(No Model.) 3 Sheets—Sheet 1.

C. SPIRO.

TYPE WRITING MACHINE.

No. 381,652. Patented Apr. 24, 1888.

Fig. 1.

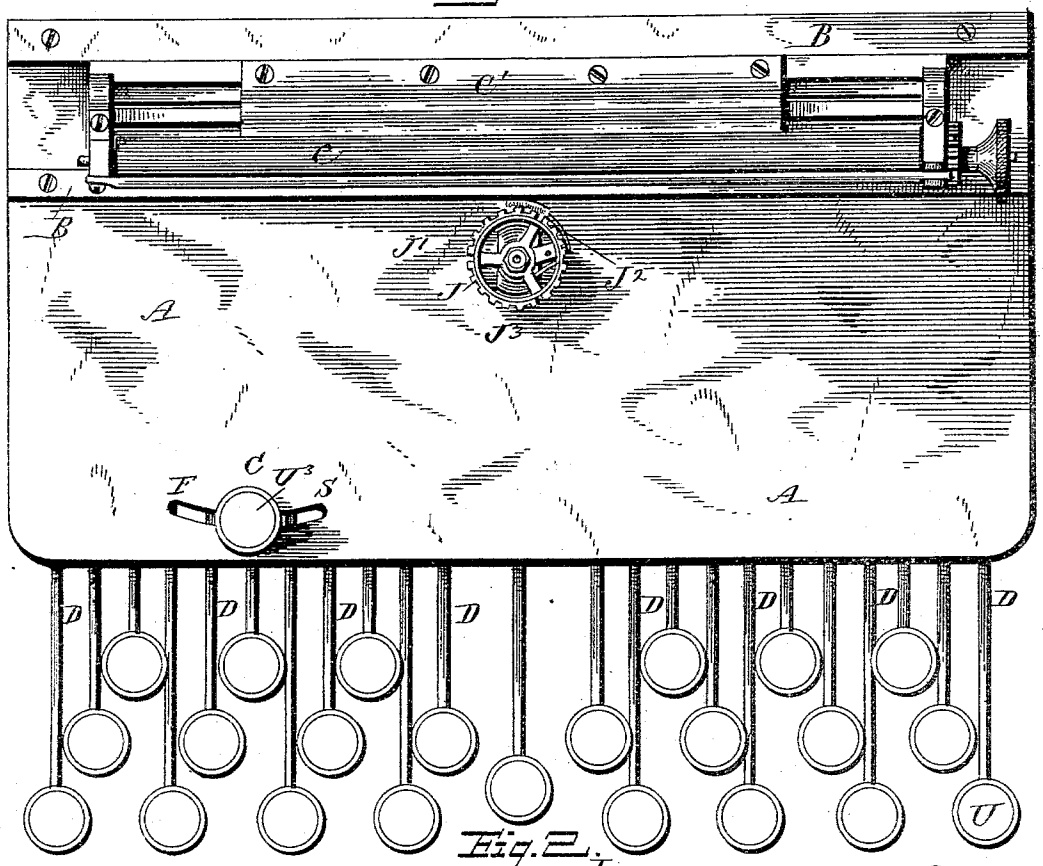
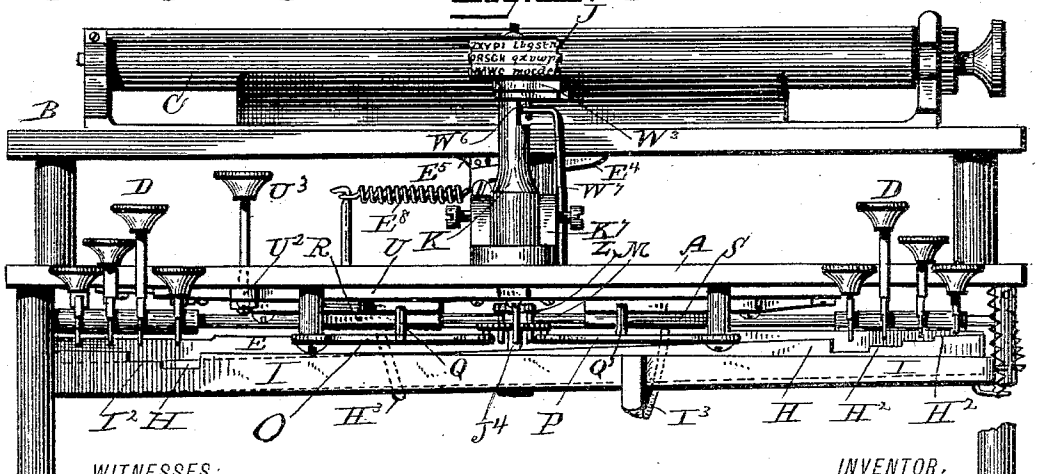


Fig. 2.



WITNESSES:

L. C. Mills

Wm. E. Dunlap.

