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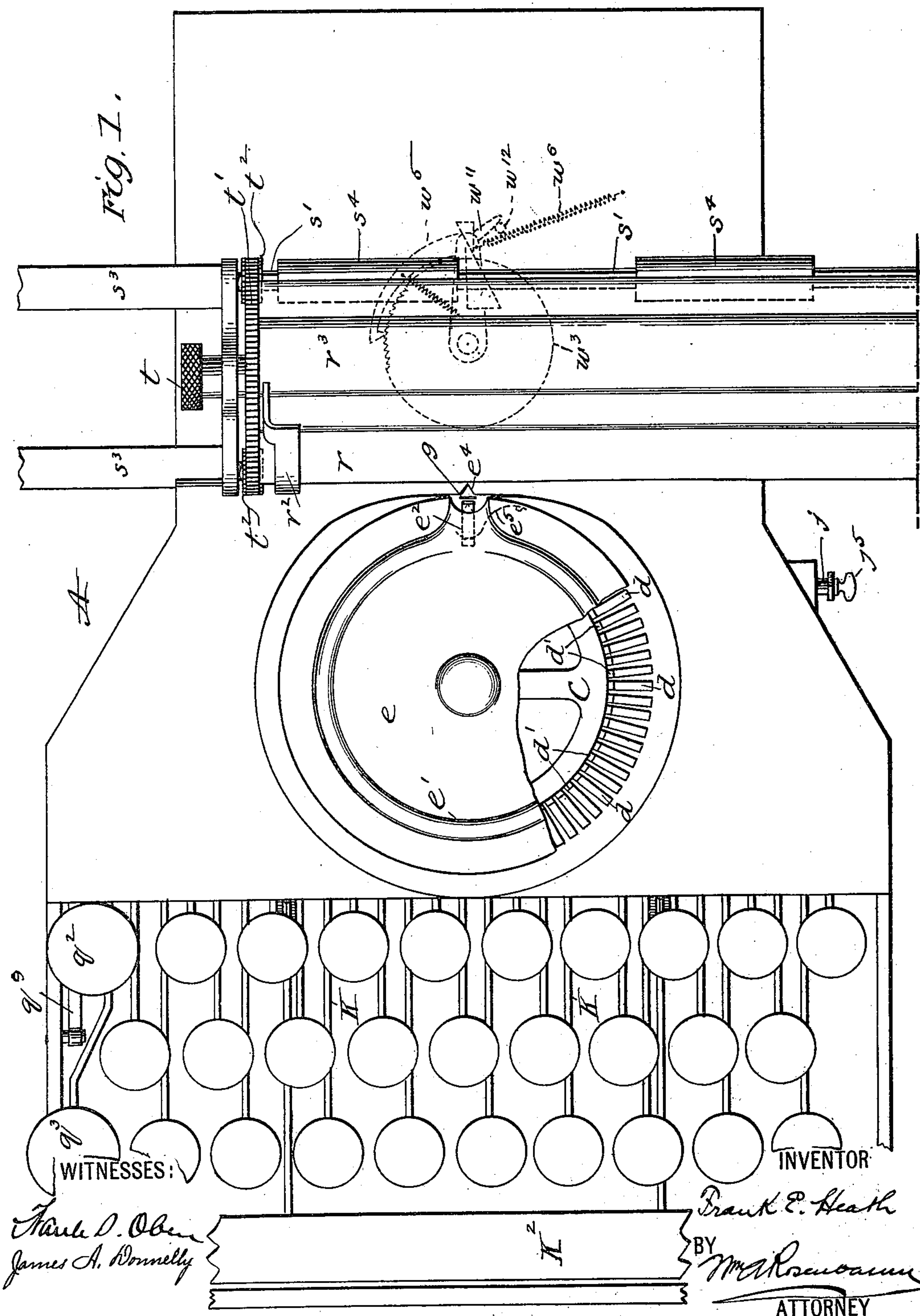
Patented Feb. 12, 1901.

F. E. HEATH.
TYPE WRITING MACHINE.

(Application filed Apr. 18, 1900.)

(No Model.)

4 Sheets—Sheet 1.



No. 667,773.

