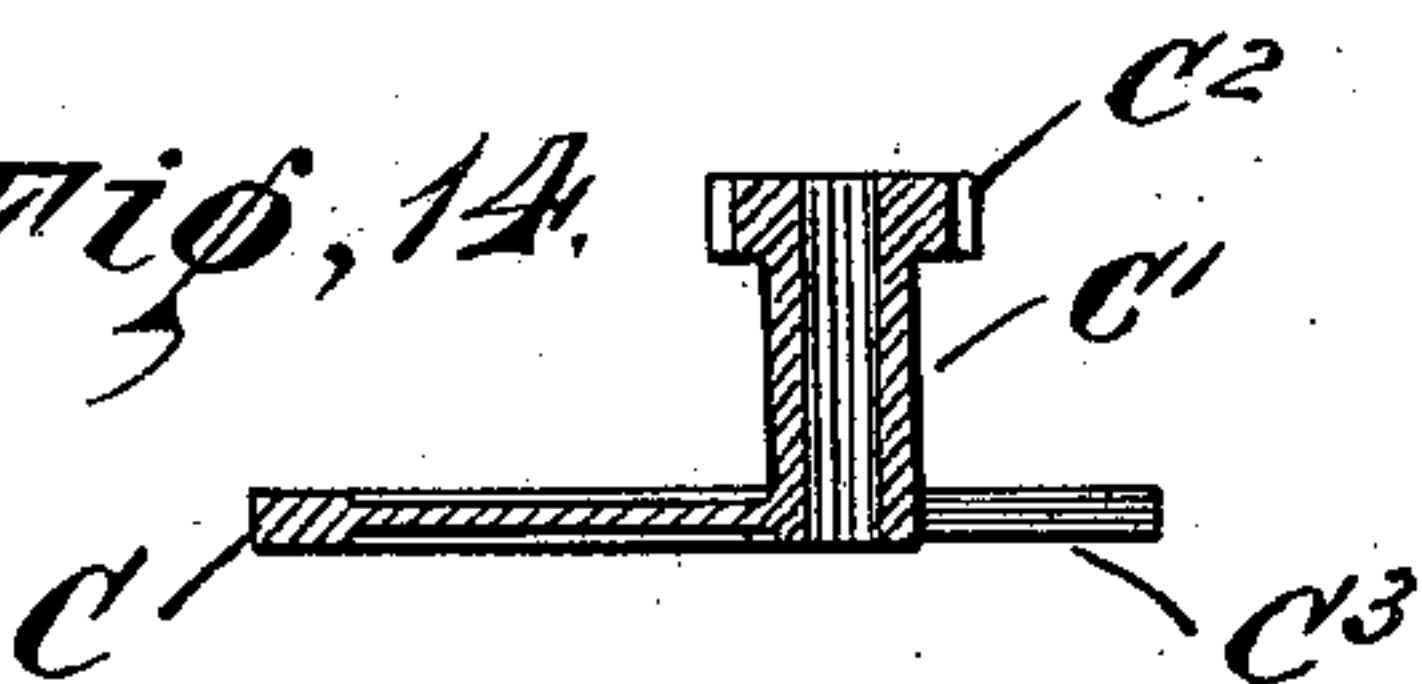


Fig. 15.

