

(No Model.)

22 Sheets—Sheet 1.

W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.

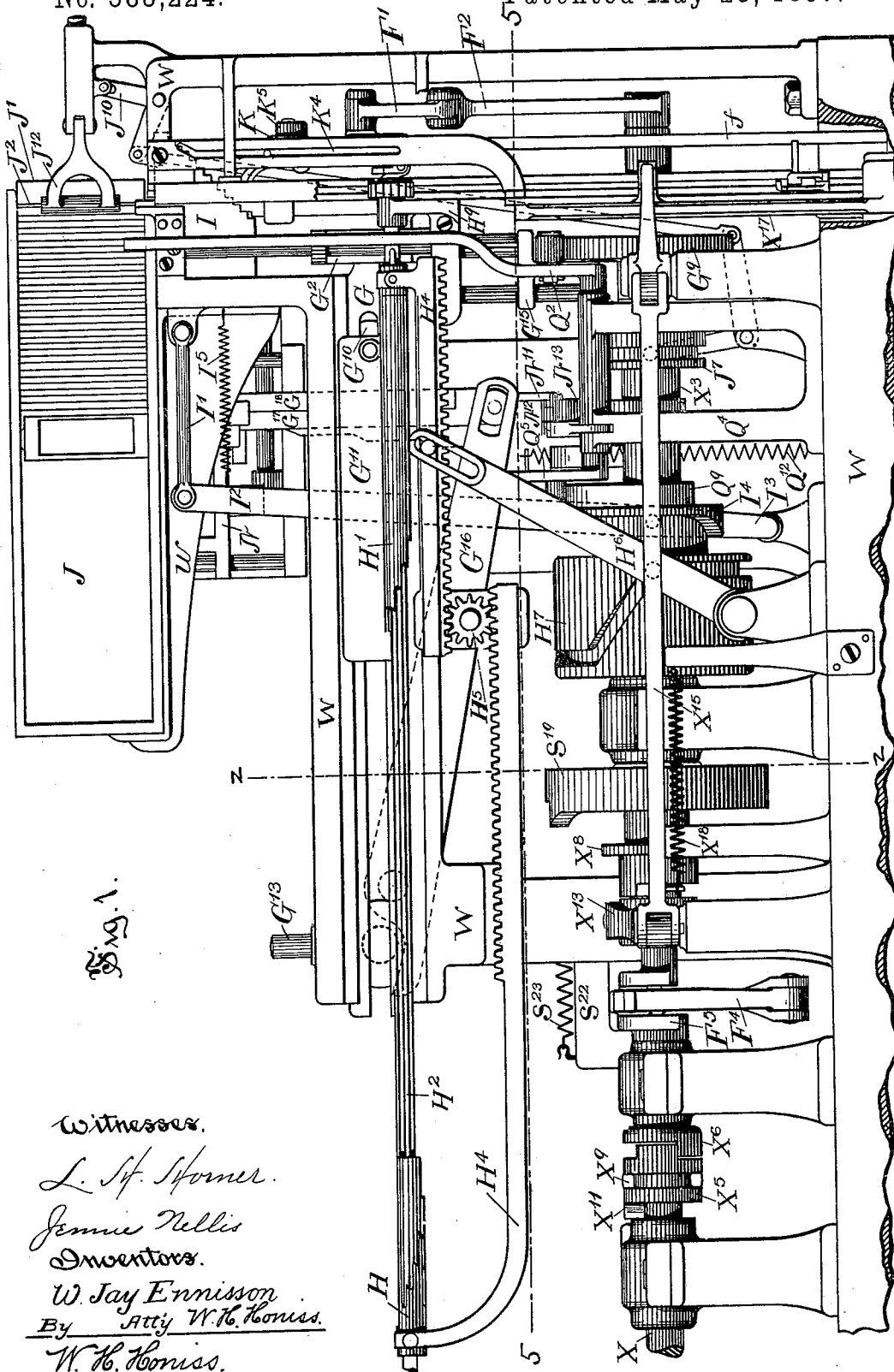


Fig. 1.

Witnesses.

L. S. H. H. H.

Jennie Nellis

Inventors.

W. Jay Ennisson

By Atty. W. H. Honiss.

W. H. Honiss.

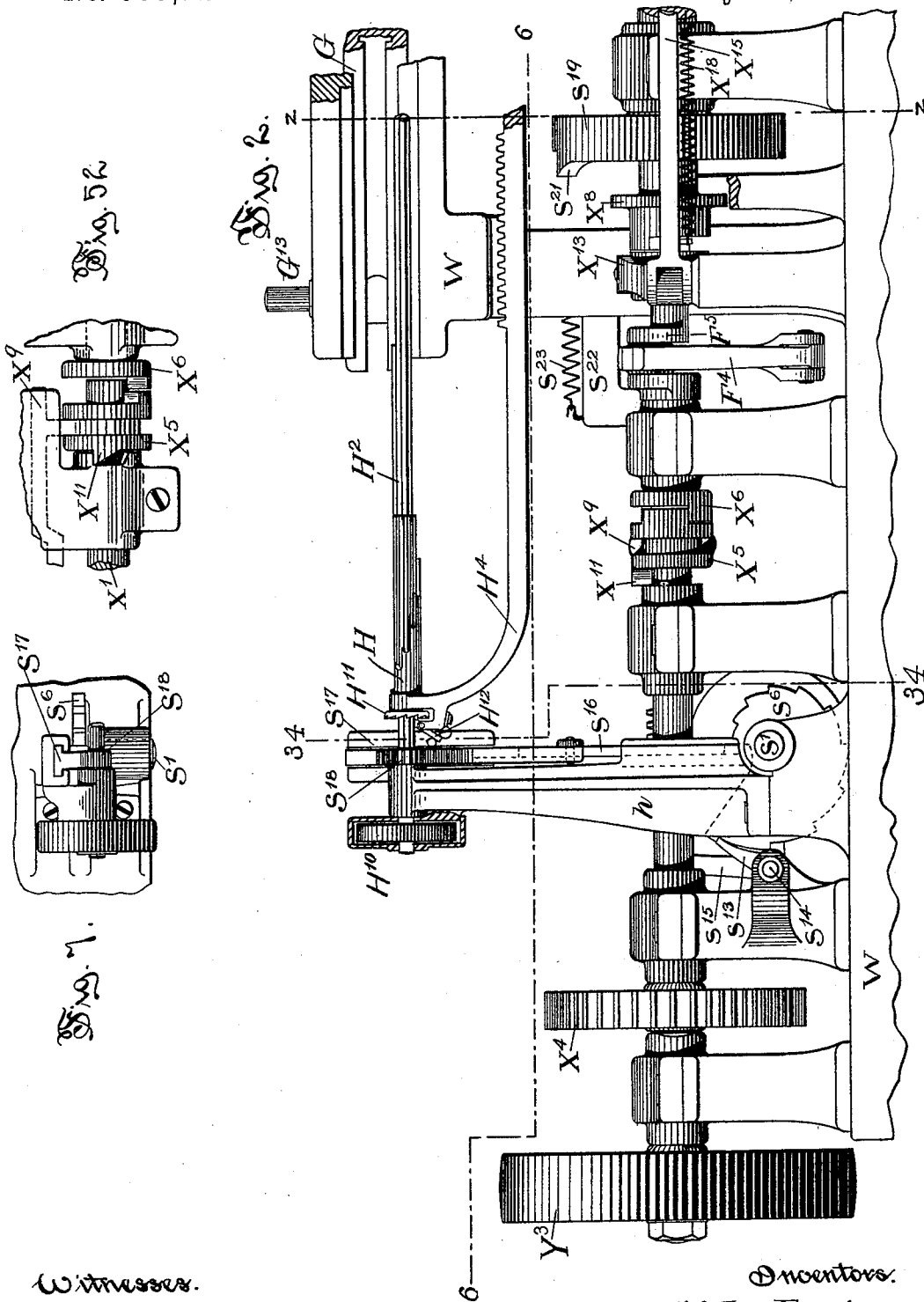
(No Model.)

22 Sheets—Sheet 2.

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TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.



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L. S. S. S. S.
Jennie Nellis

Inventors.
W. Jay Ennisson.
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W. H. Honiss.

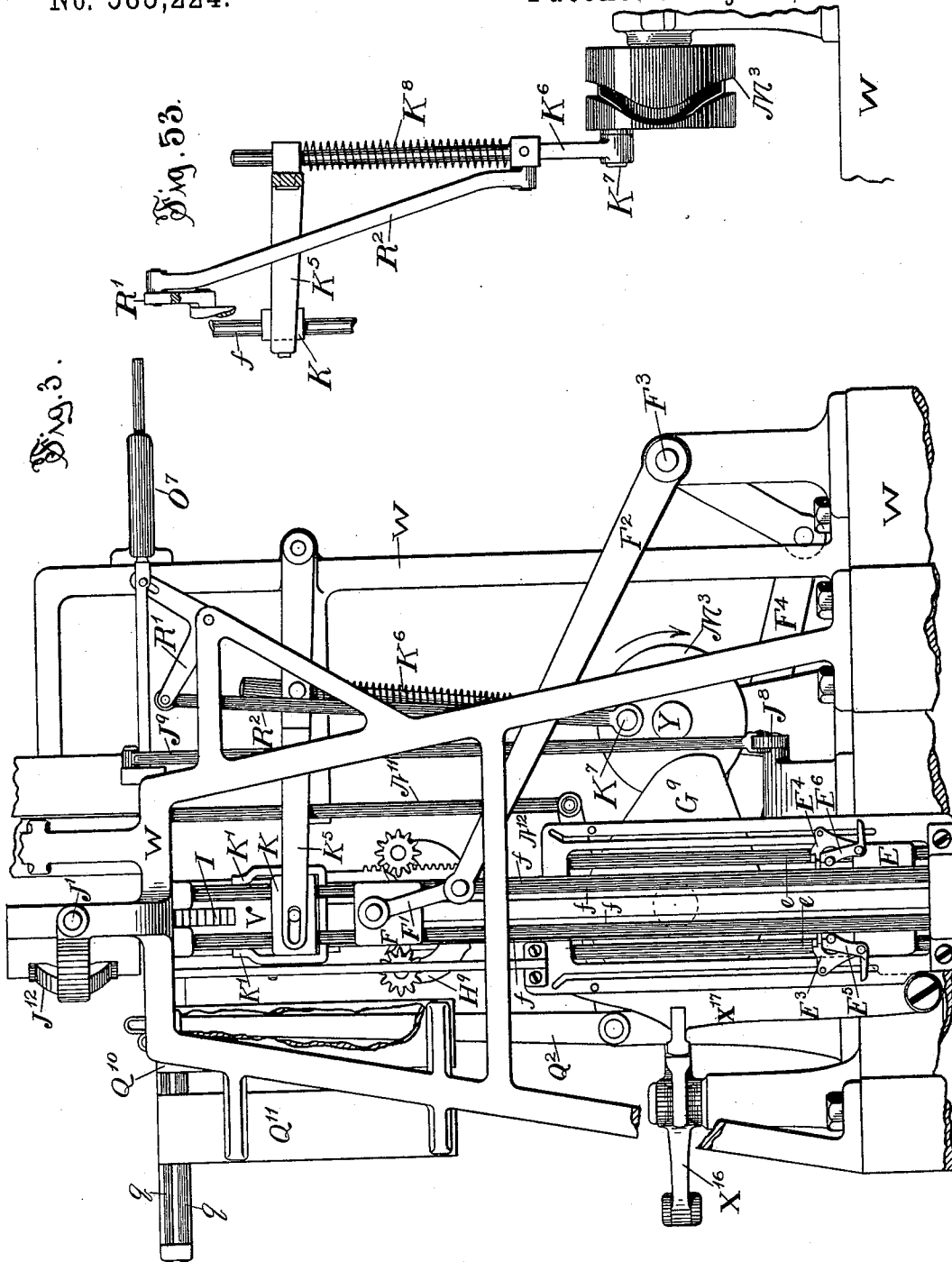
(No Model.)

22 Sheets—Sheet 3.

W. J. ENNISSON & W. H. HONISS.
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No. 583,224.

Patented May 25, 1897.



Witnesses.

L. H. Spomer.
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Inventors.

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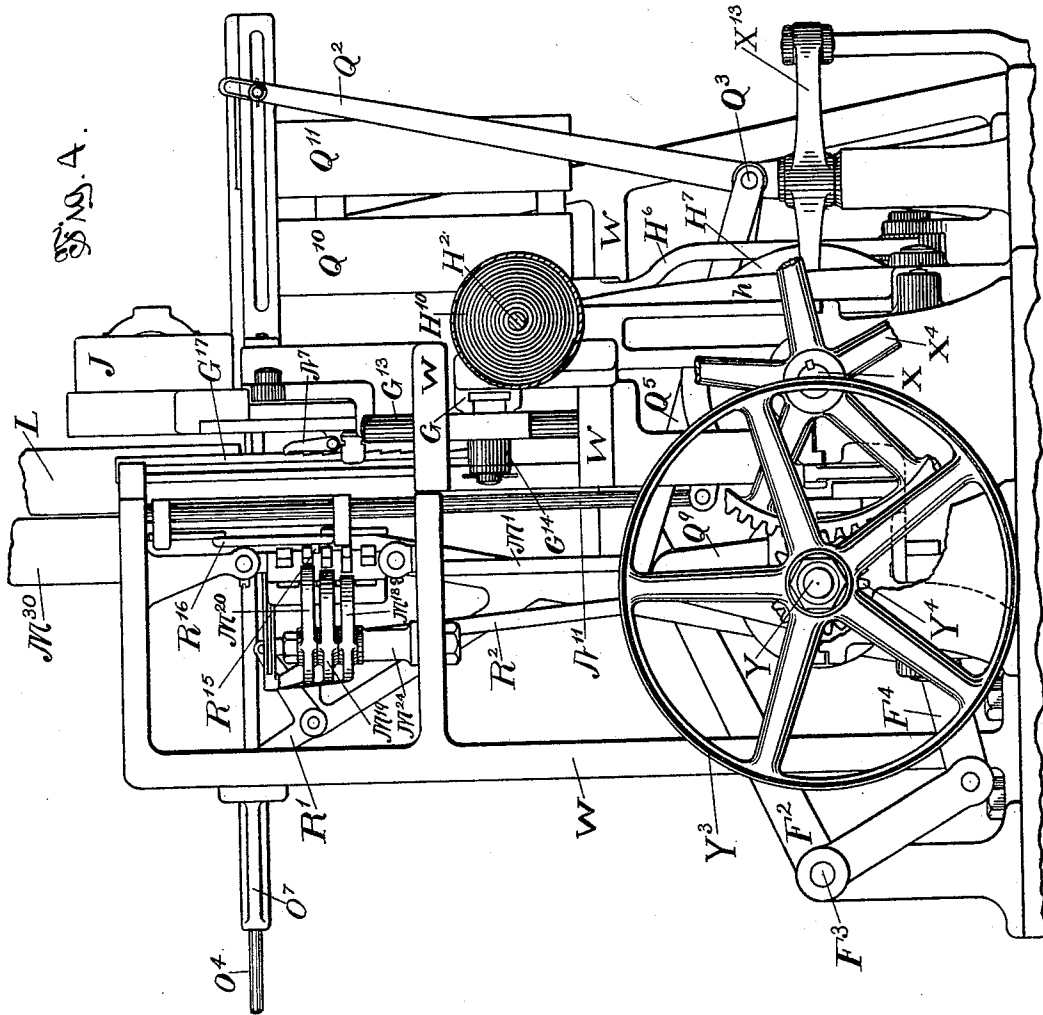
(No Model.)

22 Sheets—Sheet 4.

W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.



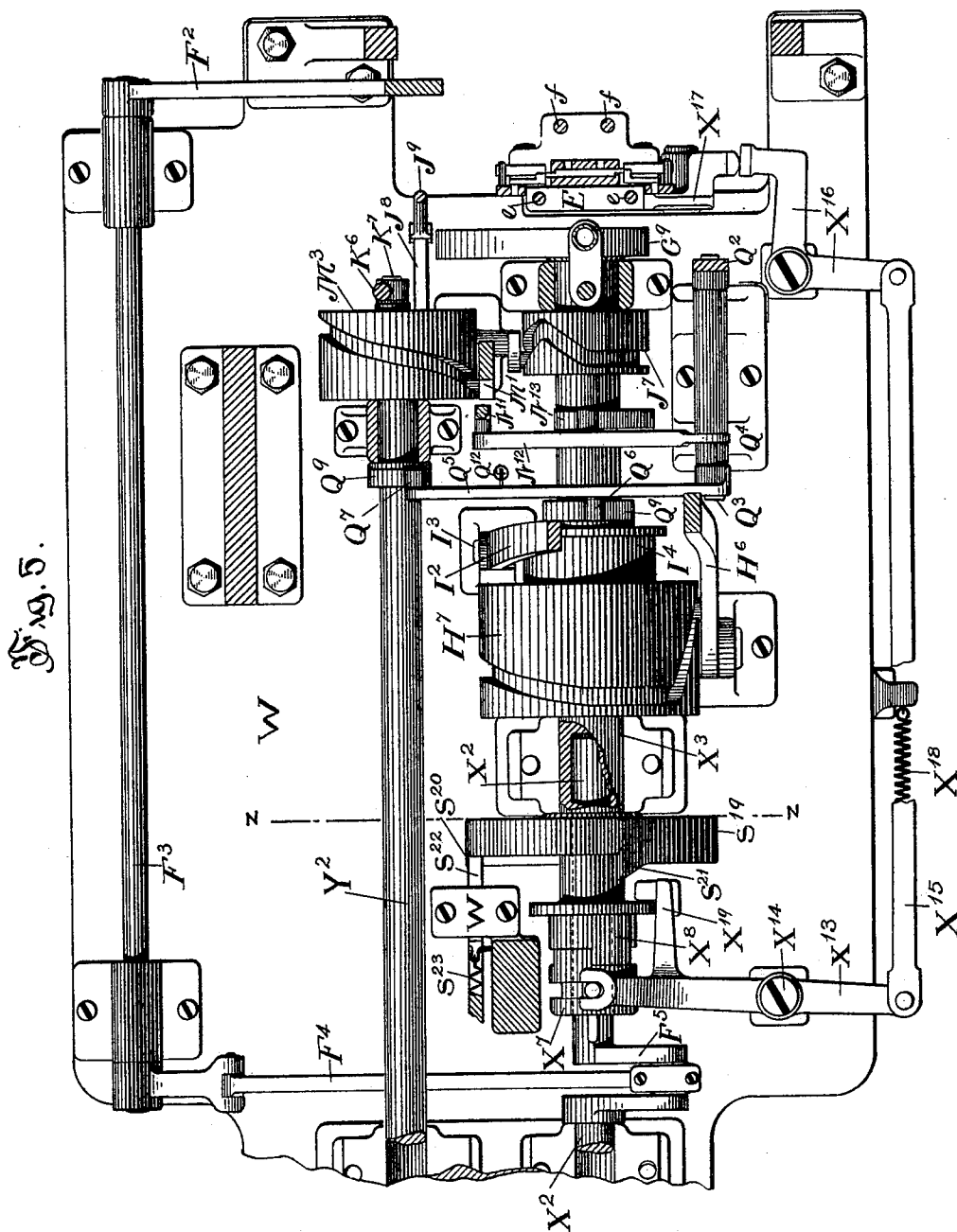
Witnesses.
L. S. Storer.
Jennie Nellis

Inventors.
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W. H. Honiss.

