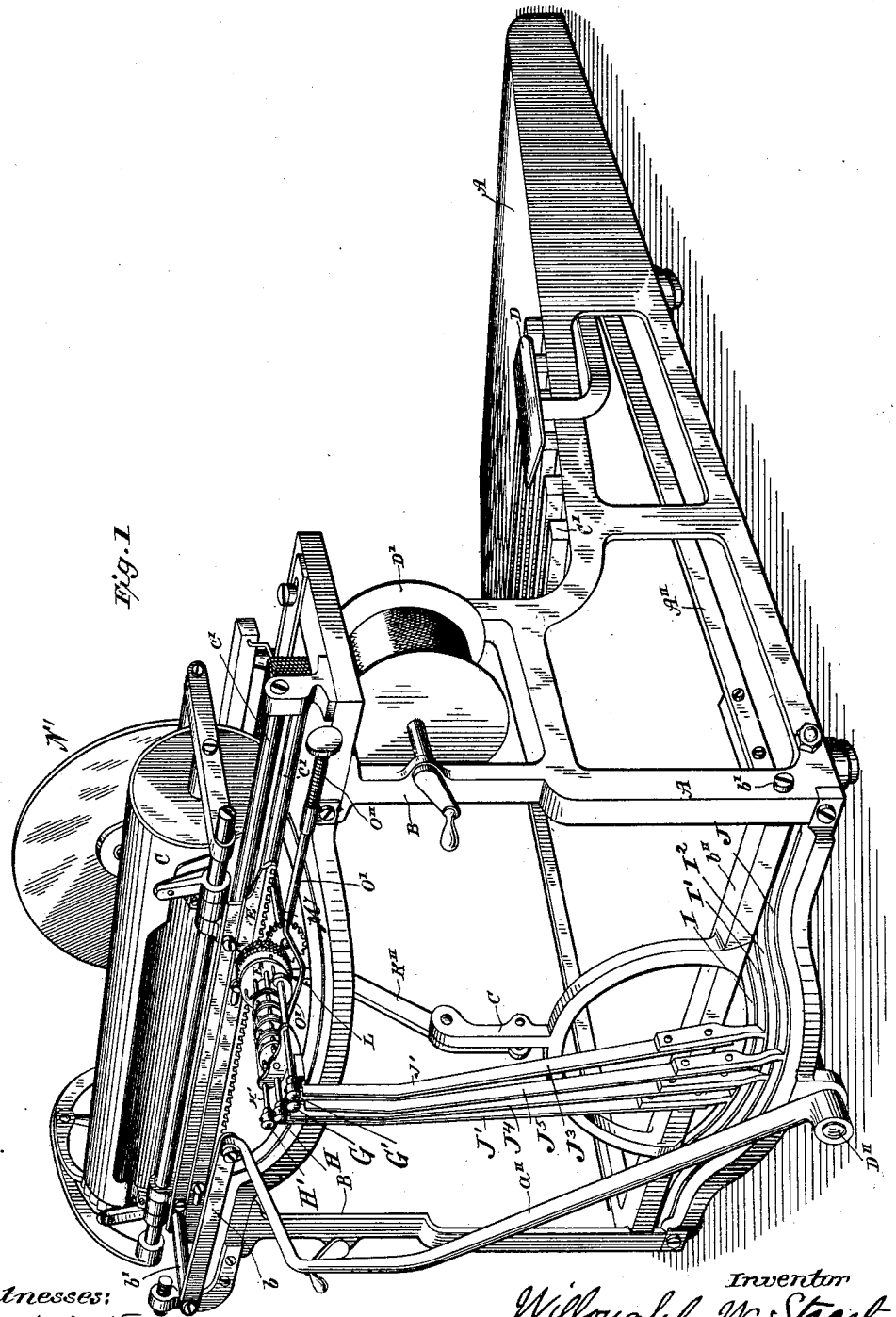
(No Model.) 5 Sheets—Sheet 1.

W. W. STREET.

TYPE WRITING MACHINE.

No. 480,677. Patented Aug. 9, 1892.

Fig. 1.



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(No Model.) 5 Sheets—Sheet 2.

