(No Model.) 3 Sheets—Sheet 1.

F. A. HEISS.

TYPE WRITING MACHINE.

No. 588,746. Patented Aug. 24, 1897.

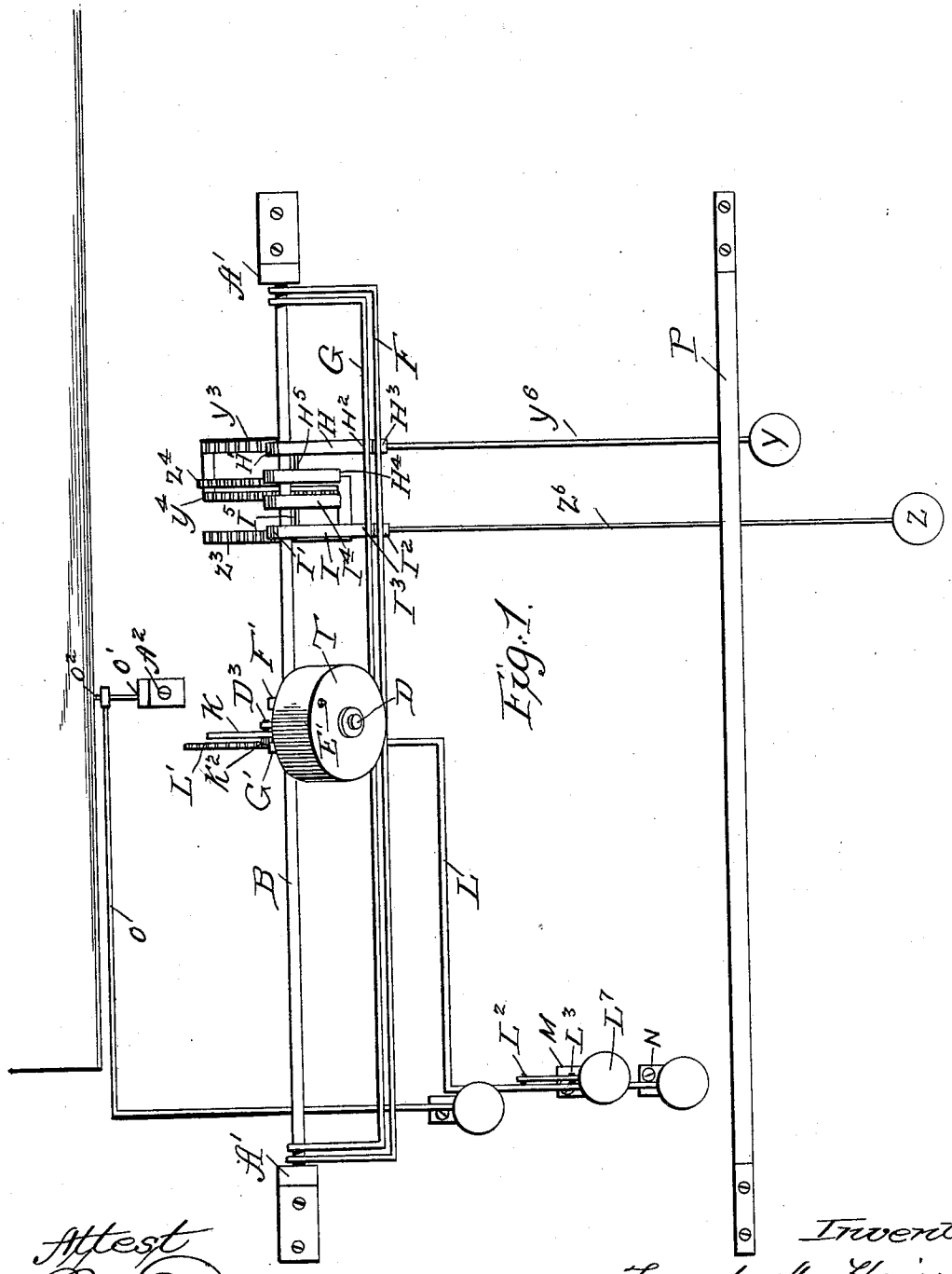


Fig. 1.

Attest
Wallace Donaldson
James M. Shean

Inventor
Frank A. Heiss
by Ellis Spear
Atty.

