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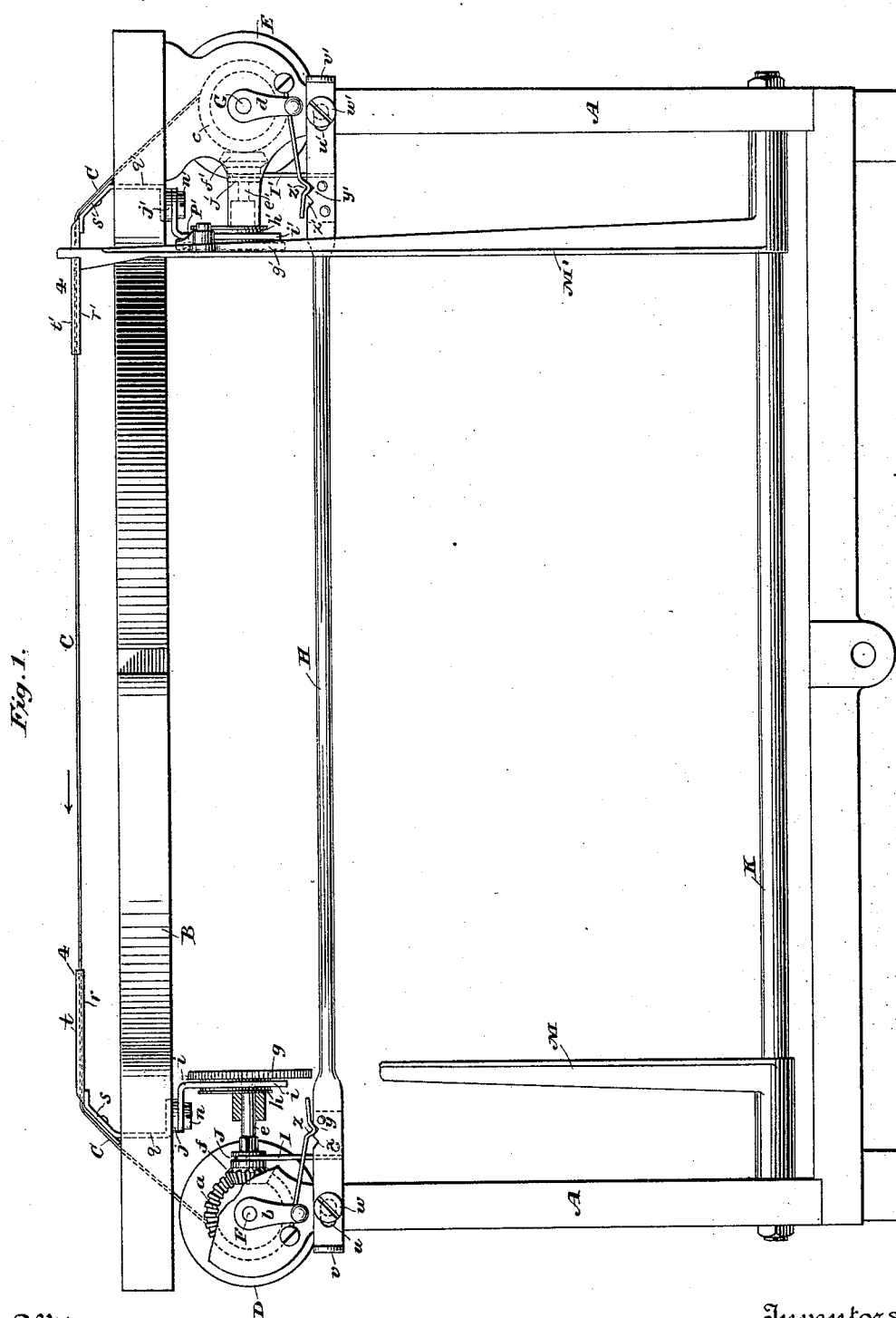
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J. M. FAIRFIELD & G. I. FRANCIS.

TYPE WRITING MACHINE.

No. 420,870.

Patented Feb. 4, 1890.



Witnesses  
Geo. W. Brock.  
Edward Thorpe.

Inventors  
John M. Fairfield and  
Graham I. Francis  
By their Attorney  
Jacob Felbel.