W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.



Witnesses.

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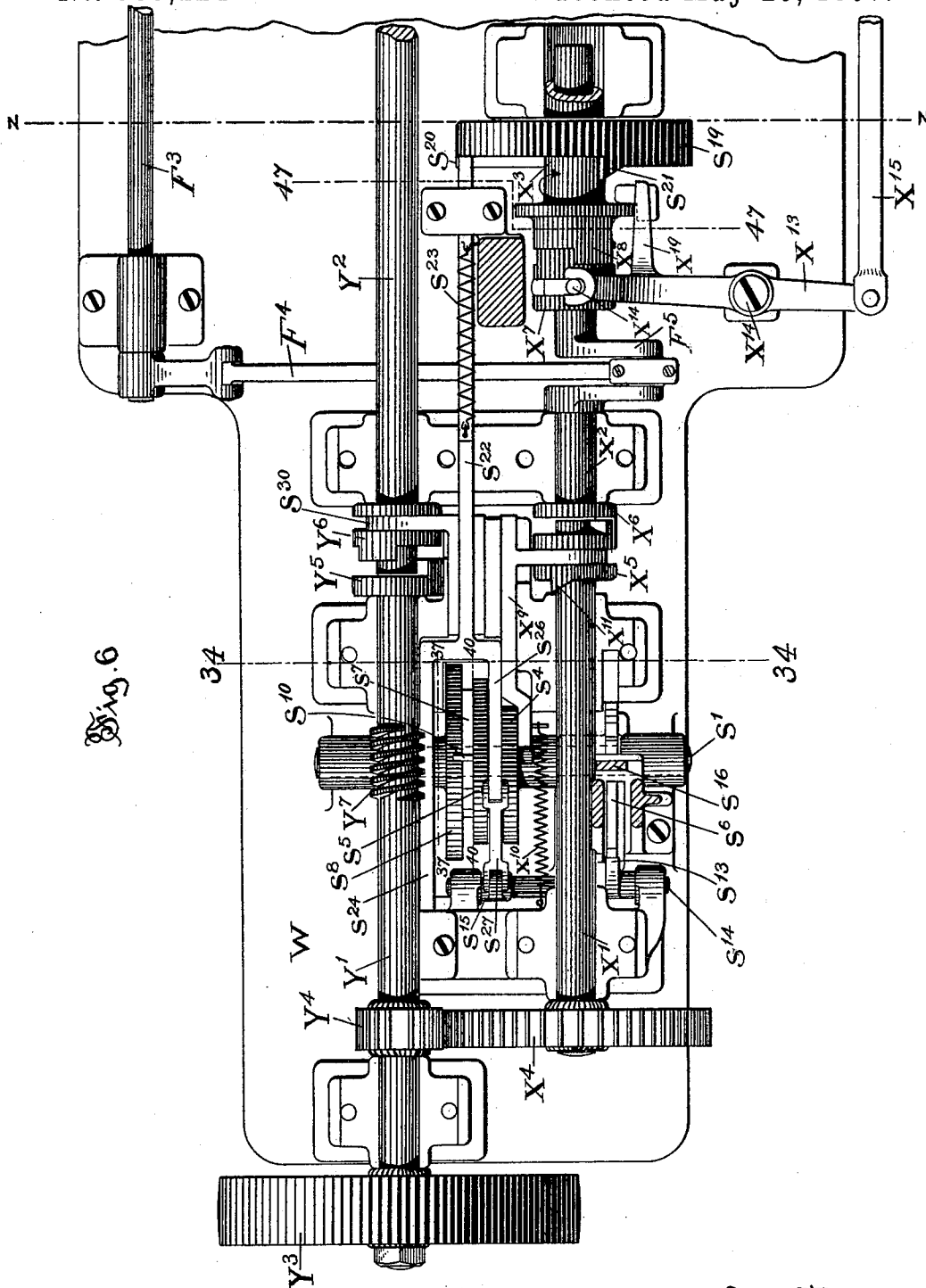
(No Model.)

22 Sheets—Sheet 6.

W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE

No. 583,224.

Patented May 25, 1897.



Witnesses.

L. S. Storer.
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Inventors:

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W. H. Honiss,

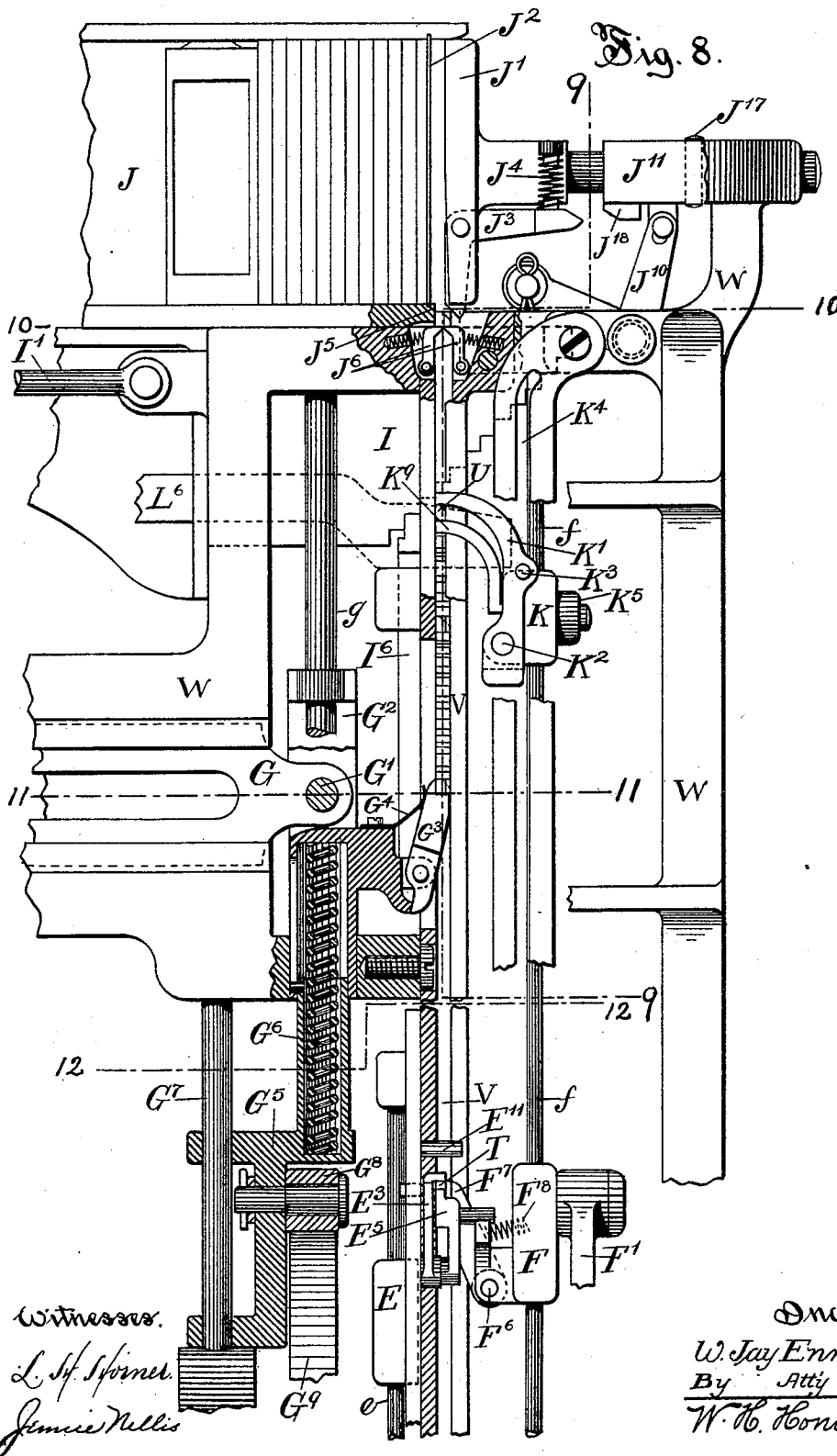
(No Model.)

22 Sheets—Sheet 7.

W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.



Witnesses.

L. St. Spomer.

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Incentors.

W. Jay Ennisson

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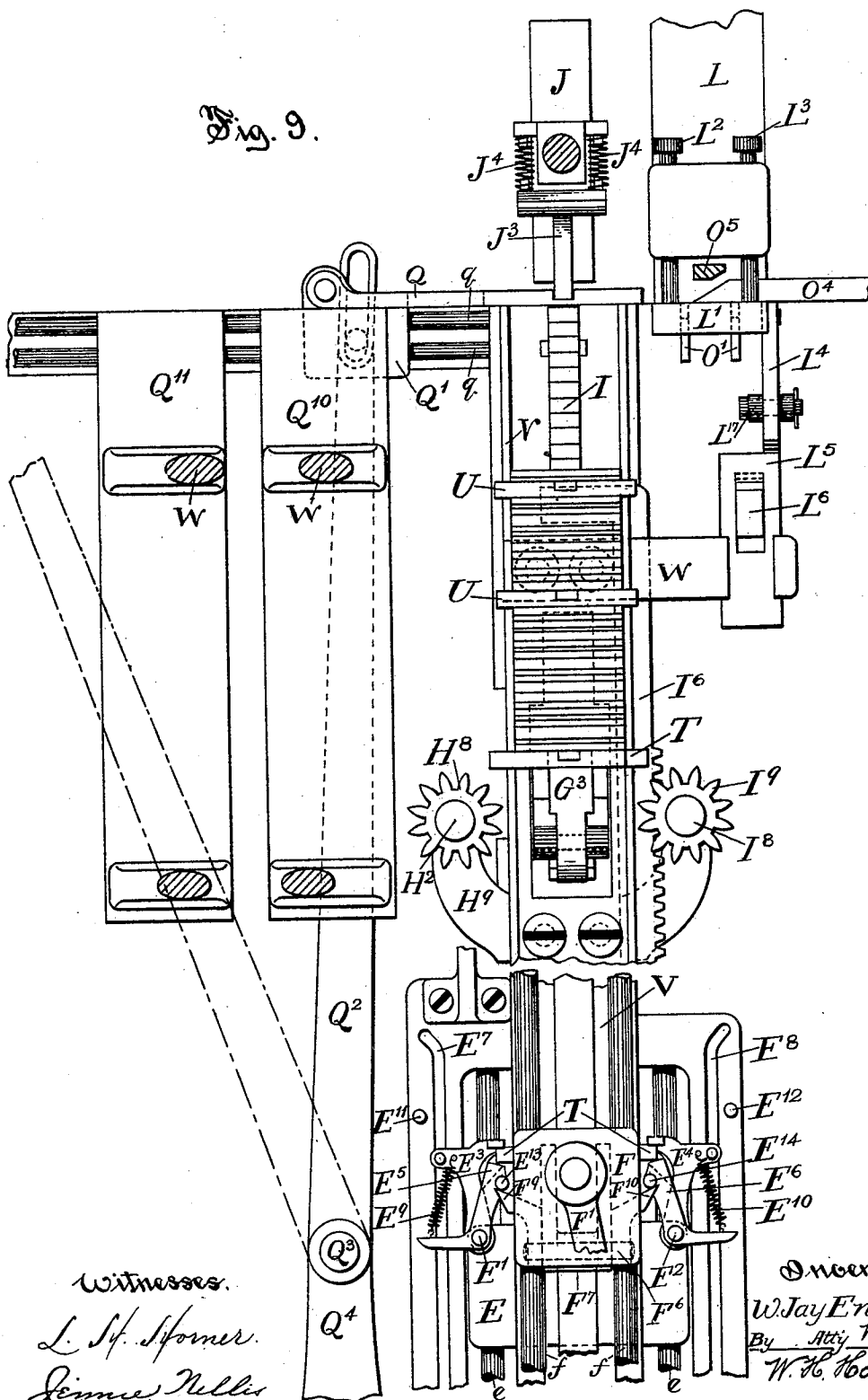
W. H. Honiss.

W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.

Fig. 9.



Witnesses.
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TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.

Fig. 10.

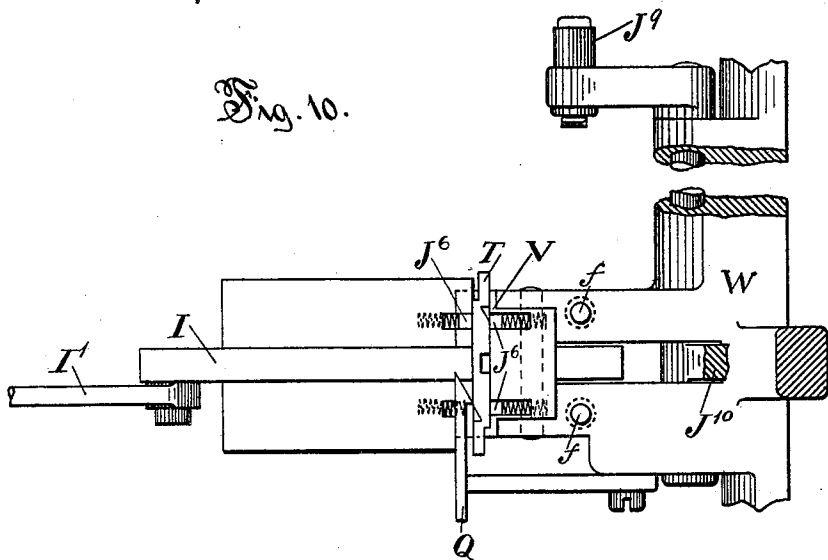


Fig. 11.

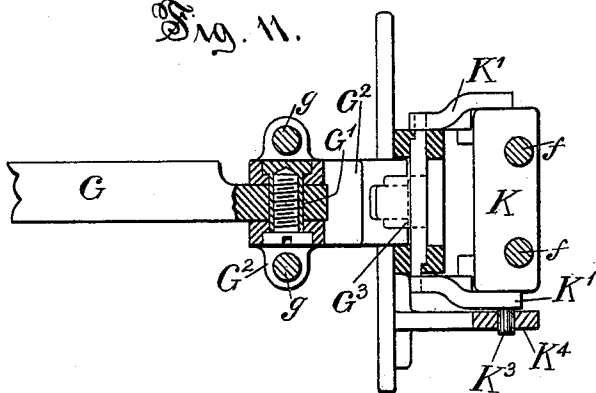


Fig. 13.

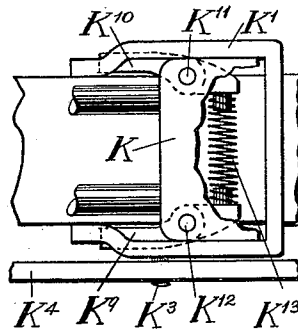


Fig. 12.

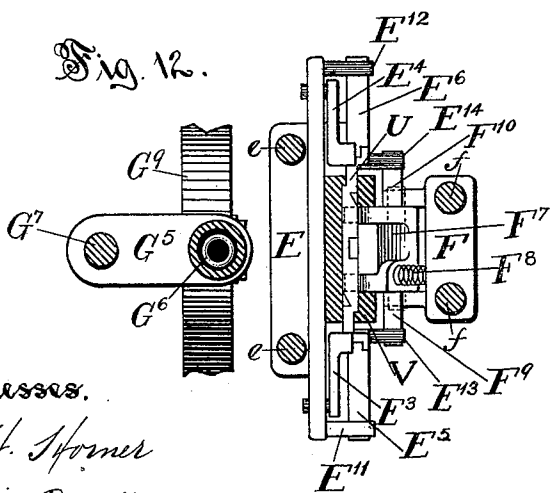
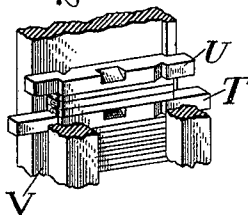


Fig 54.



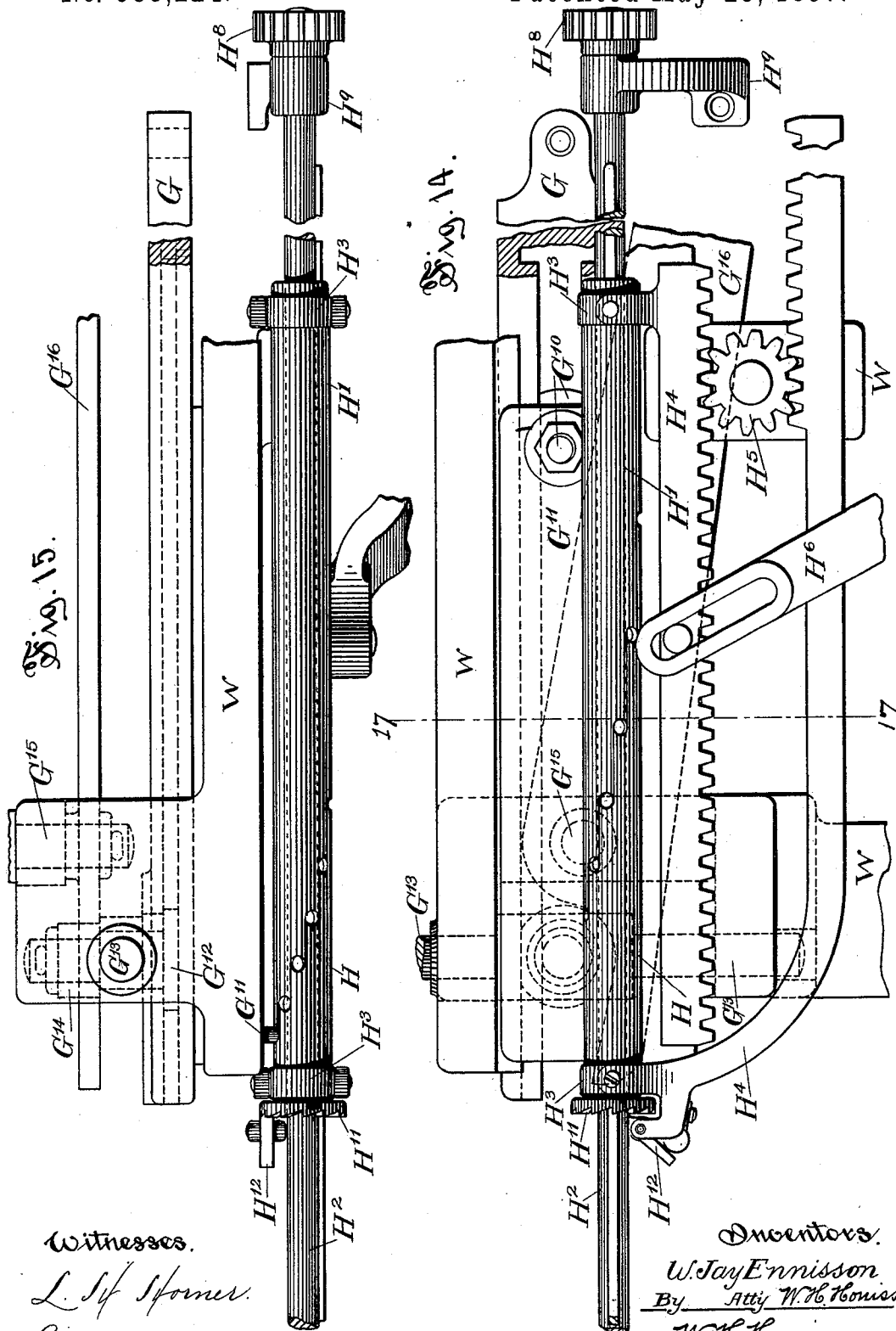
Witnesses.
L. H. Homer
Jennie Nellis.