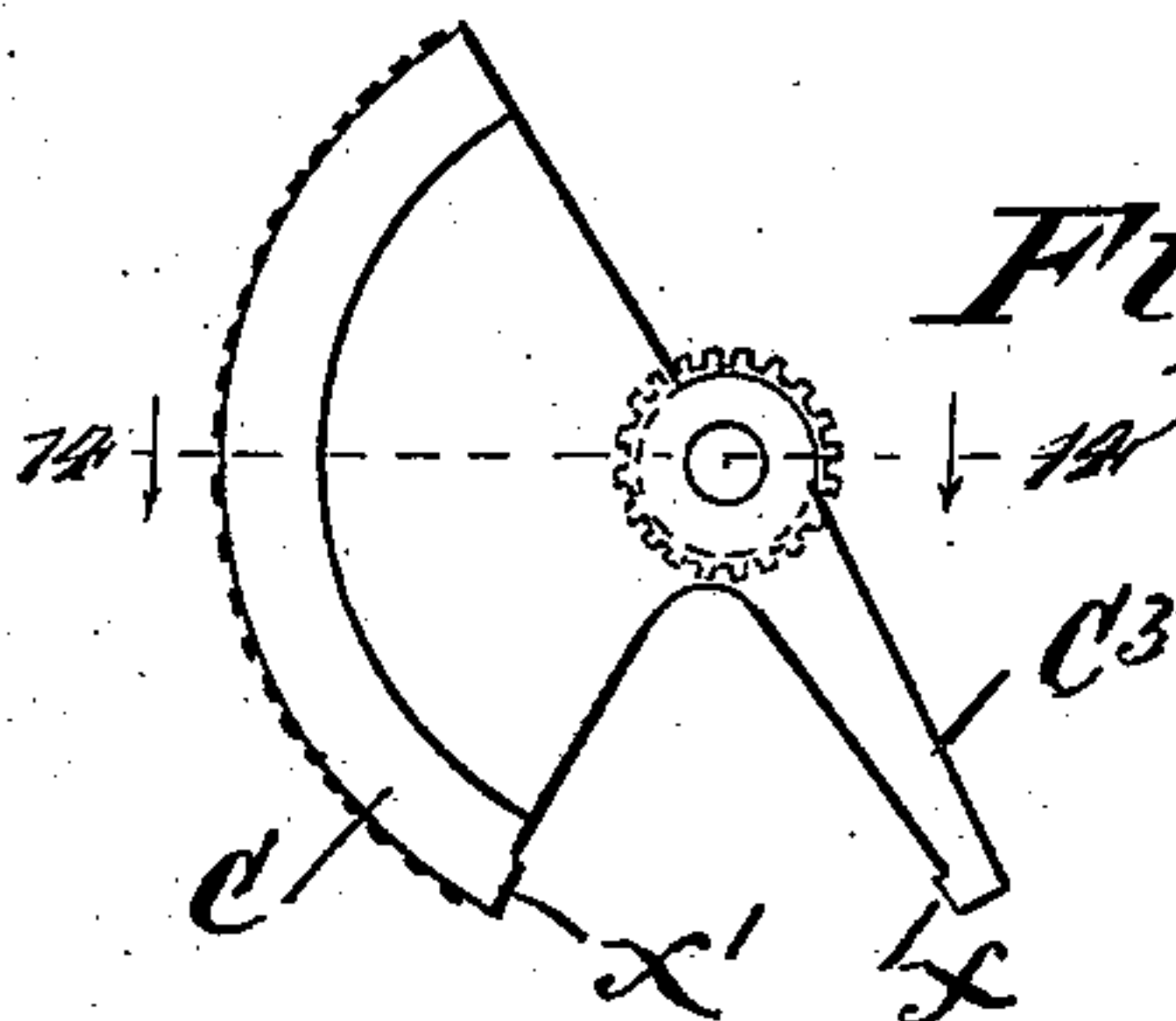
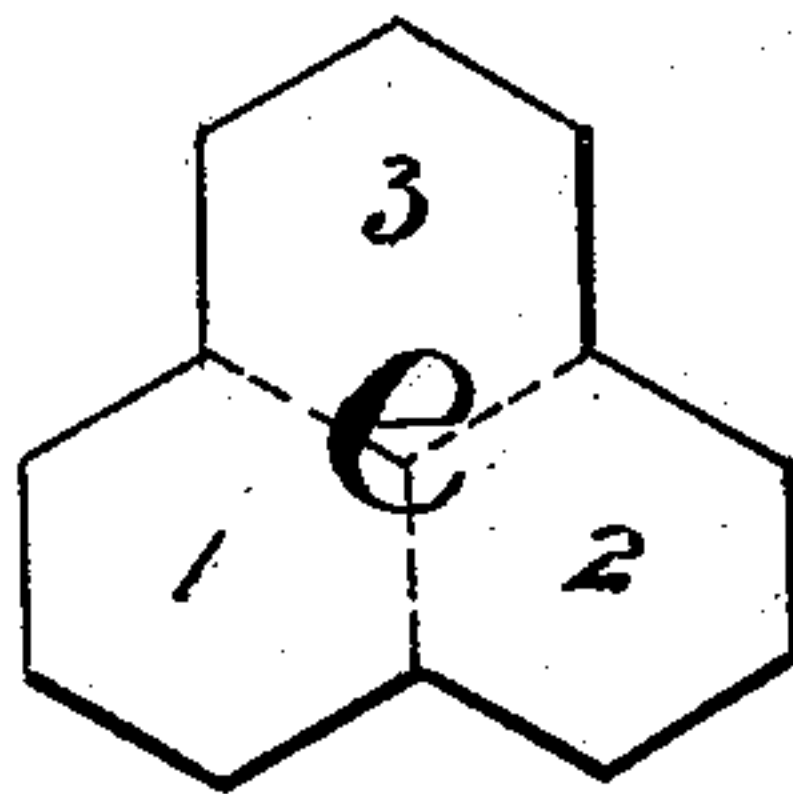
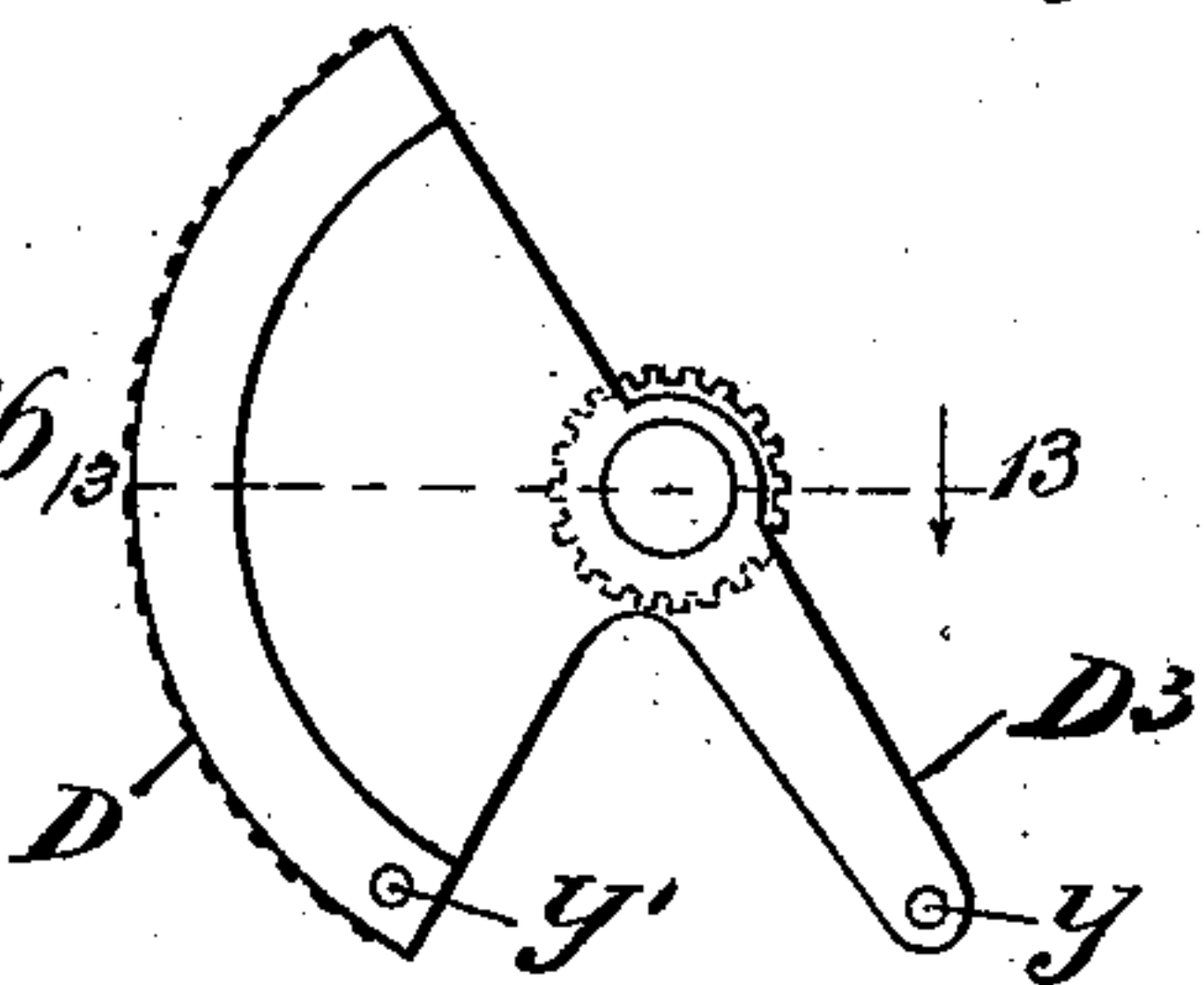


Fig. 16.