W. W. STREET.

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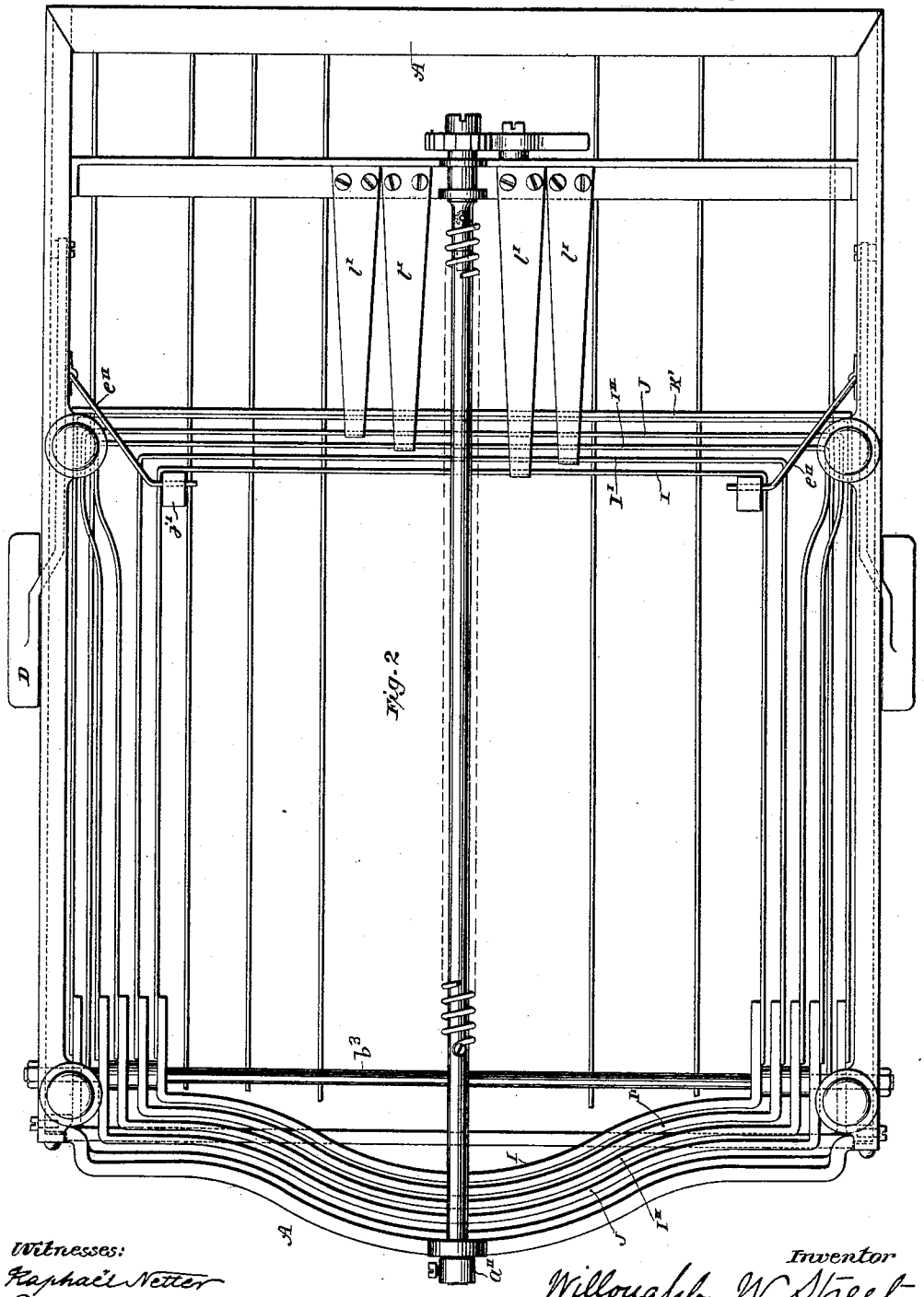

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(No Model.) 5 Sheets—Sheet 3.

W. W. STREET.

TYPE WRITING MACHINE.

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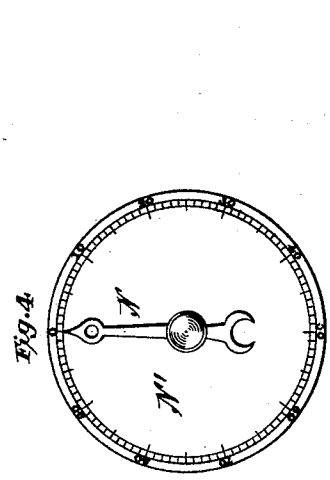

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(No Model.) 5 Sheets—Sheet 4.

W. W. STREET.

TYPE WRITING MACHINE.