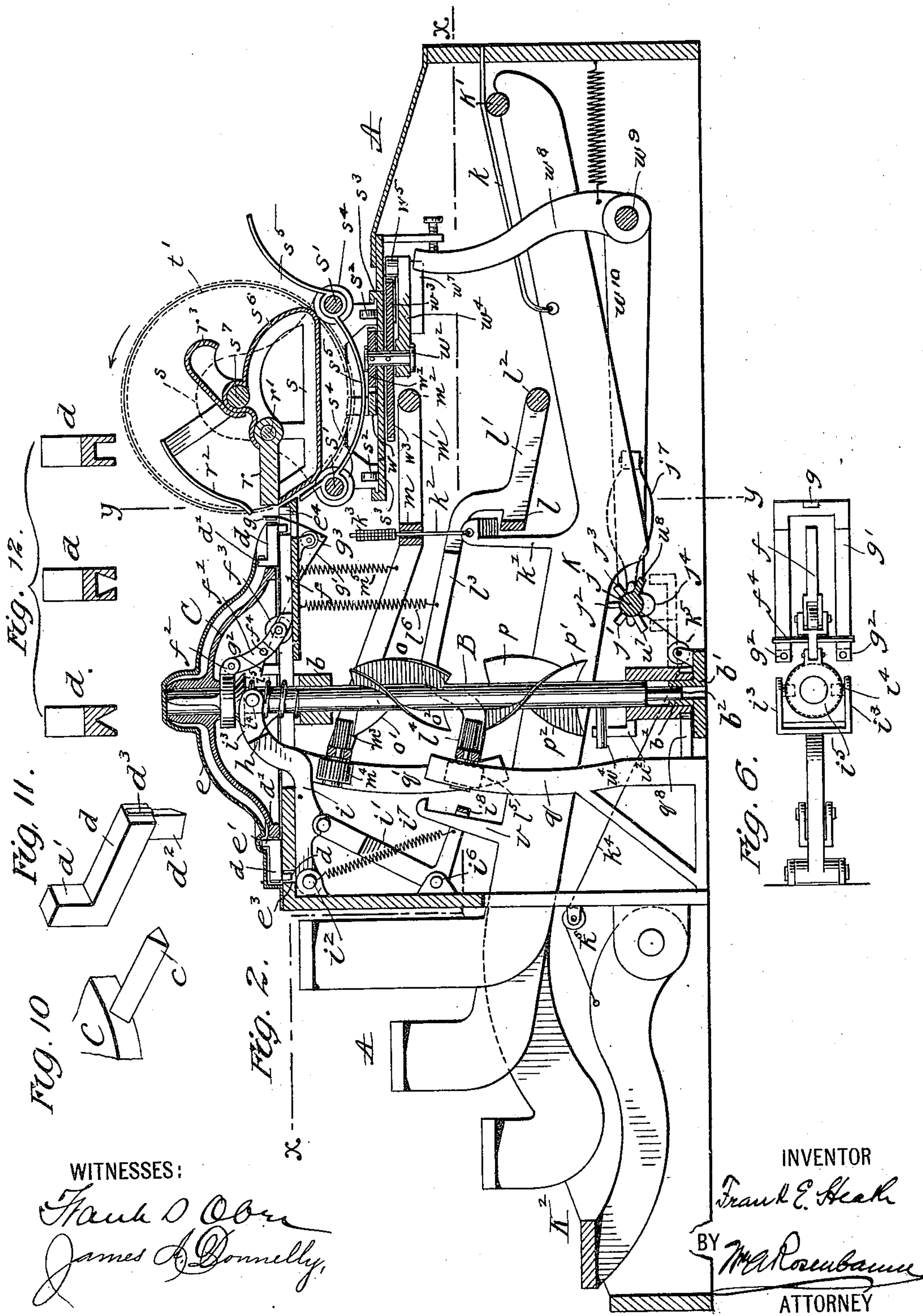
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4 Sheets—Sheet 2.



No. 667,773.

