(No Model.) 5 Sheets—Sheet 1.

W. RAAB.

PNEUMATIC TYPE WRITING MACHINE.

No. 522,491. Patented July 3, 1894.

Fig. 1.

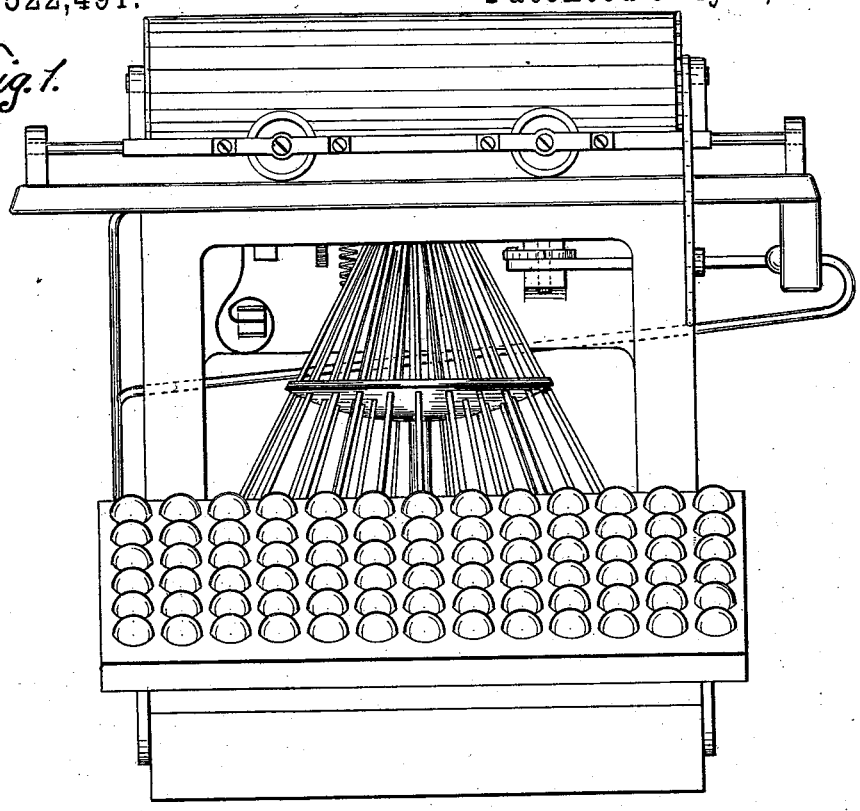
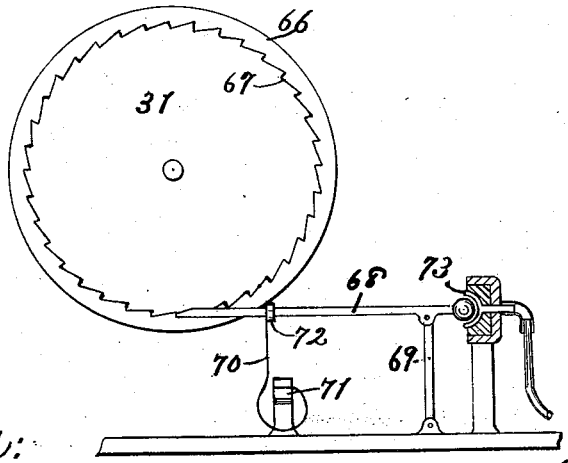


Fig. 7.



Witnesses:
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J. A. Camp.

Inventor:
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(No Model.) 5 Sheets—Sheet 2.

W. RAAB.

PNEUMATIC TYPE WRITING MACHINE.

No. 522,491. Patented July 3, 1894.

Fig. 2.