INVENTOR.

Chas. Spiro,

BY E. B. Stocking

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N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 3 Sheets—Sheet 2.

C. SPIRO.

TYPE WRITING MACHINE.

No. 381,652. Patented Apr. 24, 1888.

Fig. 3.

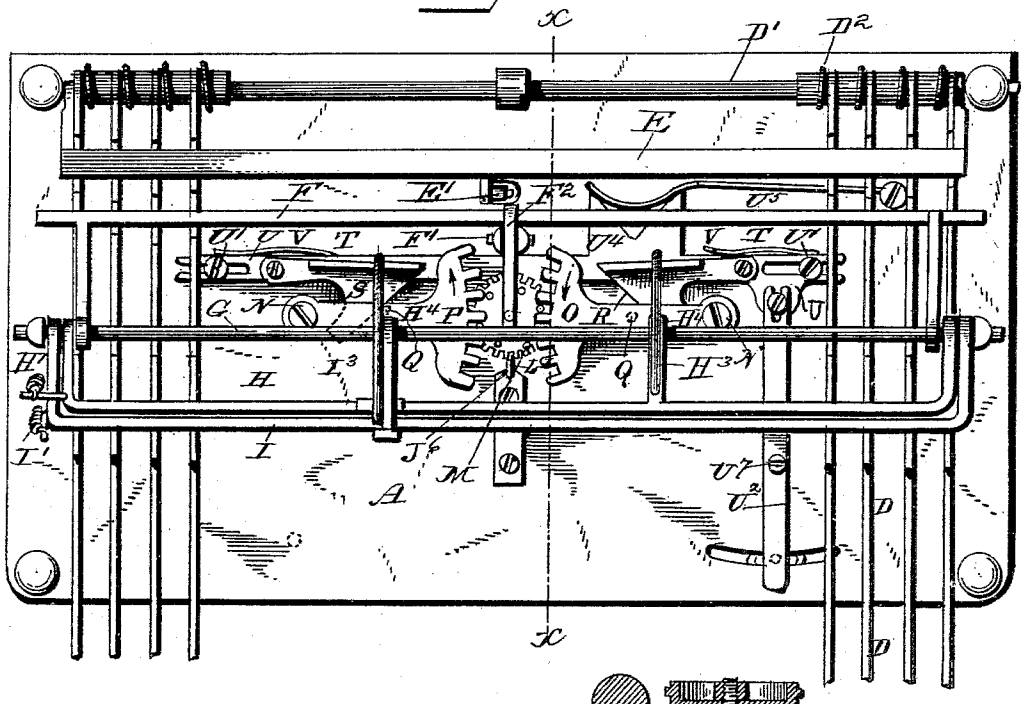


Fig. 4.

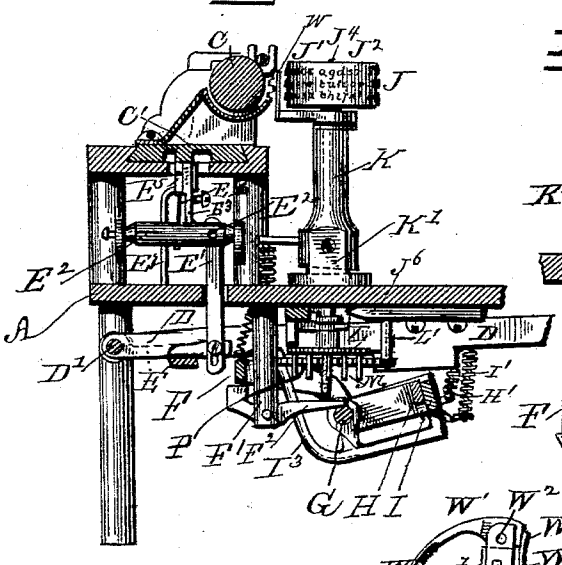


Fig. 5.

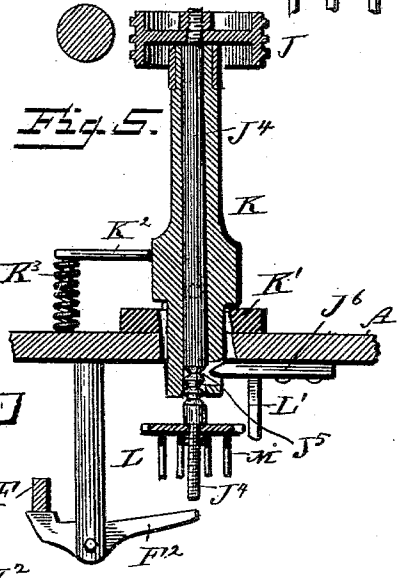




Fig. 5. a

WITNESSES:

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(No Model.) 3 Sheets—Sheet 3.

C. SPIRO.

TYPE WRITING MACHINE.

No. 381,652. Patented Apr. 24, 1888.