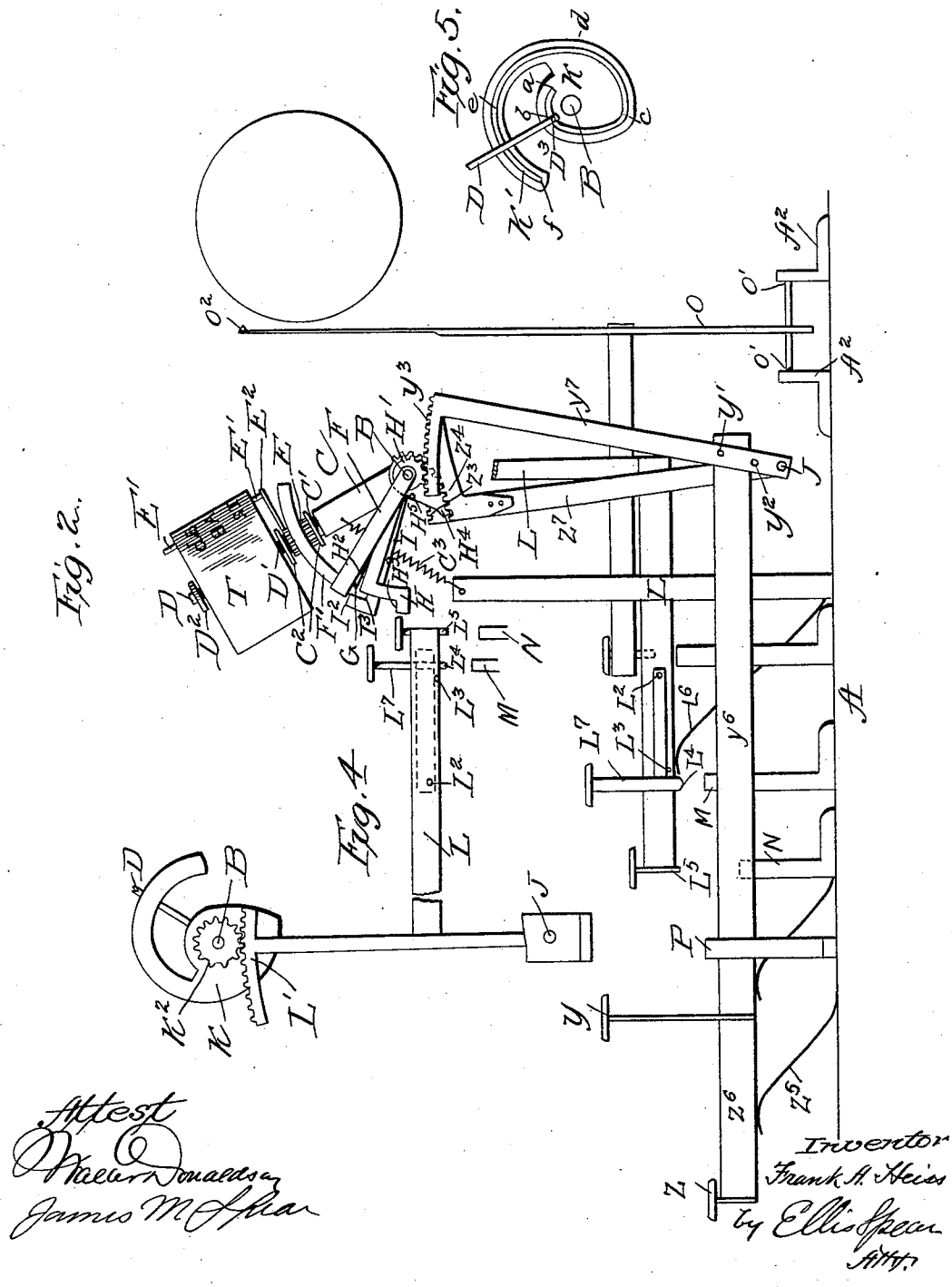
THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

F. A. HEISS.

TYPE WRITING MACHINE.

No. 588,746. Patented Aug. 24, 1897.