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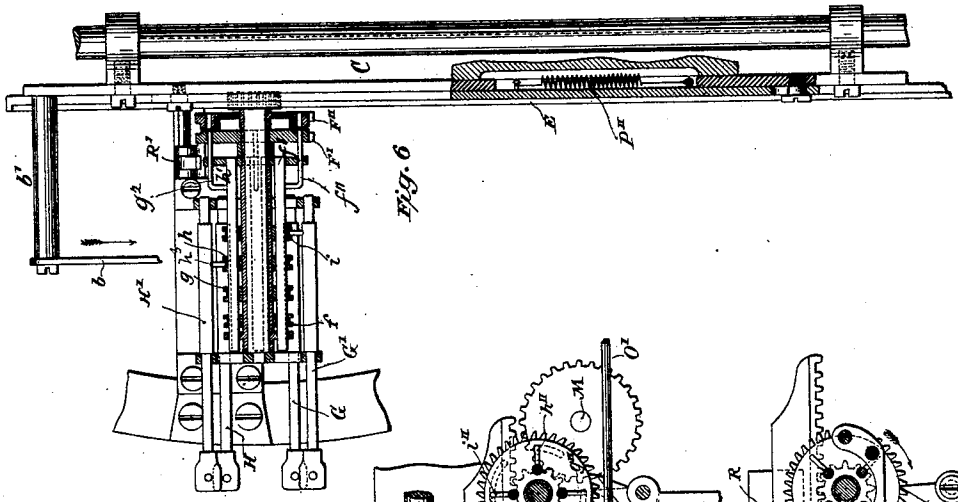

Fig. 6

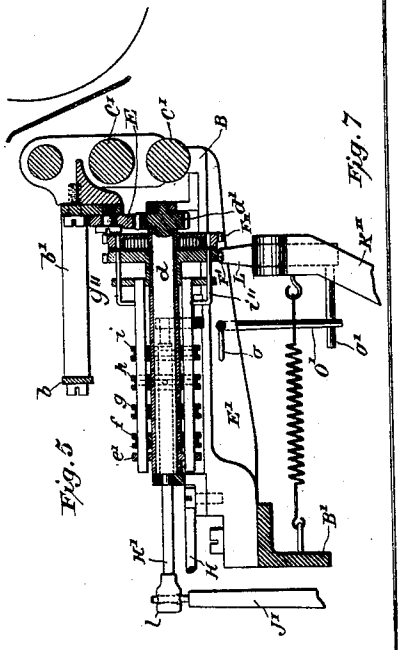

Fig. 5

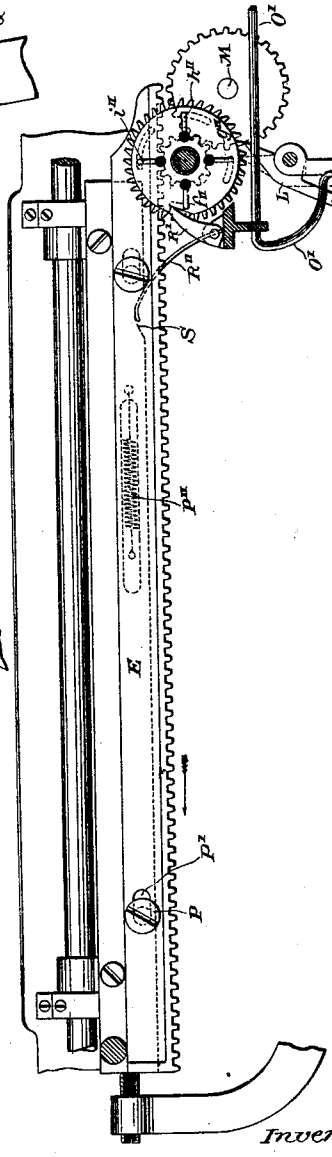

Fig. 7

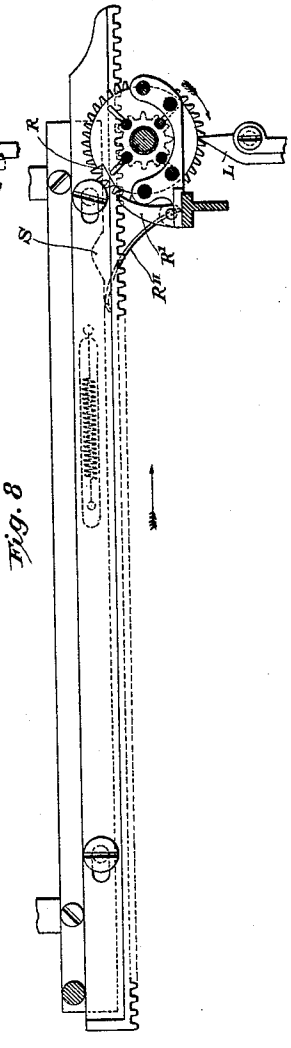

Fig. 8

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(No Model.) 5 Sheets—Sheet 5.

W. W. STREET.

TYPE WRITING MACHINE.

No. 480,677. Patented Aug. 9, 1892.

