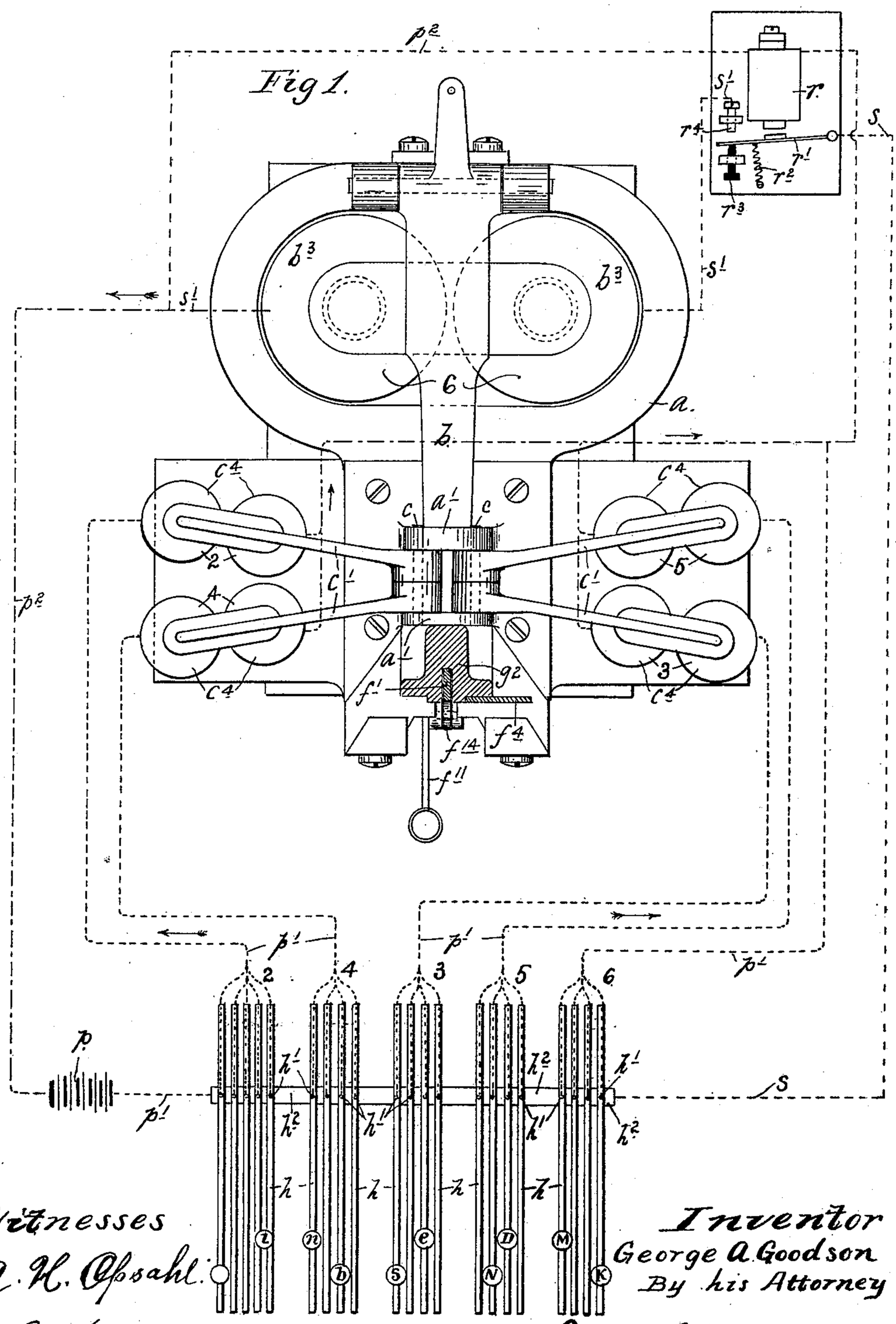
(No Model.) 4 Sheets—Sheet 1.

G. A. GOODSON.

DIFFERENTIAL LETTER SPACE REGISTER FOR COMPOSING MACHINES.

No. 605,957. Patented June 21, 1898.

Fig 1.



(No Model.) 4 Sheets—Sheet 2.

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No. 605,957. Patented June 21, 1898.

Fig. 3.