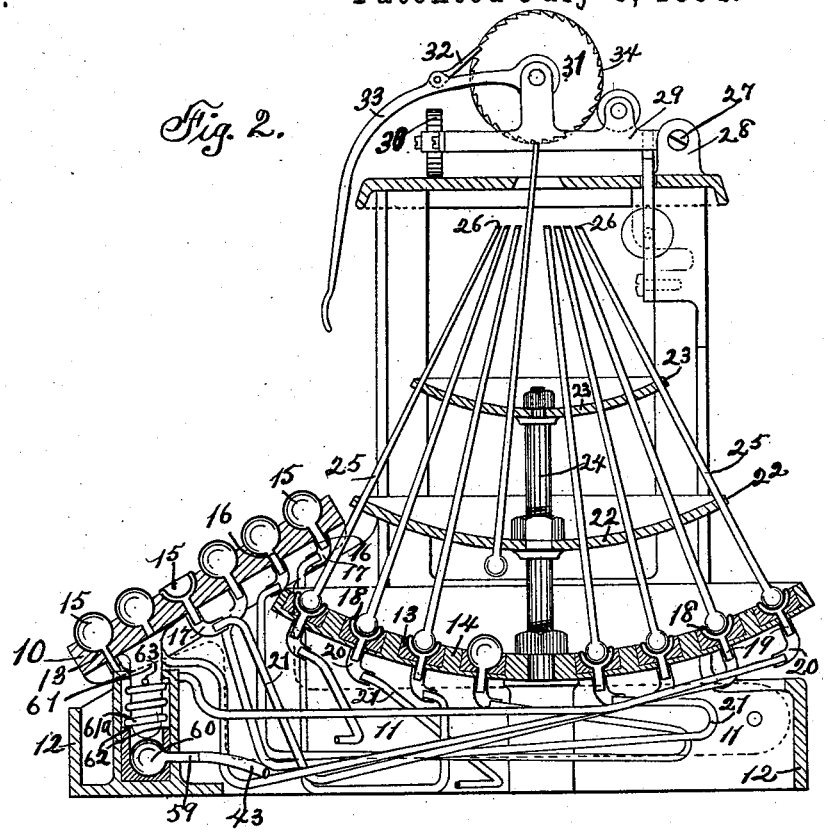


Fig. 6.

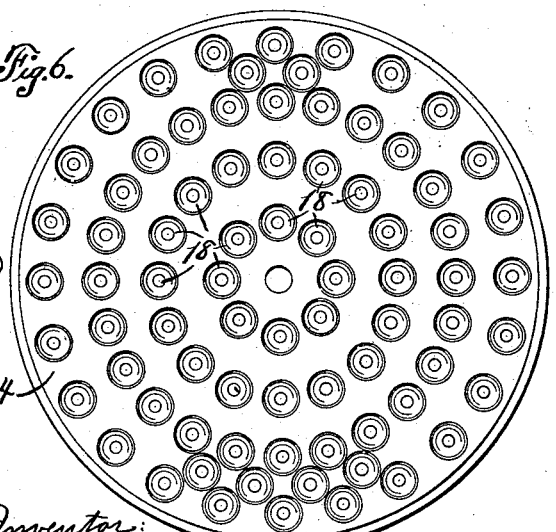
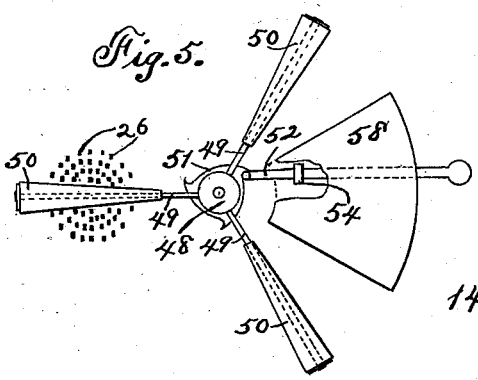


Fig. 5.



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(No Model.) 5 Sheets—Sheet 3.

W. RAAB.

PNEUMATIC TYPE WRITING MACHINE.

No. 522,491. Patented July 3, 1894.

Fig. 3.