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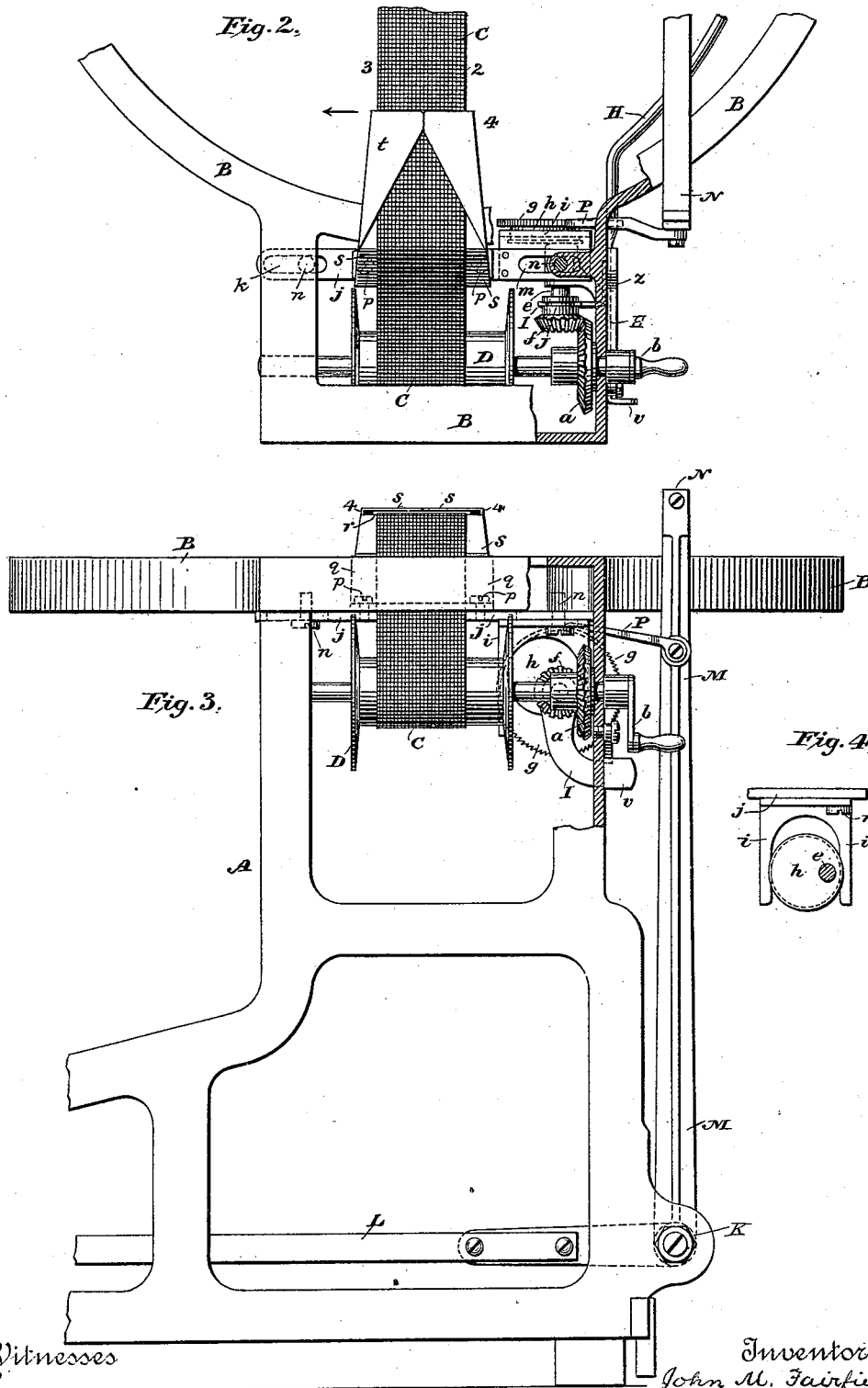
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# UNITED STATES PATENT OFFICE.

JOHN M. FAIRFIELD AND GRAHAM I. FRANCIS, OF HARTFORD, CONNECTICUT, ASSIGNORS TO THE AMERICAN WRITING MACHINE COMPANY, OF SAME PLACE.

## TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 420,870, dated February 4, 1890.

Application filed March 22, 1889. Serial No. 304,307. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN M. FAIRFIELD and GRAHAM I. FRANCIS, the former a citizen of the United States, and the latter a subject of the Queen of England, and both residents of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

Our improvements in type-writing machines relate particularly to what is known as the "ribbon movement," and have for their main objects the provision of simple and efficient means for feeding the ribbon both longitudinally and transversely in order that the entire surface of the ribbon may be utilized.

To these ends our invention consists in the features of construction and combinations of devices, hereinafter more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a rear sectional elevation of a type-writing machine embodying our invention. Fig. 2 is a partial plan view of the same with a portion of the frame-work broken away for the sake of clearness. Fig. 3 is an elevation taken at the right-hand side of the machine, a portion of the frame being broken away. Fig. 4 is a detail view of a portion of the means for effecting the transverse movements of the inking-ribbon.

In the several views the same part will be found designated by the same letter or numeral of reference.

We have shown our invention embodied in that construction of machine known as the "Caligraph;" but it will be understood that it may be used in other forms or constructions of machines with equal advantage.

A represents the frame-work of the machine, B the top plate or type-ring, and C the inking-ribbon, connected at one end to a spool or roller D and at its other end to a spool or roller E. The spools are keyed or otherwise secured upon their respective shafts F and

G, which are transversely arranged and mounted or suitably journaled to rotate in the frame-work.

Upon the shaft F is fixed a bevel-gear *a* and a crank *b*, and upon the shaft G a similar gear *c* and crank *d*.

*e* designates a short longitudinally-arranged shaft, and *f* a bevel-pinion sleeved or splined at the outer end thereof, adapted to slide axially of the shaft and to mesh with the gear *a*. At the inner end of said shaft *e* is secured a toothed or ratchet wheel *g* and a cam or eccentric *h*, straddled by a bifurcated arm or strap *i*, depending from a plate, bar, or rod *j*, adapted to be reciprocated by the eccentric *h*. The plate or bar *j* is slotted at each end, as seen at *k* and *m*, and is supported in working position by the heads of two screws *n n*, the points or shanks of which pass up through the slots *k* and *m* and enter tapped holes in the frame-work A.

Fastened to the bar *j*, preferably by screws *p*, is a ribbon support and guide composed, preferably, of a vertical portion *q*, a horizontal portion *r*, and an intermediate inclined portion *s*, arranged in a direction about tangential of the spool D. The horizontal portion of the device is made tubular, preferably by bending over and down two ears or wings *t t*.

On the opposite or left-hand side of the machine there is a duplication of parts.

*e'* is a short shaft or stud bearing at its outer end a longitudinally-movable bevel-pinion *f*, adapted to engage with the gear *c*, and provided at its inner end with a ratchet-wheel *g'* and an eccentric *h'*, working within a frame or forked arm *i'*, extending down from a reciprocating bar *j'*, which is slotted and supported in exactly the same way that the bar *j* is. To said cross-bar *j'* is connected a ribbon support and guide similar in construction and arrangement to the one at the right of the machine and just above described, and consisting of a vertical portion *q'*, a horizontal portion *r'*, and an intermediate inclined portion *s'*, the horizontal portion being made tubular by wings *t'* after the fashion

of the corresponding portion at the right-hand side of the machine.

H designates a switch-bar provided with elongated holes  $u$  and  $u'$  and with lugs or finger-pieces  $v$  and  $v'$  at opposite ends, screws  $w$   $w'$  passing through said holes into the frame-work A to support and limit the movement of the switch. The upper edge of the switch-bar is notched at  $x$   $y$  and  $x'$   $y'$  to receive the bent free end of springs  $z$   $z'$ , attached to the frame-work.

Near one end of the switch-bar is an upwardly-projecting yoke I, engaging with a collar or hub J, connected to the gear  $f$ , and near the other end of said switch is another similar yoke I', engaging with a like collar or hub J', connected to or formed integral with the gear  $f'$ , said yokes being provided to simultaneously move the gears  $f$  and  $f'$  upon their shafts or axles whenever the switch-bar is operated, in order to effect an engagement or disengagement of said gears with their fellow gears  $a$  and  $c$ , the arrangement being such that when the gear  $f$  is in mesh with the gear  $a$  the gear  $f'$  is out of engagement with the gear  $c$ .