Fig. 10

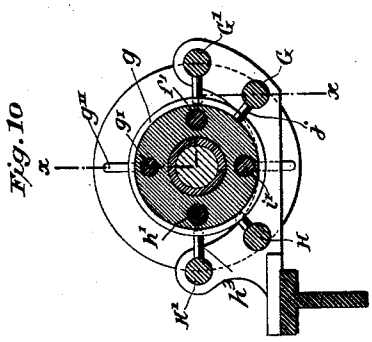


Fig. 13

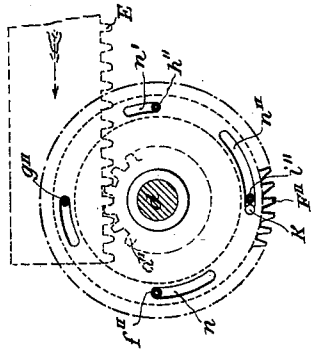


Fig. 9

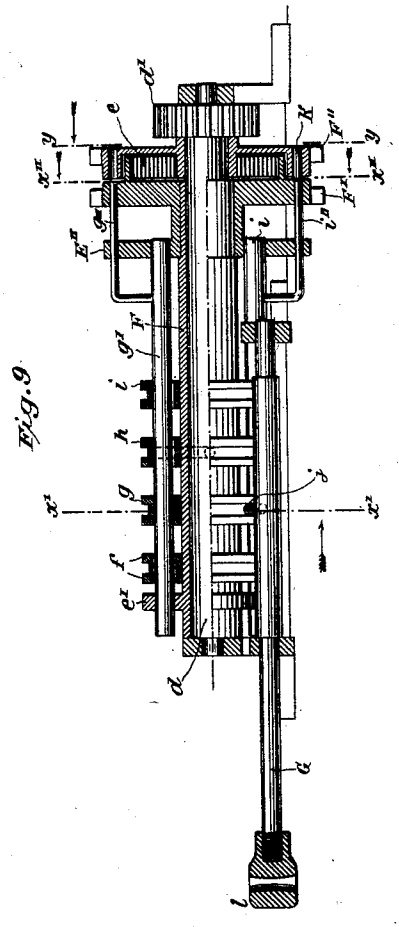


Fig. 12

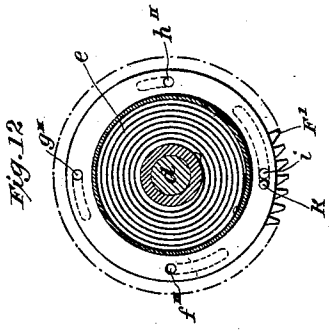
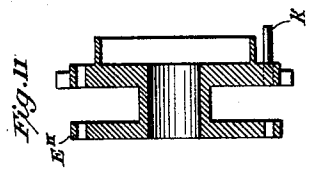


Fig. 11



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UNITED STATES PATENT OFFICE.

WILLOUGHBY W. STREET, OF SPRINGFIELD, MASSACHUSETTS.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 480,677, dated August 9, 1892.

Application filed October 8, 1890. Renewed July 5, 1892. Serial No. 439,051. (No model.)

To all whom it may concern:

Be it known that I, WILLOUGHBY W. STREET, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

Primarily the object of this invention is to provide means for facilitating the justification of lines of print produced by the successive impression of type-dies into a yielding material employed in making a matrix from which to cast stereotype-plates. The purpose of the invention in this respect will be more readily understood from a brief statement of the conditions that obtain in the art of matrix-making on the plan above referred to.

Matrix-making machines are now in use in which the dies are cut or conformed to a certain scale or system known as the "unit system," in which each die is a multiple of a predetermined space-unit. By means of keys or other suitable character-selecting devices the dies are successively impressed into cardboard or other material to form the matrix from which the stereotype-plates are cast. The impression of any die is accompanied by a feed movement of a carriage, upon which is placed the matrix material, the extent of feed being in every instance in exact accordance with the number of space-units accorded in the system to the letter or character impressed. Thus while in a line of impressions each character will occupy its proper relative position and the several characters and words will be properly and systematically spaced it is still desirable that the final character of each line should occupy the last space in such line—in other words, that each line should be perfectly justified. Where the lines are produced by successive impressions of the dies, it is obviously a matter of no little difficulty to justify them either by the eye or by counting the remaining units of space when a line is nearly completed and throwing in the extra units between words and letters toward the ends of such lines. Several plans or methods of justifying have accordingly been resorted to. For instance, the copy is prepared on a type-writing machine, the lines measured, and the extra units of space, which it is necessary to throw in for proper justification, noted at the end of each line, so that the operator of the matrix-making machine, observing at a glance the number of space-units to be allowed for in any given line, may throw them in between any of the words in that line. It has also been proposed to employ an index or scale having divisions corresponding to the space-units in the lines to be printed and a pointer moving over the scale and arranged to be moved by variable feed mechanism over any number of divisions up to that corresponding to the maximum number of space-units for any character used in printing. The operation of the feed devices which move the pointer is dependent upon the closing of independent electric circuits controlled by the keys of a type-writing machine, the connection between the keys and the circuits being such that each key when depressed produces a movement of the pointer through that number of space-units which the character corresponding to such key occupies in print. When the pointer by its position on the scale shows that the type-written characters in a line will exactly fill a printed line or that the number of space-units remaining is not sufficient for another word or syllable, the operator begins a new line, noting at the end of the finished line the extra space-units, if any, indicated by the pointer. From copy thus prepared the matrix-lines may be easily justified, the extra spaces being distributed through the line either by hand or by automatic devices which have been devised for this purpose. Such an apparatus, on account of the necessary complication of the type-writing machine and the large number of circuit connections and electrical contacts required, is very apt to get out of order and is at best uncertain in its action. The necessity of devising some more practicable substitute for this apparatus led to the invention, the subject of my present application.