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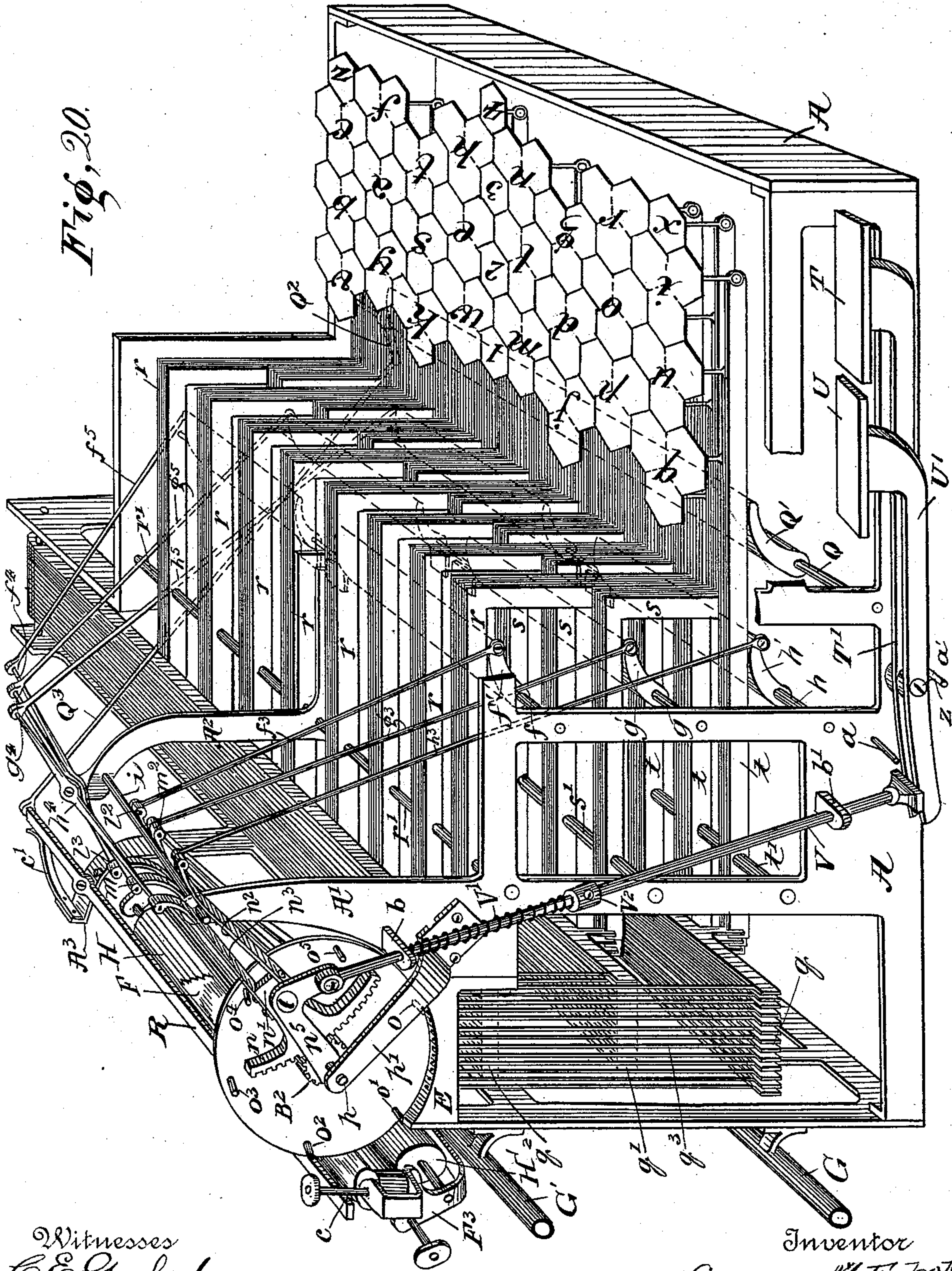
(No Model.)

8 Sheets—Sheet 8.

G. M. ECKELS.  
TYPE WRITING MACHINE.

No. 466,490.

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# UNITED STATES PATENT OFFICE.

GEORGE M. ECKELS, OF CHICAGO, ILLINOIS.

## TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 466,490, dated January 5, 1892.

Application filed October 10, 1890. Serial No. 367,751. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE M. ECKELS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Type-Writing Machines, of which the following is a specification.

The object of my invention is to provide a type-writing machine by means of which more than one character in the proper consecutive order, with requisite spaces between letters and words, may be printed upon the paper by simultaneous pressure upon the keys which produce the characters and spaces.

To this end my invention consists, primarily, in providing for the character more than one key, pressure upon either of which shall produce the imprint of the same character; further, in mechanism whereby the different keys for the same character cause the letter to be imprinted in different order with relation to the other letter or letters produced by simultaneous pressure upon other keys; and it consists, furthermore, in the general mechanism and various details of construction and combinations of parts whereby my invention is carried into effect.

In the drawings, Figure 1 is a top plan view of the machine with a part broken away for purposes of illustration; Fig. 2, a view of the same in side elevation; Fig. 3, a broken perspective view of the back of the device and showing only certain of the details; Fig. 4, a perspective view of a part of the mechanism removed from the frame and placed in operative relation, some of the details shown being indicated in part, where hidden, by dotted lines, and another detail being partly broken away for purposes of illustration; Fig. 5, a broken perspective view of the same character as the last and illustrating some of the same and other details of the construction; Fig. 6, a plan view of the key-board; Fig. 7, a broken perspective view of a detail of the spacing mechanism; Fig. 8, a view in elevation of a wheel provided on its perimeter with type, hereinafter designated as the "first-position type," and having indicated by dotted lines the normal relative position of the two adjacent segments, which are also provided on their perimeters with type, hereinafter designated, respectively, as "second" and

"third" position types; Fig. 9, a view in elevation of the type-wheel detached from the segments; Fig. 10, a section taken on the line 10 10 of Fig. 8 and viewed in the direction of the arrows; Fig. 11, a section taken on the line 11 11 of Fig. 9 and viewed in the direction of the arrows; Fig. 12, a top plan view of the type wheel and segments; Fig. 13, a section taken on line 13.13 of Fig. 16 and viewed in the direction of the arrows; Fig. 14, a section taken on line 14.14 of Fig. 15 and viewed in the direction of the arrows; Fig. 15, a view in elevation of the second-position type-segment; Fig. 16, a similar view of the third-position type-segment; Fig. 17, a group of keys for the three positions of one character; Figs. 18 and 19, two views of a detail, showing it in different positions; and Fig. 20, a perspective of the general construction, showing the general arrangement of parts and not confined to the specific form in every detail.