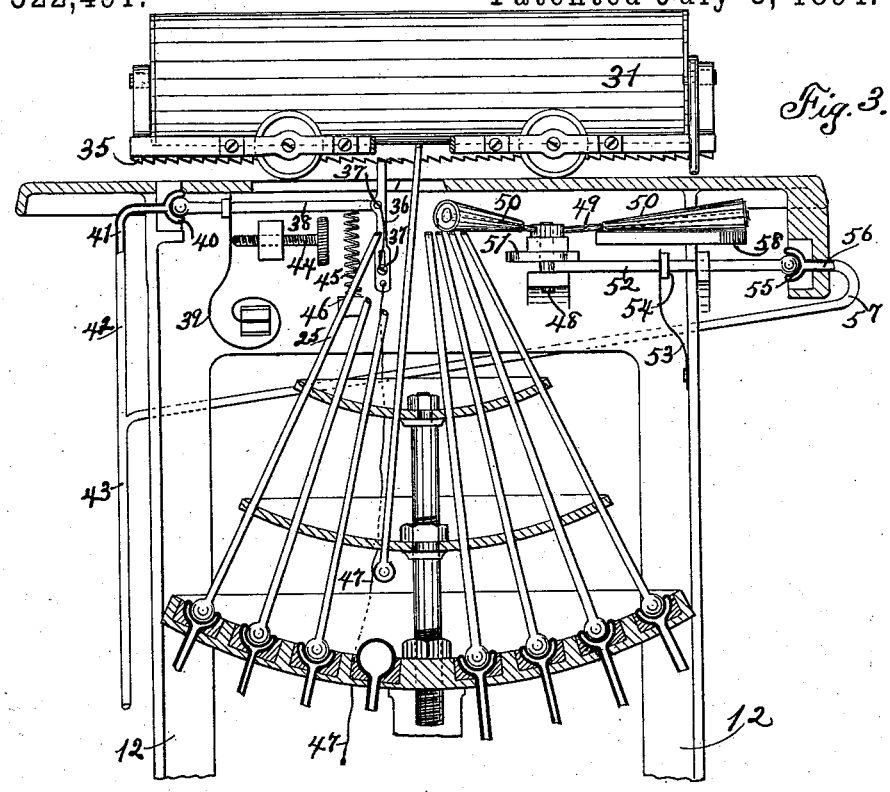
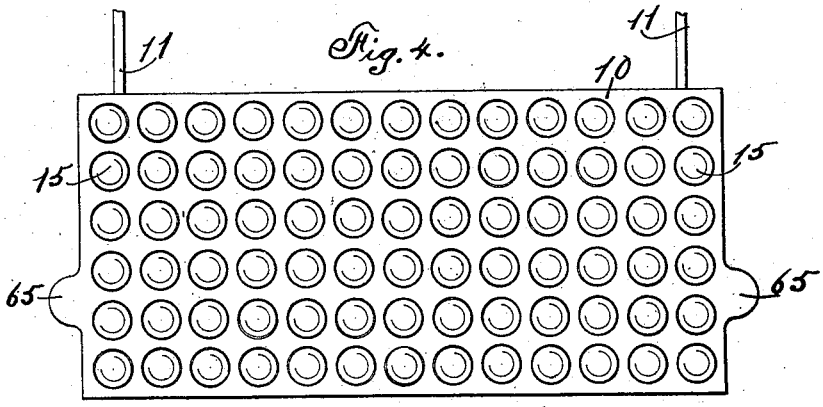


Fig. 4.



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(No Model.) 5 Sheets—Sheet 4.

W. RAAB.

PNEUMATIC TYPE WRITING MACHINE.

No. 522,491. Patented July 3, 1894.

Fig. 7.