The improvements contemplate, chiefly, a purely mechanical apparatus for accomplishing the same result, and also the employment of means by which the carriage of the type-writing machine shall be subject to a variable feed, so that to each character will be given the same number of space-units as are

necessary for the corresponding characters in print. The operator preparing copy by such an apparatus need therefore observe only the position of the carriage of the machine in order to properly fill out the lines, as in the ordinary use of the machine, and when a type-written line is as complete as the number of spaces will allow the number of extra space-units or those remaining at the end of a line will be indicated on an index-dial and a pointer similar to that above referred to.

My invention resides in a combination of devices that constitutes an attachment to a type-writing machine and which with suitable modification in detail may be applied to several forms of type-writing machines, being in effect a feed-controlling mechanism intermediate to the character-keys and the carriage, which permits or imparts to said carriage certain feed movements whenever a key is depressed, the extent of such feed being dependent upon the particular key depressed and determined by the number of space-units which in regular print is accorded to the character corresponding to such key.

The improvements also include an index and a traveling pointer moving in exact accord with the feed of the carriage to show the number of space-units traversed by said carriage at any given point in a line of copy.

I have shown my invention as adapted and applied to a well-known form of type-writing machine known as a "Caligraph," and I now refer to the drawings for a description of the same.

Figure 1 is a perspective view of the frame and portions of the mechanism of a type-writing machine to which my invention is applied. Fig. 2 is a plan view of the under side of such a machine. Fig. 3 is a view, partly in section and partly in side elevation, of Fig. 1. Fig. 4 is a face view of the indicator-dial and pointer. Fig. 5 is a detached view, partly in section and partly in side elevation, of a detail of the feed mechanism. Fig. 6 is a similar view of these parts, looking down on the machine. Fig. 7 is a rear view in elevation of the carriage and portions of the feed mechanism. Fig. 8 is a similar view of the same in a different position. Fig. 9 is an enlarged sectional view of a portion of Fig. 5, taken on the line $x\,x$ of Fig. 10. Fig. 10 is a section on the line $x'\,x'$ of Fig. 9, looking toward the right. Fig. 11 is a central section of a part of Fig. 9 detached. Fig. 12 is a vertical section on line $x''\,x''$ of Fig. 9, looking toward the left; and Fig. 13 is a section on line $y\,y$ of Fig. 9 and looking toward the left.

For the sake of clearness very many of the parts which go to make up a complete type-writing machine are omitted from the drawings, only such parts being shown as are necessary to an understanding of the invention.

The general character of the machine will be understood by reference to Figs. 1, 2, and 3.

A is the rigid framework of a type-writing machine now known in the market as a "Caligraph." In the lower part of this frame the key-levers, as A′, and the spacer bars or levers A″ are supported horizontally. The upright part B of the frame carries a circular support B′, to which the type-levers B″ are pivoted, and provides a bed upon which the carriage, with its paper-roller C and appurtenances, slides.

C′ are the bars through which work the character-keys C″, pivoted to the key-levers A′. These levers are connected with the type-levers B″ by rods a.

D are the spacer-keys connected with the bars A″.

D′ is one of the two reels for the inking-ribbon.

Under the machine is a horizontal shaft D″, around which is a spiral spring a'. To the rear end of the shaft D″ is fixed an arm a'', connected by a link b to a stud b' on the carriage. By these devices the tension is applied that moves the carriage along its bed when released by the spacing or key lever. In these machines as ordinarily constructed the spacer-levers A″ are rigidly connected with a rock-shaft b'', carrying an arm c, provided with a pivoted pawl at its end that engages with the rack or racks on the carriage. Whenever a spacing or character key is depressed, the carriage is released and allowed to move through the space of one tooth of the rack, when it is again engaged by the pawl. I substitute for this means of locking and releasing the carriage other means, which I shall now describe.

To the carriage, which comprises all the parts moving on the two guide-rods $c'\,c'$, I secure a rack-bar E, which for the present may be considered as rigidly secured to the same. The teeth of this rack should be cut with exactness, the space between each being equal to the unit-space selected for the machine. On a support E′, (see Fig. 5,) which is secured to the parts B B′ of the frame of the machine, is mounted a shaft d, carrying a pinion d', that meshes with the rack E.