Fig. 6.

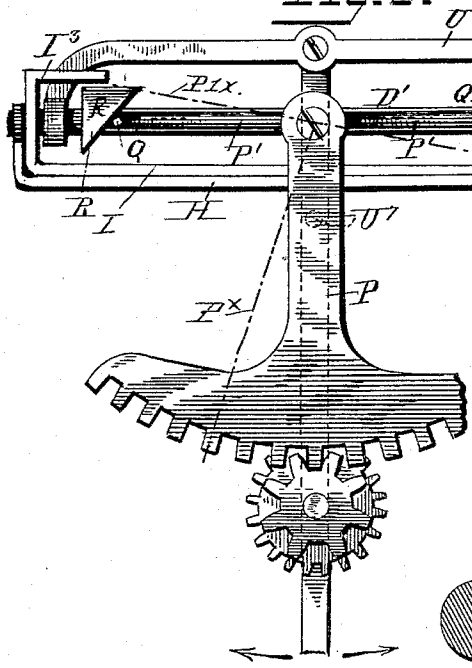


Fig. 7.

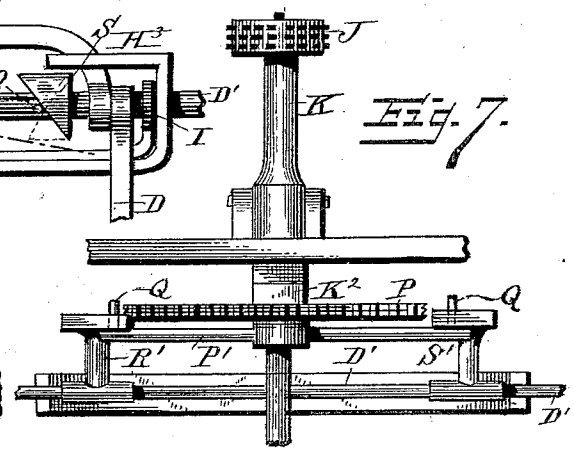


Fig. 8.

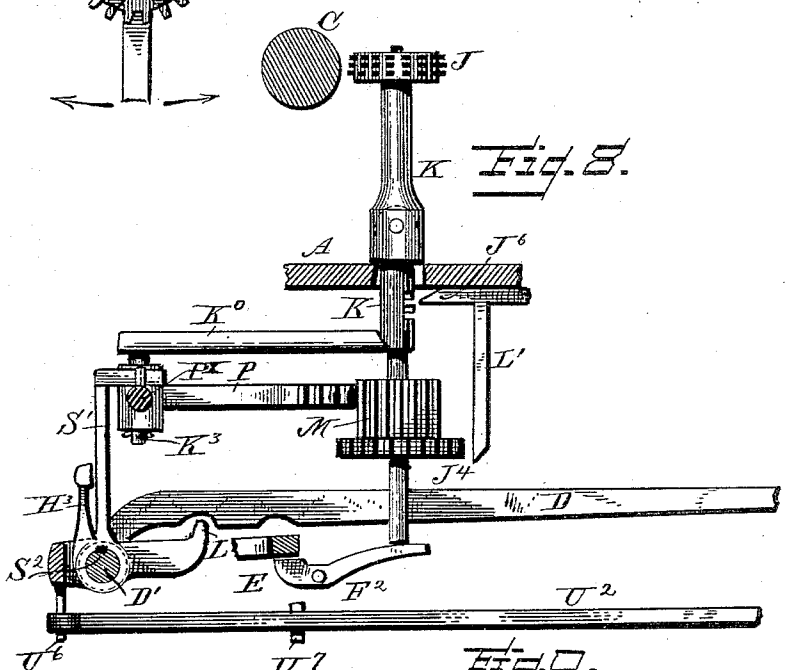
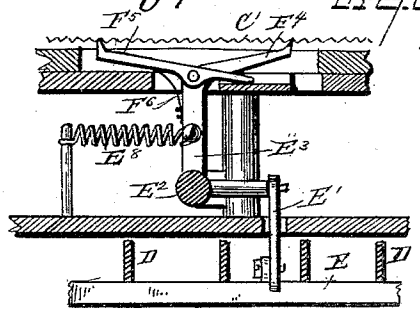


Fig. 9.



WITNESSES:

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UNITED STATES PATENT OFFICE.

CHARLES SPIRO, OF NEW YORK, N. Y.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 381,652, dated April 24, 1888.

Application filed September 26, 1885. Serial No. 178,217. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SPIRO, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention has relation to type writers of that class known as "wheel-machines," and the term "wheel," as used, includes disks, cylinders, sleeves, and segments provided with printing-characters on their peripheries, which characters are selected for giving impressions by mechanical devices which serve to oscillate or rotate the wheel, cylinder, or segment, or which serve to reciprocate a sleeve. Other mechanical devices are employed in the class of machines referred to for the purpose of either giving motion to the wheel or its equivalent device, or to the paper-carriage, or to a hammer for the purpose of taking an impression from the type selected.