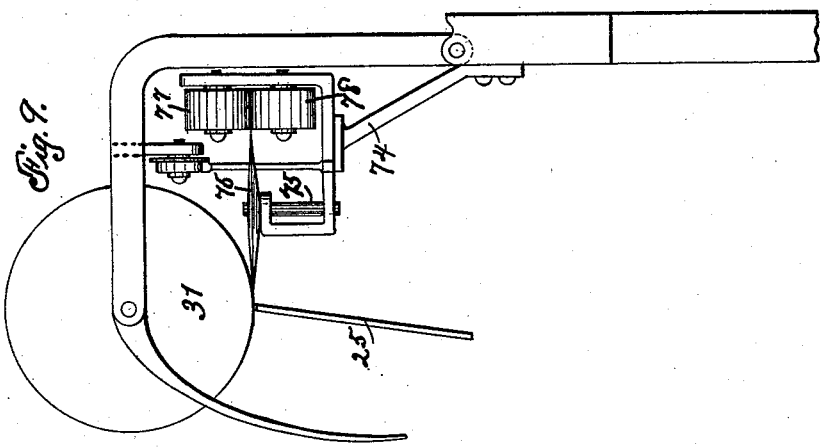
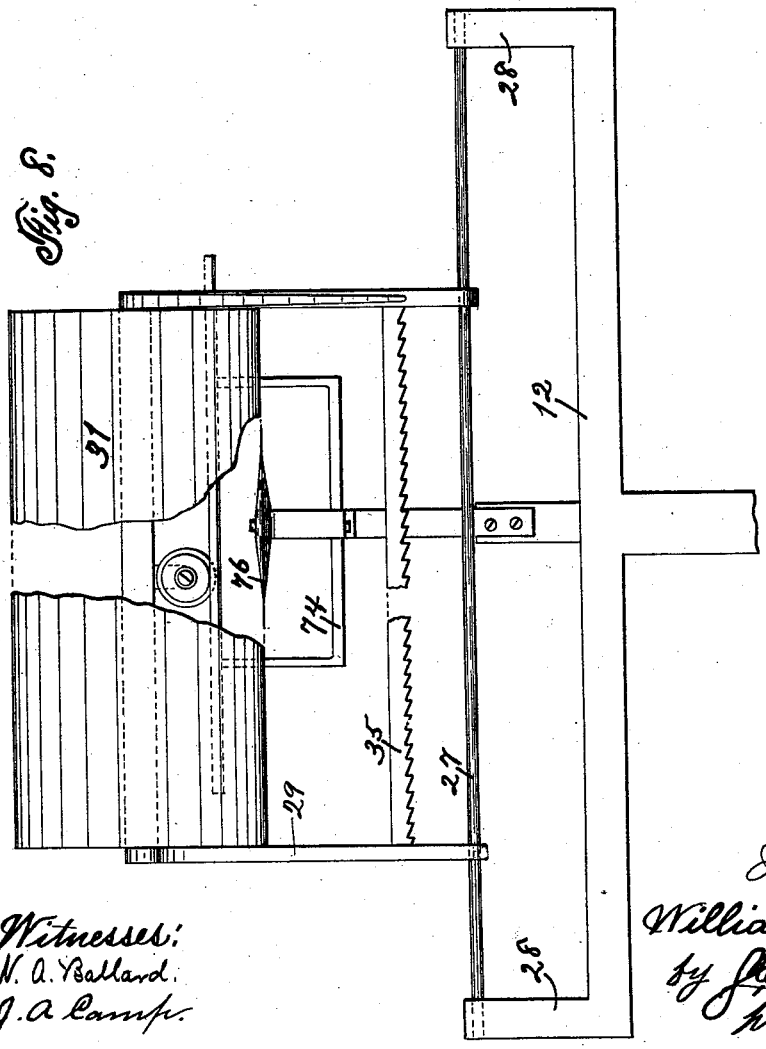


Fig. 8.



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(No Model.) 5 Sheets—Sheet 5.

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PNEUMATIC TYPE WRITING MACHINE.

No. 522,491. Patented July 3, 1894.

Fig. 10.

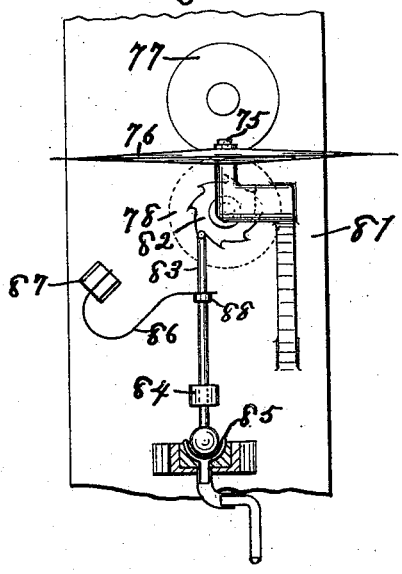


Fig. 11.