F is a sleeve that surrounds and turns freely upon the shaft d. A wheel, which is preferably formed with a deep groove, or a reel is secured to the sleeve F, and one part or end of this reel is a ratchet-wheel F′. By the side of wheel F′ is a ratchet-wheel F″, fixed to shaft d and of the same diameter as wheel F′ and having the same number of teeth. The wheels F′ F″ are connected by a coiled spring e, one end of which is connected with the hub of wheel F″ and the other to the wheel F′ near its periphery.

Four disks or wheels $f\,g\,h\,i$, with grooves in their peripheries, are mounted at short distances apart on the sleeve F and are loose thereon. To each of these disks is secured a rod, as f', to disk $f\,g'$, to disk g, and so on, each rod being arranged to slide in bearings in a flange e' on the sleeve and in the end E″ of the reel, respectively, and passing freely

through all the disks, except the one to which it is connected. Each rod f' g', &c., is provided with a parallel extension or arm f'' g'', &c., passing through the two parts or ends E'' F' of the reel, and opposite to the openings in the wheel F' are slots in the wheel F'', into which the arms f'' g'', &c., pass if the rods carrying them are moved forward.

With the four disks f g, &c., are associated four rods G G' H H', mounted to slide in stationary guides parallel to the axis of the shaft d. Each of the said rods engages with one of the disks by means of a pin j, set in the rod and entering the groove in the disk.

The four slots in wheel F'' are of different lengths, as will be described, and a pin k, set in the face of the wheel F', extends permanently through the longest slot, which is also in position to receive the end of arm i.

Referring now to Figs. 1, 2, and 3, the spacer-bars A'', which are rigidly connected to the rock-shaft b'', are joined at the front of the machine by the cross-bar k', which lies under all the keys, so that the depression of any key encounters and forces down the cross-bar and turns the rock-shaft b''. The arm or bracket c on the rock-shaft b'' carries at its end a pawl L, that normally engages with the teeth of the ratchet-wheel F'. This pawl is pivoted to the end of an extension k'' of the arm, as shown in Figs. 5 and 8, and while in engagement with wheel F' locks against movement the wheel F'', engaging with the wheel F' by the pin k, the pinion d', and the rack and carriage. In addition to the spacer-bars A'' and the cross-bar k', which appear in all machines of this class, I mount on the shaft b^3, but loosely thereon, the four-sided frames I I' I'' J, which constitute the differential spacer bars or frames. These frames are similar to the regular spacer-levers A'', so far as their relation to the keys is concerned; but the sides beyond or back of the rock-shaft b'' are rounded or curved, as shown in Fig. 1, in order to afford space for four rigid arms J', J^3, J^4, and J^5, which extend upward therefrom and which are joined with the ends of the sliding bars H' G H G', respectively, by a pivotal or yielding connection, such as shown—that is to say, the end of the arm J' is reduced in size and works in a perforation in a head l on the end of the bar H' and the other arms J^3, &c., are connected in the same manner to their respective bars. Flat springs l', secured at one end to the frame A and at the other to each of the differential spacer-frames, maintain or assist in maintaining all of these bars in their normal position, with their forward ends raised and with the sliding bars G H, &c., drawn out to their fullest extent by the arms J', J^3, J^4, and J^5. The usual spiral spring l', connected to the frame B' and the arm or extension k'', serves to maintain the pawl L in engagement with the teeth of wheel F', and the usual spring-blades m, connected to each key-bar A', bear upon a fixed part of the frame A.

All the key-bars A' are in contact with or very close to the cross-bar k' of the spacer-levers A''. In addition to this, each bar, except such as correspond to characters that require six units of space in printing, carries a pin m', of which four are seen in Fig. 3. All the key-bars of letters or characters requiring two units of space have their pins in such positions as to rest on or encounter in the downward movement of the bars the two-unit spacer-frame, which in this machine is designated by the letter I. In a similar manner keys for three-unit characters are arranged to depress the frame I' and those for four and for five units the frames I'' and J, respectively. The spacer-keys D are provided with bent wires e'', that rest in hooks j', depending from the two unit-frame I, and when depressed encounter projections m'' on the cross-bar k' of the ordinary spacer-bars A''.