It is well to state in the outset that in the type-writer illustrated each small letter, except *x* and *z*, has three keys grouped together, as shown in Figs. 4, 5, and 17, and as outlined by the heavy lines in Figs. 1 and 6. The lower left-hand key of each group (marked 1) in the first-mentioned figures is the first-position key, the lower right-hand key (marked 2) the second-position key, and the upper key (marked 3) the third-position key. The paper on which the letter-press is to be produced is inserted in a traveling carriage to move across the face of the type wheel and segments, and the impression is produced by the impact against the reverse side of the paper opposite the type of a hammer, which drives the paper and an inked ribbon located between the paper and type against the type when any one of the said keys is struck. The striking of a first-position key operates to rotate the type-wheel and bring the character which corresponds with that of the key into alignment and to cause the hammer to produce the impression, and the release of the key causes the carriage to travel the distance of one space. When a second-position key is struck, it operates to rotate the second-position type-segment and bring the character thereon which corresponds with that of the key into alignment and operate the hammer, and when a third-position key is struck



it rotates in like manner the third-position segment and operates the hammer. The release of a second-position key causes the carriage to move a distance of two spaces, and the release of a third-position key causes the carriage to move a distance of three spaces. At the middle of the key-board are the spacing-keys, (shown most clearly in Figs. 5 and 6,) and marked, respectively, 1, 2, 3, and 4, to indicate the distance or number of spaces which the carriage will travel when the particular key is struck and released.

To illustrate the operation—say, for example, that the word "the" is to be written—the operator will place the fingers of his right hand on the first-position t-key, the second-position h-key, the third-position e-key, and the 4-space key and press them all down simultaneously. This operation will cause the entire word to be printed at once and the carriage to move along four spaces when the keys are released. If the word to be written is "these," the operator will strike the letters t h e simultaneously, (but not the 4-space key, which will cause the carriage to move only three spaces and then strike the first-position s-key, second-position e-key, and the 3-space key simultaneously, which will complete the word and space it from the word to follow.

A is the frame of the device. Each key is mounted upon a separate key-lever, the first-position keys on the straight key-levers  $t$ , which are all fulcrumed upon the diagonal rod  $t'$ , the third-position keys on the angular key-levers  $s$ , which are all fulcrumed upon the rod  $s'$ , and the second-position keys on the angular key-levers  $r$ , all of which are fulcrumed on the rod  $r'$ . Fulcrumed at one end at the side of the frame and extending diagonally across the latter near the back are levers  $q$ , which rest each normally on the ends, respectively, of two levers  $t$ , located at opposite sides of the space-key levers, levers  $q'$ , which in the same manner rest on the ends of two similarly-located levers  $s$ , and levers  $q^2$ , which rest on the ends of two similarly-located levers  $r$ . Thus there are half as many levers  $q$   $q'$   $q^2$  as key-levers  $t$   $s$   $r$ , and those of the same class extend side by side, as shown in Figs. 1 and 2.

The type-wheel B is provided on its perimeter with the twenty-six small letters of the alphabet, which occupy one-third of the perimeter, twenty-six capitals, which occupy another third, and all the marks of punctuation and other desired symbols, which occupy the remaining third. The second-position type-segment C and third-position type-segment D each have a perimeter equal to about one-third of that of the wheel B, and upon which are provided only twenty-four small letters of the alphabet, being all but  $x$  and  $z$ . The wheel B has a sleeve  $B'$ , provided with a pinion  $B^2$ , and is mounted upon a shaft  $p$ , which passes loosely through the sleeve. The shaft is supported at opposite ends in brackets  $p'$

and  $p^2$  upon the frame, as shown. The segment C has a sleeve  $C'$ , which fits loosely over the shaft  $p$  and is provided with a pinion  $C^2$ , and the segment D has a sleeve  $D'$ , which fits loosely over the sleeve  $C'$  and is provided with a pinion  $D^2$ . Upon the outer side of the wheel B, near its periphery, are six short studs  $o$ ,  $o'$ ,  $o^2$ ,  $o^3$ ,  $o^4$ , and  $o^5$ , located equidistant apart. The segments C and D have each an arm  $C^3$  and  $D^3$ , respectively projecting radially from its sleeve at an angle of about sixty degrees from the lower end of the segment. Stops  $x$   $x'$  are formed on the adjacent edges of the arm  $C^3$  and segment C, and upon the segment D and arm  $D^3$  are studs  $y$  and  $y'$ .

Meshing with the pinion  $B^2$  is a segmental rack  $n$ , provided with a head  $n'$ , from the upper and lower sides of which extend spring-arms  $n^2$  and  $n^3$ . A similar segmental rack  $m$  meshes with the pinion  $D^2$ , and is provided with the head  $m'$  and lower and upper spring-arms  $m^2$  and  $m^3$ , and a segmental rack  $l$ , like the others, meshes with the pinion  $C^2$  and has the head  $l'$  and lower and upper spring-arms  $l^2$   $l^3$ . The rack  $n$  is pivoted at its head upon a short shaft  $n^4$ , mounted in a swinging bracket  $n^5$ , which is fulcrumed at one end upon the shaft  $p$  and supported at its opposite end by a rod V, hereinafter described. The segmental racks  $m$   $l$  are pivoted at their heads, respectively, upon a shaft  $l^4$ , supported by the arm  $p^2$ . Extending between the arms respectively of the racks  $n$   $m$   $l$ , near the free ends of the former, is a rod  $i$ , supported near opposite ends in two substantially similar standards  $A'$  and  $A^2$ , which form part of the frame A. The rod  $i$  extends through and beyond the standard  $A'$ , as shown.

Fixed at their ends in the frame and extending transversely across the latter are shafts  $h$ ,  $g$ , and  $f$ . The shaft  $h$  extends below the series of key-bars  $t$ , the shaft  $g$  below the key-bars  $s$ , and the shaft  $f$  below the key-bars  $r$ . Each shaft carries a pair of curved plates  $h'$   $h^2$ ,  $g'$   $g^2$ , and  $f'$   $f^2$ , respectively, which extend along the shafts on opposite sides of the space-key bars. The curved plates rock upon the shafts and extend normally against the under sides of the respective series of key-bars, excepting only the key-bars of the space-keys. At the end of its free edge nearest the respective end of the shaft  $h$  the rocking plate  $h'$  is pivotally connected to a rod  $h^3$ , which at its opposite end is pivotally connected with the free end of the spring-arm  $n^2$ . In like manner the plate  $g'$  is connected by a rod  $g^3$  with the spring-arm  $m^2$ , and the plate  $f'$  by a rod  $f^3$  with the spring-arm  $l^2$ . Fulcrumed at their centers upon the standard  $A^2$  are three levers  $h^4$ ,  $g^4$ , and  $f^4$ . The lever  $h^4$  is pivotally connected at one end with the spring-arm  $n^3$ , the lever  $g^4$  with the spring-arm  $m^3$ , and the lever  $f^4$  with the spring-arm  $l^3$ . At their opposite ends the levers  $h^4$ ,  $g^4$ , and  $f^4$  are pivotally connected respectively with the ends of the free edges of the rocking-plates  $h^2$   $g^2$   $f^2$  by the rods  $h^5$   $g^5$   $f^5$ .