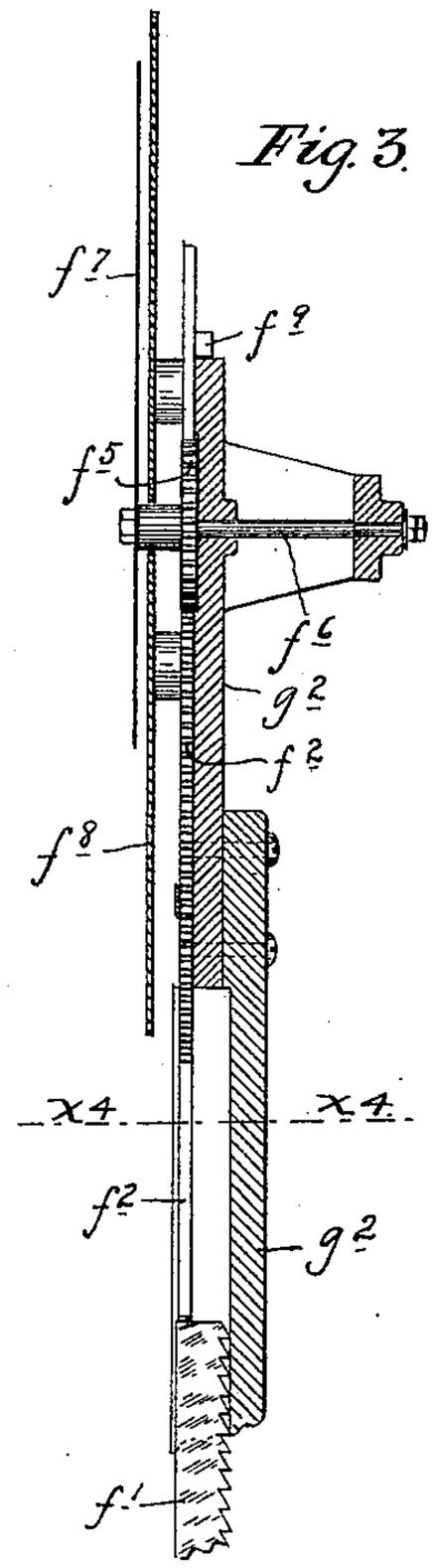


Fig. 2.

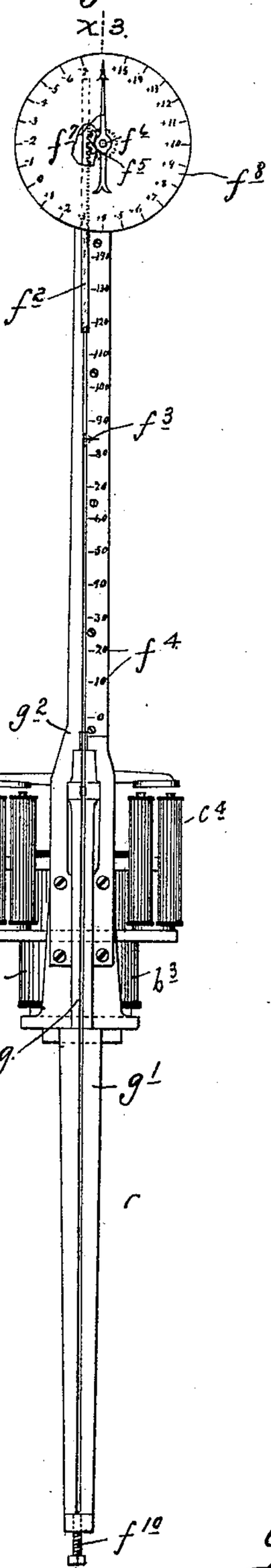
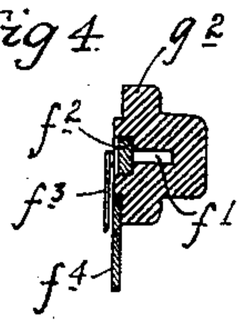


Fig 4.



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(No Model.) 4 Sheets—Sheet 3.

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Fig 5.