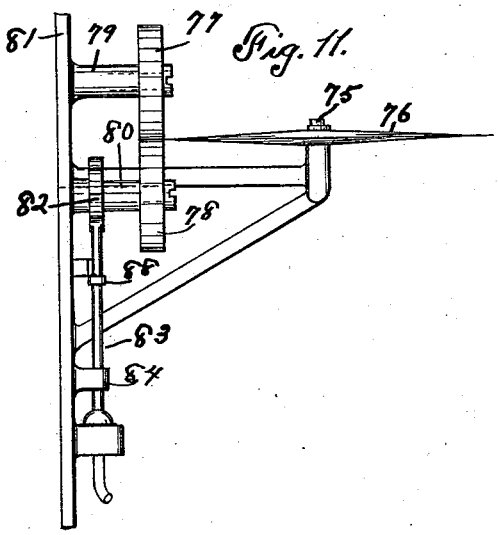
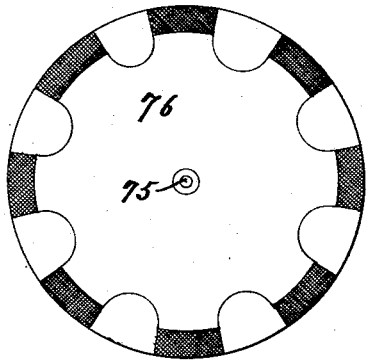


Fig. 12.



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Inventor:
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by J. H. Lucas
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UNITED STATES PATENT OFFICE.

WILLIAM RAAB, OF CEDAR FALLS, IOWA.

PNEUMATIC TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 522,491, dated July 3, 1894.

Application filed June 10, 1893. Serial No. 477,224. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM RAAB, a citizen of the United States of America, and a resident of Cedar Falls, in the county of Black Hawk, State of Iowa, have invented a new and useful Pneumatic Type-Writing Machine, of which the following is a specification.

The object of my invention is to provide means whereby the movement of a body of air, or the creation of air waves, is utilized for the forcible impaction of printing symbols against a receiving surface.

A further object of my invention is to be found in the provision of means whereby the forcible impact of a moving body with a compressible body sets up a movement of air within an inclosed space, which in turn exerts an expansive influence which by impaction with a second moving body causes said moving body to engage with an approximately stationary surface adapted to receive an imprint from the said second moving body.

A further object of my invention is to be found in the provision of means whereby the forcible impact of an operator's finger produces a motion in a compressible body, which in turn creates a wave, in a body of confined air, of sufficient force to, when said wave reaches the opposite limit of the confined space, forcibly propel a body in contact therewith a sufficient distance to cause said body to contact with a receiving surface.

My invention has for its further object the provision of means, for approximating a printing surface and a receiving surface, by the employment of air waves manually controlled and acting upon one or more of said surfaces.

A further object of my invention is to be found in the provision of means whereby type-faces are caused to impact with receiving surfaces, by the motion of air within a confined space acted upon by the fingers of an operator.

A further object of my invention is to be found in the provision of means for utilizing manually created air currents for the operation of inking devices and the advancement of a carriage across the point of impact of printing devices.

My invention consists in carrying out the before mentioned objects, and in the construction, arrangement, and combination of parts, hereinafter set forth, pointed out in my claims, and illustrated by the accompanying drawings, in which—

Figure 1 is a face view of the complete machine. Fig. 2 is a sectional elevation of the complete machine, viewed from one side. Fig. 3 is a sectional elevation of the machine viewed from the front, the key board being removed. Fig. 4 is a plan view of the keyboard. Fig. 5 is a detail plan view of the type-faces and inking devices. Fig. 6 is a plan view of the convex type basket. Fig. 7 is an enlarged detail end view showing a means of pneumatically operating the platen in a movement of rotation. Fig. 8 is a front view, partly in section, showing a modified form of carriage construction and inking devices. Fig. 9 is an end view of Fig. 8. Figs. 10, 11, and 12 are detail views of the modified forms of inking devices.

In the construction of the machine as shown, the numeral 10 designates a key-board secured to the upper end of a standard 11, which standard extends downward and rearward to a point of pivotal attachment to the lower portion of the main frame 12, which main frame forms the foundation of the machine and supports all the moving parts thereof. Keyseats 13 are formed in the keyboard 10 and perforations are provided leading from the bottom of said key seats through the said keyboard.

Mounted within the lower portion of the main frame 12, is a convex type basket 14 also provided with key seats and perforations identical in construction with the same devices on the key board.

Mounted within the key seats 13 are flexible, compressible and elastic bulbs or keys 15 provided with hollow stems 16 leading downward therefrom through the aforesaid perforations to a point of attachment to, and communication with, one end of hollow metallic elbows 17. The keys 15 and stems 16 are made of soft, pliable, rubber and each key has embossed thereon a symbol, letter, or numeral, corresponding to the characters desired to be reproduced upon a sheet of paper, or other receiving surface, employed to con-

vey intelligence. The keys 15 are normally expanded and filled with air of a normal pressure.