Inventors.
W. Jay Ennisson
By Atty W. H. Honiss
W. H. Honiss.

W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.



Witnesses.

L. S. Spencer.

Jennie Nellis

Inventors.

W. Jay Ennisson.

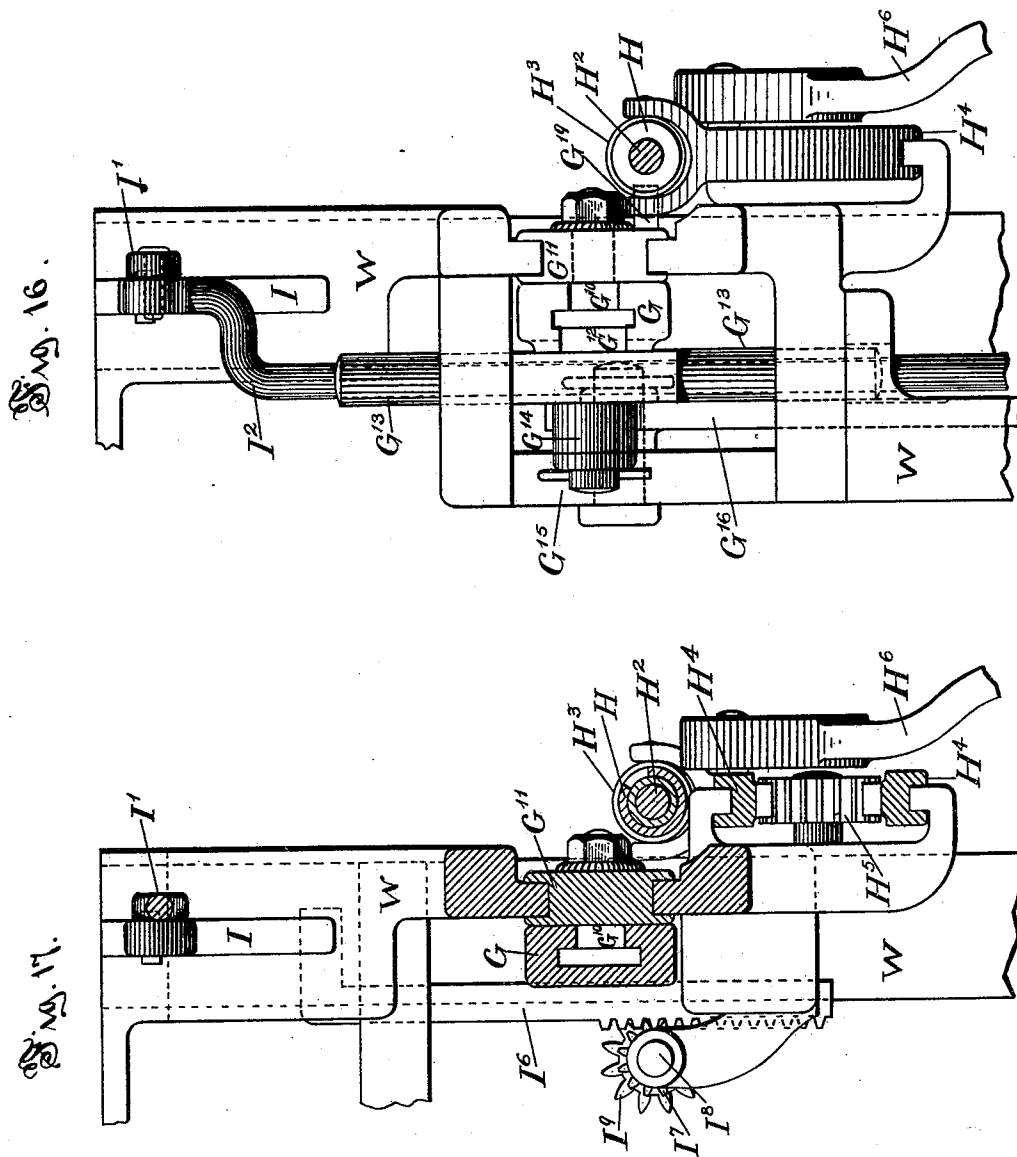
By Atty W. H. Honiss

W. H. Honiss.

W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.



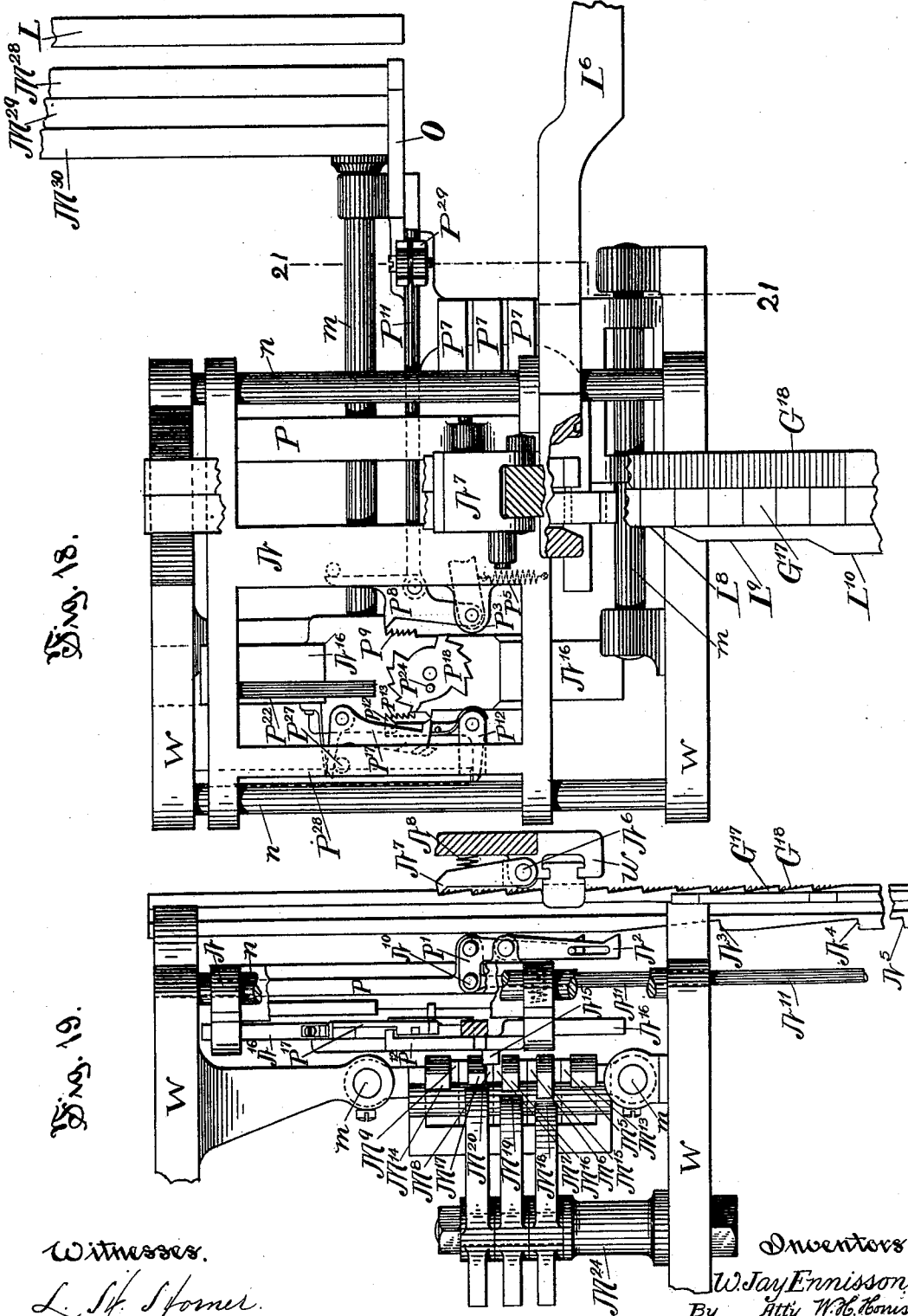
Witnesses.
L. M. Spomer
Jennie Nellis.

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W. Jay Ennisson
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W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.



Witnesses.

L. S. Spomer.
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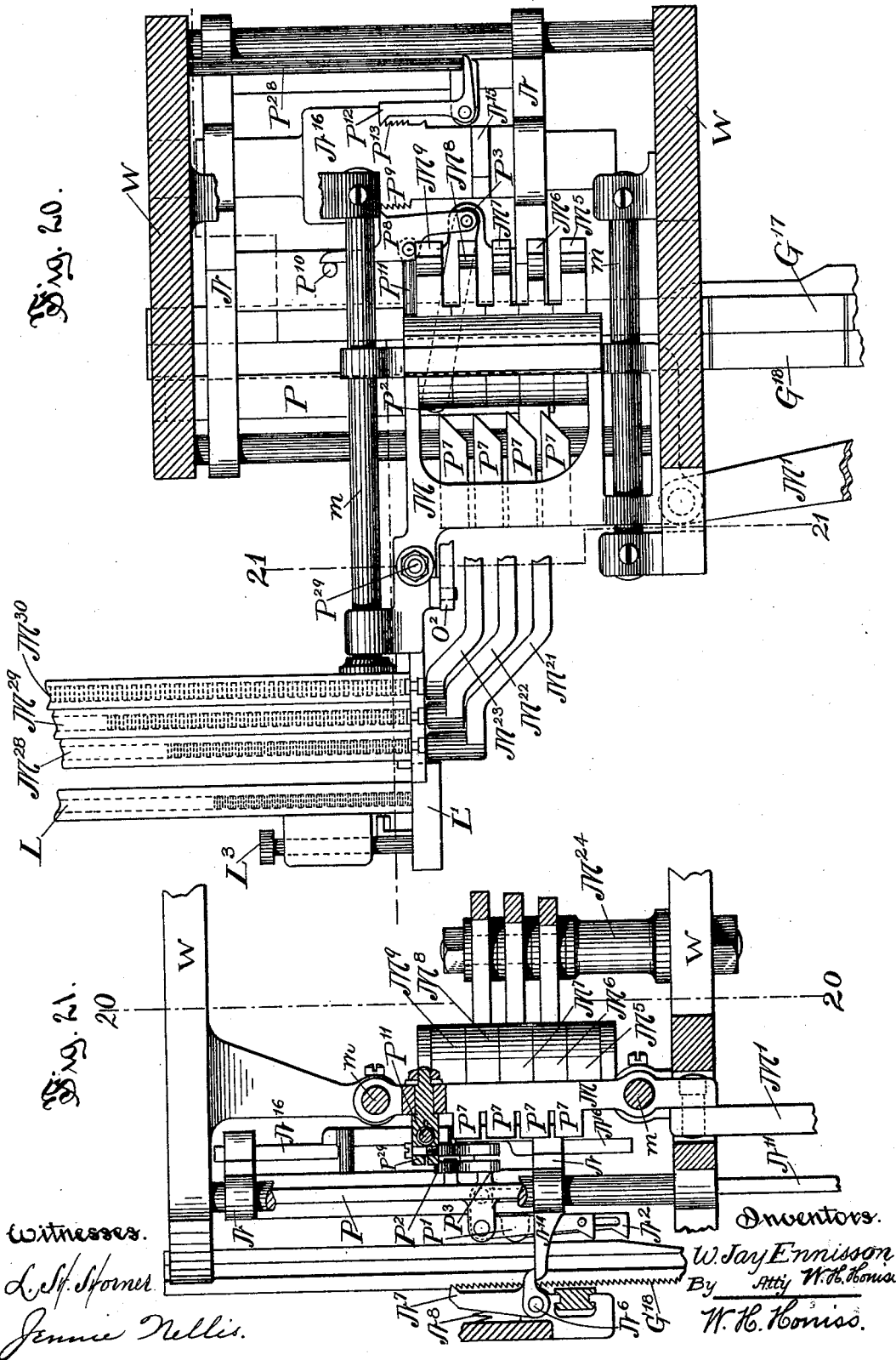
(No Model.)

22 Sheets—Sheet 13.

W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.

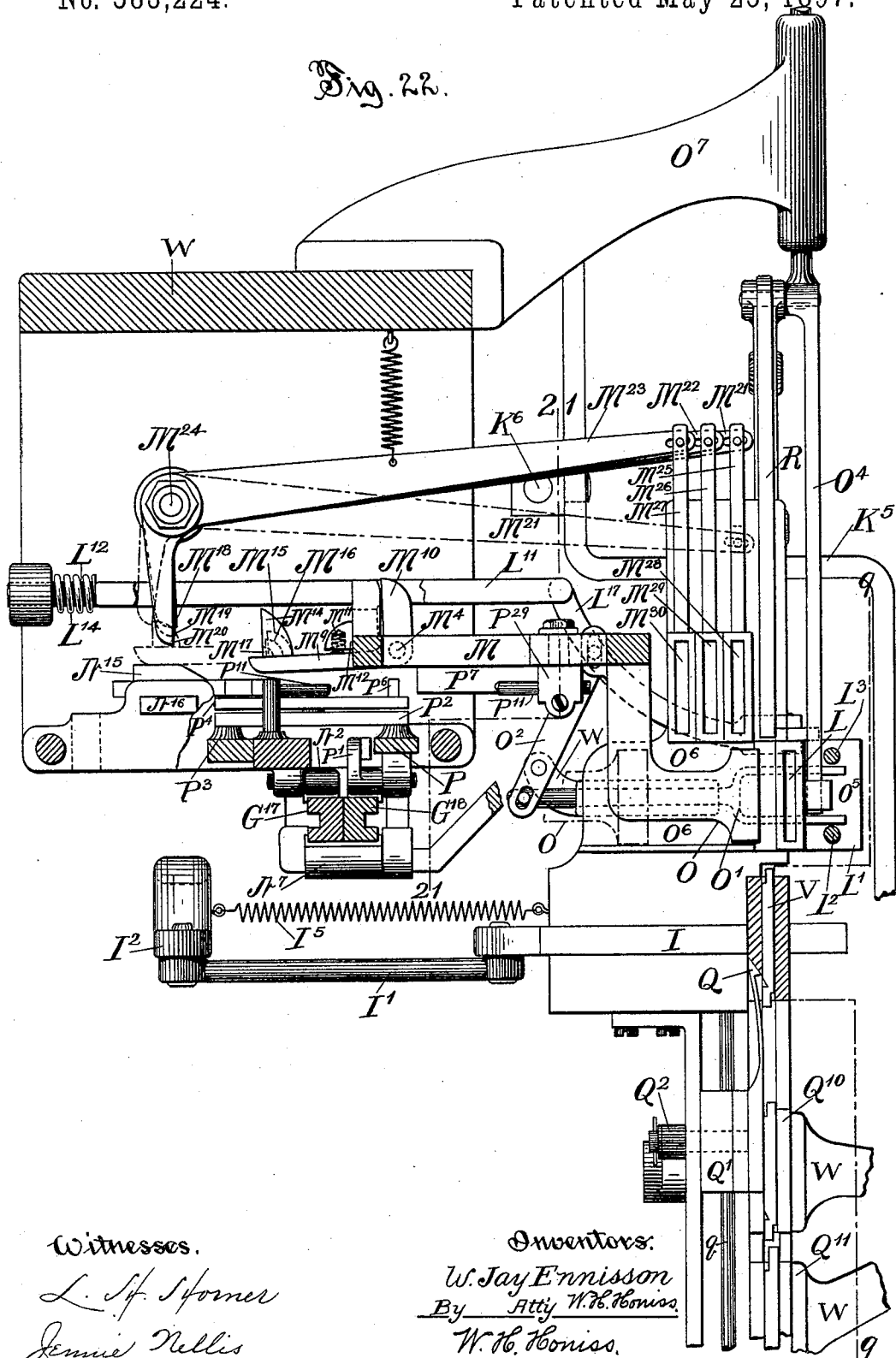


22 Sheets—Sheet 14.

No. 583,224.

Patented May 25, 1897.

Aug. 22.



Witnesses.