K designates a rock-shaft, to which is connected the universal bar L, that, as usual, effects an oscillation of the shaft K every time the space-key or any of the character finger-keys is depressed or actuated. To this rock-shaft near opposite ends are connected upright arms M M', preferably joined at their upper extremities by a bar N. Pivoted to each of said arms is a driving pawl or finger P, engaging with the ratchet-wheels  $g$  and  $g'$  in a manner to partially rotate the same at each forward vibration of the arms M M'. The ribbon, connecting at one end with the spool D, passes up over the incline portion  $s$ , then horizontally through the tubular portion  $r$   $t$ , thence across the machine through the tubular portion  $r'$   $t'$ , and down the incline  $s'$  to the spool E.

The following description will suffice to enable those skilled in the art to understand the operation of the machine. As shown, the pinion  $f$  is in engagement with the gear  $a$  and the pinion  $f'$  at the left out of engagement with the gear  $c$ , and the spring dog or check  $z$  is in the notch or depression  $y$  and the check  $z'$  in the notch  $y'$ , thus maintaining the switch H in position and insuring the described relation of the gears and pinions  $a$   $f$  and  $c$   $f'$ . At each oscillation of the rock-shaft and forward movement of the arms M and M' the pawls on fingers P rotate the ratchet-wheels  $g$  and  $g'$  the distance of one tooth, thus partially rotating the pinions  $f$   $f'$  and the eccentrics  $h$   $h'$ . The pinion  $f$ , being in mesh with the gear  $a$ , turns it a portion of a full revolution, as well as the shaft F and spool D, thus winding the ribbon C in the direction of the arrow onto the spool D and unwinding it from the spool E, which may now turn freely, owing to the disengagement of the gears  $c$  and  $f'$ . While the gears are

drawing or feeding the ribbon longitudinally, the eccentrics  $h$   $h'$  and their connections are feeding or moving the ribbon laterally or transversely. Thus the ribbon is wound spirally upon the spool, which is made sufficiently long for this purpose.

Referring particularly to Figs. 2 and 3, it will be seen that the ribbon is adapted to be gradually moved laterally toward the front of the machine or in the direction of the arrow. When the rear edge 2 of the ribbon has been moved over to or near the plane of the printing or impression point at the center of the type-ring B, the eccentrics begin their return movements and draw the ribbon rearwardly until its front edge 3 arrives at or near the plane of the printing-point, the revolutions of the eccentrics thus effecting continually a to-and-fro lateral movement of the ribbon during the operation of the machine. The eccentrics operate upon the ribbon through the intermediate connections described, the straps or forks  $i$  and  $i'$  of the eccentrics actuating the bars  $j$  and  $j'$  and the ribbon supports and guides or carriers with a sliding back-and-forth movement, the bars being guided and supported by the screws  $n$  in the slotted ends of the bars.

The beds or table-surfaces  $r$   $r'$  serve to support, guide, and give direction to the ink-ribbon.

By providing the wings or covers  $t$   $t'$  vertical flanges or stops 4 are formed on the beds  $r$   $r'$ , which maintain the ribbon in proper relation to the beds, and a sort of flat tubular structure is also thus formed to prevent the formation of wrinkles or folds in the ribbon. The beds and their wings preferably taper, as shown, to facilitate the feed of the ribbon and the removal of any folds or creases which may be made in the ribbon.

When the ribbon has been wholly unwound from the spool E and has filled the spool D, the direction of travel of the ribbon may be reversed by moving the switch H toward the left until the checks  $z$   $z'$  engage, respectively, with the notches  $x$   $x'$ . In this manipulation of the switch the yoke I moves the pinion  $f$  out of engagement with the gear  $a$  and the yoke I' shifts the pinion  $f'$  into engagement with the gear  $c$ . As the operation of the machine is continued the ribbon will now unwind from the spool D and wind spirally upon the spool E by reason of the lateral movements given it by the eccentrics  $h$   $h'$  and the longitudinal movements afforded by the gears  $c$  and  $f'$ .

On account of the step-by-step feeding the ribbon both longitudinally and transversely its surface is used in oblique or zig-zag lines for practically its whole width and length, thus not only utilizing the entire surface of the ribbon, which is a great desideratum, but rendering it possible to use the machine for a very much greater length of time before it becomes necessary to shift the direction of movement of the ribbon; or, in

other words, by thus feeding the ribbon it will take much longer to wind it from one spool to another.