Below the type-wheel and type-segments is a block E, having a concave upper face concentric with the wheel and segments. It is provided with three rows of holes, the first 5 having thirteen holes and the others each twelve, and extend vertically through the block, one row being adjacent to the outer side of the type-wheel, the second row coincident with the second-position type-segment, 10 and the third row adjacent to the outer side of the third-position type-segment.

Extending vertically upward from the thirteen bars  $q$  are an equal number of rods  $q^3$ . The thirteen holes of the first-mentioned row 15 in the block E are each in direct vertical line with a bar  $q$ , and the rods  $q^3$  extend loosely through the holes which correspond with the respective bars from which they rise, and their upper extremities normally are approximately flush with the curved upper surface of the block. The holes of the second row in the block E are in direct vertical line with the bars  $q^2$ , and the third row of holes in the same relative location to the bars  $q^1$ . Rods  $q^4$  extend upward from the bars  $q^2$  through the 25 second row of holes, and rods  $q^5$  from the bars  $q^1$  through the third row of holes. Like the rods  $q^3$  the rods  $q^4$  and  $q^5$  are loose in the holes and extend approximately flush with 30 the upper surface of the block.

The carriage F comprises a frame having corresponding arms  $F^1$   $F^2$  and upward-extending brackets  $F^3$  and  $F^4$ . The carriage is mounted to move upon rods G G', supported 35 by brackets  $G^2$   $G^3$  on the back of the frame. The carriage is held to the rods by collars  $G^4$ , which are open, as shown in Fig. 2, to clear the brackets  $G^3$ .

Fulcrumed at opposite ends respectively in 40 the brackets  $F^3$   $F^4$  are rollers H H', normally in frictional contact, and the shaft of the upper roller extends through the bracket  $F^3$  and carries at its end a thumb-wheel H<sup>3</sup>, by means of which the upper roller may be turned and 45 by friction rotate the lower roller.

Extending across the back of the frame is a fixed horizontal bar I, having a serrated upper edge, the teeth affording between them the spacing-notches  $e$ . Upon the side of the 50 bar I is a bar I', provided with notches  $e'$ , corresponding with the notches  $e$ . The bar I' has elongated slots  $e^2$  near its opposite ends and is secured to the bar I by screws  $e^3$ , which pass through the slots into threaded holes  $e^4$  55 in the latter bar. This connection between the bars permits to the bar I' independent longitudinal play the distance of four notches, and a spring I<sup>2</sup>, connected at opposite ends respectively with an ear  $e^5$  on the bar I and 60 an ear  $e^6$  on the bar I', tends normally to maintain the latter bar at the forward limit of its play.

On the under side of the bars I and I' are sockets  $e'$  of a length each of four spacing-notches  $e$   $e'$ , and when the bar I' is at the backward limit of its play the sockets of the two bars are coincident.

Fulcrumed at opposite ends in the arms  $F^1$   $F^2$ , and extending parallel with and directly over the bar I, is a rock-shaft I<sup>3</sup>, formed with 70 a radial plate I<sup>4</sup>. Extending through a socket in the rock-shaft I<sup>3</sup>, and pivotally secured therein, is a dog I<sup>5</sup>, having a weighted arm  $e^8$ , which tends to maintain the dog at the lowest limit of its oscillation.

K is a weight upon the end of a cord or like flexible medium K', which runs over a sheave K<sup>2</sup> on the back of the frame and connects at its opposite end with the arm  $F^2$  of the carriage. The dog I<sup>5</sup> engages normally 80 with the notches  $e'$  and holds the carriage, while the weight K operates to draw the carriage forward when the dog is oscillated from the notches  $e$  into the notches  $e'$ , as hereinafter described.

Rigid upon the adjacent ends of the curved rocking plates  $h'$   $h^2$ , and extending toward each other in rear of the shaft  $h$ , are spacer-plates  $d$ . The curved plates  $g'$  and  $g^2$  and  $f'$  and  $f^2$  are provided with similar spacer-plates 90  $d$  in the same relative locations.

L, M, N, and O are respectively first, second, third, and fourth position spacer-levers, which are fulcrumed adjacent to each other on the rod  $s'$ . Each spacer-lever has a head 95  $d'$  of the width of the notches  $e$   $e'$  and extending normally into the sockets  $e'$  and a downward-projecting arm  $d^2$ . The key-levers  $t$  of the space-keys are provided with upward-projecting arms  $t^2$ , which extend into contact 100 with the backs of the arms  $d^2$  of respective spacer-levers. On the fourth-position spacer-lever O is a lug  $d^3$ , which projects over the top of the third-position spacer-lever N. On the latter there is a similar lug  $d^3$ , which projects 105 over the top of the second-position spacer-lever M, and on the last-named lever is also a lug  $d^3$ , which projects over the top of the first-position spacer-lever L. An arm L' extends from the spacer-lever L beyond its 110 fulcrum, down to the two spacer-plates  $d$  of the curved plates  $h'$   $h^2$  and is flanged at the end to rest normally on both of those plates. In like manner an arm M' of the lever M extends to and rests on the plates  $d$ , extending 115 from the second-position curved plates  $f'$   $f^2$ , and an arm N' on the lever N extends to and rests upon the plates  $d$ , extending from the third-position curved plates  $g'$   $g^2$ .

P is a lever fulcrumed on the rod  $r'$ . At 120 one end the lever P is bifurcated to afford a socket P', which fits loosely over the rocking plate I<sup>4</sup>, and at its opposite end it extends down to the plates  $d$  on the first-position curved plates  $h'$   $h^2$ , where it rests normally 125 upon the flanged end of the arm L' of the lever L.

Q is a rock-shaft fulcrumed at opposite ends in the frame and extending transversely across the latter. The rock-shaft Q carries a 130 curved plate Q', which rocks with the shaft and extends normally against the under sides of all the key-levers, except those of the space-keys, the levers of which are at their



under edges on a higher plane than the other key-levers, as shown in Fig. 5. At one end the rock-shaft Q carries an eccentric-arm Q<sup>2</sup>.