L. S. Spomer
Jennie Nellis

Inventors:

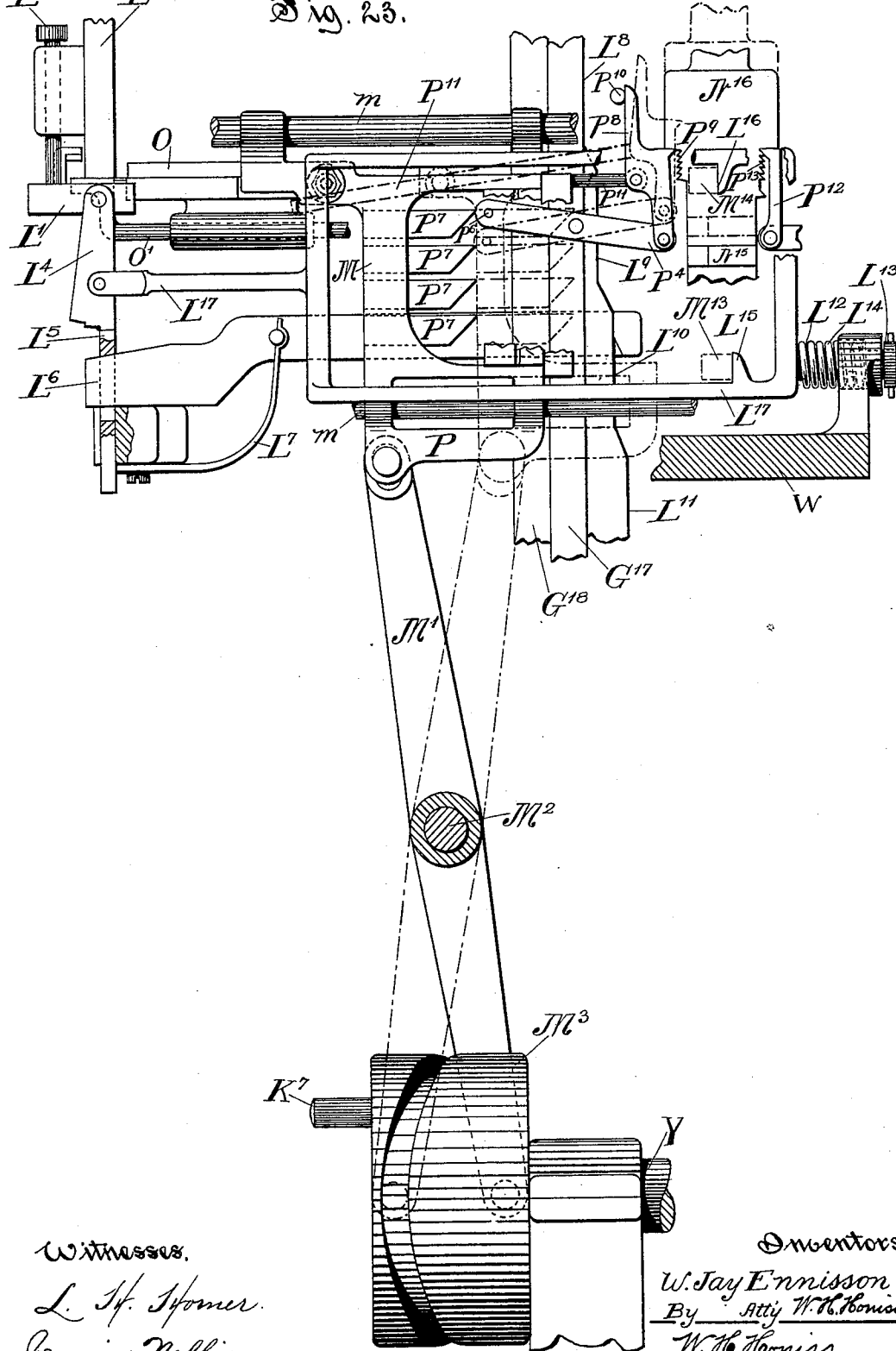
W. Jay Ennisson
By Atty W. H. Honiss.
W. H. Honiss.

W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

L³ No. 583,224.

Fig. 23.

Patented May 25, 1897.



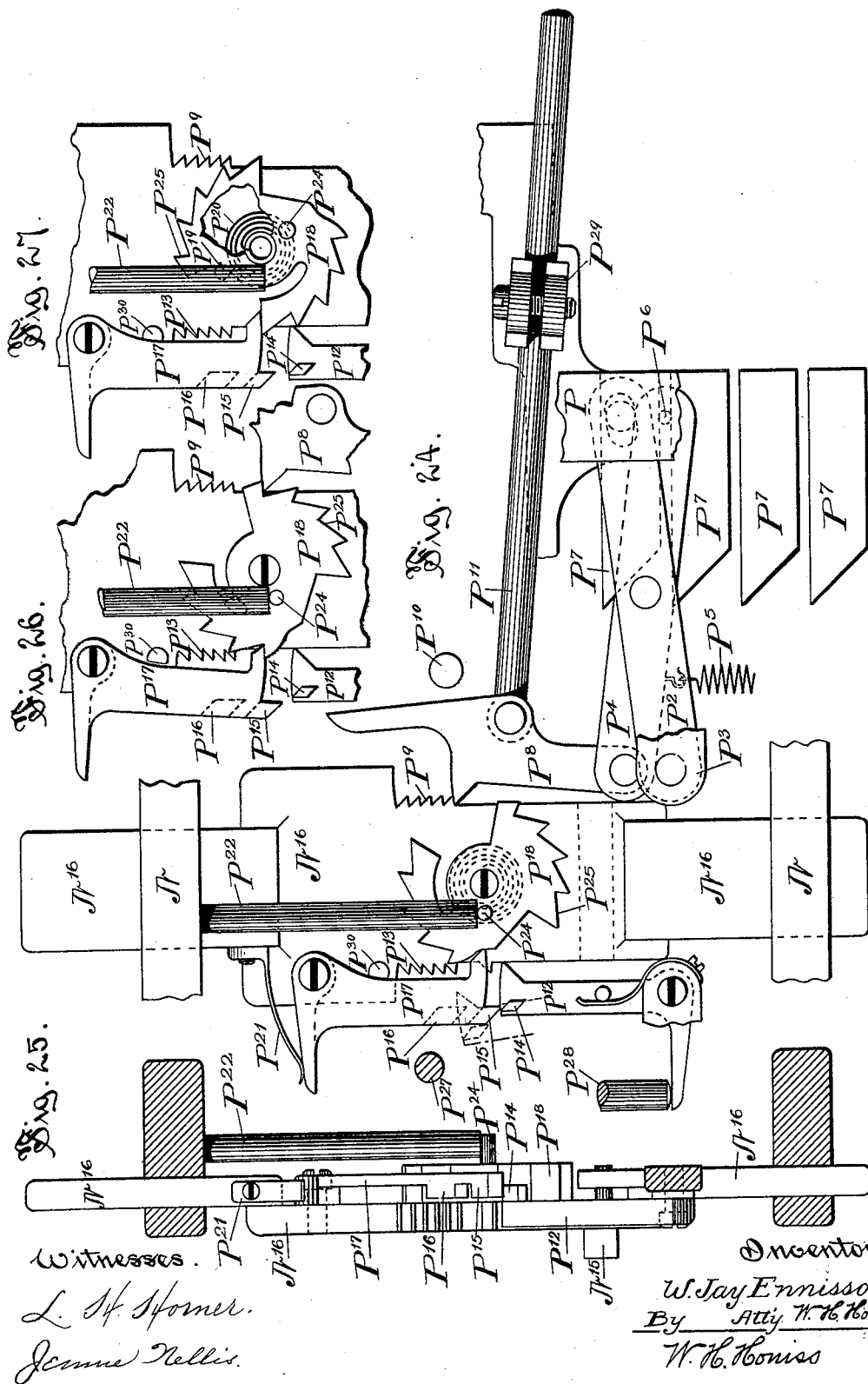
Witnesses.
L. H. Homer.
Jennie Nellis.

Inventors.
W. Jay Ennisson.
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W. H. Honiss.

W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.



W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.

Fig. 28.

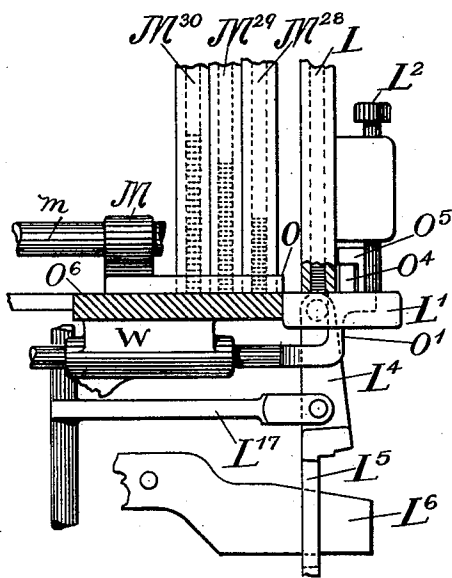


Fig. 29.

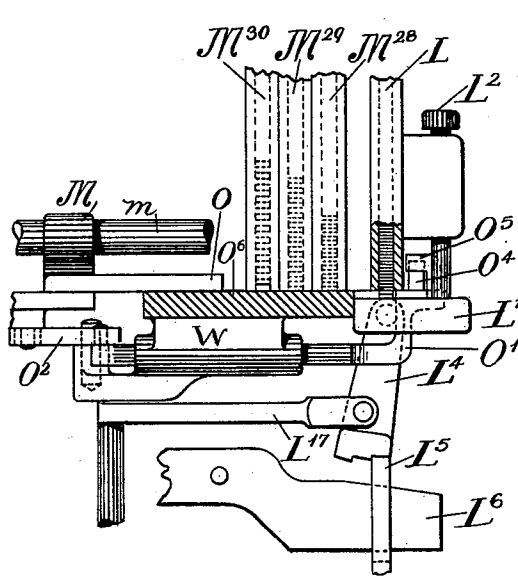


Fig. 30.

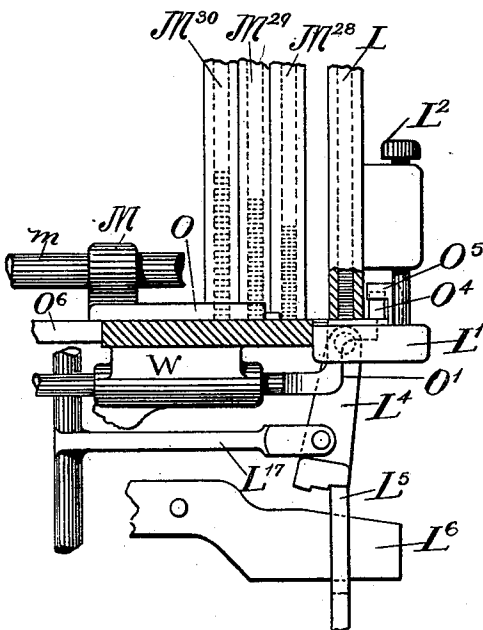
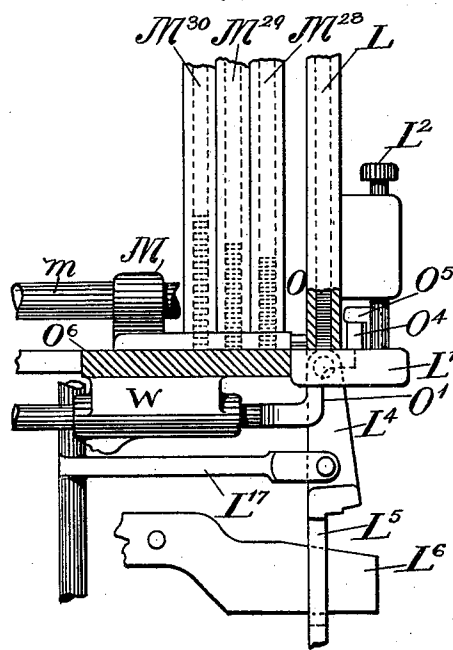


Fig. 31.



Witnesses.

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W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.

Fig. 32.

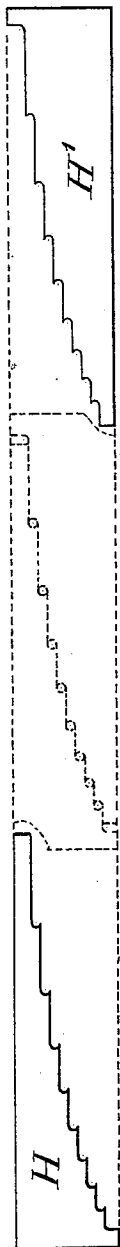


Fig. 33.

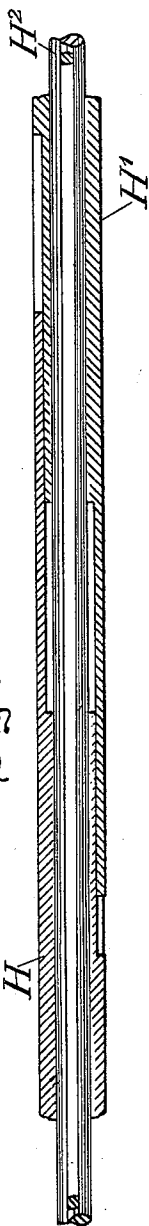


Fig. 51.

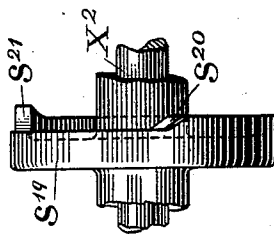
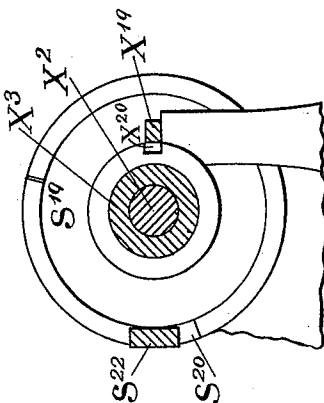


Fig. 47.



Witnesses.

L. H. Sforner
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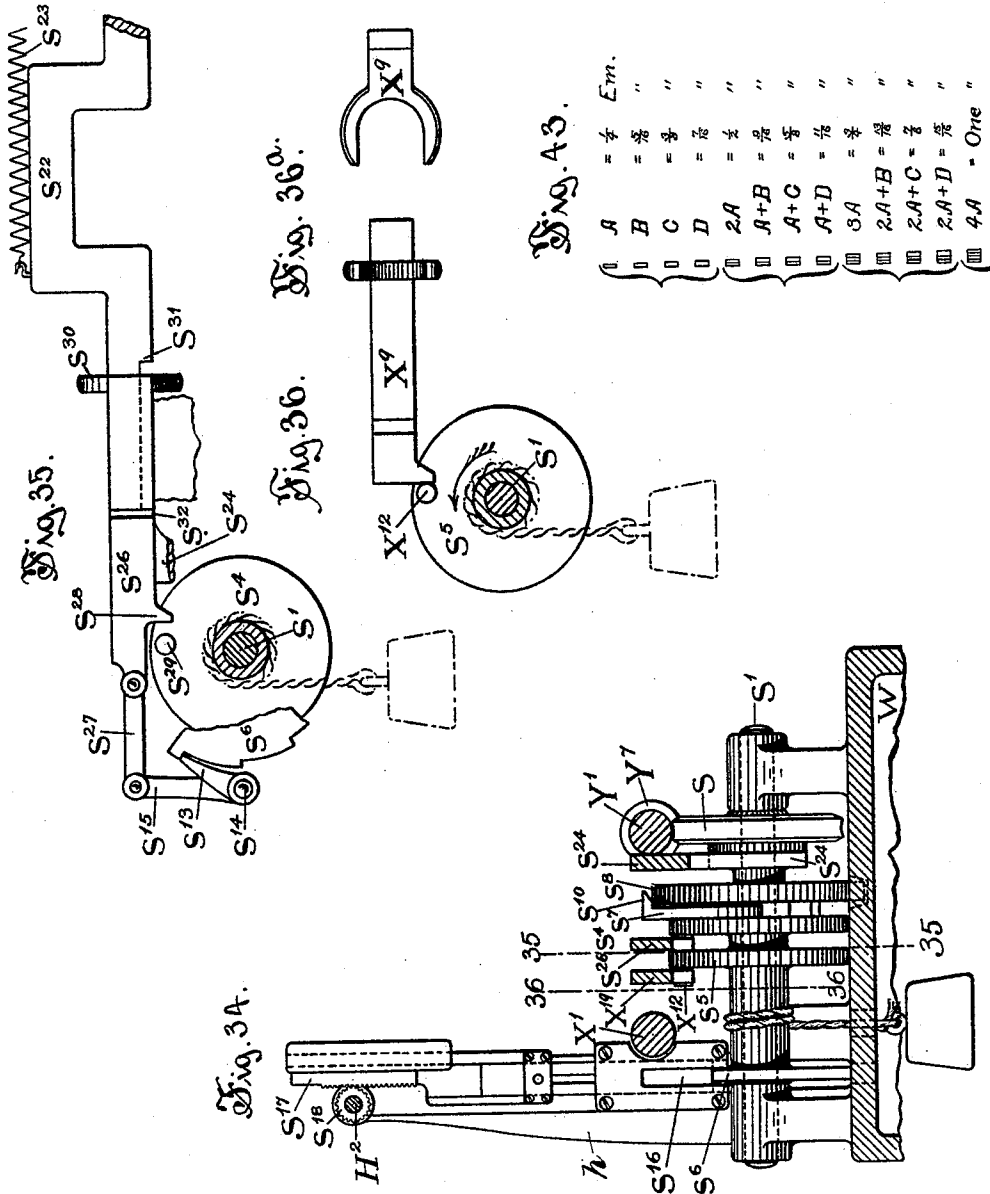
Inventors.

W. Jay Ennisson
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TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.



Witnesses.