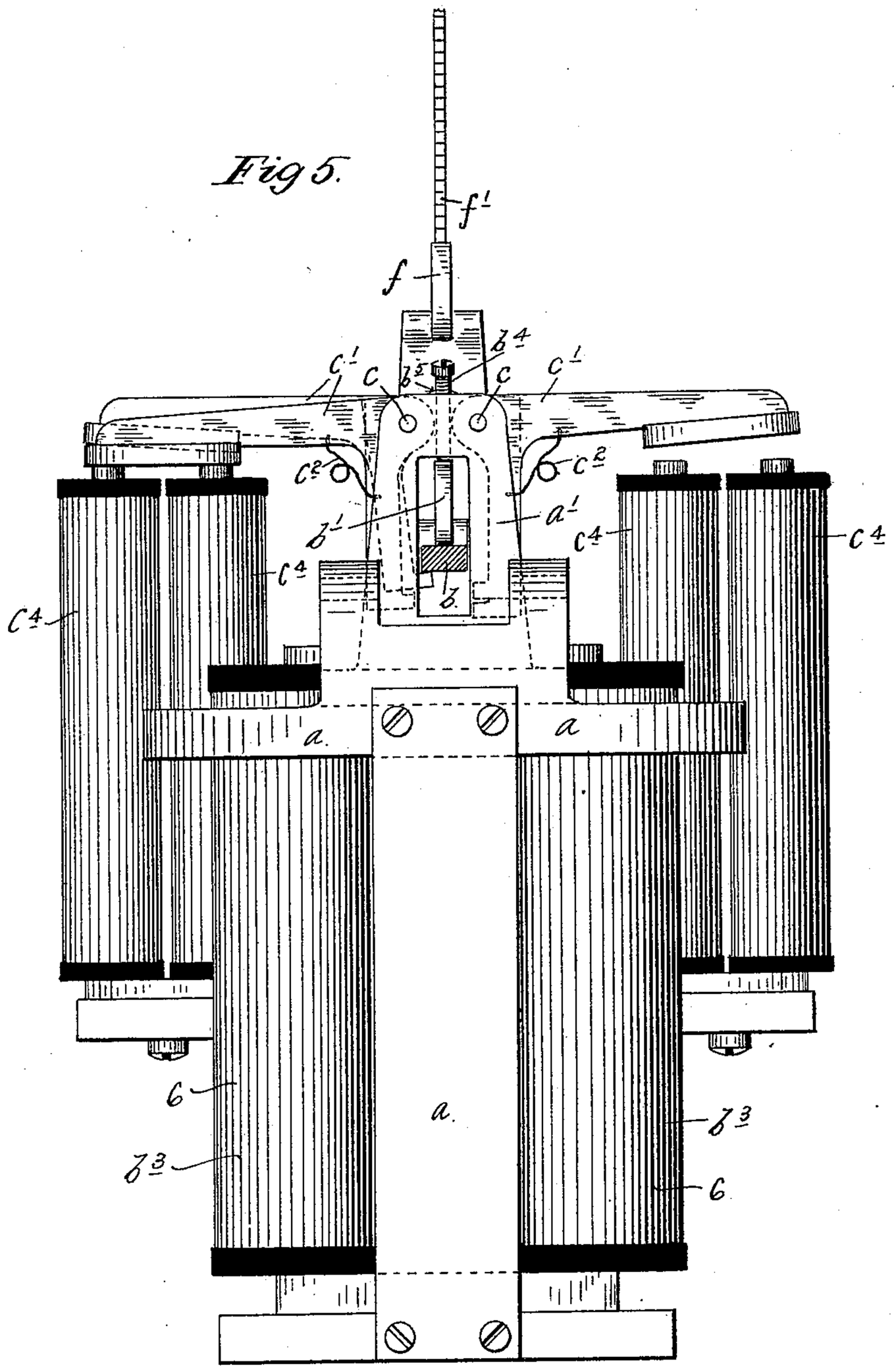

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Fig. 7.