Heretofore sleeve-machines have been constructed wherein the sleeve provided with printing-characters has been rotated wholly or partially on its axis and reciprocated longitudinally thereon in both directions to select a desired printing-character, and bodily moved at an angle to its axis for the purpose of giving an impression. So, also, segments and wheels have been similarly operated by means of keys answering each to one of the printing-characters upon the periphery of the segment or wheel.

In wheel-machines as heretofore constructed and operated difficulty has arisen in the provision of devices in overcoming the momentum acquired by the wheel in changing from one position to another, so that a complicated system of stops has been employed, and the number of parts of a machine has thereby been increased.

Among the objects of my invention are to provide a wheel-machine which shall be simple in construction, and in which the momentum of the wheel in changing from one position to another shall be reduced to a minimum.

Other objects and advantages of my invention will appear in the following description, and the novel features thereof will be particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a plan, Fig. 2 is a front elevation, and Fig. 3 a bottom view, of a machine constructed in accordance with my invention. Fig. 4 is a vertical section on the line *x* of Fig. 3. Fig. 5 is a vertical section of the type-wheel and its standard. Fig. 5ª is a detail of the inking mechanism. Fig. 6 is a plan, Fig. 7 a front elevation, and Fig. 8 a vertical section, of a modified arrangement of some of the principal elements of my invention. Fig. 9 is a front view, partly in section, of the carriage and feed mechanism.

Like letters indicate like parts in all the figures of the drawings.

A represents a suitable base or table, above which are supported the ways B of the paper-carriage and platen C.

D represents the keys, which are arranged under the base, mounted at their inner ends upon a rod, D′, (see Fig. 3,) each key being provided with a coiled or other spring, D^2, for the purpose of elevating the free end of the key, as usual.

Upon the key-shaft D is mounted a feed-bail, E, which passes beneath the keys, so that a depression of any one of the series of keys depresses the feed-bail, and a connecting-rod, E′, which passes upwardly through the bed and is attached to an arm of a rock-shaft, E^2, (see Fig. 4,) to a second vertical arm, E^3, of which is rigidly secured a check-pawl, E^4, (see Fig. 2,) and to the same vertical arm is pivotally secured a feed-pawl, E^5, which, by means of a spring, E^6, Fig. 4, is made to take into and is permitted to pass over one or more teeth of the rack-bar C′ of the paper-carriage. The feed-pawl is provided with a projection disposed in an opposite direction from its operative tooth, which projection comes into contact with the standard E^7, which serves to hold the operative tooth of the pawl entirely free from the rack when the feed-bail is completely depressed in order that the carriage may be completely removed or moved by hand independently of the pawls.

The motive power for moving the carriage from right to left is derived from a spring, E^8, secured to the upright arm of the rock-shaft and to a fixed part of the machine, whereby when a key is depressed said rock-shaft tends to stretch said spring, that by its resiliency, and after the feed-pawl has taken into an ad-

vanced tooth of the rack of the carriage, the carriage may be moved for the purpose of spacing between letters and words. The next bail in advance of the feed-bail is the lifting-bail F, which is pivoted to a transverse shaft, G, and is arranged beneath the keys. Pivoted in a standard, F′, is a lifting-lever, F^2, the short arm of which is projected beneath the bail F, and the long arm of which is projected to the front and beneath the type-wheel shaft, for a purpose hereinafter described. Upon the same shaft G, and arranged in front thereof, are two bails, H and I, which constitute in their construction and operation what may be designated as a "compound bail," and these, by means of springs H′ and I′, are held upwardly against the lower edges of the key-levers.

By reference to Fig. 2 it will be seen that the bail H is higher on the right than the bail I and lower on the left than said bail I, and that the bail I is higher on the left and lower on the right than the bail H, and, further, that each of said bails is notched beneath each key-lever, as shown at H^2 and I^2, respectively. From the bail H there is an arm, H^3, extended rearwardly and then bent upwardly toward the bed of the machine. A similar arm, I^3, is arranged on the bail I. For the simple purpose of strengthening the arms and bails the arms are also pivoted on the shaft G.

The system of key-levers is notched or otherwise made irregular in shape at such points as come in contact with the several bails in the machine, so that at different times during the depression of any one of the levers the bails are successively operated thereby.

Immediately in front of the platen C is arranged the type-wheel J, having upon its periphery and in three circumferential sections thereof a series of printing-characters, the capitals occupying one section, J′, the small letters occupying an adjacent section, J^2, and the punctuation-marks, figures, and other characters occupying the third section, J^3. The characters in each section are arranged in three circumferential rows, so that the entire alphabet of upper-case letters is in one section and the entire alphabet of lower-case letters in an adjacent section on the periphery of the type-wheel. By this arrangement of the printing-characters a wheel of small diameter is made available, whereby momentum is materially reduced. The wheel, as shown in Figs. 1 and 2, is substantially two-thirds full size. The wheel in the full-sized machine is about one inch in diameter, while the periphery is about seven-eighths of an inch wide. Of course these dimensions can be increased or diminished in proportion to the size of the printing-characters employed.