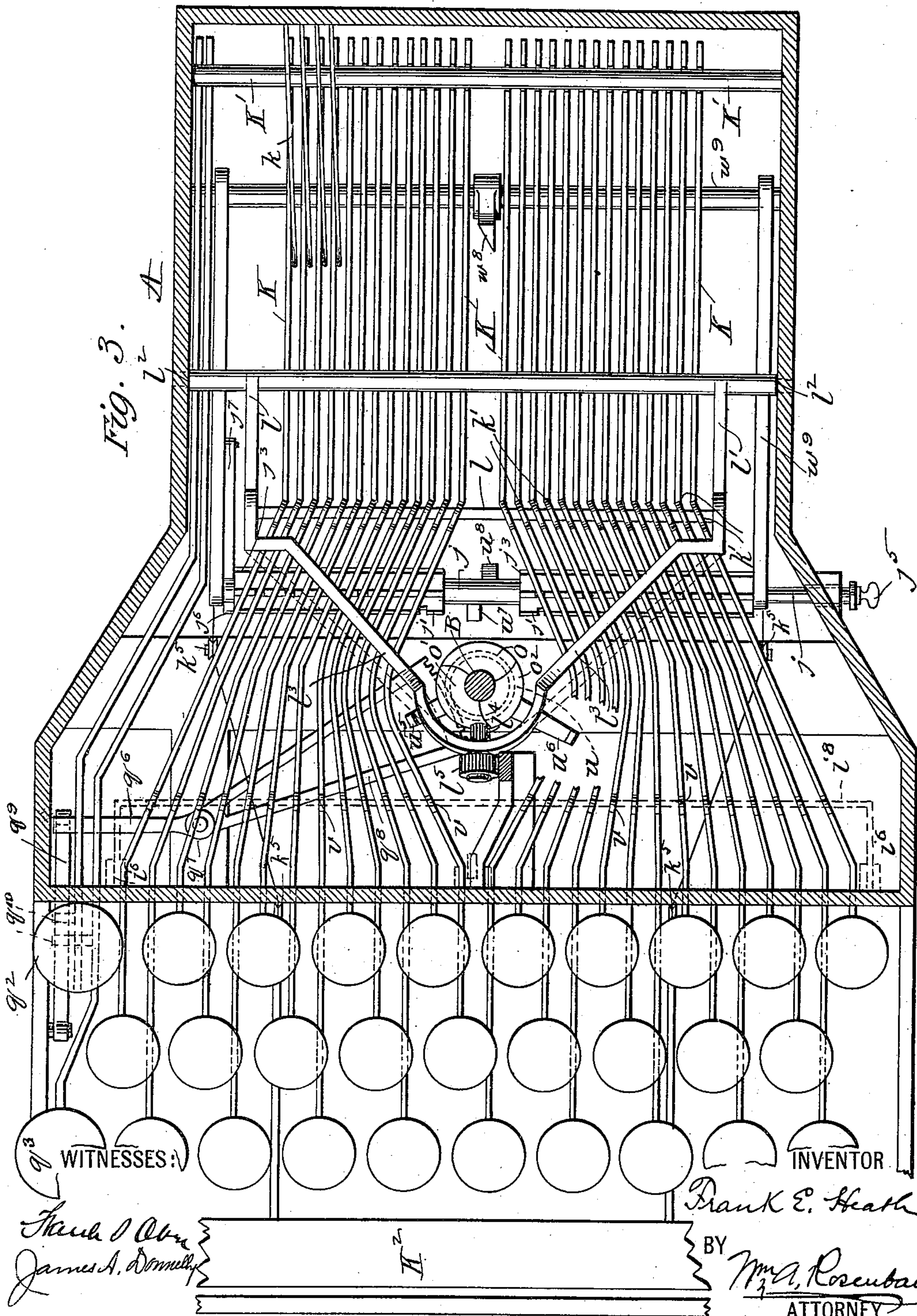
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4 Sheets—Sheet 3.



No. 667,773.

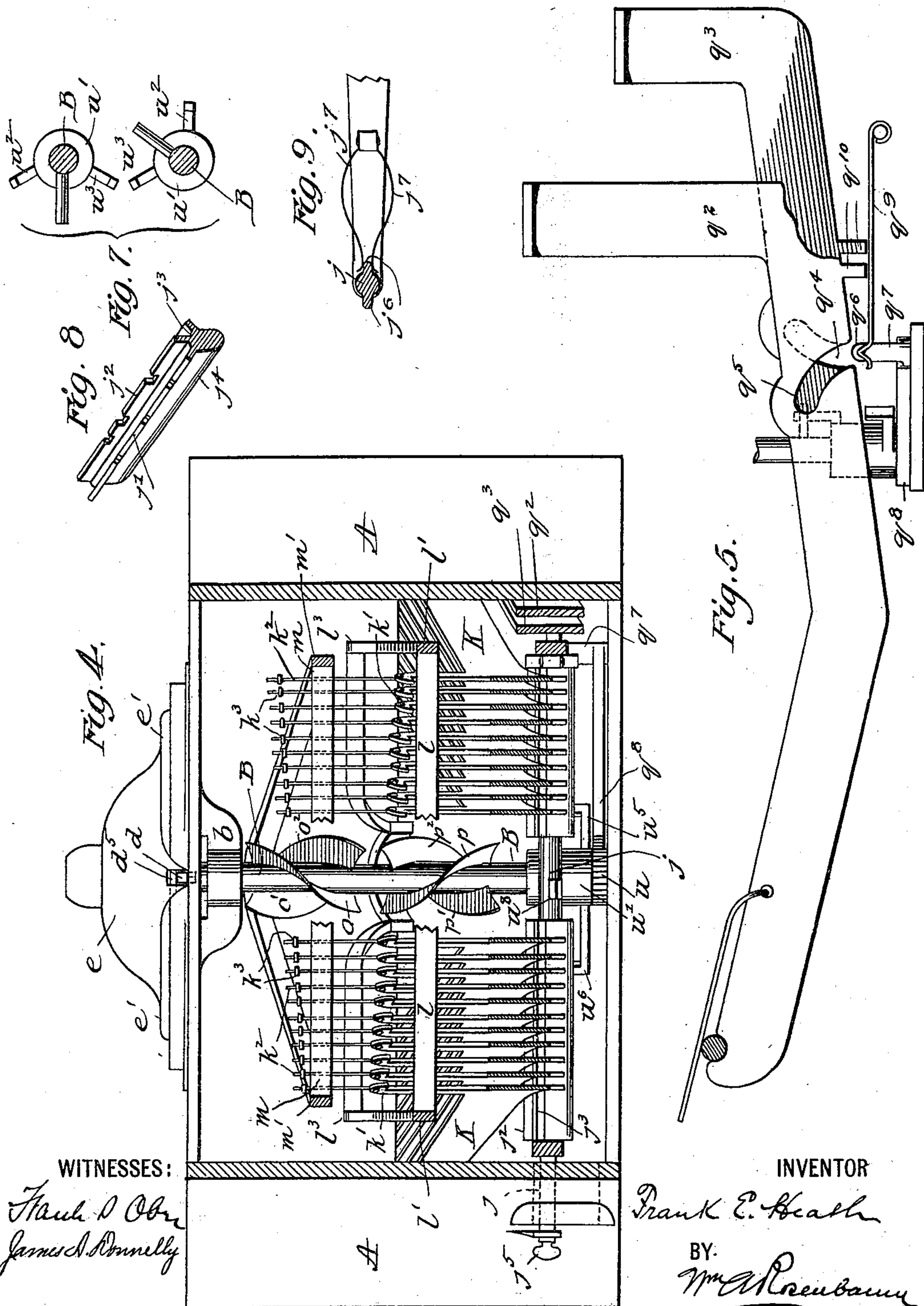
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(No Model.)