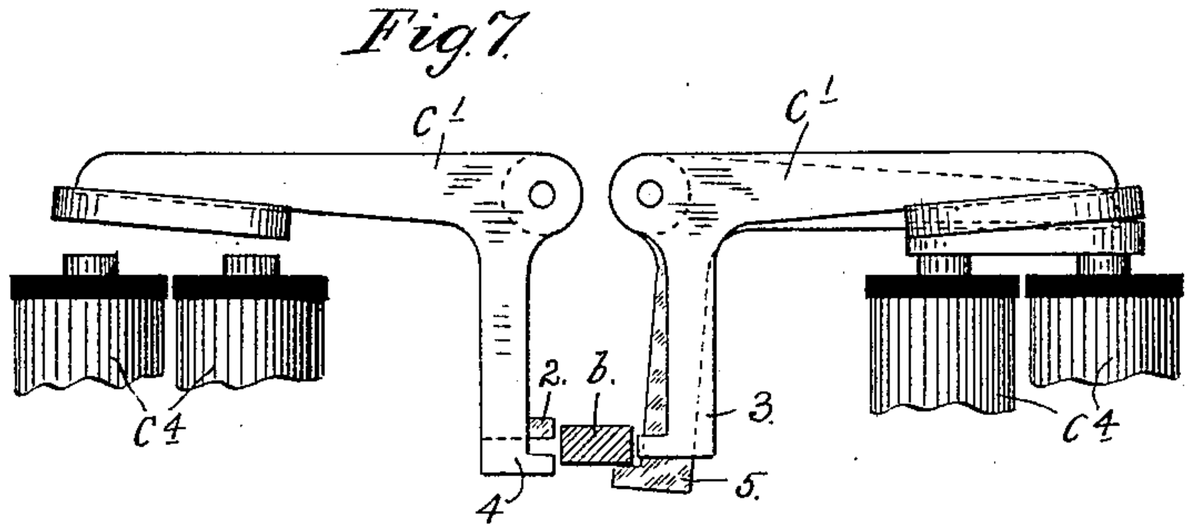
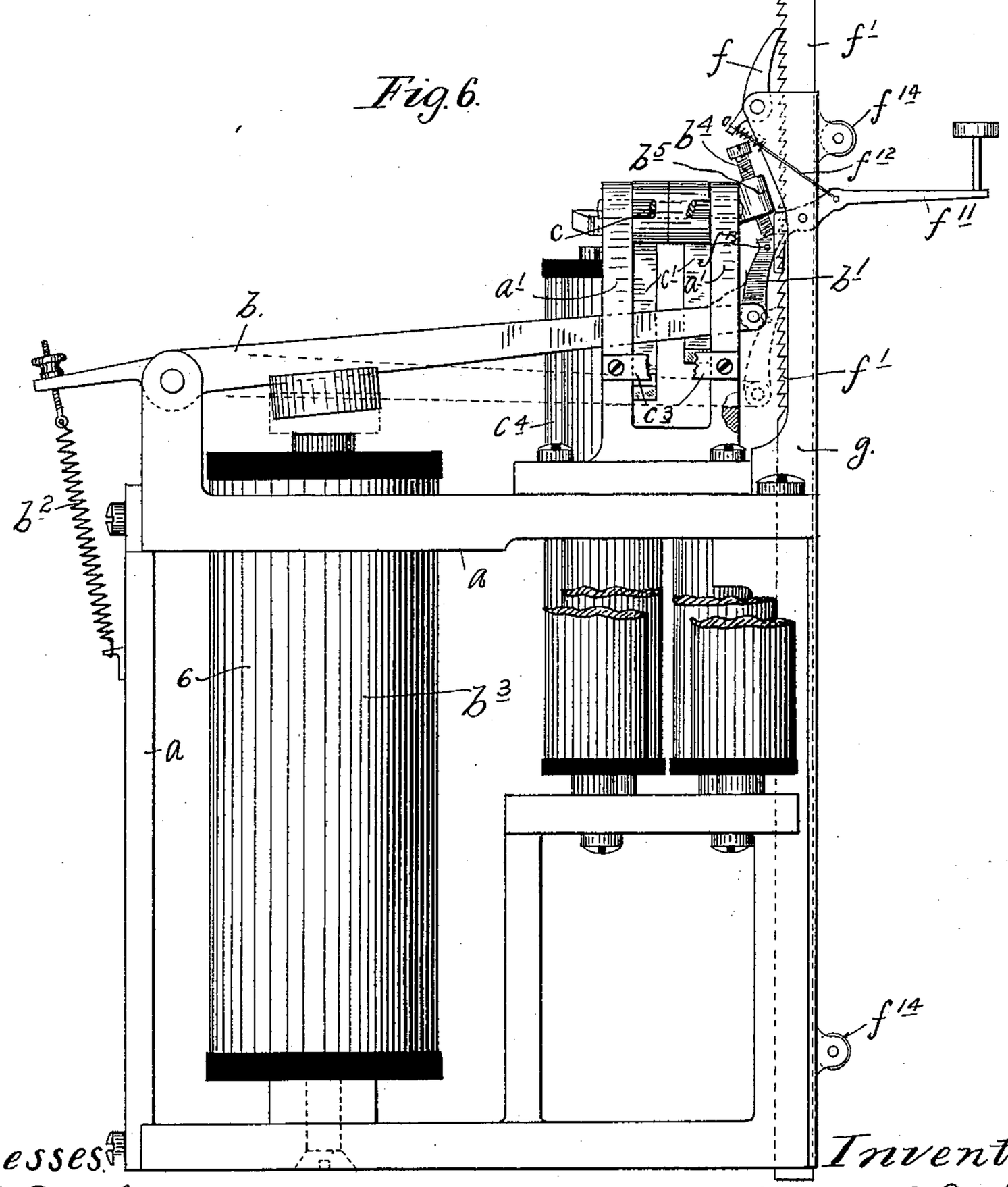