By providing mechanism for elevating and depressing the wheel, so as to bring each one of the three circumferential lines of printing-characters thereon opposite the printing-point, and by providing means for partially rotating the wheel to such a distance as will cause one-third of its periphery to pass and repass the printing-point, each of the characters in each printing field or section of the wheel may be brought to the printing-point, so that by either of the well-known methods of producing an impression from a printing-character the work of the machine may be accomplished—that is to say, by the provision of a hammer to force the paper against the type, or of devices for swinging the platen against the type; or, as I have illustrated and will hereinafter describe, by the provision of devices for tilting or throwing the wheel against the platen, characters may be printed as desired.

I will first describe the means for elevating the type-wheel to present either of the rows of characters thereon to the printing-field. The wheel J is mounted on a shaft, J^4, which extends downwardly beneath the bed of the machine and immediately over the long arm of the lifting-lever F^2. The shaft J^4 is circumferentially grooved, as shown at J^5, Fig. 5, so that when the wheel is inclined to make the impression one or the other of said grooves is made to embrace a fixed stud, J^6, projecting into the path of the shaft and entering the groove either directly in front of the shaft or at a side thereof, as desired, the latter being preferable, as it does not interfere with the complete inclination of the wheel and satisfactory impressions by the characters thereon.

Now it will be readily understood that when the lifting-bail is depressed to a greater or less distance by any one of the keys thereover, said key being notched to determine the extent of the depression of the bail, one of the three grooves J^5 (in accordance with one of the three circumferential rows of printing-characters upon the wheel) will be brought opposite the stud J^6, and that during the tilting of the wheel toward the platen said groove will be brought into immediate contact with the stud J^6.

To permit of the tilting of the type-wheel, its shaft is mounted in a standard, K, which is pivoted in brackets K′, mounted upon the bed of the machine. Upon the shaft J^4 and near its lower end is a locking-wheel, L, and depending from the bed of the machine, or, if desired, from the stud J^6, secured thereto, is a locking-bracket, L′, the function of which is to enter between the teeth of the locking-wheel, which rotates with the type-wheel and the shaft to prevent oscillation of a printing-character when once selected. By means of the stud J^6 and bracket L the type-wheel is locked against movement in any direction, except toward the platen at the commencement of its oscillating or tilting movement. An arm, K^2, projects from the standard and rests upon a spring, K^3, for returning the standard to position after it has been tilted.

It now remains to describe the mechanism employed for selecting a desired printing-character in either section of the wheel. Depending from the locking-wheel are a series of pins, M, constituting a long pinion fixed to the

shaft, so that when said pinion is rotated the shaft and the type-wheel will also be rotated. Meshing with the said pins or pinion are two pivoted segments, O and P, pivoted at N to the bed of the machine. In this instance two segments are used, the one being opposite the other and each meshing with opposite sides of the pinion M, so that when by means of the segments said pinion is rotated or partially rotated in one direction one of the segments will move to the front and the other will move to the rear, as indicated by arrows, Fig. 3. The relative proportion of the segments to the pinion M is such that a complete movement of one of the segments will give the pinion a complete or more than a complete rotation, and so that necessarily the type-wheel shall receive a like movement. Now it will readily be seen that by using a portion only of each of the segments to partially rotate the pinion to and fro a desired field or section of the type-wheel may be rotated to and fro to bring any one of the printing-characters of one of the circumferential lines of characters thereon to the printing-point, and that by means of the lifting mechanism heretofore described any one of said lines of characters may be brought to the printing-field; hence by the lifting mechanism and the segments any entire section of the wheel is capable of being operated to present any single character in that section to the printing-point.

The means for oscillating the segments comprise the following devices: Each of the segments has an upwardly-projecting pin, Q. (See Fig. 2 and dotted circles, Fig. 3.) The pin, rod, or stud Q of the segment O projects into the path of a cam, R, while the similar pin Q of the segment P projects into the path of the cam S. These cams are pivoted at T to a longitudinally-reciprocative bar, U, secured to the bed A by means of screws U′, passing through slots in the bar, as clearly shown in Fig. 3. A lever, U^2, pivoted to the bed at U^7 and pivotally connected to the bar U, serves to reciprocate the bar, which is done by means of a key, U^3, Fig. 1. The bar U is provided with a V-shaped projection, U^4, in which a spring-detent, U^5, rests, for the purpose of removably retaining the bar U in an adjusted position, its adjustment being effected by the lever U^2 U^3. The spring-detent U^5 will hold bar U in at least three positions (that shown in Fig. 2 and the extreme right and extreme left adjustments of the bar) by the contact of the detent with the rear edge or points of the projection U^4 of the bar. Springs V, fixed to the bar U, bear upon the cams R and S between their free ends and their pivots, so as to yieldingly hold their inclined faces against the pins Q of the segments when pressed rearwardly so as to come in contact with said springs.