R is the hammer, which is in the form of a lever, with a face or striking surface *c* near one end. The hammer is fulcrumed on a standard A<sup>3</sup> at the back of the frame and extends in a plane parallel with the roller H, directly above the latter. The striking-surface *c* is in the alignment plane of the type on the wheel B and segments C and D, and is maintained normally away from the type by a spring *c'* on the standard A<sup>3</sup>. At the end opposite the face *c*, beyond its fulcrum, the hammer is pivotally connected by means of a rod Q<sup>3</sup> with the eccentric-arm Q<sup>2</sup>. The inked ribbon S is connected at opposite ends with vertically-disposed rollers S' S<sup>2</sup> upon shafts which are journaled, respectively, upon the brackets F<sup>3</sup> and F<sup>4</sup> of the carriage. The ribbon is wound upon the rollers, and the latter are provided upon their shafts with thumb-wheels S<sup>3</sup>.

The keys are all arranged together in a key-board, those of corresponding characters being grouped together in clusters. The keys are preferably of hexagonal shape, and so arranged that the key-board may be as small as possible consistent with the necessary size of the keys. The keys of each cluster fit as closely together as practicable. The clusters intermesh with each other, as shown, and to clearly distinguish them they may be separated from each other by spaces slightly in excess of the spaces between the keys which go to form a cluster, or they may be marked along their edges with lines or the like to render them readily distinguishable. As shown in Fig. 6 of the drawings, each cluster may be marked with its character, the mark spreading over the three keys of the cluster. The aggroupment of the keys of corresponding characters into clusters, as described, is a most convenient arrangement, and, besides economizing space, reduces the complexity of the key-board to a great degree.

The operation of the mechanism thus far described is as follows: When any one of the first-position keys to the left of the space-keys is struck, the long arm of its respective key-lever is depressed and its short arm (in rear of the fulcrum at *t'*) raised. The rise of its short arm lifts the respective bar *q*, which rests upon it, and raises the rod *q*<sup>3</sup>, attached to the said bar, through the respective guide-opening in the block E to cause the end of the rod *q*<sup>3</sup> to project into the path of the studs on the side of the type-wheel B. As the initial movement is given to the rod *q*<sup>3</sup> the key-lever commences to press down the rocking curved plate *h'*, causing it to draw down the spring-arm *n*<sup>2</sup> through the medium of the connecting-rod *h*<sup>3</sup>. While the spring-arm *n*<sup>2</sup> is being drawn down the spring-arm *n*<sup>3</sup>, which is of equal resilience with the latter, is stopped from descending with it by the rod *i*, as shown in Fig. 18. The arm *n*<sup>3</sup> is thus caused to yield by the force exerted

against the arm *n*<sup>2</sup> and the segmental rack *n* is rotated approximately with one-half the speed with which it would be turned were the resistance of the arm *n*<sup>3</sup> not present, the work to be performed by the segment offering, as it does, comparatively little resistance to be overcome. It being unnecessary under any circumstances, as hereinafter explained, to turn the type-wheel B (or, in fact, either of the type-segments) more than one-sixth of a revolution, a comparatively slight rotation of the segmental rack against the small pinion B<sup>2</sup> suffices. Thus as the spring *n*<sup>2</sup> is drawn down the type-wheel is rotated until its stud *o'* meets the raised rod *q*<sup>3</sup>, which prevents further turning of the type-wheel. The relative positions of the openings in the block E and the ends of the rods *q*<sup>3</sup> therein, and the stud *o'* and small letters of the alphabet on the wheel which correspond with those on the first-position keys to the left of the space-keys are such that when any one of said keys is struck down and its rod *q*<sup>3</sup> raised and the type-wheel turned, as described, the engagement of the stud *o'* with the rod will bring into the position of alignment the letter which corresponds with that on the key. As the key-lever is depressed it presses down the curved plate Q', which rocks the shaft Q and turns the eccentric-arm Q<sup>2</sup> upward. Through the medium of the rod Q<sup>3</sup> the hammer R is thereby turned against the resistance of its spring *c'* and the surface *c* strikes the paper and inked ribbon against the type, which has by this time been brought into alignment, and produces the letter-press upon the paper in the manner hitherto common in typewriters. The rocking of the curved plate *h'* described causes its extension or plate *d* to turn upward and carry with it the adjacent ends of the levers L and P. This movement of the lever L causes its head *d'* to descend out of the sockets *e'*, and that of the lever P causes the latter to oscillate the plate I<sup>4</sup> and swing the dog out of engagement with the respective notch *e'* into the respectively adjacent notch *e*. The first spacer-head *d'* being out of the socket *e'* and the dog I<sup>5</sup> out of engagement with the movable bar I', the latter is drawn forward by its spring I<sup>2</sup> until stopped by engagement of the end of its socket *e'* with the second spacer-head *d'*. When the key which has been struck is released, the resilience of the spring-arm *n*<sup>3</sup> draws up the curved plate *h'* and that of the spring *c'* the curved plate Q', thereby raising the key-lever to its normal position, causing the bar *q* to descend with its rod *q*<sup>3</sup> out of the path of the stud *o'* and the type-wheel to be turned to its initial position. The lever P at the same time swings the dog I<sup>5</sup> out of engagement with the respective notch *e* into the respectively-adjacent notch *e'*, when the weight K will draw the carriage forward and also the bar I' against the resistance of its spring I<sup>2</sup> until the end of its socket *e'* strikes the side of the fourth-position key-lever head