Fig. 6.



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UNITED STATES PATENT OFFICE.

GEORGE ARTHUR GOODSON, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE GOODSON TYPE CASTING AND SETTING MACHINE COMPANY, OF SAME PLACE.

DIFFERENTIAL LETTER-SPACE REGISTER FOR COMPOSING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 605,957, dated June 21, 1898.

Application filed January 25, 1897. Renewed March 31, 1898. Serial No. 676,009. (No model.)

To all whom it may concern:

Be it known that I, GEORGE ARTHUR GOODSON, a citizen of the Dominion of Canada, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Differential Letter-Space Registers for Composing-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to differential letter-space registers for type-writing or composing machines, and has for its object to provide such a register of increased efficiency and greater simplicity of construction.

The register herein disclosed is especially designed for use in connection with the composing-machine described in my pending application, Serial No. 493,115, filed December 8, 1893. The said composing-machine described in my pending application produces a punctured representative strip which subsequently comes into use on a type casting and setting machine for controlling the actions of the same to produce justified lines of type, as fully disclosed in my United States Patent No. 530,481, of date December 4, 1894. In the said composing-machine an ordinary type-writing machine is provided with electric connections to the strip-perforater for producing the representative strip. In order to provide for justification of the line of type on the type casting and setting machine, the last thing done on the composing-machine is to produce holes in the strip representing the amount of justification, or, otherwise stated, which comes first into use on the type casting and setting machine to set a justifier, which is operative to produce quads of the proper size to justify the line of type. Hence on this composing-machine it is necessary to employ a differential register of some kind which will indicate to the eye of the operator the amount of letter-space which has been represented on the strip when the line is broken in order to ascertain the amount of space which requires distribution in order to justify the line. The lines of type are set, of course, to a column-line of a predetermined length, expressed in units of type-face. The type, including the quads as type, differ from each other by exact units, or, otherwise stated, the type-faces are all multiples of a common unit.

My present register is especially designed to meet the conditions above noted.

To these ends the invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein, like notations referring to like parts throughout the several views—

Figure 1 is a view showing the register detached, chiefly in plan, but partly in section, and showing the electric connections for controlling the same in diagram, with the keys of the type-writer shown as if the keys representing characters or elements requiring similar amounts of letter-space were grouped together. Fig. 2 is a view, on a reduced scale, showing the register in front elevation detached and with some parts removed. Fig. 3 is a view in vertical section on the line $x^3 x^3$ of Fig. 2, with some parts broken away and others shown in elevation. Fig. 4 is a detail in cross-section on the line $x^4 x^4$ of Fig. 3. Fig. 5 is a rear elevation of the machine with some parts removed and others broken away. Fig. 6 is a side elevation of the machine with some parts removed and others broken away; and Fig. 7 is a detail, partly in rear elevation and partly in section, with some portions broken away for showing the relations of the stop-levers to the driving-lever by which the indicator is operated.