The inclined faces of the cams R and S are at least three times longer than the distance through which the pins Q are moved by the segments in performing their function of partially rotating the type-wheel over a distance equal to or slightly greater than one printing-section thereof, so that in the use of the complete type-wheel the pins Q are rested upon one or the other of the middle or end one third divisions of the inclined faces of the cams.

As represented in Fig. 3, the type-wheel, the pinion, and the segments are in the position which they assume when the printing-section J′ of the wheel is in use. Now in order to bring the printing-section J^2—that is, the lower-case letters—into use the key U^3 is moved to the right in Fig. 1, (which will be to the left in Fig. 3, the letters F C S in the former figure indicating "figures," "capital letters," and "small letters.") The movement of the bar U to the right in Fig. 3 throws the pin Q of the segment P into a third of the inclined face of the cam S, which is at its outer end, and throws the pin Q of the segment O into a third of the length of the cam R, which is at its inner end. This movement of the pins carries the segment O to the rear and the segment P to the front, thus rotating the pinion, type-wheel shaft, and type-wheel, so as to bring a new printing section of the latter into the printing field. By an opposite movement of the lever U^2 the remaining section of the type-wheel is brought into position.

Now, taking the parts in the position illustrated in Fig. 3 and depressing a key on the right—for instance, that answering to the letter U—its lever is brought first into connection with the bail H, which, as before stated, is higher at that end of the machine than is the bail I, and therefore is capable of performing a function before the key-lever comes into contact with the bail I. That function is to throw the cam R to the front by means of the arm H^3, which projects upwardly and in rear of the cam. The forward movement of the cam, acting on the pin Q of the segment O, causes it to partially rotate the type-wheel to select as the printing character the type U answering to the key depressed. Now the outlines of the lower edge of the key-lever and of the upper edge of the feed and lifting bails and of the bail H are such (the letter U being, for example, in the second circumferential line of characters in the type-wheel section employed) that the lifting-bail is also depressed at the same time as is the bail H, so that when the key-lever comes into contact with the bail I its arm I^3 is in contact with the cam S; and as the two bails H and I now move downward in unison—that is, as one bail—their arms I^3 and H^3, pivoted on the shaft G, are at their inner ends, which project upwardly back of the cams, moved to the front in unison with each other, thus carrying with them the two segments in unison with each other, so that the pinion M and the lower end of the type-wheel shaft, to which it is secured, are carried to the front with the segments, and the upper end of the shaft, with the type-wheel, is carried to the rear against the platen, the center of motion being the pivots in the brackets K′, which support the type-wheel standard. As

pressure is removed from the key the parts assume their normal position for another operation, the type-wheel returning to its starting-point, which may be at any point in a printing-section thereof.

An inking-pad, W, (see Fig. 5ª,) is hung on the arm W′, pivoted at W^2 to a spoke, W^3, projecting from a hub, W^4, mounted on the standard K of the type-wheel shaft, a spring, W^5, acting on the arm W′ to removably retain the inking-pad in contact with the periphery of the type wheel and to permit of the swinging of the pad outwardly and away from the type-wheel, so that ink may be applied to the pad. The pin W^6 (see dotted lines, Fig. 5ª) projects downwardly from the spoke W^3 into a slot in the fixed standard W^7, mounted at the side of the standard K, so that as the standard K and type-wheel are tilted to the front the pin is retained by the slot, and therefore movement of the inking-pad upon the periphery of the printing-wheel in one direction is secured, and as the said parts are returned to their normal positions a movement in an opposite direction of the pad is secured, whereby the ink is distributed upon the printing-characters.

In the modification illustrated in Figs. 6, 7, and 8 I employ a single segment, and I dispose it and the pinion in line with the direction of the movement of the pinion M and the type-wheel shaft when the type-wheel is inclined to give an impression. Where two segments are employed and arranged at right angles to the direction of the movement bodily of the pinion, there may be more or less lost motion between the pinion and the segments, whereby accuracy and precision in the type-wheel are reduced. Such precision, however, is secured in the modification which I am about to describe.