$d'$ , at which time the first head  $d'$  enters the socket  $e^7$  again to resume its normal position by the force of the descent of the arm  $L'$ . The carriage has thus been moved ahead the distance of one space. When a first-position key to the right of the space-keys is struck, the short arm of its lever  $t$  raises the respective bar  $q$  and causes its rod  $q^3$  to project above the block  $E$  into the path of the studs on the type-wheel. The long arm of the key-lever rocks down the curved plate  $h^2$  and draws with it the connecting-rod  $h^5$  and lever  $h^4$ , which raises the spring-arm  $n^3$ . Raising the spring-arm  $n^3$  causes the arm  $n^2$  to bear against the rod  $i$  and bend, as shown in Fig. 19, as the segmental rack  $n$  is rotated downward. This movement of the segmental rack turns the type-wheel in the direction contrary to that before described until the stud  $o$  strikes the projecting rod  $q^3$ , at which time the small letter of the alphabet corresponding with that on the key struck is in the position of alignment. The impression and spacing are produced, as before described, by the rocking of the curved plate  $Q'$  and extension  $d$  of the curved plate  $h^2$ . It will be noticed that the same bar  $q$  and rod  $q^3$  do duty for aligning one type when the rod  $q^3$  is met upon one face by the stud  $o'$  and for aligning another type when met upon the opposite face by the stud  $o$ . The striking of a second-position key to the left of the space-keys causes the short arm of its key-lever to raise a bar  $q^2$ , and through it a rod  $q^4$ , through the block  $E$  into the path of the stop  $x'$  on the second-position type-segment  $C$ . At the same time the curved plate  $f'$ , being turned down, draws with it the connecting-rod  $f^3$  and spring-arm  $l^2$  against the resistance of the spring-arm  $l^3$ , which bears against the transverse rod  $i$  and turns the pinion  $C^2$  and type-segment  $C$  until the stop  $x'$  meets the projecting rod  $q^4$ , which brings the type corresponding with that on the key struck into alignment. The impression is produced by the rocking of the plate  $Q'$ , as before, and the spacing by the rise of the extension or plate  $d$  on the curved plate  $f'$ , which raises the arm  $M'$  of the space-lever  $M$ , swings the heads of the latter lever and lever  $L$  out of the sockets  $e^7$ , and causes the arm  $L'$  to swing the lever  $P$ . When the key is released, the carriage moves forward the distance of two spaces. When a second-position key to the right of the space-keys is struck, the operation is in all respects the same, except that the curved plate  $f^2$  is rocked, and, through the medium of the connecting-rod  $f^5$  and lever  $f^4$ , raises the spring-arm  $l^3$  against the resistance of the arm  $l^2$ , and turns the type-segment in the contrary direction to that described, until its stop  $x$  strikes the projecting rod  $q^4$ , which brings the proper type into alignment. A third-position key when struck causes its respective bar  $q'$  and rod  $q^5$  to be raised, so that the latter will project into the path of the studs  $y$   $y'$  on the type-segment  $D$ , and, depending upon whether the key struck is to the left or

right of the space-keys, the spring-arm  $m^2$  is drawn down or the spring-arm  $m^3$  drawn up to turn the type-segment  $D$  in the first instance until its stud  $y'$  strikes the projecting rod  $q^5$  to bring the desired type into alignment, or, in the second instance, to turn the segment  $D$  in the contrary direction until its stud  $y$  strikes the rod  $q^5$  for the same purpose. The impression is produced as before, and the spacing by the rise of the extension-plate  $d$  of the rocking plate  $g'$  or  $g^2$  and consequent disengagement from the sockets  $e^7$  of the heads of the three spacer-levers  $L$ ,  $M$ , and  $N$ , which permits the carriage to travel the distance of three spaces. When a space-key is struck, the arm  $t^2$  of its lever engages the arm  $d^2$  of the respective spacer-lever and disengages the head of the latter, and with it (if it be the second, third, or fourth position key) the head or heads of the levers which precede it. Thus, for example, if the fourth space-key is depressed, the heads of all the spacer-levers are disengaged from the sockets  $e^7$  and the dog  $I^5$  swung out of engagement with the movable bar  $I'$ , which latter is drawn by its spring the distance of four spaces, whereby when the key is released the disengagement of the dog from the bar  $I$  and its re-engagement with the bar  $I'$  permits the carriage to be advanced the distance of four spaces.

It is to be understood that in practice, except in the case of the space-keys, a second-position key is never struck alone, but always simultaneously with a first-position key, and a third-position key simultaneously with keys of the first and second positions. The type-wheel and type-segments are always returned to their normal positions by their respective spring-arms, which bear against opposite sides of the transverse rod  $i$ . The type-wheel is provided with characters over the entire surface of the respective third of its perimeter, because some one of its characters is to produce an impression each time the hammer strikes. Those parts of the perimeters of the type-segments  $C$   $D$ , however, which, when the latter are in their normal states, are in the position of alignment are depressed or unprovided with characters, so that when a first-position character is struck alone no impression is made upon the paper by the type-segments. The characters of the type-segments are equally distributed along their perimeters on opposite sides of the blank spaces mentioned. When the type-wheel is in its normal position, the stud  $o^2$  is adjacent to the point of alignment and the small letters of the alphabet on the perimeter of the wheel range between points adjacent to the studs  $o'$  and  $o^3$ . The type of the figures, punctuation-marks, &c., range between the studs  $o^3$  and  $o^5$ , and of the capital letters between the studs  $o^5$  and  $o'$ . The capitals, figures, and marks of punctuation are of course distributed only over the first-position keys.

T is a key at the side of the key-board, mounted upon a lever  $T'$ , which is fulcrumed



at  $z$  to the side of the frame, and  $U$  a key in rear and slightly to one side of the key  $T$ , mounted upon a lever  $U'$ , also fulcrumed at  $z$ . Resting normally upon the short arms of the levers  $T'$   $U'$  is the rod  $V$ , before mentioned, extending through guides  $b$   $b'$  on the side, respectively, of the standard  $A'$  and frame  $A$ , and pivotally connected at its opposite end with the swinging bracket  $n^5$ , to which the head  $n'$  of the segmental rack  $n$  is fulcrumed. Projecting over the short arm of the lever  $T'$  from the side of the frame is a stop  $a$ , and projecting below the lever  $U'$  from the side of the frame is a stop  $a'$ . The key  $T$ , when depressed until its lever meets the stop  $a$ , causes the rod  $V$  to be forced longitudinally upward, which swings the bracket  $n^5$  upward on its pivot  $p$ . The spring-arm  $n^2$ , bearing against the transverse rod  $i$ , which acts as a fulcrum, causes the segmental rack  $n$  to move upward and rotate the pinion  $B^2$  to turn the type-wheel  $B$  one-third of a revolution. This brings the type adjacent to the stud  $o^4$  into the position of alignment, so that the figures and punctuation-marks, types, &c., range equally on opposite sides of that position. When a first-position key to the left of the space-keys is struck, the type-wheel is rotated to cause its stud  $o^3$  to meet the respectively-projecting rod  $q^3$ , and when a first-position key to the right of the space-keys is struck the type-wheel is, as before described, rotated in the opposite direction until its stud  $o^2$  meets the projecting rod  $q^3$ , which in each case brings the proper type into position of alignment. When the key  $T$  is released, the parts are returned to their normal positions by the resilience of a spring  $V'$  upon the rod  $V$ , which, when the rod is raised, is compressed between a collar  $V^2$  on the rod and the guide  $b$ . The key  $U$ , when depressed until its lever  $U'$  strikes the stop  $a'$ , lifts the rod  $V$  twice the distance which it is raised when the key  $T$  is depressed and causes the type-wheel to be rotated two-thirds of a revolution to bring the type which is adjacent to the stud  $o$  to the point of alignment. The capital letters are ranged at opposite sides of the type named and are brought, respectively, into alignment by the striking of the stud  $o^5$  against the projecting rod  $q^3$  or of the stud  $o^4$  against the latter, depending, as before, upon whether a first-position key to the left or right of the space-keys is struck.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a type-writing machine, the combination of two or more sets of type having corresponding series of characters and supported to imprint in consecutively-adjacent fields, a key for each character, operating, when actuated, to bring its respective character into its respective field and produce the impression, a carriage for the paper on which the impression is produced, actuated by the key from which the said impression is produced to move across the said fields a distance correspond-

ing with the spaces thereof occupied by the impression produced, and a graduated series of three or more spacer-keys, each operating, when actuated, to cause the carriage to move across the said fields a number of spaces controlled by the position of the key in the graduated series, substantially as described.