Attest
Walter Donaldson
James M. Shear

Inventor
Frank A. Heiss
by Ellis Spear
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

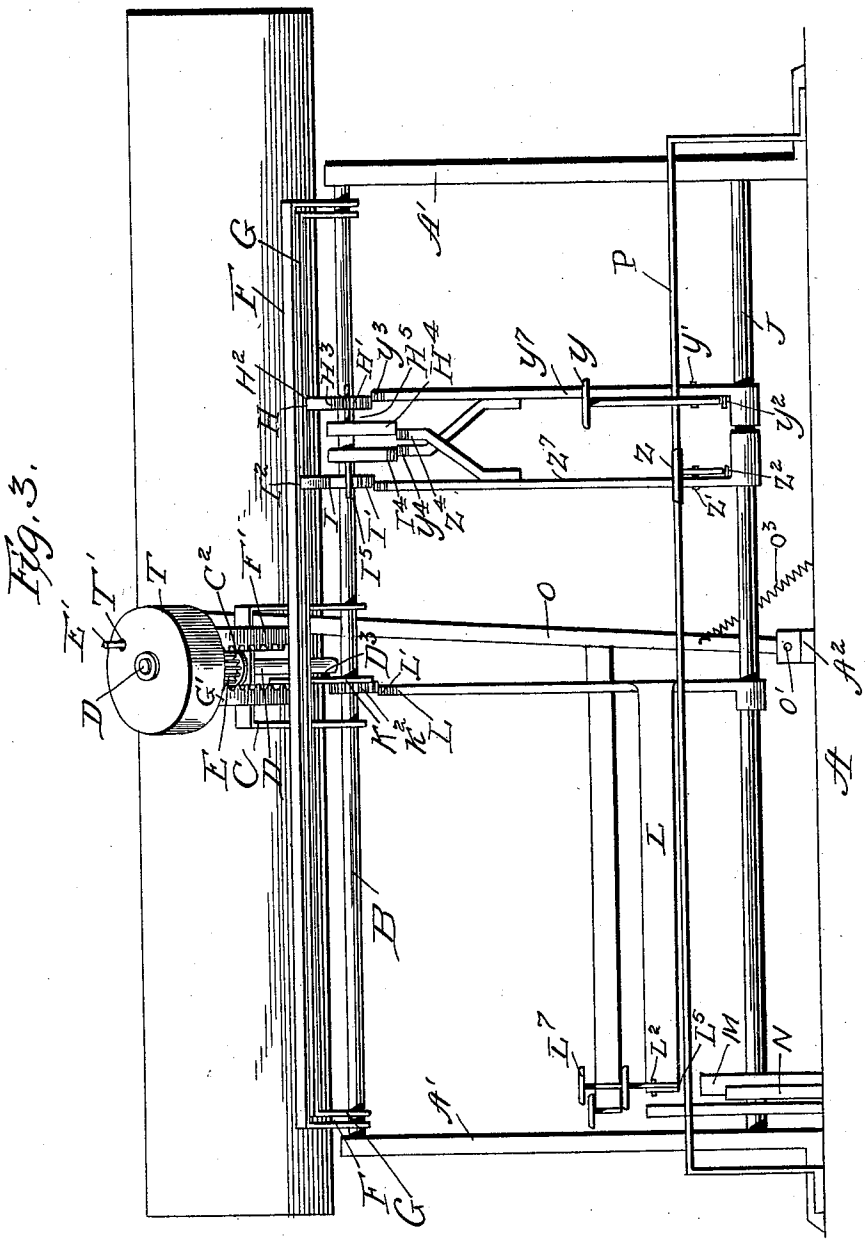
(No Model.) 3 Sheets—Sheet 3.

F. A. HEISS.

TYPE WRITING MACHINE.

No. 588,746. Patented Aug. 24, 1897.

Fig. 3.



Attest
Walter Dwaeson
James McSpear.

Inventor
Frank A. Heiss
by Ellis Spear
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FRANK A. HEISS, OF PORT JERVIS, NEW YORK.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 588,746, dated August 24, 1897.

Application filed April 3, 1896. Serial No. 586,117. (No model.)

To all whom it may concern:

Be it known that I, FRANK A. HEISS, a citizen of the United States, residing at Port Jervis, in the county of Orange and State of New York, have invented certain new and useful Improvements in Type-Writers, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention belongs to that class of type-writers in which the type are carried upon a rotary wheel having mechanism to turn it so as to bring the desired letter opposite the printing-point and then cause the type-wheel to move bodily to the platen in order to deliver the blow in printing.