At the lower end of the pivotally-supported standard K is affixed or projected an arm, K^2, which has a depending stud or shaft, K^3, upon which the segment P is mounted. This segment has projecting from its hub diametrically-opposite arms P′, which are arranged at right angles to the center line of the segment, and these arms are provided with upwardly-projecting pins P^2, which abut against the inclined faces of the cams R and S, and these cams are mounted upon rock-arms R′ and S′, which are mounted upon the key-shaft D′ of the machine. A bail, U, is mounted upon the shaft D′, so as to be movable longitudinally thereon, and so as to embrace the cam-rock arms, or by any suitable mechanical connection with said rock-arms to move them longitudinally upon the shaft and yet permit their oscillation upon the shaft. These functions may be performed in the cam-arms R′ S′ by a key and spline, S^2, Fig. 8. The bail U is an equivalent of the bar U, Fig. 3, and is pivoted upon the shaft D′, and has a depending pin or lug, U^6, which serves to pivotally connect with the bail the lever U^2, which is pivoted at any fixed part of the machine at U^7, so that by oscillating the free end of the lever U^2 the bail and the cams are reciprocated along the shaft, so that the pins Q of the segment-arms P′ shall ride against the different portions of the faces of the cams when said cams occupy different positions upon the shaft. For instance, when said cams are shifted to the left, Fig. 6, the arms P′ will occupy the position indicated by the dotted line P'^x, and the center line of the segment will occupy the position indicated by the dotted line P^x, thus bringing a different printing-field of the type-wheel into operation from that when the parts are in the position shown in full lines of said figure. An opposite reciprocation of the bail and the cams will bring the third printing-field of the type-wheel into position. A double bail, H I, is mounted upon the key-shaft D′, and is projected to the front beneath the key-levers D and extends across the machine under the entire series of key-levers. Each bail H and I also extends upwardly in rear of and across the rock-arms S′ R′, respectively, of the cams, so that as the lower edge of each of the key-levers is notched with relation to the position upon the type-wheel of the character answering to that of the lever a greater or less depression of the front end of the bail H I and a greater or less oscillation of the cam-arms to the front and against the pins is produced, whereby also a greater or less oscillation of the segment P upon its pivot K^3 is produced, and therefore a greater or less oscillation of the type-wheel is effected to bring the desired character to the printing-field. A continuation of the pressure of the key-lever D causes the segment, the arm K^2, the pinion M, and the shaft J^4 to advance to the front of the machine, these parts moving about a center which is the point of pivotal support of the standard K. In this movement of the parts the stop J^6 and the locking-bracket L′ come into action and perform their functions in the manner previously described.

Various modifications of detail will suggest themselves to persons skilled in the construction of type-writing machines. For example, the stop J^6 and bracket L′ may be adjustably secured to the bed A, and thus determine the limit of the tilting movement of the type-wheel, and therefore the force of its impression against the platen.

As indicated in the preliminary clause of this specification, my invention relates and is applicable to all type-writing machines in which the printing-characters are mounted upon the periphery of a wheel or disk, a cylinder or a segment, or any other form of printing device which is mounted pivotally for the purpose of bringing different printing-characters thereon to the printing point. A single cam, as R, may be used to oscillate a segment, P, with an arm, P′ Q, and a spring may serve to return the segment to its normal position.

Speaking of the keys, I use the expression "having varied shapes," by which I mean that the different key-levers have notches differ-

ently located or of different depths, whereby the movements of the double or oppositely-inclined bails are varied in extent when operated by different keys.

No claim is herein made for a type-wheel having a plurality of independent printing-fields and a pinion on its shaft with a segment proportioned to completely rotate the wheel in a complete oscillation of the segment and cams for confining the oscillation of the segment to a portion of its teeth and for oscillating said segment through said portion only. Nor is any claim made for a type-wheel having a plurality of independent printing-fields having a pinion on its shaft and mounted for tilting a segment proportioned to give a complete revolution of the wheel at each complete oscillation of said segment, and cams for presenting a limited portion of said segment for use to partially rotate said wheel, substantially as specified, as these claims appear in a companion application, Serial No. 203,883, filed June 1, 1886.

Having thus described my invention and its operation, what I claim is—

1. In a type-writer of the class specified, the combination, with the type-wheel or its described equivalent, of a series of keys, a pivoted segment, a cam for operating the same, connections between the cam and the keys, and connections between the wheel and segment, substantially as specified.

2. The combination of a type-wheel, its shaft, and a pinion thereon, a pivoted segment, a cam arranged adjacent thereto and movably connected therewith, and a bail connected with the cam and with the keys, substantially as specified.

3. The combination of a type-wheel, shaft, and pinion, an oscillating segment meshing with the pinion, independently-movable cams for oscillating the segment, oppositely-inclined bails for moving the cams, and key-levers for operating the double bail, substantially as specified.

4. In a type-writer, a type-wheel mounted on a shaft, in combination with a pivoted standard for the shaft, oppositely-inclined bails, substantially as described, for raising and lowering the shaft, and a swinging segment and cams for tilting the standard, substantially as specified.

5. The combination, with the type-wheel and its shaft having peripheral grooves, of a standard pivotally supported for tilting and a fixed stop arranged in front in the direction of the movement of the grooved portion of the shaft when tilted, substantially as specified.