4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

FRANK E. HEATH, OF NEW YORK, N. Y.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 667,773, dated February 12, 1901.

Application filed April 18, 1900. Serial No. 13,316. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. HEATH, a citizen of the United States, residing at the city of New York, borough of Manhattan, State of New York, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a full, clear, and exact description.

This invention relates to type-writing machines.

In general my improved machine is a compromise between what is known as the "type-wheel" machines and those in which the type are individually movable for printing.

The invention comprehends a machine in which individually-movable type are arranged upon a wheel, the wheel being rotatable upon its axis to bring the selected type into position for printing, at which position the wheel is locked while the printing mechanism operates to throw the selected type against the paper. The key action is uniform in all instances, the first part of the stroke serving to rotate the wheel to bring the selected type into printing position and the latter part of the stroke accomplishing the printing.

My machine also includes a novel arrangement of the type upon the wheel, consisting in the location of the lower-case types around a certain segment of the periphery, the upper-case types around another segment thereof, and the numbers, punctuation-marks, and miscellaneous characters around a third segment of the wheel, the arrangement being such that each segment occupies one-third of the circumference. The machine will therefore be equipped with two shift-keys, one of which will make the upper-case types available; while the other will make the miscellaneous types available, the third or lower-case types being normally available and not requiring a shift-key.

My invention also includes special mechanism for effecting either typographic or uniform spacing at the will of the operator, as also certain details of construction, all of which will be fully hereinafter described.

In the accompanying drawings, Figure 1 is a plan of my improved machine with parts broken away. Fig. 2 is a central section from

front to rear. Fig. 3 is a section looking downward along line xx of Fig. 2. Fig. 4 is a section on line yy of Fig. 2 looking forward. Fig. 5 is a detail of the shift-keys. Fig. 6 is a detail of the type-actuating devices. Fig. 7 shows two positions of a portion of the shifting mechanism for the type wheel or carrier. Fig. 8 is a detail of a part of the spacing mechanism. Fig. 9 is another detail of the spacing mechanism. Fig. 10 is a detail of the type-carrier. Fig. 11 shows one of the types enlarged, and Fig. 12 illustrates modifications of the type.

A indicates the main frame of the machine, at about the center of which is mounted a vertical shaft B, projecting through the top plate of the frame and having a bearing at b and another at b' , the latter being a socket, into which the reduced end b^2 of the shaft projects. The upper end of the shaft has splined to it a dish-shaped wheel C, having arranged around its periphery in a horizontal plane a series of pins c or other supports, such as channels or sockets, upon each of which is mounted to slide a type d . The under side of the type is provided with a groove similar in shape to the pins c , the latter being triangular or of a dovetail shape to insure a stable seat for the type, on which it may slide. Various shapes of the groove in the type, corresponding to different shapes of pins, are shown in Fig. 12. The inner end of each type has an upward projection d' and the outer end has a downward projection d , the latter being V-shaped in front for the purpose of centering the type when printing, and its back being square and adapted to receive the impact of a hammer, as will be hereinafter described in the printing operation. The character is shown at d^3 on the front end of the type. One-third of the rim of the wheel is occupied by characters of the lower case, another third is occupied by characters of the upper case, and the remaining third is occupied by numbers, punctuation-marks, and miscellaneous characters, or any other subdivision may be adopted. The wheel is covered by a stationary plate e , conforming in shape thereto and having an annular groove e' , into which the lugs d' project to hold the type in position on the wheel at all points except at the printing position, at which point

the groove runs into a radial passage-way e^2 , which permits a type to move outward from its normal position to print.