On a suitable frame a is mounted a pivoted armature-lever b, carrying at its outer or free end a spring-pawl b'. This lever b may for distinctness of statement be called the "driving" or "feed" lever. The said lever b is subject to an adjustable spring b^2 and a magnet b^3. The spring b^2 tends to throw the lever b upward to its limit or until the spring-pawl b' is intercepted by a stop-screw b^4. The stop-screw b^4 is finely threaded and is held by a keeper-nut b^5, shown as formed on one mem-

ber of a pair of bearing-plates a', rising from the top of the main frame a and spaced apart from each other lengthwise of the lever b. The said bearing-plates a are centrally cut away or otherwise formed to embrace the driving-lever b and afford clearance for the pivotal movement of the same, as shown in Figs. 5 and 6. The said plates a' are provided with a pair of pins c, spaced apart from each other crosswise of the lever b, and on said pins c are mounted pairs of stop-levers c', which are shown as in the form of bell-cranks, with their elbows pivoted on said pins c. The vertical arms of these bell-crank stop-levers c' extend downward from their fulcrum-pins and are hook-shaped, adapting the same to engage under the driving-lever b. The hook-shaped or stop arms of these levers c' are of different lengths, corresponding to different sizes of type-face. Two of these levers c' are on one side of the driving-lever b and two on the other, as best shown in Fig. 7. The stop-levers c' are subject to springs c^2, which normally tend to hold the same with the stop-arms thereof abutting against stop-plates c^3, fixed to the vertical plates a', so as to afford clearance for the full pivotal movement of the driving-lever b. The horizontal arms of said stop-levers c' are in the form of armatures and are subject to magnets c^4 for rocking the said levers c' against their retracting-springs c^2, and thereby throwing the same in position to variably intercept the driving-lever b.

The pawl b' of the driving-lever b operates constantly on the primary section f' of a two-part or divided rack f' f^2, constituting parts of a pair of indicators. The primary rack f' is also constantly engaged by a spring-pawl f, which operates to hold the rack in whatever position it may be set under the action of the driving-lever b. The primary rack f' is mounted in a suitable guide, shown as composed of the three sections g g' g^2, which are supported from the main frame a in any suitable way. The rack-sections f' f^2 are mounted in their guides in an upright position and are of sufficient weight to drop to their lowermost or normal position by gravity when released. The primary rack f' is provided with a pointer f^3, which moves over a scale f^4, fixed to the guide-section g^2 in units of type-face, as shown in Fig. 2, for indicating distance from the beginning of the line of composition. The rack-section f', pointer f^3, and scale f^4 may conveniently be called the "primary" indicator.

The rack-section f^2 engages a pinion f^5 on a horizontal arbor f^6, shown as carried at the upper end of the guide-standard g^2. The arbor f^6 has attached thereto a pointer f^7, which moves over a graduated dial f^8. The downward movement of the rack-section f^2 is limited by a suitable stop, as f^9, for holding the same in its lowermost or normal position. After the primary rack-section f' has reached a certain predetermined point in its travel it engages with the secondary rack f^2 and thereafter moves the secondary rack throughout the remainder of the primary rack's travel. The dial f^8 is marked with positive numbers from "16" to "1" and with negative numbers from "—1" to "—8" on opposite sides of the zero-mark. The pointer f^7 normally stands opposite "+16" and "—8" and moves from the left toward the right. Hence the secondary rack-section f^2, the pointer f^7, and the dial f^8 coöperate to form what may be called the "secondary" indicator for exhibiting to the eye of the operator the distance from the end of the line in positive numbers until the line's limit is reached and in negative numbers after the line's limit is passed.

Turning now to the diagram view, h represents the keys of the type-writer or other composing machine shown for convenience of illustration as grouped according to the different sizes of letters or running widths of type-face. Quads are treated as type in this statement. Five sizes of type-face are sufficient for all the elements of a line of composition. These keys h control an electric circuit from a battery p or other source, having a series of branch wires p', which extend through the stop-magnets c^4, and a relay-magnet r, and thence by common return-wire p^2 to the battery or other source p. The relay-magnet r controls the pivoted armature-lever r', which is normally held by its spring r^2 against an insulating-stop r^3, but may be thrown by the magnet r in contact with pin r^4 for closing a circuit over the wires s s' through the feed-lever magnet b^3. The feed-circuit thus controlled by the said relay is shown as a branch of the main circuit from the battery p. The keys are assumed to be of wood or other insulating material and as having contact-pins h', to which the branch wires p' are secured, and all of the said keys are assumed to be normally spring-held in an uppermost position, so as to keep the branch circuit controlled by any given key open at that point until the key is depressed and the pin h' carried thereby is dipped into a mercury-trough h^2. All the branch circuits through the stop and relay magnets are therefore normally open at the keyboard, and the feed-magnet circuit is normally open at the relay. Whenever a key is depressed the branch, through the particular stop-magnet c^4 controlled thereby, will be closed and at the same time the branch through the relay-magnet will also be closed, thereby throwing over the armature-lever r' against the contact r^4 and closing the circuit through the feed-magnet b^3. The purpose of the relay and the separate circuit for the feed-magnet b^3 is to insure the proper relative timing in the action of the stop-magnets c^4 and the feed-magnet b^3. If not intercepted by one of the stop-levers c', the driving-lever b will be pulled downward to its limit every time that the feed-magnet b^3 is energized, or, otherwise stated, at every key action, and this would set the pawl b', carried by the driv-