L. S. S. S. S.
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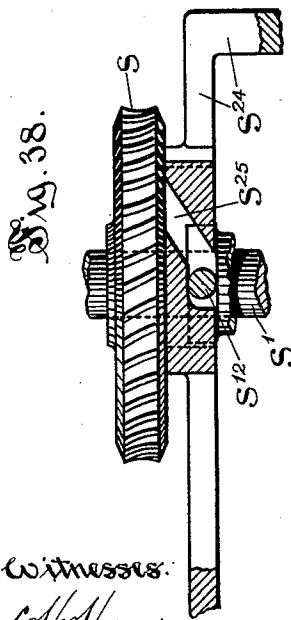
Inventors

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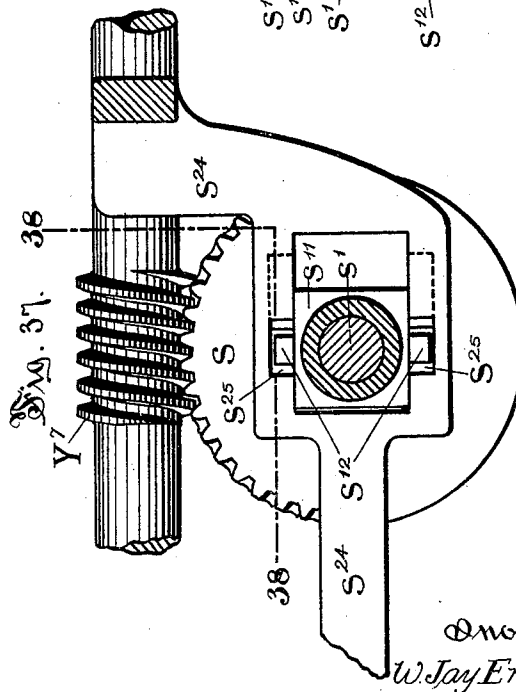
W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

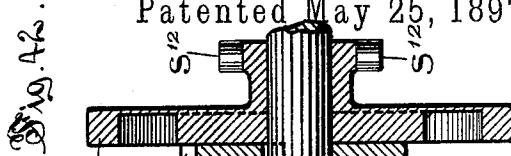
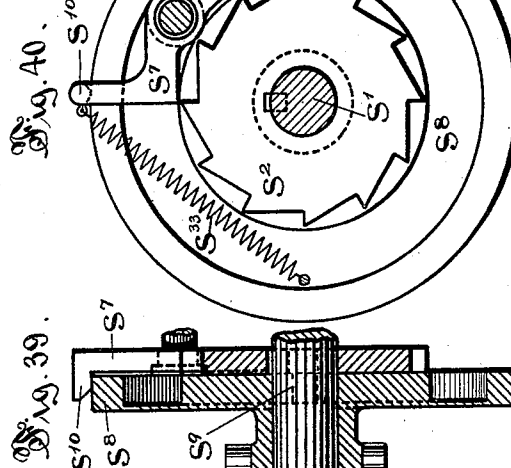
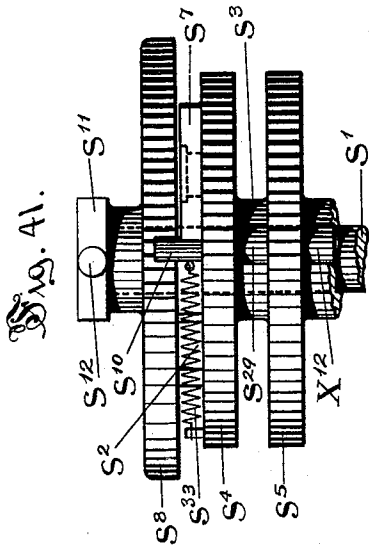
Patented May 25, 1897.



Witnesses:
L. H. Storer.
Jennie Nellis.



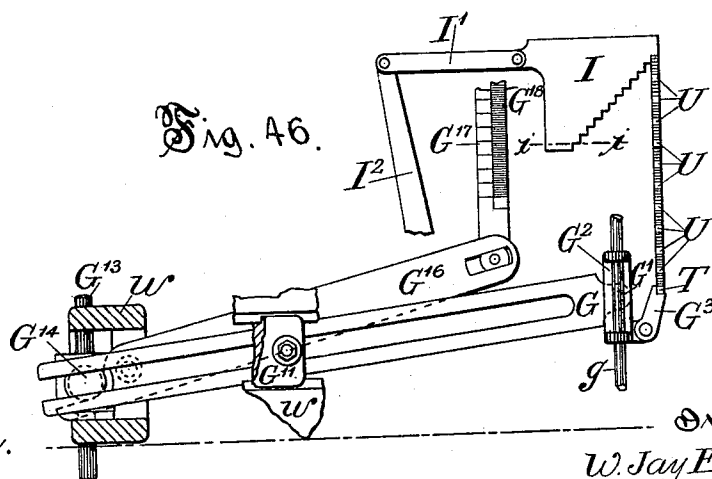
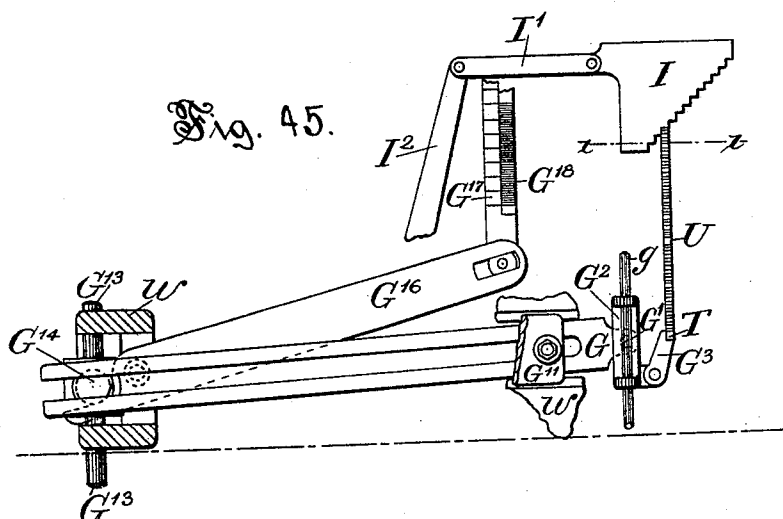
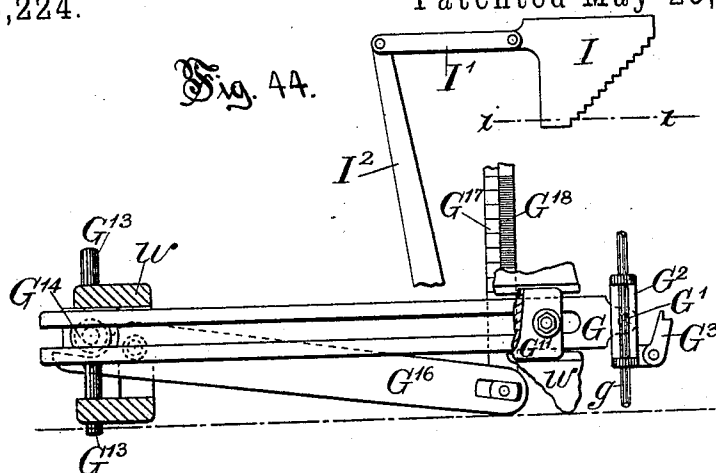
Inventors.
W. Jay Ennisson
By Atty. W. H. Honiss
W. H. Honiss.



W. J. ENNISSON & W. H. HONISS.
TYPE JUSTIFYING MACHINE.

No. 583,224.

Patented May 25, 1897.



Witnesses.

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No. 583,224.

Patented May 25, 1897.

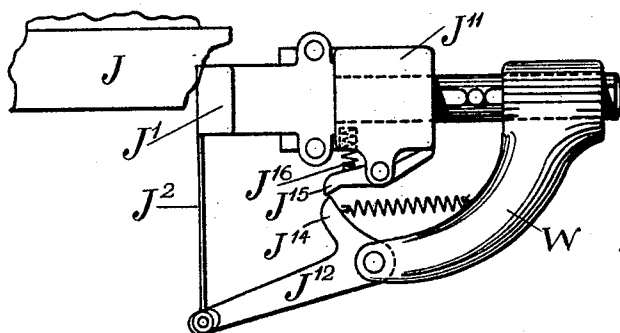


Fig. 48.

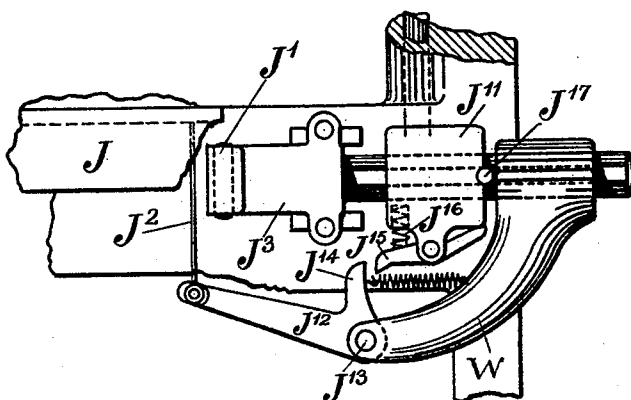


Fig. 49.

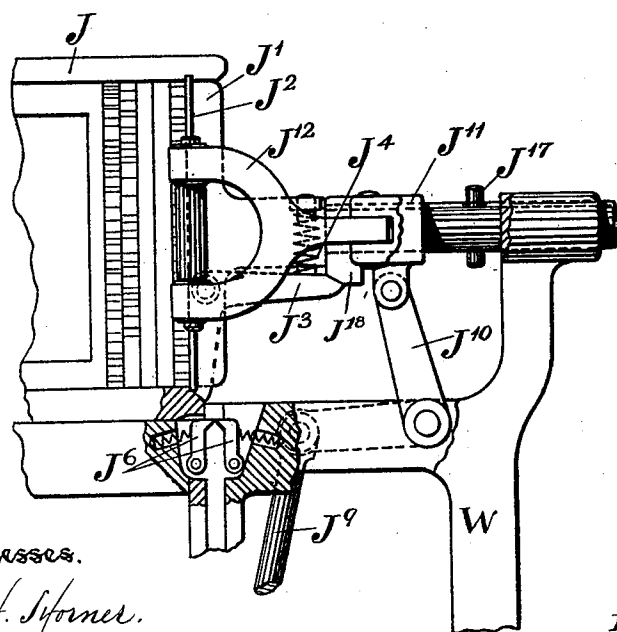


Fig. 50.

Witnesses.

L. S. Sifoner.
Jennie Nellis

Inventors

W. Jay Ennisson
By *Atty. W. H. Honiss.*
W. H. Honiss.

UNITED STATES PATENT OFFICE.

WALTER JAY ENNISSON, OF CHICAGO, ILLINOIS, AND WILLIAM H. HONISS,
OF HARTFORD, CONNECTICUT, ASSIGNORS TO THE THORNE TYPESET-
TING MACHINE COMPANY, OF NEW JERSEY.

TYPE-JUSTIFYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 583,224, dated May 25, 1897.

Application filed May 18, 1896. Serial No. 592,051. (No model.)

To all whom it may concern:

Be it known that we, WALTER JAY ENNISSON, residing at Chicago, in the county of Cook and State of Illinois, and WILLIAM H. HONISS, residing at Hartford, in the county of Hartford and State of Connecticut, citizens of the United States, have invented certain new and useful Improvements in Type-Justifying Machines, of which the following is a full, clear, and exact specification.

This invention relates to improved mechanism for justifying type or type-matrices into lines of uniform length, so as to adapt them to be made up into columns of the desired width.

The machine herein described is our most approved embodiment of this invention in its application to the justifying of separate type, and it is herein shown and described as being adapted more particularly for use in connection with that class of type-setting machines which set the type in a single continuous line. In the operation of composing this continuous line it is necessary as a preliminary to our present method of justification that the type-setting machine shall contain in its channels two different kinds of special separators, one of which is to be inserted between the words which are to form the line, and the other of which is to be inserted at each point where the continuous line is to be separated for the purpose of arranging the short lines thus obtained into column form. These special separators may be arranged each kind in its own particular channel, and may be released therefrom and assembled in proper relation to the character-type by means of special keys to be touched at the proper time by the operator, the key for the word-separator being touched at the end of each word, excepting only those words which are to come at the end of the column-lines. After each of these final words one of the line-separators may be inserted, the operator being governed in the determination of the location of these final words of the intended line by means of any suitable indicator or scale. Various forms of these separators may be employed for thus temporarily preserving the separations between the words until replaced by the final-justifying spaces, and for indi-

ating the points in the continuous line where it is to be separated to form column-lines.

The special separators herein employed differ from each other in the particular that the line-separator is slightly longer than the word-separator and both are slightly longer than the character-type with which they are employed.

It is considered desirable to preface the description of the figures and the detailed description of the machine by a brief explanation of the method or system upon which the devices operate.

The continuous line of type is fed into the machine of our present invention through a type-channel which retains the type in line, allowing the two kinds of separators to project from the edges thereof, the ends of the line-separators projecting slightly beyond the ends of the word-separators. What is termed the "line-grab" lifts the leading line from the advancing continuous line by means of the projecting ends of the line-separator which underlies the line to be separated. That line is carried by the line-grab up into what is termed the "measuring-zone," passing on the way between two star-wheels, the teeth of which are so disposed as to be engaged by the projecting ends of the separators as the line is moved past. Those separators thus operate as a rack to turn the star-wheels to an extent determined by the number of separators in the line. Arriving in the measuring-zone, the leading end of the line is carried against the proper step of the stepped jaw of the measuring device. The line is thus held against this stepped jaw while a pawl attached to the measuring-lever is brought against the opposite or lower end thereof. That lever is suspended upon a fulcrum which is capable of being moved so as to vary the effect of its measurement of the line in accordance with the number of spaces contained therein. That end of the lever which is on the other side of the fulcrum from its measuring-pawl end is connected by means of a secondary lever to the spacer-selecting devices.

The justifying-spacers are of four different sizes and are contained in four channels arranged adjacent to the spacer-selecting de-

vices above mentioned, which, governed by
 the amount of movement communicated to
 them from the measuring-lever, operate to se-
 lect from the justifying-spacer channels the
 proper sizes and combinations of spacers re-
 quired to justify the line being operated upon.
 The spacer or combination of spacers required
 to justify one of the spaces of the line are
 ejected from their channels into a raceway
 and are assembled at a point therein called
 the "injecting-plane," located immediately
 above the measuring-zone. After the line is
 released from engagement with the measur-
 ing devices each word is carried forward by
 means of a word-grab which engages with its
 underlying word-separator. The word-grab
 lifts each word-separator high enough to carry
 the character-type composing the word lying
 above that separator into the galley, where
 the character-type are retained, the word-
 separator itself being allowed to drop back
 with the returning motion of the word-grab
 as far as the plane in which its correspond-
 ing justifying-spacer or combination of spac-
 ers is located. This plane is called the "in-
 jecting-plane" because of the fact that just-
 ifying-spacers are here injected into the line
 at one side thereof, the corresponding word-
 separator being ejected therefrom into its
 proper channel on the other side of the line.

The word-grab, the spacer selecting and as-
 sembling devices, and the word-spacer ejector
 repeat their operation for each one of the
 spaces in the line to be filled, the number of
 times these operations have to be repeated be-
 ing predetermined by governor devices oper-
 ated upon by the star-wheels above described
 as having been actuated by the projecting
 ends of the separators in the line as it is
 moved up to the measuring-zone by means of
 the line-grab. The movement thus imparted
 to these star-wheels also operates through the
 one of them to determine the point to which
 the movable fulcrum of the measuring-lever
 is to be moved and operates through the other
 star-wheel to determine which step of the
 stepped jaw shall be employed for that par-
 ticular line, it being of course understood that
 the position of the fulcrum and the height of
 the jaw to be used are related to and depend-
 ent upon the number of spaces contained in
 the line to be measured at that particular set-
 ting.

Having thus briefly outlined the general
 method upon which the machine operates, a
 description will now be given of the drawings.

Figure 1, Sheet 1, represents a general front
 elevation of the right-hand end of the ma-
 chine, which is therein shown to be in the po-
 sition occupied by it after a line has been car-
 ried by the line-grab into the measuring-zone.
 Fig. 2, Sheet 2, is also a front elevation show-
 ing that portion of the machine which lies at
 the left of the portion shown in Fig. 1, it be-
 ing deemed advisable to thus extend this view
 over two sheets in order to draw it on a scale
 large enough to be readable. The line on

which these views should be joined is indi-
 cated on each of these figures by the letters
z z. Fig. 3, Sheet 3, is a general end eleva-
 tion of the machine, looking from the right-
 hand side of Fig. 1. Fig. 4, Sheet 4, is also
 a general end elevation, looking from the left-
 hand side of Fig. 2, some of the wheels be-
 ing partially broken away to enable the mech-
 anism behind them to appear more clearly.
 Fig. 5, Sheet 5, is a plan view in section,
 taken on the line 5 5 of Fig. 1. Fig. 6, Sheet
 6, is a plan view in section, taken on the line
 6 6 of Fig. 2, that line being an extension of
 the line 5 5 of Fig. 1. Fig. 7, Sheet 2, is a
 plan view of that portion of the mechanism
 shown in Fig. 2 to which it is immediately
 adjacent and from which its lines are pro-
 jected. Fig. 8, Sheet 7, is a front elevation,
 partly in section in places where the mech-
 anism therein contained may thus more clearly
 be shown. This view corresponds to what is
 shown at the right-hand side of Fig. 1 ex-
 cepting as regards the sectional parts, as above
 noted, and is drawn to a scale twice the size
 of that employed in Fig. 1. Fig. 9, Sheet 8,
 is an end view, partly in section, taken on the
 line 9 9 of Fig. 8. Fig. 10, Sheet 9, is a plan
 view in section, taken on the line 10 10 of Figs.
 8 and 22. Fig. 11, Sheet 9, is a plan view in
 section, taken on the line 11 11 of Fig. 8, which
 is herein referred to as the "datum-line" of
 the measuring-zone. The word-grab is shown
 in this view, being supposed to be at the bot-
 tom of its stroke, although its proper position
 in Fig. 8 is about half-way of its stroke. Fig.
 12, Sheet 9, is a plan view in section, taken on
 the line 12 12 of Fig. 8. Fig. 13, Sheet 9, is
 an end elevation projected from Fig. 11 of the
 parts shown in the latter figure. Fig. 14, Sheet
 10, is a front elevation, and Fig. 15 a plan
 view, drawn to enlarged scale, of the devices
 for determining the position of the movable
 fulcrum and for moving the latter to that po-
 sition, these devices being herein shown at
 the end of their stroke opposite to that at
 which they are shown in Figs. 1 and 2. Fig.
 16, Sheet 11, is a side view of what is shown
 in Fig. 14, looking from the left-hand side of
 the latter figure. Fig. 17, Sheet 11, is a simi-
 lar view excepting that it is taken in section
 on the line 17 17 of Fig. 14. Fig. 18, Sheet
 12, is a front view, and Fig. 19 is an end view,
 looking from the left-hand side of Fig. 18, of
 that part of the machine which is most inti-
 mately concerned in the selection of the
 proper justifying-spacers. Fig. 20, Sheet 13,
 is a rear view, partly in section, taken on the
 line 20 20 of Fig. 21; and Fig. 21 is an end
 view in section, taken on the line 21 21 of Figs.
 18, 20, and 22. Fig. 22, Sheet 14, is a plan
 view of the mechanism shown in the four
 preceding figures, portions of the framework
 being broken away, as shown in section, to
 enable the more important mechanism to be
 clearly seen. Fig. 23, Sheet 15, is an ele-
 vation, taken from the rearward side of the
 machine, of portions of the mechanism em-

ployed in the selecting, ejecting, and assembling of the basic justifying-spacers A. Figs. 24, 25, 26, and 27 of Sheet 16 show some of the details, in enlarged scale, of devices connected with the justifying-spacer-selecting mechanism and more especially that particular part thereof which is hereinafter referred to as the "correcting" device. Figs. 28, 29, 30, and 31 of Sheet 17 are front views of the devices for ejecting and assembling what are hereinafter termed the "basic spacers" of this system, the parts being shown in these views in four different positions during their operation. Fig. 32, Sheet 18, is a diagram representing a flat development of the circumference of what are hereinafter designated as the "fulcrum-setting quills." The open or extended position of the quills, in which they are shown in Fig. 1, is herein represented by full lines, while the closed position, in which they are shown in Figs. 14 and 15, is represented by dotted lines. Fig. 33, Sheet 18, is a longitudinal section taken through the center of the quills, showing their relation to each other and to the shaft on which they are adapted to slide. Fig. 34, Sheet 19, is an end elevation, partly in section, taken on the line 34 34 of Figs. 2 and 6, looking toward the left, showing the governor mechanism for controlling the number of times the word mechanism must repeat its operation in order to justify all of the spaces in a given line. Fig. 35, Sheet 19, is a front view of some of the details of the governor mechanism in section, taken on the line 35 35 of Fig. 34. Fig. 36, Sheet 19, is a similar view of other of those details in section, taken on the line 36 36 of Fig. 34. Fig. 36, Sheet 19, is an end projection from Fig. 36. Fig. 37, Sheet 20, is a front view in section, taken on the line 37 37 of Fig. 6. Fig. 38, Sheet 20, is a plan view in section, taken on the line 38 38 of Fig. 37. Fig. 39, Sheet 20, is an edge view in vertical section, taken through the center of the governor-shaft in Fig. 40, looking toward the right in that figure; and Fig. 40, Sheet 20, is a front view of details of the governor mechanism in section, taken on the line 40 40 of Fig. 6. Fig. 41, Sheet 20, is a plan view of other details of the governor mechanism. Fig. 42, Sheet 20, is a vertical section, taken through the center of Fig. 40, looking toward the left in that figure. Fig. 43, Sheet 19, is a table representing the system of spacer combinations, the first vertical column thereof being a representation of the progressive combinations of type, the second vertical column being descriptive of the combination in terms of the four-lettered sizes of spacers, while the third column expresses the size of each space combination in fractional parts of the em of the font employed. Figs. 44, 45, and 46, Sheet 21, are diagrammatic front elevations representing the devices employed in the measurement of the lines under three different conditions. In Fig. 44 the parts are shown in their inoperative position.