To effect the radial movement of the type for printing, there is placed in the groove of the frame at the printing position a sliding bar or hammer f , occupying a radial position immediately beneath the plane in which the type are moved. When a type has been brought to the printing position, the outer end of this hammer is immediately behind its lug d^2 . The inner end of the hammer is bent upward slightly and is pivoted to the link f' , which leads in an upwardly-inclined direction to a loose collar or other part movable with the shaft B, to which it is pivoted at f^2 . At the pivotal point, between the link f' and the roller f , a roller f^3 is inserted to roll upon the bottom of the groove in which the hammer rests. It will be seen that if the shaft is moved downward axially the link will be carried more nearly into line with the hammer, and the hammer will move outward radially to permit this motion and will carry the type with it against the paper.

For inking the type the pad g is carried at the end of the bifurcated spring g' , fixed at g^2 , and passing therefrom on each side of the link and downwardly through an opening in the frame and then upwardly to a position immediately in front of the type. A pin f^4 is attached to the link f' , and extending in both directions rests upon the two sides of the spring g' . As the link approaches a horizontal position in the printing operation the spring is depressed by the pin and the spring and the pad immediately after being struck by the face of the type are lowered out of the way of the type until it comes into contact with an inking-roller g^3 . The return of the link to its normal position permits the spring to rise to the position shown in Fig. 2, where it is ready to be struck by the next outwardly-moving type. The lugs d^2 of the type normally extend into an annular groove or slot e^3 in the top plate of the frame; but at the printing position this groove has a radial V-shaped socket e^4 , into which the forward face of the lug d^2 fits, to thereby center the type just as it strikes the paper. To return a type after it has printed and after the hammer has been withdrawn, a small spring e^5 is placed at the printing position and so located that it will be engaged by the forward side of the lug d' when the type is thrust outward, the recoil of the spring serving to carry the type back. To permit of this downward movement of the shaft B to effect the printing operation, the shaft is free to slide through the upper bearing b and is held normally in its upper position by a spring h , in which position the shoulder at the lower end of the shaft is some distance above the bearing b' , in which the reduced end of the shaft slides and rotates. The shaft can be thrust downward until the aforesaid shoulder strikes on the top of the bearing. The spring h is sufficient

to overcome the weight of the shaft, and the shaft is normally locked in its upper position by means of a lever i and a bell-crank latch i' . The lever is pivoted at i^2 and carries the fork i^3 at its free end, which is provided with inwardly-turned pins i^4 , resting beneath a circular edge i^5 on the shaft. The lever is normally sustained and the shaft held in its upper position by the latch i' , pivoted at i^6 . The free end of the latch is held in engagement with a seat on the under side of the lever by the spring i^7 . A bar i^8 , attached to the latch, extends across the machine and is adapted to be engaged by the character-keys, as will hereinafter appear.

K indicates the key-levers. They are pivoted at K' and held in the upper positions by the springs k . Each key is provided with an upwardly-extending hook k' , no two of which are of the same length, but all being graduated in length from one side of the machine to the other, as clearly shown in Fig. 4. Arranged below the hooks and in a position to be struck thereby when the keys are depressed is a transverse bar l , attached to the bail l' , pivoted in the frame at l^2 . Extensions l^3 of the bails lead forward and connect with each other in front of the shaft B. At the connecting-point or immediately in front of the shaft the bails carry two rollers l^4 and l^5 , respectively, one extending rearward toward the shaft and the other extending forward. Each of the hooks k' has attached to it an upwardly-extending thin rod k^2 , which passes through a perforation in a cross-bar m , carried by two bails m' and pivoted at m^2 . The upper end of each of the rods k^2 , above the cross-piece m , is provided with a nut or other enlargement k^3 , which will strike on the bar m when the rod is pulled downward. The position of the nuts on the rods is different in each case, they being gradually higher from one side to the other of the machine, and being lowest at that side of the machine at which the hooks k' are the highest or longest, the arrangement being such that the normal distance of any hook from the cross-bar l added to the distance of the corresponding nut from the cross-bar m is equal to the sum of these distances in every other case. The bails m' also approach and meet at a point immediately in front of the shaft B and carry rollers m^3 and m^4 .