My invention relates particularly to the means for rotating and swinging the type-wheel toward the platen, my object being to render the stopping of the rotary movement easy, gradual, and free from shock, at the same time preserving the full force of the blow in printing. This gradual stopping of the rotary movement is especially desirable and necessary for those letters located at the greatest distance from the central line of the printing-point, as, were a positive stop used, the wheel, having acquired considerable momentum, would be arrested by a decided shock, causing a rebound and also rapid wear of the parts. By my arrangement this is avoided. I have also devised special means for raising the type-wheel to bring the different rows of characters into line, and, further, I have provided special means for underscoring.

In the drawings, Figure 1 is a plan view of so much of my machine as will illustrate my invention, it being understood that the key mechanisms and tumblers are simply duplicated. Fig. 2 is a side view, the platen being indicated diagrammatically. Fig. 3 is a front view of Fig. 1, and Figs. 4 and 5 represent details of construction.

A is the bed of the machine.

B is a cross-bar held by standards A′ A′.

C is a tilting type-wheel frame, loosely pivoted by its two arms to the cross-bar B. At the center of the cross-piece of this frame is fixed a tube C′, through which loosely passes the type-wheel shaft D and around which revolves the type-wheel pinion E, which is held against longitudinal movement on the tube C′ by collars C^2 C^2 of the tube. The type-wheel T revolves on shaft D, which has slightly above the tube an offset D′, on which sets the type-wheel, which is held down by a nut D^2. The type-wheel shaft D can be raised or lowered through the tube C′ to bring different rows of characters on the type-wheel in position. The type-wheel is so connected to its pinion E by a long pin E′, fastened to an arm E^2 of the pinion and passing loosely through a hole T′ of the type-wheel, that it must revolve on the shaft D when pinion E revolves on the tube C′ even when the wheel is moved from the pinion by the raising of the type-wheel shaft D to bring a lower row of characters in position. The type-wheel shaft D has at its lower end a pin D^3, which is connected to a shift-wheel to be described later. The pinion, with the type-wheel, can make, preferably, half of a revolution in each direction.

F and G are two bails whose arms are pivoted to cross-bar B. Near the centers of the bails are racks F′ G′, which mesh on opposite sides into pinion E. A spring C^3, preferably attached to type-wheel frame C, holds the frame with its appurtenances and the racks in the normal position.

It is the relative positions of the bails F G that determine which character of a row on the type-wheel shall be positioned for striking. These bails are adjusted by tumblers, of which there are as many as there are keys. These tumblers are pivoted to cross-bar B. They are in two series, preferably half of them operating to turn the type-wheel in one direction and half in the other. Only one tumbler of each series is shown in the drawings for convenience of illustration. The tumbler to turn the type-wheel to the right is marked H and the one to turn it to the left is marked I. They have teeth cut part way around their pivot, making spur-gear H′ I′. Their free ends act on bails F and G. The tumbler H has face H^2 normally resting against the bail G, on which this face acts. The tumbler is then cut away to make face H^3 to act on bail F. The tumbler I has face I^2 normally resting against bail F, on which this face acts. The tumbler is then cut away to make face I^3 to act on bail G. No two of the tumblers are alike. Those of one series act on bail F before they act on bail G. Those

of the other series act on bail G before they act on bail F. The difference in tumblers of the same series is in regard to the distance between the two faces. It is these differences that cause the different faces of the type-wheel to be brought in position, according to the keys struck.

J is a cross-bar held by standards A′ A′ and is a pivot for all the keys. The key-board may be in any arrangement, though I prefer what is called the "universal" key-board, the keys being in three banks. In the accompanying drawings appear only two keys Y and Z, corresponding to the two tumblers H and I. The finger-button is fixed to a horizontal part $Y^6 Z^6$, connected to a nearly vertical part $Y^7 Z^7$. The vertical part is pivoted to cross-bar J and carries at its upper end a section of a spur-gear which meshes into the teeth of the tumbler belonging to that key.