In Fig. 45 they are shown in engagement with a line of type having but a single space to be justified, and in Fig. 46 the parts are shown in the position occupied by them while measuring a line having ten spaces to be justified. Fig. 47, Sheet 18, is an end elevation in section, taken on the line 47 47 of Fig. 6, looking toward the right hand in that figure. Figs. 48, 49, and 50, Sheet 22, are views representing devices for pushing the justifying-line into the receiving-galley, Figs. 48 and 49 being plan views of those devices shown in their two extreme positions, respectively, while Fig. 50 is a front elevation of the same parts on the extreme opposite position to that in which they are represented in Fig. 1. Fig. 51, Sheet 18, is a rear view of what is shown in Fig. 47, showing the position and relation of the steps of the governor-cam. Fig. 52, Sheet 2, is a fragmentary plan view showing in detail the construction and arrangement of the clutch X⁵. Fig. 53, Sheet 2, is a fragmentary rear view projected from Fig. 3 and showing in detail the arrangement of portions of the mechanism of that figure. Fig. 54, Sheet 9, is an isometric view of a fragmentary portion of the type-channel, showing a word-separator and a line-separator in connection with some character-type.

In the organization of this machine the interrelation of the parts is such that it is difficult to give a strictly consecutive description thereof in the order in which the several operations are performed, for in the description of one group of the mechanism it often happens that reference must be made to other groups not then yet described, in which case the reader is referred to the paragraph descriptive of that group. The division and subdivision herein assumed of this machine into separate groups or sections is to a large extent arbitrary, since many of the combinations set forth and claimed are comprised in more than one group of mechanism as these groups are herein divided.

The machine will therefore be herein considered under three general divisions, the first of which, for convenience, we will term the "line mechanism," it being understood to comprise all of those parts which are principally concerned in the manipulation of the lines as such and most or all of which perform their complete function once for each line justified.

The second general division of the machine is designated as the "word mechanism," comprising those devices principally concerned in the manipulation of the words and the spacers which are to go between those words. Most or all of these devices perform their complete function or cycle of movement once for each space between the words contained in the line justified.

The third general division of the machine comprises the governing and actuating mechanism, most of which is located below the lines 5 5 and 6 6 of Figs. 1 and 2.

The first two of these general divisions are herein considered as being further subdivided into sections or combinations of mechanism, the grouping being made with reference to the particular function or functions performed by each, and the name herein given to each group or section being as far as possible suggestive of its function. It will of course be understood that each of these sections, in addition to performing its own particular function, also performs its share of other functions common to two or more sections. The following description will take up these sections as far as possible in their natural and logical sequence, each under its own heading.

The general division designated as the "line mechanism" is divided into the following sections: line-grab mechanism, measuring mechanism, fulcrum-adjusting mechanism, stepped-jaw-adjusting mechanism, and galley mechanism.

That division of the machine comprehended under the general designation of "word mechanism" is subdivided into the following-named sections: word-grab mechanism, spacer selecting and ejecting mechanism, selector-correcting mechanism, spacer-assembling mechanism, separator-extracting mechanism, and spacer-injecting mechanism.

Only that portion of the framing W of this machine which is most intimately connected with the devices of this invention is herein shown, it being understood that that framework is intended to be supported on or incorporated with the general frame of the particular form of type-composing machine with which it is to be employed. In connection with the above-mentioned division of the devices of this machine into three general sections it may here be noted that those devices contained in the line mechanism are nearly, if not quite, all connected with and receive their motion from the shaft X, which is therefore designated by us the "line-shaft," while those devices included in the general division, called the "word mechanism," receive their motion from the word-shaft Y.

Following the above order, we will first describe the line-grab mechanism. This is shown in Figs. 1, 3, 5, 8, 9, and 12. Its function is to detach the leading line of type from the oncoming continuous line advancing from the type-composing machine and carry it forward into what is termed by us the "measuring-zone" of the machine, which is that portion located above the datum-line 11 11 of Fig. 8 and between the stepped and the movable jaws of the measuring devices. The line-grab consists of two principal combinations of parts, the line-separating device and the carrier. The separating device consists of a slide E, which is loosely fitted upon the rods e e, attached at their ends to the framework W of the machine. This separator-slide has pivoted upon it at E' and E², respectively, the stop-arms E³ and E⁴. Upon the same pivots

are also loosely mounted the fingers E⁵ and E⁶. These arms and fingers are arranged in pairs upon the opposite edges of the type-channel V, the extreme upper ends of each pair being located adjacent to each other and just within the paths traversed by the respective ends of the special line-separators T, lying, however, outside of the paths of travel of the word-separators U. The normal positions of these pairs of stop arms and fingers with relation to the type-channel V is best delineated in Fig. 9, wherein they are shown to be in engagement with the ends of one of the special line-separators T. The extent of oscillatory movement of the stop-arms E³ and E⁴ is regulated by means of pins which extend therefrom into the grooves E⁷ and E⁸, (best seen in Fig. 9,) the fingers E⁵ and E⁶ being therein shown in their innermost position, toward which they are urged by their respective springs E⁹ and E¹⁰, respectively. These separating devices attached to the slide E are moved upward by means of the advancing line of type until disengaged therefrom on arriving at the upper end of their permitted movement, at which point the grooves E⁷ and E⁸ curve outward and open the arms E³ and E⁴. At the same time the cranked outer ends of the stop-fingers E⁵ and E⁶ are brought in contact with the pins E¹¹ and E¹², by means of which those fingers are also moved outside of the path of the line-separators and at the same time are moved out of engagement with the carrier, which will next be described.

The carrier-slide F is loosely fitted upon the rods f f and is connected by means of the link F', arm F², shaft F³, and connecting-rod F⁴ to the crank F⁵, by means of which the carrier-slide F is caused to reciprocate vertically upon the rods f f from its extreme upward position (shown in Fig. 3) to the lower end of those rods as they appear in that figure. Upon the slide F is pivoted the lifting-pawl F⁷, which is bifurcated to enable it to pass by the measuring-pawl G³. That lifting-pawl is urged by the spring F⁸ against a stop to the position shown in Fig. 8, so as to enable its engaging end to pass under the line-separator T when that separator is lifted from the rest of the continuous line by means of the separating devices E. The inclined projections F⁹ and F¹⁰ of the slide F are adapted to engage with the projections E¹³ E¹⁴ of the stop-fingers E⁵ and E⁶, as shown in Figs. 8 and 9, the engaging surfaces of the projections F⁹ and F¹⁰, describing an arc struck from the centers of the pivots of their respective stop-fingers E⁵ E⁶ when in the position shown in Fig. 9, or those surfaces may be made normal to those pivots, the object being to enable the projections F⁹ and F¹⁰ to engage with the projections E¹³ E¹⁴ of the fingers E⁵ E⁶, respectively, and thereby lift up the line-separating devices, which in turn, engaging with the ends of the line-separator T, lift that separator so as to allow the carrier-pawl F⁷ to engage beneath it. Having thus obtained positive

engagement with the separated line of type, the carrier-slide F is moved upward by means of its crank being freed from the separating device when the latter reaches the upper limit of its stroke, as set forth in the above description of that device. Thus released from the separated line which is being moved up by the carrier the separating device drops by gravity, aided, if necessary, by a light spring, until the engaging ends of the stop-arms E³ E⁴ collide with the ends of the next advancing line-separator T, by means of which the separating device is again moved upward until upon the returning stroke of the line-carrier it is again engaged thereby. As before stated, the function of the line carrier or grab is to carry the line of type thus separated from the advancing continuous line up into the measuring-zone to a point where the under side of the line may be engaged by the measuring-pawl G³, as shown in Fig. 8.

The measuring mechanism.—A comprehension of the general principles upon which this mechanism operates may best be gained by reference to the diagrams shown in Figs. 44, 45, and 46. The details of its construction are more clearly shown in Figs. 1, 2, 8, 11, 12, 14, 16, and 17. The principal member thereof is the measuring-beam G, which is attached by means of the pivot G' to the slide G², fitted to slide vertically on the rods g g, which are attached at their ends to the framework W of the machine, and the slide is provided with an extension adjacent to the type-channel upon which is pivoted the measuring-pawl G³. (Best seen in Fig. 8.) That pawl is normally pressed by the spring G⁴ toward the position shown in that figure, so as to cause the pawl to enter beneath the line of type when the latter has been lifted up to its position by the line-grab.

Into the lower end of the slide G² is fitted the telescoping yoke G⁵, which, by means of the spring G⁶, is normally pressed outward to the fullest extent against a stop-pin, as shown in Fig. 8. This yoke G⁵ is also guided by means of projections thereof engaging the rod G⁷, and it is provided with a cam-pin G⁸, adapted to engage with the cam G⁹, fixed upon the line-shaft X. The cam G⁹ is so formed as to move the yoke G⁵ upward to an extent equal to the greatest deficiency that can occur in any of the lines of type to be measured, and the yoke is therefore necessarily moved upward to that extent for every line at each of the intermittent rotations of the shaft X. The elastic nature of the connection between the slide G² and its yoke is for the purposes of permitting the cam G⁹ to complete its stroke after the upward movement of the measuring-slide has been stopped by the line of type being measured, the mechanism being thus adapted to accommodate itself to the variations which occur in the lines. The measuring-beam G, which is connected by means of the pivot-pin G' to the slide G², is an extended member of the form shown in

cross-section in Fig. 17, having a T-slot extending along and opening out of its front surface. A corresponding T-shaped block G¹⁰ is fitted in the slot and is capable of being moved the entire length thereof. The block G¹⁰ is also provided with a cylindrical extension which has a bearing in the fulcrum-block G¹¹, being secured thereto by means of a nut and washer, as shown in Figs. 16 and 17, forming a closely-fitting pivotal connection between that block and the measuring-beam G. The fulcrum-block G¹¹ is fitted to slide in ways of the frame W of the machine, so as to enable the pivot of the measuring-beam to be moved to its several required positions by means of the fulcrum-adjusting mechanism to be hereinafter described.

The extreme left-hand end of the beam G, as seen in Figs. 14 and 15, is bifurcated in order to receive a T-shaped block G¹², similar to that of G¹⁰, excepting that it is faced in the opposite direction and has its cylindrical portion journaled in the rectangular part of the rod G¹³, which is fitted at its ends to slide in the frame W. Beyond the guide-rod G¹³ the cylindrical portion of the block G¹² is provided with a roller G¹⁴, held in place by means of a washer and split pin, as shown in Fig. 16. Upon the framework W at G¹⁵ is pivoted the secondary beam or lever G¹⁶, the shorter end of which is adapted to engage with the roller G¹⁴, by means of which the movements of the beam G are communicated to the secondary lever. That lever is connected at its longer end to the selector setting racks G¹⁷ and G¹⁸, the arrangement and function of which will be described in connection with the spacer-selecting mechanism, it being understood that the upward movements of the right-hand end of the measuring-beam during the measuring operation from the position shown in Fig. 44 to those shown in Figs. 45 and 46 produce a related upward movement of the selector-setting racks G¹⁷ and G¹⁸.

The relation of the movement of the racks to that of the measuring-pawl end of the beam G as that relation is varied by the position of the fulcrum-block G¹¹ will best be seen by the diagrammatic views comprised in Figs. 44, 45, and 46, and in this connection it is deemed desirable to give a more extended explanation of the system of measurement herein employed by us, that explanation being an almost necessary preface to the descriptions of the fulcrum-adjusting mechanism and the stepped jaw-adjusting mechanism, which are logically next in order.

For the purpose of determining the size of the spacer or combination of spacers to be inserted in the spaces which occur between the words of a line it is necessary, first, to ascertain the net deficiency of the line to be justified, or, in other words, to ascertain what aggregate thickness of spacer-type must be added to the character-type contained in that line to fill it out to the desired width, and,

secondly, to divide that aggregate thickness into the number of spaces which occur in the line in order that the spacers representing the size determined by this division shall, when all are inserted in their respective spaces, exactly fill out or justify the line.

The first requirement is to eliminate from the problem the measurement of the special separators U and T, which, as above described, have been inserted in the line in the operation of composing for the purpose of locating the divisions between the words and the lines, respectively. As a means of effecting this elimination one of the jaws of the measuring device is formed with a series of steps on its type-engaging face, the height of each of these steps being exactly equal to the thickness of one of the special separators employed. In the diagrams represented in the last-named figures of the drawings the lines *ii* indicate that step of the jaw I which should be employed if there were no separators to be eliminated from the measurement. In Fig. 45 the devices are shown in engagement with a line of two words, containing, therefore, a single word-separator U and at the bottom the inevitable line-separator T, therefore requiring for the correct elimination of the thickness represented by those separators the employment of the second step of the jaw I above that step indicated by the line *ii*. This diagram illustrates the minimum requirement of the machine, inasmuch as it is always necessary to have at least one space between the words for the purpose of justification, and when a single word occurs in the line—as, for instance, at the end of a paragraph—it is necessary to fill out the line with slugs, between which it is advisable to insert a number of word-separators, so as to allow greater range in the subsequent operation of justifying. An illustration of the opposite or maximum capacity of the machine as herein organized is represented in Fig. 46, wherein the devices are shown in engagement with a line containing ten words, and having therefore nine word-separators and at the bottom the usual line-separator. In order to eliminate the measurement of these ten separators from the line, the jaw I is drawn toward the left, so as to allow the line of type to engage with the tenth step above the plane *ii*, thus eliminating from the measurement of that line the space represented by the thickness of the ten separators contained therein and allowing of a movement of the measuring-beam G exactly equal to that which it would have in measuring a line composed only of the character-type contained in the line.

The mechanism by means of which the jaw I is moved to its correct position for each line to be measured will be described under the heading of the “stepped-jaw-adjusting mechanism.”

Having thus provided for the elimination from the measured line of all excepting the character-type therein contained, it is neces-

sary to divide the net deficiency thus determined into the number represented by the spaces between the words. The normal position of the measuring-beam G is horizontal, as shown in Fig. 44, and in that position the engaging surface of its measuring-pawl G stands coincident with the datum-line 11 11, at a distance from the plane *ii* of the stepped jaw I equal to the full column width or, in other words, to the desired length of the justified line. It will therefore be seen that the extent of upward movement of the measuring end of the beam from the horizontal or datum-line position (shown in Fig. 44) will be exactly equal to the deficiency of the line, representing therefore the aggregate setwise measurement of the spacers required to fully justify the line.

For greater convenience and definiteness we have herein shown the limit of justifying capacity of this machine to be equal to a printer's em at each space between words, as shown in Fig. 43. There is, however, nothing in the nature of the machine to limit it to this capacity, it being capable of extension to any amount required in practice. In Figs. 45 and 46 this assumed maximum of one-em deficiency is supposed to exist in each of the spaces between words therein occurring. Therefore it will be observed that the secondary lever G¹⁶ occupies the same position in both figures, although the upward movement of the pawl G³ is ten times as great in Fig. 46 as in Fig. 45. This difference in the relative movements of the beam and of the secondary lever is determined by the location of the fulcrum-block G¹¹, which in Fig. 45 occupies such a position as to cause the movement due to a deficiency of one em to impart to the secondary lever and to its selector-setting racks an amount of movement equal to that imparted to them by the movement due to a deficiency of ten ems in Fig. 46, it being obviously necessary that the selector-setting racks, which determine merely the size of the spacer or spacers to be selected, shall be set to the amount called for by each space without regard to the number of those spaces.

Having thus described the effect of the changes in position of the fulcrum, a brief description will next be given of the operation of the “measuring mechanism.” The line having been carried up by the line-grab so that its line-separator T rests on the pawl G³, the cam G⁹, acting through the yoke G⁵, carries the pawl G³ upward until the latter is stopped by the closing up of the line against the proper step of the jaw I, thus determining the movement of the beam. The cam G⁹ completes its rotation, bringing the beam back to its horizontal position. (Shown in Fig. 8.)

Fulcrum-adjusting mechanism.—This comprises means for moving the fulcrum-block G¹¹ of the measuring-beam G to the proper point thereon for the purpose indicated above. A comparison of Figs. 45 and 46 will show the extreme movement required of the fulcrum,

it being understood that the position occupied by it is governed by the number of spaces in a line to be measured, and that the fulcrum may therefore require to be moved to any one of ten positions—sometimes one, sometimes five or ten spaces or intervals to the right or to the left, as the case may be, from its previous position.