The shaft B carries two sets of spiral vanes, each consisting of three vanes o , o' , and o^2 and p , p' , and p^2 . These vanes, in two sets, lead around the shaft in opposite directions, and they are of such diameter and easy pitch that when a pressure in a direction parallel to the shaft is brought to bear upon their edges a strong tendency to rotate the shaft will be created. The roller l^4 is adapted to engage one of the lower set of vanes, while the roller m^3 is adapted to engage one of the upper set of vanes. Only one vane can be acted upon by each roller at the same time, three vanes being provided to correspond with the num-

ber of type-segments into which the type-carrying wheel is divided. If there were but two type-segments—say the lower-case characters on one half of the circumference of the wheel and the upper-case characters on the other half—there would be only two spirals in each set. As before stated, the spirals lead around the shaft in opposite directions, so that one of the rollers pressing downward against a vane would rotate the shaft in one direction, while the other roller in pressing downward upon a vane would rotate the shaft in the opposite direction. Hence when both rollers are in engagement and pressing against their respective vanes the shaft is locked and can be turned in neither direction.

The function of the rollers l^5 and m^4 is to resist a lateral thrust of the vanes against the rollers l^4 and m^3 , and for this purpose said rollers l^5 and m^4 roll against plates or tracks q and q' , respectively, fixed vertically and attached to the frame. All of the rollers have their surfaces milled in the direction of their axes, enabling them to grip the surfaces against which they act and insure positive movement. The working faces of the vanes and tracks are also milled to insure rolling and prevent slipping when the downward pull on the shaft is made, except a slight radial slip, which has no effect in rotating the shaft or wheel.

It will now be seen how the shaft and type-wheel are rotated within the range of any one segment of type. The depression of a key causes its hook k' and nut k^3 to engage the respective cross-bars l and m , depressing them, causing one of the rollers l^4 and m^3 to engage its vane and rotate the shaft until the other roller comes in contact with its vane, whereupon the shaft and wheel become locked by the opposing forces, and in moving to this locked position the type corresponding to the key which creates the motion is brought to the printing position. The type-wheel remains in the position to which it has been turned by a key, while the key returns, so that if the character is repeated by striking the same key the rollers simply travel downward together and come into contact with their respective vanes at the same instant, thus again locking the wheel for the printing operation. If a different key is next operated, one of the rollers will strike its vane first and move it until the other roller strikes its vane and again locks the wheel. After action upon the vanes the bails l^3 and m' are returned to their upper positions by the springs l^6 and m^5 , respectively.

The paper-carriage consists of end brackets s , connected together by two rods s' , the brackets having feet provided with rollers s^2 , which run upon tracks s^3 , suitably attached to the frame of the machine. The cross-rods s' are provided with rubber sleeves s^4 and also sustain a curved plate or plates s^5 , which form a paper guide and shield. A shell s^6 , piv-

otally supported upon an upper cross-rod s^7 , is formed so that it touches the rubber sleeves on the front and back rods s' to form gripping-surfaces, between which the sheet of paper is gripped and fed. The rods s' , with their sleeves, can be rotated to feed the paper by means of the knob t , which carries the gear-wheel t' , engaging with the two pinions t^2 on the respective rods. The platen forming the backing for the paper when it is struck by the type consists of a plate r , of suitable material, supported in the shell s^6 on a cross-rod r' . Immediately above is a curved paper-guide r^2 , underneath which the forward edge of the paper leads and finally hangs over the guide r^3 . To insert the paper, the shell is turned in the direction of the arrow, Fig. 2, until the edge of the platen is beyond the front rod s' , in which position, owing to the eccentricity of the shell, the paper can be freely passed by hand between the rollers and the shell until it is finally caught under the guard r^2 , whereupon the shell can be returned by hand or allowed to be carried back by a spring. (Not shown.)

Any suitable line-spacing device may be used. For letter-spacing the carriage is provided with a rack w , with which engages a pinion w' , fixed to a short shaft w^2 , passing through the frame and carrying a ratchet-wheel w^3 , having fine teeth. An arm w^4 , loosely pivoted on the same shaft, carries a pawl w^5 , adapted to engage the teeth of the ratchet-wheel and rotate it in the direction to move the carriage for spacing. When a key is struck, the pawl is to be carried forward the space of two or more teeth on the ratchet-wheel, so that with the turn of the key the spring w^6 will in acting on the pawl and wheel move the carriage a distance corresponding to the number of teeth taken up by the pawl on its backward stroke. For uniform spacing the number of teeth of course will always be the same, but for typographical spacing, wherein the carriage must be fed a distance corresponding to the width of the type used, the number of teeth must vary. For returning the pawl the arm w^4 is provided on its under side with an inclined surface w^7 , with which engages the upper end of a lever w^8 , attached to the shaft w^9 . When this lever is swung forward, the arm and pawl are moved a corresponding distance. Consequently the number of teeth which the pawl shall take up on its return movement can be determined by the stroke of the lever w^8 . The pawl carries a tailpiece w^{11} , which strikes a pin w^{12} at the end of the spacing stroke to prevent the tooth of the pawl from disengaging with the wheel, and thus allowing of independent movement of the wheel. Fixed to the axis of the lever are the forwardly-extending bails w^{10} , between the forward ends of which is pivotally sustained a shaft j . This shaft is provided with three wings j^1 , j^2 , and j^3 and with a straight edge j^4 . The shaft extends through a slot in the side of the frame and