Operating a key will, on account of the gearing with the tumbler, operate its tumbler, (H or I,) causing same to push with its first face (H^2 I^2) the bail (G or F) against which its first face bears. This will cause the rack fixed to that bail (G′ or F′) to turn the pinion E on the other rack which has not moved and to take the pinion toward the platen. The other face (H^3 or I^3) of the tumbler operated will then come in contact with the other bail, when both bails (and racks) will move together and take the type-wheel on its frame to the platen. Obviously when both racks move together the type-wheel ceases to revolve. Moreover, when both racks move together, stopping the revolving of the type-wheel, the speed of the type-wheel toward the platen is accelerated, giving a good impression against the platen; but if the key is operated quickly, or if the type-wheel is of metal and made comparatively heavy to secure durability and manifolding power, or if the character to be positioned is far from the zero-point of the type-wheel, (the point normally in position,) requiring an extensive turning of the type-wheel, the momentum of the type-wheel will defeat the positioning and cause a false impression to be made unless a device is used for stopping the rotary motion at the proper time and for steadying the wheel. To stop the revolving of the type-wheel gradually instead of suddenly, thus preventing rapid wear of the parts and unsteadiness of the type-wheel, is the principal aim of my invention. In order to secure this gradual stopping, I control the mechanism for turning the type-wheel in one direction by the mechanism for turning it in the other direction by interlocking the two mechanisms, preferably by means of large and small gears.

In my plan the tumblers work in pairs, a tumbler for turning the type-wheel in one direction in each case working with a tumbler for turning it in the other direction. When a key is operated, its own tumbler acts, and the other tumbler, which is an opposite tumbler, also acts, but slower, being merely in this case a helping tumbler. During the operating of a key the tumbler corresponding to that key (then the principal tumbler) pushes rapidly with its first face the bail against which it bears. At first the helping tumbler pushes slowly the other bail, but increases the speed as the key is farther depressed, so that by the time the second face of the principal tumbler catches up with the latter bail this bail is traveling almost (but not quite) as fast as the principal tumbler, and is thus gently taken by this tumbler from the helping tumbler, the principal tumbler doing the final adjusting of both bails, this occurring just before the type strikes the platen. These fast and slow movements of a pair of tumblers may be accomplished in several ways. In the accompanying drawings is shown a method of accomplishing them by the use of large and small gears.

For convenience of illustration the relative positions of the two keys and tumblers (a pair) shown in the accompanying drawings are exaggerated. Alongside of each tumbler is a section of an auxiliary gear, which is elliptic and pivoted to cross-bar B. This gear has a pin bearing on the tumbler and operates the tumbler when same is needed as a helper by the other tumbler. It does not operate when the tumbler is needed as a principal tumbler. In that case the regular gear of the tumbler is operated.

The keys are, as before stated, pivoted to cross-bar J. Each key is in two parts, which are pivoted to each other. A horizontal part $Y^6 Z^6$ extends to the front of the machine to hold a finger-button. A nearly upright part $Y^7 Z^7$ has two sections of spur-gears, side by side, at its upper end, one regular or concentric to operate the tumbler of that key and one eccentric to operate the elliptic auxiliary gear of the other tumbler. Take key Y. At Y′ is the elbow. At Y^2 is a pin fixed to the upright part Y^7, and on which the horizontal part Y^6 rests, the whole thus forming a practically rigid lever pivoted to cross-bar J. The upright part carries section of regular or concentric gear Y^3, which meshes into gear H′ of tumbler H. Branching out alongside gear Y^3 is irregular or eccentric gear Y^4, meshing into elliptic gear I^4, which has pin I^5 extending out from its side and bearing against tumbler I in such a way that the operating of the elliptic gear I^4 will operate tumbler I. Tumbler H has, as stated, face H^2 normally resting against bail G and has face H^3 cut farther away in the tumbler. As soon as key Y is operated this tumbler will push rapidly with its face H^2 against the bail G. Tumbler I has, as stated, face I^2 normally resting against bail F. At the point where elliptic gear I^4 meshes into gear Y^4, when the parts are in normal position, the diameter of the gear I^4 is considerably larger than gear H′, so that at the commencement of the operating of the key tumbler I will push but slowly with its face I^2 the bail F, allowing

the pinion E to roll on the slowly-moving rack F′ under the action of the rapidly-moving rack G′. On the further depression of the key the diameter of elliptic gear I^4 where it meshes into gear Y^4 gradually gets smaller, and consequently the speed of tumbler I and of bail F is accelerated, although it is never quite as fast as that of tumbler H and of bail G. Before the type-wheel reaches the platen, face H^3 of tumbler H catches up with the now only slightly-slower-moving bail F and takes it gently from face I^2 of tumbler I. Tumbler H does the final adjusting of the two bails. Tumbler I continues to fall behind and has no further effect on the bail F, its work having been done when it gave up that bail to tumbler H. The stopping of the rotary movement of the type-wheel is thus accomplished without shock to any of the parts and is absolute. Spring C^3 brings all parts back to normal position when pressure is removed from key. Meantime the other key, Z, of the pair is held up against strap P (which crosses all the keys) by spring Z^5, the elbow-joint Z′, similar to the joint Y′ of the key Y, making this possible.