A pin G^{19} (best shown in Fig. 15) extends from the fulcrum-block G^{11} into the path of movement of the adjusting-quills H and H' . These quills consist of mutilated cylinders which are capable of endwise movement to and from each other upon the shaft H^2 , to which they are splined. When brought together their mutilated portions overlap and match one another, as shown in Figs. 14 and 15, leaving circular openings along the line of their matching surfaces arranged upon a spiral line increasing from left to right, as seen in Figs. 14 and 15, being equally spaced circumferentially around the completed cylinder thus formed by the two quills; but spaced at varying distances longitudinally thereof, corresponding in this respect with the different required positions of the fulcrum. A flat development of the circumferential surfaces of these quills is shown in Fig. 32, the full lines thereof representing their open position, while the dotted lines represent their closed position. Each of these quills is provided with a loose collar H^3 , which collars are engaged by suitable forks on the racks H^4 , those racks being connected by means of the pinion H^5 , so as to impart to the racks and quills opposite simultaneous and equal movement toward and from each other to the extent indicated in Fig. 32, and shown also by a comparison of Figs. 1 and 14. One of the racks H^4 is connected by means of an arm H^6 to the cam H^7 on the line-shaft X , and that cam is so formed as to communicate to the quills suitable longitudinal movements at the proper times.

The quills H and H' are adjusted circularly to their proper position for each line by means of the pinion or star-wheel H^8 , fixed on the shaft H^2 . As previously explained, this pinion is located adjacent to the type-channel V , as shown in Fig. 9, with its teeth lying in engaging relation to the special separators which operate as they are carried past the star-wheel to turn the latter one tooth for each of the separators in the line. The shaft H^2 is journaled at its right-hand end in a bracket H^9 , attached to the frame W of the machine, and at its left-hand end it is journaled in the upper end of the governor-bracket h , as shown in Fig. 2. The shaft is also provided with a spring H^{10} , which is preferably in the form of a coiled clock-spring, as shown in Figs. 2 and 4, and is so attached to the shaft and to its casing as to tend to turn the shaft in the direction opposite to that in which it is turned by the separators. A ratchet H^{11} (shown in Figs. 2, 14, and 15) is fixed to one of the quills and is engaged by means of a detent H^{12} , piv-

oted upon the rack H^4 adjacent thereto. The function of this ratchet and detent is to retain the quills, so far as rotary motion is concerned, in the position to which they are moved by the separators acting upon the star-wheel or pinion H^8 .

The operation of these fulcrum-adjusting devices is as follows: While a line is being carried up by the line-grab, the quills are in their separated position, (shown in Fig. 1,) clear of the fulcrum-adjusting pin G^{19} . The quills are thus left free and are turned one step for each of the separators U and T contained in the line. When that line has been carried past the star-wheel, the quills remain in the position to which they have been turned by the star-wheel, so that when pushed together to the position shown in Figs. 14 and 15 the pin G^{19} is engaged by the proper notch and is moved thereby to its correct position with relation to the beam, being carried from the previous position to its new place by the right-hand or by the left-hand quill, according as it may require to be moved to the left or to the right, respectively. The quills remain in this position, holding the fulcrum in its proper place while the measuring operation is performed, when they are again separated to the position shown in Figs. 1 and 2, bringing the lower end of the detent H^{12} against a suitable pin in the frame W , which operates to release the ratchet and allow the shaft H^2 and its quills to be rotated back to their zero position by means of the spring H^{10} .

Stepped-jaw-adjusting mechanism.—This is best shown in Figs. 1, 8, 9, 10, and 16. The stepped jaw I consists of a piece with parallel flat sides, and is of a generally rectangular form, excepting as to its front or right-hand edge, which, as shown in Figs. 1, 8, and 9, is formed in steps, each of a height corresponding to the thickness of the special separators employed in the line of type, as hereinbefore explained. This jaw is fitted to slide horizontally in the frame W toward and from the main type-channel V , and substantially central thereof, as shown in Figs. 3 and 9, the members which compose the type-channel being slotted, so as to allow the jaw to pass transversely across the path of the type. The jaw is connected by means of the link I^1 to the arm I^2 , which is pivoted at I^3 to a bracket on the main frame W , and is provided with a cam-pin adapted to engage with the cam I^4 on the shaft X . That cam is not provided with a groove, but is adapted to bear against one side only of the cam-pin of the arm I^2 , and is adapted to move the stepped jaw toward the left, as seen in Fig. 1, being normally held toward the right and against the cam projection by means of the spring I^5 . Therefore, these devices, if unobstructed, would carry the stepped jaw reciprocally from right to left to the extent shown by a comparison of Figs. 45 and 46; but it is necessary to arrest the movement of the stepped jaw for each line to be measured at the point

adapted to the number of separators contained in that line, as hereinbefore described. This is accomplished by means of devices best shown in Figs. 8, 9, and 17, consisting of a stop I⁶, which is fitted to slide vertically in the framework W, having on its upper end an L-shaped portion projecting into the path of traverse of the jaw I on the stepped end thereof, the other end being provided with rack-teeth, which engage with a pinion I⁷ on the shaft I⁸, that shaft being journaled in a bracket attached to or integral with the main frame W. Upon the shaft I⁸ is fixed also the star wheel or pinion I⁹, (best shown in Fig. 9,) arranged opposite to the star-wheel H⁸, with its teeth lying in the path of travel of the separators, so that those separators, in passing between the star-wheels H⁸ and I⁹, operate to turn each of them equally—that is to say, to the extent of one tooth for each separator carried past—the resistance offered by the two pinions thus being adapted to counteract each other to avoid tilting the type. The movement thus communicated to the star-wheel I⁹ is transmitted to the stepped jaw-stop I⁶, raising it one step for each of the separators carried through. Therefore when the entire line has been carried past the star-wheels the upper end of the stop I⁶ stands in such a relation to the steps of the jaw I as to arrest its movement at the proper step thereof for the correct measurement of that particular line. The cam I⁴ is so timed as to allow the stepped jaw to be moved toward the right, as shown in Fig. 8, just after the stop has been set to its proper position, as just described, operating, therefore, to arrest the movement of the stepped jaw at the proper step thereof. The pressure of the jaw I against the stop I⁶ serves to hold the latter in the position to which it has been elevated by its star-wheel I⁹. After the completion of the measuring operation the jaw I is moved back toward the left by its cams clear of the type-channel V, so as to enable the words to be carried up into the galley, while the stop I⁶, released from the jaw I, drops to its normal position ready for the next line.

Galley mechanism.—This is best shown in Figs. 8, 9, 48, 49, and 50. It comprises mechanism adapted to hold a suitable column-galley in position to receive the justified lines of type from the word-grab mechanism and for pushing each line when completed along the column-galley, so as to make room for a new line to enter.

The column-receiving galley J, which may be so attached to the frame W as to be easily removable therefrom, rests upon its side, and is provided with a plunger J', fitted to slide into the right-hand end thereof to the extent shown by a comparison of Figs. 8 and 50. In the former figure the plunger is shown in its open position, which permits of the character-type being pushed up into the galley between the face of the plunger and the rule J². Upon the plunger is pivoted a pawl

J³, having a T-shaped bell-cranked extension (best shown in Figs. 8 and 9) adapted to be engaged by the spiral springs J⁴, by means of which the pawl is pressed downward to the position shown in Fig. 8. In that position the front face of the pawl is vertical and coincides with the front or left-hand vertical face of the plunger J', the lower portion of which is beveled backward from the general plane of its surface to an extent shown in Fig. 8, so as to allow the type to enter past the corner J⁵. The lower end of the pawl J³ is beveled at an angle of about forty-five degrees, and the separators U and T have a corresponding nick in their corners centrally of their length.

The character-type forming a word, when carried upward by means of their underlying separator, operate to crowd back the pawl J³ against the pressure of its springs, thereby allowing the character-type to pass into the galley until the lower edge of the last character-type has passed above the corner J⁵ of the bottom wall of the galley. The nick in the word-separator then permits the pawl to return to its normal position, transferring the line of character-types slightly to the left, from the support of the separator to that of the corner J⁵. The separator is then allowed to drop to its position shown in Fig. 8, resting on the pair of detents J⁶, the tops of which are pressed together by means of their springs, as shown in Figs. 8 and 50. These detents are pivoted in suitable recesses in the frame W and are forced apart by the type passing through, closing behind the separator in order to form a support for the latter while it is being extracted and also to form a support for the justifying-spacers, which are substituted for the separators. The spacers thus injected are carried up into the galley on the top of the next word, this operation being repeated until all the spaces of a line have been justified and the type carried into the galley.

The galley-plunger J' is provided at its right-hand end with a stem which is fitted to slide in a hub of the frame W for the purpose of guiding the plunger in its longitudinal movement. That movement is imparted to it by means of the cam J⁷ on the line-shaft X, which operates through the cranked arm J⁸, connecting-rod J⁹, and cranked arm J¹⁰ to impart a suitable reciprocating motion to the slide J¹¹, which is splined on the stem of the galley-plunger, so as to prevent rotary motion thereon, leaving it free to move longitudinally. That slide is provided with a beveled projection J¹², adapted to fit against the correspondingly-beveled cranked end of the pawl J³ when the slide is moved to the left, as shown in Fig. 50, thus locking that pawl in the position shown in that figure, so as to present a plane unyielding surface against the line of type for the purpose of pushing it farther into the galley. Before the line can thus be pushed into the galley it is evident that the rule J² must be withdrawn from between the line last

formed and those which precede it. That rule is made a little longer than the width of the column and is fitted to slide in grooves made in the top and bottom walls thereof. It is
 5 pivoted at its front edge to a preferably bifurcated arm J^{12} , which is pivoted at J^{13} to an extension of the frame W . That arm is provided with a bell-cranked extension J^{14} , which is adapted to engage with the pawl J^{15} , as
 10 shown in Figs. 48 and 49. That pawl is pivoted upon the slide J^{11} and is normally held in the position shown by means of a spring J^{16} . It will be observed that the slide J^{11} is required to move some distance on its supporting-plunger
 15 before abutting against those surfaces thereof by means of which it moves that plunger forward. This preliminary movement of the slide J^{11} is utilized to carry the rule J^2 out of the way of the plunger by
 20 means of the pawl J^{15} engaging with the cranked end J^{14} of the arm J^{12} , thus moving it from the position shown in Fig. 49 to its fully-withdrawn position. (Shown in Fig. 48.) The parts are so adapted that the slide J^{11} is
 25 brought against the abutting surface of the plunger, as shown in Fig. 50, so as to move the new line forward to the left just at the time when the rule is fully withdrawn, as shown in Fig. 48, at which time the engaging
 30 pawl J^{15} has passed beyond the sweep of the cranked arm J^{14} , allowing the latter to be returned by its spring, thus bringing the rule behind the new line of type, so as to permit of the return of the plunger. The slide J^{11} is
 35 then moved by means of its cam toward the right against the pin J^{17} , thereby moving the plunger back to its open position. (Shown in Figs. 8 and 49.) The spring J^{16} allows its
 40 pawl J^{15} to be depressed out of the way as it passes by the cranked arm J^{14} on the return stroke.

Having thus completed a description of the devices comprising the line mechanism, a description will now be given of the devices
 45 comprehended under the general designation of the word mechanism, beginning with the—
Word-grab mechanism.—This is best shown in Figs. 1, 3, 8, 11, 12, and 13. In its general construction and mode of operation it
 50 resembles the devices composing the line-grab mechanism, differing from those devices chiefly in the respect that the devices for separating and for carrying the words are embodied in one organization, instead of being
 55 composed of two separable organizations. The slide K is loosely mounted upon the rods ff , and is provided with the bifurcated stop-finger K' , pivoted thereon at K^2 . The bifurcations of this stop-finger are upon opposite
 60 sides of the slide K , and their upper extremities extend on either side of the type-channel V into the paths of the respective ends of the word-separators U . One of the bifurcations of the stop-finger is provided with a pin
 65 K^3 , which is fitted in a slot in the guide K^4 , the latter being attached to the main frame W . The extent of oscillatory motion of the

finger K' is controlled by the form of the groove in the guide K^4 , (best seen in Fig. 8,) the stop-finger being held in the position
 70 shown in that figure from the lowest point of its vertical motion up to within a short distance of the upward extremity thereof, at which point the groove is curved, so as to move the stop-finger to the right out of the path of
 75 the separators. Upon the slide K is also mounted the oppositely-disposed pair of pawls K^9 K^{10} . These pawls are pivoted at K^{11} and K^{12} , respectively, to the slide K , and their upper ends extend on either side of the type-channel immediately below the correspond-
 80 ing members of the bifurcated finger K' and at a distance therefrom substantially equal to the thickness of one of the word-separators, as best shown in Fig. 8. The lower
 85 ends of the pawls K^9 and K^{10} , on the opposite side of their respective pivots, are provided with the spring K^{13} , which operates to press the separator-engaging ends of the pawls toward each other and toward the type-channel.
 90

The slide K is caused to reciprocate vertically upon the rods ff by means of the arm K^5 , pivoted at the back of the main frame, as shown in Fig. 3, and that arm is connected, by means of the rod K^6 and the rod R^2 , to the
 95 crank-pin K^7 , fixed in the side of the cam M^3 on the line-shaft Y , as shown in Fig. 53. An elastic connection between the arm K^5 and the rod R^2 is formed by the spiral spring K^8 , coiled on the rod K^6 . The movement communicated
 100 to the slide K by its crank-pin K^7 is sufficient to carry the upper or separator-engaging portions of the word-pawls K^9 and K^{10} from the lower end of the line of type shown in Fig. 8 to and a little above the upper surface of the
 105 detents J^6 of the galley mechanism.

While the line is being measured and while the spacer-selecting mechanism is being set, the word-grab rests, by means of its bifurcated stop-finger K' , upon the uppermost of
 110 the word-separators U contained in the line to be measured, as shown in Fig. 8. As soon as the preliminary operations of measuring and of setting the spacer-selecting mechanism have been completed the word-shaft Y is put
 115 in operation, as hereinafter explained in connection with the governor mechanism, and the rotary motion thus communicated to the crank-pin K^7 operates to carry the word-grab to its uppermost position, the pawls K^9 and
 120 K^{10} carrying forward the separator, beneath the ends of which they have been resting, up between and past the detents J^6 . As the slide approaches the upper end of its stroke the
 125 pin K^3 , guided by its slot in the guide K^4 , is oscillated backward, so that its engaging points are outside of the path of travel of the type-separators, which are thus enabled to pass by the finger. At the beginning of the downward
 130 stroke the finger returns to within the path of the separators and is stopped by the next-occurring separator, the pawls K^9 and K^{10} dropping into engagement beneath the ends of the separator, as before, ready to elevate

it, with the character-type lying above it, into the galley, as before explained. The yielding connection formed by the spring K^8 between the crank K^7 and the slide K allows that crank to make its full downward stroke and to pick up the slide when it reaches it on the return stroke. Meanwhile the separator which has just been left resting upon the detents J^6 has been extracted therefrom, as described in connection with the separator-extracting mechanism, and the proper justifying-spacers have been substituted therefor, as explained in connection with the spacer-injecting mechanism. Those spacers are carried up into the galley on the next word, and thus by the repeated movements of the word-grab each word is elevated from the measuring-plane into the galley.

In Figs. 4, 18, 19, 20, 21, 22, 23, 28, 29, and 31 is shown the devices comprising the spacer selecting and ejecting mechanism, the selector-correcting mechanism, and the assembling and injecting mechanisms. These different mechanisms are so involved and interdependent that their separation into groups is more difficult and arbitrary than in the case of any of the other sections of the machine. It is thought advisable to preface the detailed description of these mechanisms by an explanation of the system upon which the spacers are arranged and combined.

The justifying-spacers employed in this system are four in number, herein designated as A, B, C, and D. (See the table, Fig. 43.) The setwise thickness of the spacer A is herein assumed to be equal to one-fourth of the em of the type which is being justified, or, in printers' parlance, it is a "four-to-em space." The other sizes B C D are equal, respectively, to five-sixteenths, three-eighths, and seven-sixteenths of an em. The method of combining these spacers, so as to satisfy the varying widths required, is shown in the table, Fig. 43, above referred to, to the extent of one em, it being, however, obvious that the combinations can be continued on the same system to any desired extent. The difference in size between the spacers A B C D is uniformly one-sixteenth of an em, and this difference exists also between the successive combinations formed by those spacers. These combinations are arranged in series of four, the first series employing the spacers A B C D in the order given, each of the succeeding series differing from the one preceding only by the use of an additional A spacer. Thus it will be seen that the spacers B C D are never combined with each other, and that no more than one of either of them is ever employed in a combination. On the other hand, the spacer A is repeated to any extent required to fill out the thickness called for. By reason of the fact that the A spacer is the smallest employed, and also because it is thus repeated in the different combinations, we designate it as the "basic" spacer. On account of the frequent repetition of this spacer in

the combinations we employ devices for its selection differing considerably from those employed in the selection and ejection of the B, C, and D spacers, as will be hereinafter described.

On account of their intimate relationship to the spacer-combination system it is desirable at this point to complete the description of the setting-racks G^{17} and G^{18} , which was begun in connection with the description of the measuring mechanism and carried only so far as it pertained to that mechanism. These two racks are fitted to slide in suitable guides formed by extensions of the main frame, as shown in Figs. 19 and 22, and are provided on their front surfaces with ratchet-teeth, as shown in Figs. 18 and 19. The teeth on the rack G^{17} are located at a distance apart equal to that by which the racks are elevated by the measuring mechanism for each deficiency of one-sixteenth of an em in each of the spaces of that line. The teeth on the rack G^{18} are much closer together, there being six of them in the distance which separates two of the teeth of the rack G^{17} , and the pitch of these fine teeth is therefore equal to one-sixth of that of the rack G^{17} and is also equal to the distance the racks are elevated by the measuring mechanism for each deficiency of one-ninety-sixth of an em. Upon the frame W at N^6 is the setting-rack detent N^7 , the point of which extends across both of the racks G^{17} and G^{18} , as shown in Fig. 18, being pressed into engagement with those racks by means of the spring N^8 , the function of this detent being to engage the setting-racks and retain them in substantially the highest position to which they are carried by the operation of the measuring mechanism through the medium of the secondary lever G^{16} . The rack G^{17} is connected to that lever by means of a swiveling and sliding pivot, as shown in Figs. 1, 44, and 45, the rack G^{18} resting in engagement with a suitable foot or projection of the rack G^{17} , as shown in the last-mentioned figures, being capable of vertical movement away from that foot with relation to the rack G^{17} to an extent represented by five of the small notches upon its front surface.