is provided with a knob j^5 , by which it can be rotated to bring the straight edge j^4 uppermost, so that all of the keys can act upon it and produce the same amount of movement in the pawl w^5 to effect uniform spacing. The wings j' , j^2 , and j^3 are for typographical spacing, and either of them can be thrown automatically into the uppermost position to be struck by the keys by the operation of a shift-key. The middle wing j^2 is normally in position, because it controls the spacing for the lower-case type. The notches j^6 in its edge provide for different lengths of travel of the keys before they strike the wing, depending upon the amount of feed required for the individual letters. The sooner the key strikes the wing the greater will be the feed of the carriage. Since capital letters and the miscellaneous characters require different spacing from the lower-case letters, the wings j' and j^3 , which are notched to afford the proper spacing for the capitals and the miscellaneous characters, respectively, are automatically thrown into position when the type-wheel is shifted to bring the segment containing the capital or the segment containing the miscellaneous characters into operative position. The shift-keys are indicated by q^2 and q^3 . They are each provided with slots q^4 , upwardly inclined in opposite directions and arranged above an arm q^6 , projecting from a hub q^7 , pivoted vertically in the frame and carrying also a gear-segment q^8 . It will be seen that when either of the shift-keys is pressed downward its slot q^5 will engage the arm q^6 and move it forward or backward, causing the segment to swing in a corresponding direction. The arm q^6 is normally locked in either position by a spring q^9 , entering a notch on its under side, and this spring is removed by lugs q^{10} on the keys when either of them is operated. The segment engages with a pinion u , formed on a sleeve u' surrounding the base of the shaft B. From this sleeve there are two posts u^2 and u^3 , projecting upward, and between which a radial pin u^4 , carried by said shaft plays, through an angle of one hundred and twenty degrees. The sleeve also carries two radial arms u^5 and u^6 , having upwardly-turning ends and standing one hundred and twenty degrees apart, one of which is adapted to be thrown immediately beneath a lug u^7 , carried by the shaft j , and the other beneath a lug u^8 , also carried by said shaft, but on its opposite side, depending upon which direction the sleeve is turned when the segment acts upon it. The inclination and length of the slots in the shift-keys is such that a full stroke of the key will rotate the sleeve u' one hundred and twenty degrees. In this movement one of the posts u^2 or u^3 will strike the pin u^4 and move the shaft B and type-wheel to a position where the types of a different segment of the type-wheel will be brought into the same relative location with respect to the printing position as was occupied by the types in the segment which was previously in operative position.

At the same time that a new segment of types is brought around into operative position a new pair of vanes o and p are brought into operative position to be engaged by the rollers l^4 and m^3 . Let us assume that one of the shift-keys has been operated and that the arm u^5 , for instance, has been thrown beneath the lug u^7 . While the shift-key is thus held down, the selected character-key is operated. In descending it first strikes upon the wing j^2 of the shaft j and carries said shaft downward, causing the lug u^7 to strike the arm u^5 and rotate the shaft until wing j' is brought beneath the character-key, which then regulates the final movement of the lever w^8 by the depth of the notch beneath the particular key acting. Hence the shift-key not only brings a new set of type into operative position, but also readjusts the spacing mechanism to correspond with the type, and also brings a new set of type-selecting spiral vanes into operative position with respect to the rollers.

For ordinary spacing between words the key K^2 is used. Wires k^4 are attached to it and lead over guide-pulleys k^5 to the ends of the bails w^{10} .

In order to hold the spacing-shaft j in its normal position with the middle wing j^2 uppermost, one end of the shaft is provided with diametrically-placed lugs j^6 , one of which is held between springs j^7 , attached to one end of the bails w^{10} . After the shaft has been shifted through the small angle necessary to bring one of the wings j' or j^3 uppermost, said wing is immediately returned by the action of the springs upon the lug, the lug not having meanwhile passed out of the embrace of the springs. When the shaft has been turned half-way around by the knob j^5 , the second lug j^6 is embraced by the springs to hold the shaft in position.

The entire mechanism and operation of the machine have now been described except that relating to the printing operation.