If key Z is operated, the working of the tumblers will be reversed. Tumbler I will then be the principal tumbler, while tumbler H will be the helper. Tumbler I will push rapidly with its face I^2 the bail F. Tumbler H will push slowly at first, but with increasing speed, the bail G, on account of elliptic gear H^4 and pin H^5, the diameter of the elliptic gear where it engages with the gear Z^4 growing constantly smaller as the depression of key Z is continued, but never getting quite as small as that of gear I′. Before the type-wheel reaches the platen and when bail G is traveling almost as fast as bail F tumbler I face I^2 comes in contact gently with bail G and takes the bail away from tumbler H and adjusts both bails. In this case key Y is held up against strap P by spring Y^5. This description will apply to any pair of keys, there being no difference in their operation. The only difference in them is as to the shape of their tumblers, which determine the direction of the rotary movement of the type-wheel, and how long that movement shall continue.

I do not wish to limit myself to this particular construction. For instance, each tumbler may have a helping tumbler to act only as such. Again, instead of the ends of the key-levers being formed into gears they might be made to bear on projecting arms or pins of the tumblers at a certain regular distance from the pivot of the tumbler in the case of a principal tumbler and at a greater and variable (decreasing as the key is depressed) distance from the pivot in the case of a helping tumbler. Of course where the character to be positioned is close to zero-point the connecting of the tumbler with an opposite tumbler is not necessary, a helping tumbler not being required to steady the type-wheel after a small revolution. It is only the extensive turning of the type-wheel that requires the catching device.

It will be noticed that I accomplish a most important result in my arrangement in that the means employed for gradually arresting the rotation of the type-wheel gradually increases the speed of the type-wheel toward the platen, delivering a strong blow for a good impression—that is to say, as the rolling of the pinion E on the helping rack is retarded by the increasing movement of that rack the swinging movement of the type-wheel toward the platen is accelerated, and the striking force is highest as the wheel goes against the platen, for at this time both racks are locked to the pinion and are moving at the same rate, moving the type-wheel forward without any lost motion.

During the tilting of the type-wheel against the platen a shift-wheel K, loosely pivoted to cross-bar B, keeps the type-wheel shaft D from rising or lowering in tube C′. The shift-wheel has a slot K′ on one side, in which slides pin D^3 of type-wheel shaft D, and a spur-gear K^2 on the other side.

The type-wheel shown in the accompanying drawings has three rows of characters. Normally the shift-wheel is in the position shown. (See Figs. 4 and 5.) This is the "small-letter" position, and it is maintained during the tilting of the type-wheel by pin D^3 sliding from *b* to *a*, between which points the slot is equidistant from pivot. From *b* to *c* the slot bears away from the pivot, and from *c* to *d* it is again equidistant from pivot. This is for capital letters. To make a capital letter, it is necessary to revolve the shift-wheel about three-fourths of a turn, either before or at the same time that a key is struck. This revolving will cause type-wheel shaft D, on account of pin D^3 sliding in slot K′, to rise through the tube C′ and put the type-wheel in the "capital-letter" position. This position will then be maintained during the tilting of the type-wheel by pin D^3 sliding from *d* to *c*. A more extensive revolving of the type-wheel—say one and one-half revolutions—will in the same way cause shaft D to rise farther and put the type-wheel in the "figure" position as the slot again bears away from the pivot, from *d* to *e*. This position will be maintained during the tilting by pin D^3 sliding from *f* to *e*. Of course the lengths of the concentric portions of the slot increase as they leave the pivot, to correspond to the increased play of the lower end of type-wheel shaft D where the pin D^3 is fastened. Thus it is farther from *d* to *c* than from *b* to *a*, and farther from *f* to *e* than from *d* to *c*. The revolving of the shift-wheel is accomplished by shift-lever L, pivoted to cross-bar J and having a spur-gear L′ at its inner end, acting on spur-gear K^2, fixed to the shift-wheel. The shift-key is made in two parts. The capital-letter part L^7, pivoted at L^2 to the main key, bears on pin L^3, and thus when depressed takes with it the whole of the key

until downwardly-projecting lug L^4 touches block M. This causes spur-gear L' to operate the shift-wheel. The figure part has a more extensive movement. It is depressed until downwardly-projecting lug L^5 reaches block N, and this extensive movement is permitted by lug L^4 and block M through the pivoting at L^2. A spring brings all parts back to the normal position.