6. The combination, with a type-wheel, its grooved shaft, and a locking-wheel mounted thereon, of a fixed stop and locking bracket, and mechanism, substantially as described, for elevating and tilting the shaft, substantially as specified.

7. The combination of a type-wheel having a series of circumferentially-disposed printing-characters on its periphery, its shaft, a pivoted standard for the shaft, a lifting-lever, and a lifting-lever operating-bail, and a series of keys having different shapes to vary the operation of the lifting-lever, substantially as specified.

8. The combination, with a series of keys having varied shapes, of a feed-bail, a lifting-bail, and a printing-character selecting-bail, arranged in the order specified, from the key-shaft, whereby the successive functions indicated are successively performed in the depression of each key, substantially as specified.

9. A compound bail comprising two bails, one portion of one projecting above the adjacent portion of the other, whereby the one portion is adapted to perform an independent function and both portions are adapted to perform conjointly a succeeding independent function, substantially as specified.

10. The combination of a double bail, two independently-movable cams, and a segment for rotating and tilting the type-wheel, and key-levers having adjacent to the double bail notches of varied depths, substantially as described, for communicating motion to the parts specified in varied degrees by single key-levers, substantially as specified.

11. A type-wheel the periphery of which is divided circumferentially into three printing-fields, in combination with oppositely-inclined bails and segments and a pinion mounted on the type-wheel shaft, substantially as described, for bringing either field into operative position and for partially rotating the selected field for the selection of individual printing-characters thereof, substantially as specified.

12. A type-wheel the periphery of which is divided into three printing-fields, each having a plurality of circumferential lines of printing-characters, in combination with double-inclined bails, segments, and a lifting-lever, and a pinion mounted on the type-wheel shaft, substantially as described, for bringing either field into operative position and for elevating said wheel for bringing either line of characters into operation and for partially rotating said wheel to bring either character in either line into operation, substantially as specified.

13. The combination of a type-wheel mounted for tilting and having a pinion on its shaft, a segment for rotating said pinion, a cam for determining the relative position of the segment on the pinion, and mechanism, substantially as described, for moving the cam and for restricting its movement within a limited portion of the face of the cam, comprising a bail operated by a key-lever, substantially as specified.

14. The combination of the type-wheel J, shaft J^4, notched, as at J^5, and carrying locking-wheel L, the pivotally-supported standard K, locking-bracket L′, and shaft-locking lug J^6, substantially as specified.

15. The combination of a tilting type-wheel having a pinion on its shaft, a segment meshing with said pinion, and cams, substantially as described, for oscillating said segment and

for moving it and said pinion bodily for the purpose of tilting said type-wheel, substantially as specified.

16. The combination of a tilting type-wheel having a pinion and locking-wheel on its shaft, a segment for operating said pinion, cams for operating said segment, bails for operating said cams, a locking-bracket, and a series of keys, each different from the other in configuration at points which come in contact with said bails, substantially as specified.

17. The combination of a type-wheel, a series of key-levers of varied outline, a lifting-bail, and a compound bail, one portion of which varies in outline from the other portion thereof and each portion having a projecting arm, a pair of cams adjacent to said arms and adjacent to the type-wheel-operating segments, and a lifting-lever adjacent to the lifting-bail and arranged to come in contact with the shaft of the type-wheel, substantially as specified.

18. The combination of the type-wheel J, the pivoted standard K, the fixed slotted standard W^7, and the inker-arm W^3, provided with the pin W^6 and carrying an inking-pad, W, pivotally mounted on the arm, substantially as specified.

19. The combination of the pivotally-supported standard K, the type-wheel J, the shaft J^4, notched or grooved, as at J^5, and the fixed stud J^6, substantially as specified.

20. The combination, with the carriage and platen C, the former provided with the rack-bar C′, of the rock-shaft E^2, carrying the feed and check pawls, connecting-rod E′, the feed-bail E, the keys D, the lifting-bail F, the lifting-lever F^2, the compound bail H I, having arms H^3 I^3, the cams R S, the segments O P, the pinion M, the shaft J^4, standard K, and the type-wheel J, substantially as specified.

21. The combination of the shaft D′, the keys mounted thereon, the compound bail H I, having arms H^3 I^3, the cams R S, segments O P, having the pins Q, and the reciprocating bar U, substantially as specified.

22. The combination of the type-shaft, wheel J^4, pinion M, segments O P, cams R S, bar U, having projection U^4, detent U^5, and lever U^2, substantially as specified.

23. The combination, in a type-writer, of two bails arranged one within the other and one projecting above the other at the ends, substantially as specified.

24. The combination of two bails, one arranged within and projecting above the other at one end and having an irregular outline, with a series of keys having an irregular outline proportioned to that of the bails, substantially as specified.

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

CHARLES SPIRO.

Witnesses:
JULIUS E. LEVY,
A. BARONN.