ing-lever b, in position to make the longest, or six-unit, feed stroke on the rack-section f' under the action of the spring b^2 whenever the magnet b^3 is deënergized, or, in other words, whenever the key is released. If, however, the particular key depressed should be any other than one representing one of the largest letters, then the proper corresponding stop-magnet c^4 will be energized in advance of the feed-magnet b^3, so as to throw the proper stop-lever c' into the path of the feeding or driving lever b for intercepting the same on its idle or return stroke when pulled down by the magnet b^3. Hence by the stop-levers c' the driving or feed lever b will be variably intercepted on its idle or return stroke, so as to set the same for feed strokes of the different required lengths upon the release of the keys. A differential feed for the movable member f' of the primary indicator is therefore provided, which is adapted to impart feed-steps of different lengths thereto, corresponding to the different sizes of the elements, letters, punctuation, &c., represented at the keyboard. The downward movement of the rack-section f' is limited by an adjustable pin f^{10}, and when the said rack-section f' is in this lowermost position the pointer f^3, carried thereby, will stand at the zero-mark on the coöperating scale f^4. Hence under the key action the said rack-section f' will move upward steps of different lengths, according to the keys depressed, and the pointer f^3 will indicate on the scale f^4 the distance from the beginning of the line or the aggregate of the letter-space required for the composition so far made. When the primary rack f' reaches a certain predetermined point in its travel, it will begin to move the secondary rack-section f^2, and thereby bring the secondary pointer f^7 and the scale f^8 into action for indicating the distance from the end of the line. In the illustration given it is assumed that the column-line is one hundred and thirty units in length, that provision is made for the distribution of sixteen units of space by way of addition, and the distribution of eight units by way of subtraction or hair-spacing. The dial f^8 is graduated accordingly, as hitherto noted. Hence the secondary indicator begins to operate when the primary indicator denotes the reading one hundred and fourteen units and will continue to operate thereafter throughout the primary rack's movement, or, in the illustration given, until the primary indicator denotes a reading of one hundred and thirty-eight units. The secondary indicator will therefore denote in positive or negative numbers the amount of space requiring distribution by way of addition or subtraction. The operator can therefore tell at a glance the number of units of space requiring distribution by way of addition or subtraction for the purpose of justification whenever he stops the line of composition at the keyboard. On the composing-machine, with which this register would be employed, the operator would then strike a justification-key for making the proper holes in the strip to set the justifier on the type casting and setting machine.

The register is provided with a releasing-key f^{11}, with a connection f^{12} to the rack-retaining pawl f, and with the heel of the lever f^{11} in position to strike a stud f^{13} on the driving-pawl b'. Hence when the line of composition is stopped the operator strikes the releasing-key f^{11} and by a single movement releases the two pawls b' and f from the primary rack f' by a single movement of the key, thereby permitting both of the rack-sections f' and f^2 to lower by gravity into their lowermost or normal positions ready for use for the next line. As shown, the long or primary rack-section f' is held in its guideways by rollers f^{14}. In the releasing action of the lever f^{11} on the driving-pawl b' the driving-lever b yields downward against the tension of its spring b^2 in order to permit the head of the pawl b' to clear the end of the stop-screw b^4.

For the purpose of greater distinctness in reading the drawings the groups of keys, the stop-magnets, the stop-levers, and the feed-magnet are also marked with numerals corresponding to the different sizes of type-face or feed movements to be produced in some views.