Another feature is the manner of underscoring or drawing a line under figures or letters. The underscoring is done at the same time that the letters or figures to be underscored are printed. The underscoring-type is on a separate device and when needed is thrown in front of the type-wheel, which takes it along to the platen and thus makes the line under the character struck. Obviously the underscoring-type is on the same side of the ink-ribbon, if a ribbon is used, as the other types. A rod O, pivoted at O' to standards A^2 and extending to the left and then to the front to a finger-button, has a vertical end with the underscoring-type O^2 between the type-wheel and the platen and a short distance from the latter. Normally the underscoring-type is a little to one side of the type-wheel. It is brought over in front of the type-wheel by the depressing of the said finger-button. The vertical part holding the underscoring-type is so formed into a thin spring—or it may be jointed and have a separate spring—that the type can easily be taken by the type-wheel the short distance to the platen and will return from the platen on being released by the type-wheel. A spring O^3 restores the underscoring device to the normal position when its key is released. So long as the underscorer-key is held or latched down each letter or figure struck will be underscored without further attention. This device is useful on various kinds of typewriters.

I claim—

1. A type-writer comprising a platen and a rotary type-wheel having a variable rotary movement gradually decreasing in speed to bring the desired letter to the printing-point without shock with means for rotating and arresting the said type-wheel, substantially as described.

2. In combination in a type-writer, a platen, a rotary type-wheel and means for rotating the same and arresting its rotary movement without shock, consisting of the pinion, the two racks and means for giving said racks a differential movement in the same direction, substantially as described.

3. In combination, in a type-writer, a platen, a rotary type-wheel and means for rotating and arresting the same without shock, and for swinging the type-wheel toward the platen consisting of the pinion, the two racks, one on each side of the same and means for giving said racks, at first a differential movement and finally a movement in unison, substantially as described.

4. In a type-writer, the combination of a platen, a rotary type-wheel, a swinging support therefor, a pinion connected with the type-wheel, a pair of racks, one on each side of the pinion, the swinging bails carrying the racks, the key mechanism and the tumblers operated thereby to swing the bails, said tumblers as they move forward being adapted to swing the bails in succession, on the same stroke and in the same direction, substantially as described.

5. In combination in a type-writer, the platen, a rotary type-wheel, a swinging support therefor, a pinion connected with the type-wheel to rotate the same, a pair of racks, one on each side of the pinion, the main tumblers for operating one of the racks, the helper-tumblers for operating the other rack, a key mechanism for operating the tumblers, substantially as described.

6. In combination, in a type-writer a platen, a rotary type-wheel, a swinging support therefor, the pinion connected to the type-wheel to rotate the same, a pair of racks one on each side of the pinion, a series of main tumblers for operating one rack, a series of helper-tumblers for operating the other rack and means for giving said main and helper tumblers a differential movement in relation to each other, substantially as described.

7. In combination in a type-writer, a platen, a rotary type-wheel, a swinging support therefor, a pinion and a pair of racks for rotating the type-wheel, a series of main tumblers, a series of helper-tumblers, said tumblers being arranged to operate their respective racks, and the main tumblers being arranged to operate both racks in unison after a predetermined movement of the racks has taken place.

8. In combination in a type-writer, the platen, a rotary type-wheel, the swinging support therefor, a pinion connected to the wheel, a pair of racks, a pair of bails connected to the racks, a series of main tumblers for operating one bail, the helper-tumblers for operating the bail of the other rack, means for giving the helper-tumblers a gradually-increasing movement, and means for giving the main tumblers a faster movement in relation to the helper-tumblers said main tumblers having a bearing to contact with the main bail and a second bearing to contact with the helper-bail after a predetermined movement has taken place.