Mounted within the key seats in the basket 14 are a plurality of force bulbs 18, provided with stems 19 extending downwardly through the perforations opening from said key seats, to a point of attachment to the metallic elbows 20, identical in construction with the elbows 17. The force bulbs 18 and stems 19 are made of soft compressible rubber, and are preferably of less thickness than the keys 15. Flexible rubber tubes 21 connect the adjacent ends of the elbows 17 and 20, and taken in conjunction with the said elbows and the stems afford communication between the keys and force bulbs, and permit the passage of air from each key to the corresponding force bulb, and return of the same. The joints in the air passages are air tight, and the amount of air confined in the chamber and inclosed by the key, force bulb, elbows, and tube is less than would be required to expand said chamber to its fullest capacity, this construction being desirable in order that the force bulbs may normally be collapsed, and the keys normally expanded.

Mounted within the main frame in tiers above the basket, and concentric therewith, are a plurality of guide plates 22, 23, supported on a central mast 24 rigidly mounted in the base of the main frame, the basket being also secured to said mast. Each of the guide plates is provided with a plurality of vertical apertures angular or oval in plan view, arranged in concentric rows, in alignment with each other and with the key seats in the type basket.

Mounted within the perforations in the guide plates 22, 23, are stencils 25, the outer row of which stencils forms a cone concentric with cones formed by the inner rows of said stencils, the imaginary apex of said cone being coincident with the point of convergence of the longitudinal planes of all the said stencils. Type faces 26 are formed on, or fixed to, the upper ends of the stencils 25, which type faces are arranged at such an angle relative to the longitudinal plane of the stencil as that the said faces will strike flat and fair against the receiving surface positioned to receive the imprint thereof.

A track 27 is horizontally mounted in standards 28 fixed to and vertically extended from the top of the main frame, and hinged to said track is a carriage 29, the hinges being so formed as to provide a slide bearing between the said carriage and track. The forward side of the carriage is supported on the wheels 30 resting and traveling upon the top of the main frame. A platen 31 is rotatably mounted within the carriage 29, and is adapted to be rotated in an advance direction by means of a pawl 32, mounted upon a manually operated lever 33, said pawl engaging with a ratchet 34 formed on the end of said platen.

A ratchet bar 35 is fixed to one side of the carriage 29, and projects below the plane of said carriage. A pawl 36 is fulcrumed upon a screw 37 mounted on the main frame beneath the carriage 29, the said pawl being provided with a slot through which the said screw is inserted, thus permitting of a slight vertical movement on the part of said pawl. A shot-bolt 38 is pivoted at one end to the pawl 36 and supported at the other end by attachment to a convolute spring 39, seated on the main frame, the outer end of said shot-bolt normally contacting with a collapsed force bulb 40, provided with a stem 41, which stem communicates through a tube 42 with a tube 43, hereinafter more particularly described. An adjusting screw 44 is mounted in a screw seat formed in the main frame, and impinging against the upper end portion of the spring 39 is adapted to regulate the resilience of said spring and the consequent movement of the shot-bolt. An expansive spring 45 is interposed between a lug 46, formed on the main frame, and the inner end portion of the shot-bolt 38, thus supporting the said shot-bolt and normally holding the upper end of the pawl 36 in engagement with the ratchet bar 35. A cord 47 is secured at its upper end to the lower end portion of the pawl 36 and depends therefrom, the said cord being adapted for manual operation to release the said pawl from engagement with the ratchet bar, thus permitting a reverse movement of the carriage.