With the register above described it will be seen that the electric devices simply set the differential feed or driving devices under the control of the keys for permitting an actuating-spring or equivalent device to effect the feed on the movable part of the indicator upon the release of the keys. This is a great advantage or improvement over any register wherein the feed is imparted to the movable member of the indicator by direct or indirect action at the time when the key is depressed, for the reason that with the register herein disclosed the time during which the operator is going from one key to the other is utilized for the feed movement on the movable part of the indicator. This insures a much more nearly uniform time for the feed regardless of the key action, thereby rendering it much easier to provide a construction which will secure an accurate feed to the indicator. In this connection it should be noted that the head of the driving-pawl b' is beveled and that the stop-screw b^4 is set substantially at right angles to the head of said pawl when in banking position. Hence when under the action of the spring b^2 the driving or feed lever b throws the pawl b' upward to its limit against the stop-screw b^4 the said pawl b' will be locked to the rack by said stop-screw b^4, thereby preventing the rack from racing or being thrown past the proper stopping-point under the effect of momentum. Accuracy in the movement of the rack is thus insured. It will also be noted that the tension of the actuating-spring b^2 for the

driving or feed lever *b* may be adjusted at will, so as to graduate the speed of the feed movement on the rack as may be desired.

From the description now given it must be obvious that by this invention a differential letter-space register is afforded that is reliable and true, that produces the feed upon the release of the keys, and that is of extremely simple and cheap construction.

It will be understood, of course, that the principle involved is capable of a considerable range of modification in the construction without departing from the spirit of the invention.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with a bank of keys and an indicator, of differential feed devices for the same, comprising a spring-actuated driver operative on a movable part of the indicator, and electric devices, under the control of said keys, adapted to variably set said driver against its actuating-spring, when the keys are depressed for variably feeding the movable part of the indicator when the keys are released, substantially as described.

2. The combination with a bank of keys and an indicator, of a spring-actuated feed or driving lever operative on the movable part of the indicator, a retracting-magnet for said feed or driving lever adapted to set the same for a maximum feed stroke, spring-held stop-levers operative to variably intercept said feed-lever, on its return or idle stroke, for variably setting the same to make feed strokes of different lengths, magnets for said stop-levers, and electric connections for all of said magnets, under the control of said keys, substantially as described.

3. The combination with a bank of keys and an indicator, of a spring-actuated feed or driving lever operative on the movable part of said indicator, a magnet tending to retract said feed-lever to a maximum distance, for setting the same to make its greatest feed stroke, spring-held stop-levers operative to variably intercept said feed-lever on its idle or return stroke, for variably setting the same to make feed strokes of different lengths, magnets for said stop-levers a relay, an electric circuit controlled by said keys, with branches through said stop and relay magnets, and an electric circuit through said feed-lever magnet controlled by said relay, for timing the action, substantially as described.

4. The combination with a bank of keys, of a differential letter-space register comprising a differential driving or feed mechanism, and a pair of indicators operated thereby, the primary member of which indicators, operates throughout the entire line of composition, for denoting the distance from the beginning of the line in units of type-face, and the secondary of which indicators operates only through a predetermined final part of the line of composition, for denoting distance from the end of the line in units of type-face, substantially as and for the purposes set forth.

5. In a differential letter-space register, the combination with a differential feed or driving mechanism, of a pair of indicators operated thereby, the primary member of which indicators is constantly subject to said driving or feed mechanism for denoting distance in units, from the beginning of the line, and the secondary member of which indicators is controlled from said primary member, during only a predetermined final part of the primary indicator's movement, for denoting distance, in units, from the end of the line, substantially as described.

6. In a differential letter-space register for composing-machines, the combination with the differential driving mechanism, of a divided or two-section rack operated thereby, and a corresponding pair of scales and pointers operated by said rack-sections, the primary member of which rack-sections is constantly subject to said driving mechanism, for indicating the distance in units of type-face, from the beginning of the line, and the secondary member of which rack-section is operated by the primary member only through a definite final part of the primary rack-section's travel, for indicating the distance in type-units from the end of the line, with the primary rack movable beyond the line-limit, and with the secondary dial graduated in positive numbers within the line-limit, and in negative numbers beyond the line-limit, substantially as described.

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

GEORGE ARTHUR GOODSON.

Witnesses:

JAS. F. WILLIAMSON,

C. F. KILGORE.