In order to insure that the ribbon in traveling in the reverse direction shall not travel at the printing-point in exactly the same lines that it previously did, just before the switching is effected the empty spool may be turned slightly by means of its crank. This will move the ribbon lengthwise a short distance and bring a fresh field or portion into use. The cranks may also be used for moving the ribbon rapidly onto either spool, so that the ribbon may be detached and a new one substituted.

Instead of having the spools long and immovable upon their shafts, they may be made short and arranged to slide upon their shafts by any suitable connections with the bars  $j$  and  $j'$ .

The guides and supports form carriers for conveying the ribbon back and forth in the direction of its width, and these carriers, it will be evident, may be greatly changed in detail construction without departing from the spirit of our invention.

It will be apparent that in lieu of mounting the bevel-pinions  $f$  and  $f'$  to slide upon the counter-shafts  $e$  and  $e'$  they may be made fast thereon, that the shafts, with their eccentrics and ratchet-wheels, may be moved or shifted all together, in which event the faces or peripheries of the eccentrics and the ratchet-wheels and the ends of the driving-pawls may be made sufficiently wide or broad to maintain them always in operative connection. Preferably both carriers move step by step and in unison.

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

1. The combination of a ribbon, a sliding ribbon-carrier adapted to move the ribbon widthwise, an eccentric for operating said sliding carrier, and a step-by-step rotatory spool mounted in the main frame independently of said carrier and adapted to move the ribbon lengthwise.

2. The combination of a pair of spools, a ribbon connected thereto, means for rotating said spools step by step and thus moving the ribbon lengthwise, a pair of ribbon-carriers, and a pair of eccentrics for reciprocating said carriers and thus moving the ribbon widthwise, the combination being such that the spools are rotated and the carriers reciprocated at the same time, whereby the ribbon is moved simultaneously both longitudinally and transversely.

3. The combination of a pair of spools, a ribbon connected to the same, gears for rotating said spools, ratchet-wheels and driving-pawls for actuating said gears, a pair of ribbon-carriers, and a pair of eccentrics for reciprocating said carriers.

4. The combination of a pair of spool-shafts, a spool mounted on each shaft to rotate therewith, a gear secured to each shaft, a pair of counter-shafts, a gear mounted loosely on each counter-shaft and arranged to slide axially thereof, and a switch for moving the counter-shaft gears.

5. The combination of a pair of spool-shafts, a spool and a gear mounted on each shaft, a pair of counter-shafts, a gear and an eccentric on each counter-shaft, a ribbon, and a pair of ribbon-carriers.

6. The combination of a pair of spool-shafts, a spool and a gear mounted on each shaft, a pair of counter-shafts, a gear, an eccentric, and a ratchet-wheel on each counter-shaft, a pair of driving-pawls, a ribbon, and a pair of ribbon-carriers.

7. The combination of a pair of shafts having a step-by-step rotary motion, a pair of eccentrics attached one to each shaft, a pair of bars or plates adapted to be reciprocated by said eccentrics, and a pair of ribbon guides and supports attached to said bars or plates and adapted to move therewith and carry the inking-ribbon in a transverse horizontal plane.

8. The combination of a pair of reciprocatory bars or plates, a ribbon, and a pair of tapering tubular ribbon guides and supports.

9. The combination of a pair of ribbon-spools, a ribbon, a pair of ribbon-carriers, and means for simultaneously rotating said spools and reciprocating said carriers, whereby the ribbon is moved mechanically both longitudinally and transversely in its travel across the machine.

10. The combination of a ribbon, a ribbon-carrier, a transverse bar or plate supporting the ribbon-carrier and provided with a depending strap or fork, a shaft provided with an eccentric for sliding back and forth said bar or plate and said ribbon-carrier, a ratchet-wheel on said shaft, and a pawl for driving said ratchet-wheel and shaft.

11. The combination of a ribbon, a ribbon-spool, a spool-shaft, a gear on said shaft, a counter-shaft provided with a gear and an eccentric, means for rotating the counter-shaft and the spool-shaft, and a ribbon-carrier adapted to be actuated by said eccentric, whereby the ribbon is fed both longitudinally and transversely.

Signed at Hartford, in the county of Hartford and State of Connecticut, this 12th day of March, A. D. 1889.

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GRAHAM I. FRANCIS.

Witnesses:

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