A spindle 48 is vertically positioned within the main frame, at a point adjacent to and at one side of the type faces, to which spindle are secured laterally extending arms 49, which arms carry conical inking rollers 50, which inking rollers are revoluble upon the said arms and extend laterally such a distance as to cross the type faces in their travel about the common center formed by the spindle 48. A ratchet plate 51, having teeth corresponding in number with the arms 49, is mounted upon the spindle 48 and concentric therewith, the ratchet thereon being adapted to be engaged by a shot-bolt 52, supported by the main frame and normally held in a retracted position by means of a leaf spring 53, fixed at one end to the main frame and impinging at its other end against a shoulder 54 formed on the shot-bolt. The outer end portion of the shot-bolt 52 normally rests in contact with a collapsed force bulb 55, which force bulb is provided with a stem 56, connected to and communicating with a tube 57 extending to the tube 43 hereinafter described. An ink plate 58 is provided, which is mounted on the main frame and extends therefrom in a horizontal plane coincident with the plane of the type faces to a point within the orbit of the roller 50. The tube 43 leads from its point of connection with the tubes 42, 57, to a point of connection with a stem 59 formed on and communicating with a key bulb 60 (Fig. 2), located beneath the key board. A stud 61 fixed to the lower portion

of the key board extends downwardly from said key board to a point of contact with the key bulb 60, and is normally held in position permitting the free expansion of said key bulb by means of an expansive spiral spring (61ª) mounted thereon and impinging at one end against a shoulder 62 formed on the main frame and at its other end against a pin 63 laterally extending from the said stud.

The spherical ends 64 on the stencils and shot-bolts are preferably made of unyielding, unelastic substance, in order that the said stencils may respond quickly to the force bulb.

It will be observed that the tubes 21 are of uniform length thus providing that a uniform pressure on the keys will produce a uniform expansion of the force bulb and a consequent uniform imprint by the type faces.

In the practical operation of this machine the keys are manipulated in the ordinary manner producing alternating depressions of individual keys, and since the operation of one is identical with that of another the description of one will suffice for all, it being understood that the pressure is removed from the impacted key immediately upon the complete depression of the same. The depression of one of the keys 15 forces the air therefrom through the stem 16, elbow 17, and tube 21 into the force bulb 18, thereby expanding said force bulb and forcibly ejecting the stencil 25 from its seat a sufficient distance to cause the type face 26 to forcibly impact against the receiving surface, or sheet of paper, carried by the platen. It is to be understood that the resultant action of the force bulb is coincident with the compression of the key, no perceptible period of time intervening between the compression of the key and the expansion of the force bulb. The momentum attained by the hand of the operator in depressing a key also depresses the key board, causing the stud 61 to compress the key bulb 60 and force a quantity of air from said key bulb through the tube 43 into the tubes 42, 57, thus expanding the force bulbs 40, 55, resulting in a consequent operation of the shot-bolts 38, 52. In the operation of the shot-bolt 38 the pawl 36 is turned upon its pivot and the upper end thereof caused to move rearwardly, the said pawl yielding downwardly against the resilience of the spring 45 in order that it may pass over one or more teeth of the ratchet bar 35, the number of teeth passed over being determined by the adjustment of the screw 44. When the shot-bolt has reached its limit of advanced movement, the resilience of the spring 39 is exerted to retract said shot-bolt, and in so doing retracts the pawl 36, which pawl having engaged with the ratchet bar 35 moves the carriage a distance coincident with the throw of the shot-bolt, thus positioning the carriage for the impact of the next letter.

In Fig. 4 are shown spacing lugs 65, 65, arranged at the sides of the key board and fixed thereto, said lugs being adapted to receive an impact from the operator to depress the said key board independently of the operation of the keys, and thereby operate the carriage as required to provide blank spaces in the lines on the receiving surface.

In the operation of the shot-bolt 52 the inner end of said shot-bolt engages one of the teeth on the ratchet plate 51 rotating said ratchet plate and the mechanism connected therewith, causing one of the ink rollers to cross the face of the type, at the same time one of the remaining ink rollers is receiving ink from the plate 58. When the shot-bolt 52 has reached the limit of its advance movement it is immediately retracted by the resilience of the spring 53, and positioned preparatory to a succeeding movement.

In Fig. 7 is shown a rim 66 secured upon and extending beyond one end of the platen 31, said rim having formed on its interior face a ratchet 67. A shot-bolt 68 is mounted on a standard 69 pivoted to the main frame, said shot-bolt having a pivotal connection with said standard. The forward end portion of the shot-bolt is supported by a leaf spring 70, fixed to a lug 71 at its lower end and engaging the shot-bolt and a shoulder 72 thereon at its upper end, and the extreme inner end of said shot-bolt engages the ratchet 67. The rear end of the shot-bolt 68 is normally in contact with a collapsed force bulb 73, which force bulb is adapted to be expansively operated in the same manner as the remaining force bulbs are operated, the connecting and operating mechanism not being shown.