9. In combination in a type-writer, a platen, a rotary type-wheel, a swinging support therefor, a rotating pinion and a pair of racks, the main and helper bails, the main tumbler arranged to contact with both the main and helper bails in succession, the helper-tumbler arranged to contact with the helper-bail, the small pinion on the main tumbler, the rack for operating the same, the pinion on the

helper-tumbler having an eccentric portion and a small portion of slightly larger diameter than the pinion of the main tumbler, the rack for operating the same and the key mechanism for operating the racks, substantially as described.

10. In combination, the platen, a rotary type-wheel, a swinging support therefor, the pinion, a pair of racks, the bails connected therewith, a series of tumblers each being adapted to operate the bails in succession, means for operating the tumblers in pairs and for giving one a uniform fast movement in relation to the gradually-increasing movement of the other, each tumbler being arranged to act when its key is depressed as the main tumbler in conjunction with the other tumbler of the pair which then acts as a helper, substantially as described.

11. In combination, the platen, the type-wheel, a swinging support therefor, a pinion and pair of racks, the bails carrying the racks, a series of tumblers H, I, arranged in pairs each one being adapted to operate the bails in succession and each having a pinion H′ I′ to give its rack a uniform fast movement, the racks Y^3 Z^3 for actuating said pinion respectively, the helper-gear H^4 I^4 connected with their respective main tumblers H and I and means for operating each rack Y^3 and Z^3 and for communicating the said movement to the helper-gear of the companion tumbler, substantially as described.

12. In combination, the platen, the rotary type-wheel, a swinging support therefor, the pinion and racks, the bails connected therewith, a pair of tumblers each arranged to operate the bails in succession, key-levers one for each tumbler with means for connecting the same with the tumbler and a connection from the key mechanism of each tumbler to the other tumbler whereby each tumbler may be made to act as a helper for the other tumbler, substantially as described.

13. In combination, the platen, a type-wheel, the pinion and racks, a pair of tumblers each one being adapted to act as a helper, the main tumbler and key mechanism comprising the horizontal levers Y^6, the upright levers connected therewith by a pivot Y′ and a pin Y^2 adapted to permit the upright lever to move independently of the horizontal lever.

14. In combination, the platen, the rotary type-wheel, the racks and pinion, the pair of main and helper tumblers and the key mechanism comprising the horizontal and vertical levers with a loose joint between them, each lever being connected to a main tumbler and being adapted to remain stationary when said main tumbler is acting as a helper-tumbler to another lever, substantially as described.

15. In combination, the swinging type-wheel and means for raising and lowering the same, consisting of a cam on the pivot of the swinging support, said cam being connected with the shaft of the wheel and means for rotating the cam, substantially as described.

16. In combination, the platen, a type-wheel and swinging support therefor, and means for raising and lowering the type-wheel, consisting of the cam having portions which are eccentric and concentric relatively to the pivot of the swinging support, said portions engaging the type-wheel shaft and means for rotating the cam and means for operating the swinging support independent of the cam, substantially as described.

17. In combination a platen, a swinging type-wheel and means for raising and lowering the same consisting of a two-part lever, a supplemental part being pivoted to the main part, stops for the supplemental and main parts and connections from the said lever to the type-wheel.

18. In combination, the platen, the type-carrier arranged to strike against the same and an underscorer arranged to be interposed between the platen and the type-carrier at a point below printing-point and adapted to be thrust against the paper by the type-carrier whereby the underscoring and printing of the letter is done simultaneously by the type-carrier.

19. In combination, the platen, the type-carrier and an underscorer comprising an arm having a spring portion and extending up in front of the platen to one side of the printing-point and means for adjusting said arm to bring its printing portion below the printing-point and in front of the type-carrier to be thrust against the paper by the same so that the letter and underscorer will be printed simultaneously through the action of the said type-carrier, substantially as described.

20. A type-carrier comprising a platen and a rotary type-wheel having a variable rotary movement gradually decreasing in speed to bring the desired letter to the printing-point without shock with means for rotating and arresting the type-wheel, said means also acting to swing the type-wheel toward and from the platen, substantially as described.

21. In combination, in a type-writer, a platen, a rotary type-wheel, a swinging support therefor, a pinion connected with the type-wheel, a pair of racks, one on each side of the pinion, the swinging bails carrying the racks, key mechanism and the tumblers interposed between said key mechanism and bails and having stops to engage and operate the bails, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK A. HEISS.

Witnesses:
J. H. LOUNSBURY,
N. T. CONN.