2. In a type-writing machine, the combination of two or more type-supports mounted to oscillate across consecutively-adjacent fields and formed with corresponding segmental faces provided each with a set of type, the sets corresponding with each other in the series of characters they afford, a key-board provided with a key for each type mounted upon a key-lever, stop projections upon the said type-supports, lever mechanism, substantially as described, for oscillating the said type-supports and operated from the said key-levers, and a series of movable stops for each type-support normally out of the paths of the said stop projections on the respective type-supports and movable into the paths of the said stop projections by movement of the key-levers, whereby when a key is struck its key-lever operates to oscillate the respective type-support and advance a movable stop into the path of a stop projection thereon to bring the respective type into the respective field of alignment, a hammer mounted opposite the fields of alignment and actuated to strike against the aligned type by the movement of a key-lever, and a carriage for the paper on which the impression is produced, maintaining the paper between the hammer and said fields of alignment and operated by movement of the key-levers on the return thereof to their normal positions to move the paper across the said fields, substantially as described.

3. In a type-writing machine, the type-wheel  $B$ , divided circumferentially into segments, each segment respectively being provided with a different set of characters, and mechanism for rotating the type-wheel to bring the segments respectively into operative position, comprising the pinion  $B^2$ , connected with the type-wheel, swinging bracket  $n^5$ , movable rack  $n$  on the swinging bracket engaging the pinion, movable rod  $V$ , connected with the swinging bracket and operating-levers  $T'$   $U^2$ , substantially as described.

4. In a type-writing machine, the type-wheel  $B$ , divided circumferentially into segments, each segment respectively being provided with a different set of characters, the key-board provided with a key for each character on one segment, the same key answering for the characters in correspondingly-relative positions on the other segments, key-levers  $t$ , upon which the said keys are mounted, turning mechanism, substantially as described, for the type-wheel operative at will to bring the desired segment into position, oscillating mechanism for the type-wheel actuated by movement of the key-levers, and stop mechanism for the type-wheel, comprising stop projections on the



type-wheel, movable bars  $q$ , extending across the type-levers, and rods  $q^3$  on the said bars movable into the path of the said stop projections, whereby when a key is struck the type-wheel will be oscillated and stopped and the character on the segment which is in position and indicated by the key will be carried to the field of alignment, substantially as described.

5. In a type-writing machine, the combination of three or more sets of type having corresponding series of characters and supported to imprint in consecutively-adjacent fields, a separate key-lever for each character, and a key-board containing a separate key for each key-lever, the keys for the levers of corresponding characters being grouped together in intermeshing clusters, substantially as described.

6. In a type-writing machine, three or more sets of type having corresponding series of characters supported to imprint in consecutively-adjacent fields, in combination with a key-board provided with a hexagonal key for each character, the keys for corresponding characters being grouped together in clusters, the clusters intermeshing with the next adjacent clusters, substantially as set forth.

7. In a type-writing machine in which two or more sets of type having corresponding series of characters are supported to imprint in consecutively-adjacent fields, the combination of the key-levers, rocking plate  $Q$ , and pivotal hammer  $R$ , substantially as set forth.

8. In a type-writing machine in which two or more sets of type having corresponding series of characters are supported to imprint in consecutively-adjacent fields, the combination, with the key-levers, type-wheel, and type-segments, of pinions connected with the type-segments, segmental racks meshing with the pinions, spring-arms on the segmental racks, a stop for the spring-arms, and rocking plates engaged by the key-levers and connected with the spring-arms, substantially as set forth.

9. In a type-writing machine, the combination of the carriage  $F$ , rock-shaft  $I^3$ , dog  $I^5$ , notched stationary and sliding bars  $I I'$ , having coincident sockets  $e^7$ , spacer-levers, and lever  $P$ , substantially as set forth.

10. In a type-writing machine, the combination of an oscillatory type-wheel  $B$ , provided on one segment of its perimeter with the small letters of the alphabet, on another segment thereof with the capital letters, and on still another segment thereof with numerals and other characters, an oscillatory type-segment  $C$ , provided on its perimeter with small letters of the alphabet and mounted adjacent to the type-wheel, a key-board provided with a set of keys for the small letters on the type-wheel, the said keys controlling also the corresponding capital letters and other characters on the type-wheel and with a second set of keys for the small letters on the type-segment, the keys of the first said set being mounted upon key-levers  $t$  and the keys of the second said set upon key-levers  $r$ , stop projections on the type-wheel and type-segment, lever mechanism, substantially as described, for oscillating the type-wheel and operated from the key-levers  $t$ , lever mechanism, substantially as described, for oscillating the said type-segment and operated from the key-levers  $r$ , a series of movable stops  $q'$ , normally out of the paths of the said stop projections on the type-wheel and movable into the paths thereof by movement of the key-levers  $t$ , a series of movable stops  $q^2$ , normally out of the paths of the said stop projections on the said type-segment and movable into the paths thereof by movement of the key-levers  $r$ , whereby when a key of the first series is struck its key-lever operates to oscillate the type-wheel and advance a movable stop  $q$  to bring the respective type into its field of alignment and when a key of the second series is struck its key-lever operates to oscillate the type-segment and advance a movable stop  $q^2$  to bring the respective type into its field of alignment, a hammer mounted to strike against the aligned type by the movement of a key-lever, a carriage for the paper on which the impression is produced operated by the return of the keys to their normal positions to move across the said fields, and mechanism, as the keys  $T U$ , with their levers and the rod  $V$ , connected with the type-wheel for turning it to bring its respective segments into operative position, substantially as and for the purpose set forth.

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GEORGE M. ECKELS.

In presence of—

J. W. DYRENFORTH,  
M. J. FROST.