Referring to Figs. 8 and 9 it will be observed that the carriage 29 is located at a considerable distance above the main frame in order that the writing on the receiving surface may be rendered visible without lifting the carriage. A bracket 74 is fixed to the main frame directly below the carriage and at the rear of the platen, within which bracket a spindle 75 is vertically positioned. Rotatably mounted on the spindle 75 is a disk 76, (Figs. 8, 9 and 12) the periphery of which is notched, the portion thereof between the notches consisting of sections of inked ribbon adapted to be interposed between the type faces and the receiving surface successively and progressively. The notches in the periphery of the disk 76 permit of the imprint on the receiving surface to be in view at all times during the progress of the work.

In Figs. 10 and 11, the disk 76 is shown pivoted on the spindle 75, and having that portion of its periphery diametrically opposite to the point of impact of the type faces confined between friction rollers 77, 78, mounted respectively on horizontal pivots 79, 80, fixed to and laterally extending from a support 81. A ratchet wheel 82 is rigidly mounted on the pivot 80, and a vertically positioned shot-bolt 83 is in contact at its upper end with the said ratchet wheel. The shot-bolt 83 is supported in a bearing 84 fixed to the support 81, and the lower end thereof is normally in contact

with a collapsed force bulb 85 adapted for connection with the tube 43, heretofore mentioned, when the devices under consideration are substituted for those earlier described herein. A leaf spring 86 is fixed at one end to a lug 87, (Fig. 10) and at the other end is fixed to the shot-bolt 83 and impinged against a shoulder 88 on said shot-bolt, by means of which spring the shot-bolt is retracted after an advance movement thereof has been imparted by the force bulb 85. It will thus be seen that in the actuation of the shot-bolt 83 the disk 76 is rotated by the rollers 77, 78, thus bringing the sections of inked ribbon into use successively and progressively.

If desired the rollers 77, 78, may be inked and employed to, in turn, ink the sections of ribbon in the disk 76, but if so employed the disk must be located at such a distance below the platen as that the said disk will contact with the receiving surface only when impacted against by the type faces.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent of the United States therefor, is—

1. A typewriter, comprising a platen and means for supporting said platen and a receiving surface in connection therewith, type-bearing stencils, expansible seats for said stencils, compressible keys, flexible connections between said keys and stencil seats, a body of air confined within said keys and connections, which body of air synchronously with the compression of said keys expands said seats and forcibly propels said stencils toward the said platen, whereby the type are caused to impact with the receiving surface.

2. A typewriter comprising a paper supporting platen and carriage, a type-basket, force bulbs mounted within said type basket and normally collapsed, type-bearing stencils seated upon said force bulbs, a key board, compressible keys or bulbs located in said key board, tubular connections between said keys and force bulbs, a body of air confined within said keys and tubular connections, means for advancing said carriage across the face of the type, inking devices located in proximity to said type, and means for operating said inking devices.

3. A typewriter comprising a support, a concaved type basket mounted in said support, hollow compressible bulbs mounted in said type basket and normally collapsed, type stencils seated on said bulbs and extending upward therefrom, guide plates mounted on said support above the type basket, perforations in said guide plates in which said stencils are positioned, a platen, a key board hinged to the support, compressible hollow keys mounted on said keyboard, and tubular connections between said bulbs and keys, substantially as set forth.

4. In a typewriter the combination with the writing devices of a support therefor, a carriage mounted upon and adapted to travel transversely of said support, a ratchet bar fixed to said carriage, a pawl engaging said ratchet bar, a shot bolt connected to said pawl, a force bulb normally collapsed and contacting with said shot bolt, a compressible key, connections between said key and the writing devices, and tubular connections between the key and force bulb, substantially as set forth.

5. In a typewriter the combination of a support, type faces mounted on said support, inking rollers mounted on said support and adapted to roll across said type faces, and pneumatic devices adapted to act upon and operate said rollers, substantially as and for the purposes set forth.

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

WILLIAM RAAB.

In presence of—
H. C. HEMENWAY,
LAUPAR KNAPP.