I will now explain the action of the devices or parts above described. Let any key be depressed to print a character, which may be assumed to be a two-unit letter. The depression of the key and key-bar or lever A' depresses the forward ends of the spacer-levers A'' and the two-unit frame I. The movement of the former carries the pawl L out of engagement with the wheel F' and into engagement with the wheel F''. At the same time the movement of the frame I moves forward the sliding bar H', and this latter, engaging with disk h by means of the pin h^3, which enters the groove in its periphery, moves said disk forward, carrying the arm h'' on rod h' through the wheel F' into the slot n' in the wheel F''. The wheel F' and all the parts connected with it—viz., the sleeve F, the disks f g &c., and bars f' g', &c.—being thus released, while the shaft d and wheel F'' are locked by the pawl L, will be turned by the action of the spring e until the end of the extension or arm h'' encounters the end of the slot n', or when, in other words, it has moved through a space of two teeth or unit-spaces, the position and length of slot n' being determined to permit exactly this movement. The carriage, meanwhile, has not moved and the character corresponding to the key depressed has been printed. Then when the key is released and rises the pawl L shifts from the wheel F'' to the wheel F' and the extension or arm h'' is withdrawn from the slot n'. This releases the wheel F'' to the action of the tension of the rack-bar, which turns it through the pinion d' from the position in which it was released to the position in which the pin k comes to the end of the slot n', a movement which is obviously equal to two units of space. In a similar manner, if a four-unit letter be printed the four-unit spacer-frame, as I'', moves forward the bar G', disk g, bar g', and extension g'', which, entering slot n, permits a movement of the rack and carriage through four units of space. It may be remarked here that there is no spacer-frame for one unit, as that space is smaller than any character used

and is employed only in justification. It will also be understood that since the six-unit space is the greatest ever required, that the stop *k* that limits the movement of the wheel F″ when this space is desired may be fixed to wheel F′ and always extend through the long slot *n″*. This being the case, the five-unit stop *i* may also be made to enter slot *n″* in advance of the fixed stop *k* when a five-unit movement is to be imparted to the carriage. The keys and key-levers of such characters as require six space-units do not encounter any of the differential spacer-levers, but depress only the spacer-bars A″. It is obvious that the wheel F′ will move when thus released until the pin *k* has traversed the entire length of the slot *n″* and that the corresponding movement of the rack after the key is released will be through a space of six units. The spacer-keys D, through their connection *e* with the two-unit lever, it will now be understood, move the carriage two units of space at each depression. Mounted in fixed bearings in the frame of the machine is a shaft M, gearing with the pinion *d′* on shaft *d*. By means of suitable bevel-gears M′ the movements of this shaft, which of course are proportioned to the movement of the carriage, are imparted to a spindle M″, that carries a pointer N, that sweeps over an index-plate N′. This latter is marked off in divisions, each one of which corresponds to one space-unit, and the position of the pointer on the scale shows at all times the total number of space-units traversed by the carriage from its normal position of rest at the beginning of a line. The bar O, that in the ordinary Caligraph is used to disengage the ratchet from the carriage-racks, I have modified in the following particulars: The said bar or rod carries at its end a bent wire O′, that slides through the stationary bracket or part of the frame E′. In order to prevent this wire from turning, an arm *o* is attached to it and bent back at right angles and made to slide in a small hole in the part E′, as shown in Fig. 5. The end of the wire O′ is bent into a hook which engages with a pin *o′*, extending out from the pawl L. When the bar O is pushed in against the spiral spring O″, the lower end of the pawl L is moved away from the extension *k″*, to which the pawl is pivoted, and the pawl turned out of engagement with the wheel F′. This permits the carriage to be moved freely back and forth on its guides or ways.

I have heretofore described the rack-bar E as rigidly secured to the carriage. In practice, however, I have found that while such a construction is suited for slow work or small spacing in rapid work it does not insure certainty of the proper feed for all spaces in rapid work, owing to the inertia of the carriage and the very short period of time which is allowed for the feed or movement between the release of one key and the depression of another. This difficulty I have avoided in the following way: The rack E is secured to the carriage by screws P, which pass through slots P′ in the rack, so that there is a certain play or lost motion between the carriage and the rack. This is taken up by a spiral spring P′, which is secured to the rack at one end and to the carriage at the other, as shown in Fig. 6, the tension being applied through the arm *b′* to the carriage. The normal position of the respective racks thereto would be that shown in Fig. 8—that is to say, the carriage will be moved forward until the screws P encounter the forward ends of the slots P′. When the shaft *d* and pinion *d′* are released, the tension of spring P″ draws the light rack forward immediately as far as the pinion *d′* will permit, while the heavy carriage, which starts more slowly, has ample time to overtake it and move up to position before the next character is printed.

Another useful feature which I have devised is shown in Figs. 7 and 8. When at the end of a line, the carriage is drawn back to its zero or starting-point, the pawl L is disengaged from the wheels F′ and F″, and wheel F′, held to wheel F″ only by the engagement of the pin *k* in slot *n″*, is liable to become displaced or turned by the failure of the pawl L to engage it at the proper instant or by the shock of the carriage against its stop and to turn forward through the space of one or more teeth before it is again engaged by the pawl L. By this means an extra amount of space will be thrown in equal to the distance that pin *k* has moved in slot *n″*. To avoid this, I cut a notch R in the wheel F′ and pivot a pawl R′ to the bracket E′, which will engage with said notch when the rack has been moved back to its starting-point and the wheel F′ turned to its proper corresponding position by the engagement of pin *k* with slot *n″* in wheel F″. A light spring-arm R′, attached to the pawl R, drops into a notch S in the carriage at the moment the rack and wheel F′ come into proper starting position, so that the wheel F′ is locked against any rebound or movement until released for a feed movement.