Each of the character-keys is provided with a hook v , which stands some distance above the cross-bar i^8 on the latch i' . The first downward motion of a key is accompanied in whole or in part by a rotary movement of the type-wheel in selecting the type, the motion being caused by the action of the rollers upon the spirals. The motion ceases when both rollers come into contact with their respective spirals, and at about that instant the hook v strikes the cross-bar i^8 and pulls the latch i' from beneath the lever i . In the further downward movement of the key a downward force is exerted upon the shaft B, due to the locked engagement of the two rollers, and the shaft is carried down until the shoulder on its lower end strikes against the bearing b' . In this motion the collar on the upper end of the shaft carries the end of link f' down, causing the hammer f to carry the selected type against the paper. The first motion of the type carries its face against the inking-pad g , which is immediately thereafter

withdrawn by the pin f^4 pressing downward upon the spring g' . At the recoil of the key the rollers l^4 and m^3 are lifted by springs l^6 and m^5 , the shaft B is lifted by the spring h and becomes locked by the return of the latch i' under the action of the spring i'' , and finally the type itself is withdrawn by the action of the spring e^5 . All parts are then in position for the selection and printing of another character.

Having described my invention, I claim—

1. In a type-writing machine the combination of a type-wheel, a shaft therefor, two spiral vanes on said shaft leading around the same in opposite directions, a key-lever and connections between the lever and both vanes whereby the motion of the lever will serve to rotate the shaft to a locked position, substantially as described.

2. In a type-writing machine, the combination of a type-wheel, a shaft therefor, two spiral vanes on said shaft leading around the same in opposite directions, devices moving parallel to the shaft and simultaneously engaging the respective vanes, and key-levers connected with said devices for moving the same, substantially as described.

3. In a type-writing machine, the combination of a type-carrying wheel, a shaft therefor, two spiral vanes on said shaft leading in opposite directions around the same, devices adapted to move parallel to the shaft and to traverse the respective vanes, two levers or frames carrying the respective devices, and key-levers having differential connections with said levers or frames, for the purpose set forth.

4. In a type-writing machine, the combination of a type-carrying wheel having a plurality of groups of characters arranged in successive segments around the periphery thereof, a shaft for said wheel, a plurality of spiral vanes on said shaft corresponding respectively with the groups of characters on the periphery of the wheel, a device adapted to operate against said vanes to rotate the shaft, character-keys controlling the movements of said devices and a shift-key adapted to bring a particular segment of type and its corresponding spiral vanes into operative position, substantially as described.

5. In a type-writing machine, the combination of a type-carrying wheel provided with movable type, a series of key-levers by which the respective type can be moved into printing position, a shaft for the wheel having an axial movement independent of the wheel and means whereby said axial movement of the shaft will cause a type to be thrust outward for printing.

6. In a type-writing machine, the combination of a type-wheel provided with movable

type on its periphery, a hammer located at the printing position and adapted to engage with and force outward any one of the type, a shaft for said wheel having an axial movement independent thereof, connections between the shaft and the hammer whereby said independent movement of the shaft will cause the type to be thrust outward for printing.

7. In a type-writing machine, the combination of a type-wheel carrying movable type, a sliding bar or hammer arranged to push the selected type outward, a shaft for the type-wheel having axial movement independent of said wheel, a link pivoted at an angle to said bar or hammer and to the shaft whereby the said independent movement of the shaft will be transmitted to the bar or hammer for the purpose set forth.

8. In a type-writing machine, the combination of a type-carrying wheel provided with movable type, an inking-pad normally standing in front of the type at the printing position, means for pushing said type outward to print, said means being also provided with a device for removing the inking-pad and an ink-fountain into contact with which the pad is at the same time carried.

9. In a type-writing machine, the combination of a type-carrying wheel, a shaft therefor, having an axial movement independent of the wheel, means for rotating said shaft and controlled by the keys, means for moving said shaft axially also controlled by the keys and a latch operated by the keys to release said shaft and allow it to be moved axially after it has rotated, substantially as described.

10. In a type-writing machine, the combination of a traveling paper-carriage, spacing devices therefor, a plurality of groups of type, typographic spacing devices adapted for the respective groups of type, shift-keys and means whereby a shift-key will simultaneously shift a group of type and its corresponding spacing mechanism into operative position.

11. In a type-writing machine, the combination of a type-wheel, a shaft therefor, provided with a spiral vane, a device adapted to move parallel with the shaft and against the spiral vane in order to rotate the shaft, a lateral support for said device to resist the side thrust of the spiral against the device and a series of key-levers adapted to act individually on said device, substantially as described.

In witness whereof I subscribe my signature in presence of two witnesses.

FRANK E. HEATH.

Witnesses:

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JAMES S. DONNELLY.