It will now be seen that the manipulation or manner of using this machine, so far as the acts of the operator are concerned, is the same as for the ordinary machine. The differential spacing, which produces type-written lines differing from the printed lines only in their want of complete justification, enables an unskilled operator to work the machine with ease and readiness in preparing copy for a matrix-machine. The perfect spacing of the characters and words effected by the machine, aside from its special uses in connection with matrix-making, renders it a highly useful and desirable instrument.

The advantage of the plan of construction followed is that the amount of feed for any given character is effected by mechanism entirely independent of the selection and simple depression of the desired keys, the same application of force and the same extent of

movement in the depression of the keys being to effect any feed movement from the minimum to the maximum.

Considering now the combination of devices intermediate to the key and the spacer-frames and the carriage as an entirety, it will be seen that they make up a true escapement of variable play, in which are two essential features, one a means for releasing and relocking the device to produce any effect and the other a means for checking or arresting the action or movement of the same after its release, according to the extent of feed which the differing characters require. The first of these functions is performed by the pawl L and levers A″, which latter are common to all of the keys, and the other by one or the other of the frames I I′, &c., which are common to groups or certain of the keys only, according to the number of space-units which the characters corresponding to such groups require, and the sliding bars or stops *f′ g′*, &c., by the operation of which the escapement is permitted to move through two, three, or more units of space, as the case may be. With this understanding it is obvious that the specific construction of these parts may be very greatly modified without departure from the invention.

What I claim is—

1. In a type-writing machine, the combination, with the key-levers and a movable carriage under tension provided with a rack, of a shaft and pinion engaging with said rack, two ratchet-wheels, one fixed and the other loose on said shaft, a spring connecting said wheels, a pawl adapted to engage with the two wheels alternately, a lever carrying said pawl and worked or moved by the depression and elevation of any one of the key-levers, bars or stops arranged to slide through the loose ratchet-wheel and to enter slots of different lengths in the other, and levers for moving said stops and causing them to engage with the slots, each of said levers being adapted to be moved or operated by certain key-levers only, according to the space required by the characters to which said levers correspond, as set forth.

2. In a type-writing machine, the combination, with the key-lever, a carriage under tension, and feed-controlling levers or frames adapted to be depressed or moved by said key-levers, one by all of said key-levers and the others by groups of the same classified according to the spaces required by the characters to which they correspond, of a shaft and pinion engaging with the carriage or a rack therein, two ratchet-wheels, one fast and the other loose thereon, a spring connection between the two wheels, a series of bars or stops adapted to slide through the loose wheel and to enter slots of different lengths in the other, a pawl or detent adapted to engage with the ratchet-wheels alternately, connections between said pawl and the feed-controlling lever or frame common to all the other keys, and independent connections between the sliding rods or pins and the other feed-controlling levers, respectively, substantially as and for the purpose set forth.

3. In a type-writing machine of the kind described, the feed-controlling mechanism for the movable carriage, consisting in the combination of a pinion-shaft engaging with the rack-bar of the carriage, a ratchet-wheel containing slots of unequal lengths and fixed to the pinion-shaft, a sleeve turning loosely on the same, a plurality of grooved disks mounted loosely on the sleeve, a ratchet-wheel fixed thereto, a spring connection between the two ratchet-wheels, a series of sliding rods or stops, each fast to one of the grooved disks and passing freely through the others, a series of sliding bars in fixed bearings and connected with the spacing-levers, and pins projecting from the said bars and engaging with the grooved disks, respectively, whereby the movement of any one of the sliding bars carries the corresponding stop through an opening in the ratchet-wheel on the sleeve into one of the slots in the ratchet-wheel on the pinion-shaft and determines the extent of the movement of one ratchet relatively to the other.

4. In the type-writing machine herein described, the combination, with the carriage and rack under tension, and the feed-escapement for such carriage, comprising the pinion-shaft and the fixed and loose ratchet-wheels thereon and a spring connecting the same, of a pawl R′ in position to engage with a notch or step in the said loose ratchet-wheel when the carriage has been moved to its starting-point, as set forth.

5. The combination, with the loose ratchet-wheel F′, of the feed-escapement and the carriage the feed of which is controlled by said escapement, and the pawl R′, having a spring R″ connected therewith, the said arm being adapted to enter a recess in the carriage when the same is in its starting position and turn the pawl into engagement with a notch or step in the ratchet-wheel F′, as and for the purpose set forth.

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