When the racks are carried up by the operation of the measuring device, the detent N^7 drops into each of the notches and as the measuring-beam moves back to its horizontal position it leaves the setting-racks and the secondary lever G^{16} , connected therewith, suspended upon the detent at approximately the highest point of the measurement. As it would seldom happen that a tooth of the rack G^{17} would be exactly in position to be engaged by the detent N^7 , it follows that that rack would drop down with the returning movement of the measuring mechanism until its next tooth came in contact with the detent N^7 . Thus it might happen that the rack G^{17} might return to an extent represented by one, two, three, four, or five of the notches of the rack G^{18} . The position in which the rack

G¹⁷ is thus suspended as the result of each measuring operation is utilized as hereinafter described in connection with the selecting mechanism to determine which spacer or combination of spacers are to be inserted, and the difference in the relative vertical positions of the two racks when suspended from the detent N⁷, after the completion of the measuring operation, is also utilized in the manner hereinafter to be described in connection with the selector-correcting mechanism. It is desirable, however, to explain in this connection that the backs of these racks are each provided with steps N³, N⁴, and N⁵, (best shown in Fig. 19,) which are located at a distance apart equal to four times the pitch of the rack G¹⁷. The corresponding steps of the two racks exactly coincide when the rack G¹⁸ rests on the foot of the rack G¹⁷, and they are carried out of coincidence to the extent of the relative displacement of the two racks as a result of the measuring operation.

The spacer-selecting mechanism will now be described, beginning with that portion thereof which attends to the A or basic spacers.

In the plan view, Fig. 22, may best be seen the relative location of the spacer-containing channels. The channel L, containing the A spacers, is alongside the main type-channel V, while the channels M²⁸, M²⁹, and M³⁰, containing the spacers B C D, respectively, are arranged side by side adjacent to a raceway into which the required spacers are ejected.

The selecting mechanism for the A spacers is shown in Figs. 9, 23, 28, 29, 30, and 31. Beneath the channel L, containing the A spacers, is an elevating raceway or table L', upon which those spacers rest. That table serves also as an elevating-raceway, and is provided with the guide-rods L² and L³, which are fitted to slide in projections from the side of the channel L. Pivoted upon the table L' is the stop L⁴. (Best seen in Figs. 9 and 23.) The lower end of this stop is provided with three steps of a height above one another corresponding to the thickness of the basic or A spacer. These steps of the stop L⁴ are adapted to rest upon the shoe L⁵, fitted to slide vertically in the frame, and that shoe is provided with a slot through which is transversely passed the end of the table-elevator L⁶, which is also fitted to slide in the frame W, and is urged toward the left, as seen in Fig. 23, by means of the spring L⁷. The opposite or right-hand end of the elevator passes beyond and in front of the selector-setting rack G¹⁷. That rack is provided with a longitudinal cam-like surface along one edge thereof, as shown in Figs. 1 and 23, having four planes L⁸, L⁹, L¹⁰, and L¹¹, those planes being arranged in equal steps from the rack G¹⁷ and connected by short inclines, the elevator-L⁶ having at its end a projection adapted to be engaged by these stepped and inclined surfaces of the rack G¹⁷. From this description and reference to the figures it will be seen that the vertical posi-

tion of the raceway-table L', so far as it is governed by the position of the elevator L⁶, is at its highest position when the elevator rests against the plane L⁸, the table being then close against the bottom of the channel L, so that none of the spacers are exposed to the action of the extractor, the operation of which will be hereinafter described; but as the rack G¹⁷ is pushed upward by the operation of the measuring mechanism the elevator L⁶ is carried successively upon the planes L⁹, L¹⁰, and L¹¹, thus permitting the basic table L' to drop away from the bottom of the channel L to an extent equal to the thickness of one, two, and three spacers, respectively, to satisfy the requirement thus expressed by the measuring devices.

It will be understood that the rack G¹⁷ remains in the position in which it is left by the measurement of the given line throughout the operation of justifying all of the spaces contained in that line, so that the position of the elevator L⁶ remains constant during the justification of an entire line; but for reasons which appear on reference to the table in Fig. 43 and for other reasons hereinafter explained in connection with the selector-correcting mechanism it is occasionally necessary to provide for the insertion of an additional basic or A spacer, and the means for obtaining this occasional or "accidental" A spacer consists principally in the basic stop L⁴, which, as represented in Fig. 23, rests during the usual operation of the machine upon the highest of its stepped faces. As these steps differ in height by an amount equal to the thickness of one of the basic spacers, it will be seen that it is only necessary to move the stop L⁴ from the position shown in Fig. 23 to the second or third step in order to obtain one or two basic spaces, respectively, in addition to those which may have been obtained by virtue of the position of the elevator L⁶.

The stop L⁴ is pivotally connected to the frame L¹⁷, which extends along the back of the selecting devices and is supported at its opposite end by means of an extension L¹², extending through a boss in the frame W, upon the outside of which it is provided with a collar L¹³, adapted to serve as a stop for the frame L¹⁷, and that frame is pressed toward the left, as shown in Fig. 23, by means of the spring L¹⁴, thus tending to hold the basic stop L⁴ in the position shown in the latter figure, with its highest step resting upon the shoe L⁵. The lower member of the frame is provided with the spur L¹⁵, and the upper member is provided with a similar spur L¹⁶, those spurs being located adjacent to the path of travel of the selecting-fingers M⁵ and M⁹, respectively, upon the carriage M. (Best shown in Fig. 22.) By reference to Fig. 23 it will be seen that the vertical or engaging face of the spur L¹⁵ is located farther from the basic stop L⁴ than the corresponding surface of the upper spur L¹⁶ to an extent equal to the difference in horizontal position of the steps in

the lower end of the stop L^4 , the purpose of this difference being to cause the frame to be moved to the second or middle step when the spur L^{15} is engaged by its selecting-finger M^5 and to cause it to be moved to the forward or shortest step when the spur L^{16} is engaged by its selecting-finger M^9 .

The carriage M is loosely mounted upon the rods $m m$, fixed to the main frame W , and is adapted to slide horizontally thereon to an extent indicated by the difference between the full and the dot-and-dash lines thereof, (shown in Fig. 23,) being moved to this extent by means of the lever M' , pivoted at M^2 to the main frame W and driven by the cam M^3 , fixed to the word-shaft Y . Upon the vertical pivot-shaft M^4 are pivoted the selecting-fingers M^5 , M^6 , M^7 , M^8 , and M^9 . (Best shown in Figs. 20, 21, and 22.) By reference to the latter figure it will be seen that these fingers somewhat resemble the letter L in plan view, the extended base members M^{10} of the L shape of the fingers serving as a stop against a suitable extension of the carriage, against which they are urged by means of the springs M^{11} , located in the vertical member M^{12} , thus operating to normally hold the fingers in the position shown in Fig. 22. The vertical distance between the centers of the adjacent fingers is equal to the distance between the notches on the front face of the rack G^{17} for reasons hereinafter made apparent. The fingers M^5 and M^9 are provided with spurs M^{13} and M^{14} , respectively, adapted to engage with the spurs L^{15} and L^{16} of the frame L^{17} , as above described, when the carriage is at the backward end of its stroke, as represented by the dot-and-dash lines in Fig. 23, while the fingers M^6 , M^7 , and M^8 are provided with similar but shorter spurs M^{15} , M^{16} , and M^{17} , respectively, which are adapted to engage with the ends M^{18} , M^{19} , and M^{20} , respectively, of the ejecting-levers M^{21} , M^{22} , and M^{23} . Those levers are fitted to oscillate upon the stud M^{24} , fixed in the frame W to an extent represented by the dot-and-dash position of the lever M^{21} . (Shown in Fig. 22.) Those levers are attached to the ejecting-slides M^{25} , M^{26} , and M^{27} , respectively, adapted to slide through the bottom of the type-channels M^{28} , M^{29} , and M^{30} , which contain the justifying-spacers $B C D$, respectively, (best shown in Fig. 22,) and those ejecting-slides are adapted to eject singly from their respective channels the lowest spacers contained therein in the manner usual in type-setting machinery. The motion of the parts is so timed that the spacers $B C D$ are thus ejected from their respective channels into the adjacent raceway when the plunger O , which is adapted to reciprocate therein, is in the rearward position. (Shown in dot-and-dash outline in Fig. 22.)

From the above description and the drawings it will be understood that whenever one of the fingers M^5 or M^9 is oscillated upon its pivot as its carriage reaches the backward end of its stroke, as represented by dot-and-

dash lines in Fig. 22, it operates to move the frame L^{17} and the stop L^4 so as to release one or two, respectively, of the basic spacers A , but whenever one of the fingers M^6 , M^7 , and M^8 are similarly moved it operates to engage with its corresponding ejecting-lever and cause the ejection of one of the spacers $B C D$. The means whereby the required fingers are thus turned upon their pivot M^4 at the proper time of the stroke of their carriage are appurtenant to the cross-head N , which is fitted to slide vertically upon the rods $n n$, fixed to bosses on the main frame W . The extent to which the cross-head may be reciprocated vertically upon the rods $n n$ is substantially equal to the vertical space occupied by the selecting-fingers M^5 , M^6 , M^7 , and M^8 , which is also equal to the distance between each of the steps N^3 , N^4 , and N^5 on the rack G^{17} , the cross-head being represented in its uppermost position in Figs. 18, 19, 20, and 21.

Upon the cross-head at N' is pivoted the latch N^2 . (Shown in Figs. 19, 21, and 22.) The lower end of that latch is adapted to engage with the steps N^3 , N^4 , N^5 (shown in Fig. 19) on the rearward side of the selector-setting rack G^{17} and operates to support the cross-head at its desired height by means of whichever one of those steps may happen to be brought by the setting of the rack G^{17} within the range or zone of vertical movement of the latch N^2 .

The selector N^{15} is a projection preferably integral with the selector-slide N^{16} , that slide being fitted at its ends to the cross-head N . That slide normally rests in its lowest position, as shown in Figs. 18, 19, and 20, upon suitable shoulders which rest upon the lower lateral member of the cross-head, but it is capable of upward movement therefrom with relation to the cross-head for purposes hereinafter described in connection with the selector-correcting mechanism. For the purpose of the description of this section it may be considered as remaining in its lowest position shown in the last-mentioned figures.

The selector N^{15} (best shown in Figs. 19, 20, and 22) is located in the general vertical plane of the selecting-fingers M^5 to M^9 , inclusive, and moves with the vertical motion of the cross-head along that plane, so as to be brought opposite to one or the other of those fingers, as may be determined by the position in which the cross-head rests after the conclusion of the measuring operation. In the last-mentioned figures, the cross-head being shown in its uppermost position, the selector N^{15} rests in a position to engage the selecting-finger M^8 when the latter is carried with the movement of its carriage M , and therefore operates to move that finger to the dot-and-dash position shown in Fig. 22, thereby engaging with its corresponding ejecting-lever M^{23} and causing the ejection of the spacer D into the raceway. It will be seen by reference to Fig. 20 that those portions of the selecting-fingers which move across the

vertical pathway of the selector N^{15} are separated by a space substantially equal to the vertical width of the selector, and the notches on the rack G^{17} are so located that the selector N^{15} is never permitted to engage with more than one at a time of the selecting-fingers. It will be observed that those notches are of the same pitch as the fingers and that the selector may therefore be brought into the same relation to each of the fingers as that in which it is herein shown to the finger M^8 .

The means whereby the cross-head N is carried into and out of operative relation to the setting-racks will now be described.

Upon the cross-head is mounted the correcting-slide P , being capable of vertical movement thereon to an extent equal to five of the small notches of the setting-rack G^{18} . Upon this slide is pivoted the correcting-slide latch P' , having its point adapted to engage with the steps $N^3 N^4 N^5$ of the rack G^{18} . This latch therefore lies alongside of and is substantially coextensive with the latch N^2 , to which it is connected by means of a pin on one of the latches engaging in a slot in the other latch, as shown in Figs. 19 and 21, in which views the latch P' is shown pushed above the latch N^2 to the extreme limit of its movement with relation thereto corresponding to the five notches in the rack G^{18} , as above described. The latches N^2 and P' are pressed toward their respective racks by means of the spring N^9 , seated in a recess in the cross-head. The latch P' is provided with a cranked extension, to which is pivoted at N^{10} the connecting-rod N^{11} , and that connecting-rod extends downward and is connected with the arm N^{12} , which is pivoted upon the bracket Q^4 , and is provided with a cam-pin which rests in contact with the cam N^{13} upon the line-shaft X , as best shown in Fig. 5. That cam N^{13} operates through the connecting-rod N^{11} to move the correcting-slide P upward to its extreme position with relation to the cross-head, and then, continuing its upward motion, moves the cross-head to its upper position. (Shown in Figs. 18 to 21.) The action of the rod N^{11} against the weight of the cross-head N operates by reason of the nature of its connection with the two latches to compress the spring N^9 and swing the engaging points of those latches laterally away from the path of movement of the steps $N^3 N^4 N^5$ of the setting-racks G^{17} and G^{18} . The cam N^{13} is so timed as to hold the latches and the cross-head in the position shown in Fig. 19 during the operation of the measuring mechanism, so as to permit of the setting-racks G^{17} and G^{18} being pushed up thereby to their required position, bringing some one of the steps N^3, N^4 , or N^5 of those racks within the zone of movement of the latches, that zone being, as heretofore stated, equal to the distance between those steps. Therefore as soon as one of the steps—as, for example, N^3 —of the setting-rack is carried out of the upper boundary of the zone of operation of its latch

the next step N^4 passes into the lower boundary of that zone, so that one and only one of the steps N^3, N^4 , and N^5 can at any time rest within that zone.

The operation of the selecting and ejecting mechanism is therefore as follows: The cross-head N being held in its uppermost position (shown in Figs. 18 to 21, inclusive) and the latches being consequently held out of engagement with the setting-racks, the latter are moved upward by the operation of the measuring devices to an extent determined by the deficiency existing in the line divided by the number of spaces into which the justifying-spacers, which are to supply that deficiency, are to be inserted. At the conclusion of the measuring operation those teeth of the measuring-racks which are next above the point of the detent N^7 settle into engagement with that detent and remain suspended therefrom while the cam N^{13} allows the latches N^2 and P' to be forced again into contact with the rearward or stepped surfaces of those racks by the operation of the spring N^9 , and also allows the cross-head to settle down until the engaging points of the latches rest upon those steps of the setting-racks which are within the zone of their operation, as above described. These latches and their cross-head N remain in this position throughout the justification of the line then being operated upon, determining by their position and by the resultant position of the selector which one of the selecting-fingers M^5, M^6, M^7, M^8 , and M^9 shall be moved into engaging relation to its corresponding space-ejector. The cross-head therefore rests in this position supported by the step of the rack G^{17} , holding the selector N^{15} in the path of some one of the selecting-fingers M^5, N^6, M^7 , or M^8 , the selecting-finger M^9 being never acted upon excepting when called into use by the operation of the correcting devices, as will be hereinafter described. As the carriage is caused to reciprocate, that one of the selecting-fingers which lies in the horizontal plane of the selector N^{15} is moved by that selector to the position shown in dot-and-dash line in Fig. 22, causing the ejection of its corresponding spacer into the raceway. If the selecting-finger M^5 lies in the plane of the selector N^{15} , it is brought into contact with the spur L^{15} of the frame L^{17} , thereby moving the stop L^4 so that the middle step thereof rests upon the shoe L^5 , thus permitting the column of A spacers to fall far enough so that an additional one of them is carried forward by the operation of the assembling mechanism, as hereinafter described. After the return of the carriage M to its full-line position (shown in Fig. 23) that finger which has been operated upon by its forward movement returns to its normal position even though the conditions require that it shall immediately thereafter repeat the same operation. These lateral reciprocations of the carriage are continued to the extent predetermined by the setting of the governor mechanism, at the con-

clusion of which the cross-head N is again carried to its uppermost position by means of the cam N¹³, there to remain until the next line has been measured. The cam N¹³ is so formed as to first move the cross-head slightly above the normal upper position shown in the above-mentioned figures, and this slight additional movement enables the cross-head by means of its projection N¹⁴ to engage with a cranked projection of the detent N⁷, as best shown in Fig. 21, thus momentarily carrying that detent out of contact with the teeth of the setting-racks G¹⁷ and G¹⁸ and permitting the latter to fall to their lowest or zero position in order that they may again be raised from that position by the subsequent operation of the measuring mechanism upon the next line.

Selector-correcting mechanism.—From the above description of the spacer-selecting mechanism it will be seen that that mechanism is in itself insufficient to effect the justification of the lines of type within the necessary limits of accuracy, inasmuch as it would seldom happen that any of these spacers or combination of these spacers would, if repeated without change in all of the spaces existing in a given line, justify that line with sufficient accuracy. The arrangement and operation of the above-described devices are such that if the measurement of the spacer required, as indicated by the position of the measuring-racks, does not quite equal one of the spacers or combination of spacers the selection will fall upon the next size below. In other words, if the racks G¹⁷ and G¹⁸ when at the highest position to which they are carried by the measurement of a given line do not stand at a position at which one of the notches in the rack G¹⁷ is exactly engaged by the detent N⁷ that rack will drop back until its next notch engages with the detent, thus causing the selection of a spacer or combination of spacers smaller than the size indicated by the measurement. Thus it will be seen that the effect of a certain amount of the measurement is lost, or, in other words, that the extent to which the rack G¹⁷ drops back from its measurement-indicating position to the position wherein it rests by the engagement of one of its notches with the detent N⁷ represents relatively the extent to which the spacer or combination of spacers thus selected is less than the space to be filled. The purpose of the devices at present under consideration is to compensate for these deficiencies, keeping account of them, as it were, until they have amounted to the difference between the size of the spacer selected and the size of the next larger spacer, operating then to move the selector up to a position in which it shall select and eject a spacer or combination of spacers of that next larger size. Having supplied the deficiency, the selector must return to its first position until the increments of deficiency again require the insertion of the larger spacer.

The mechanism comprising this correcting

auxiliary to the spacer-selecting mechanism is shown in the same figures in which that selecting mechanism appears.

Reference has already been made to the correcting-slide P and to its latch P', which is adapted to be engaged by the measuring-rack G¹⁸. That slide is carried upon the cross-head N and is capable of a vertical motion with relation thereto to the extent of five of the small notches of the rack G¹⁸, as shown in Figs. 19 and 21, as it might sometimes happen that the detent N⁷ at the conclusion of a measurement might engage the fifth tooth of the rack G¹⁸ below one of those teeth which normally are in line with the notches of the rack G¹⁷, holding the former rack in that position, while the rack G¹⁷ falls to the extent represented by the five notches before engaging with the detent N⁷. Upon the slide P is pivotally attached an end of the lever P², the other end of which is pivotally attached to the hub P³ of the cross-head N. At a point midway of the length of this lever is pivoted the lever P⁴, which is normally held in a position coincident with that of the lever P² by means of the spring P⁵, attached to the cross-head N, as shown in Fig. 18. One end of the lever P⁴ is provided with a projecting pin P⁶, (best shown in Figs. 22 and 24,) located in the plane of and adapted to engage with the inclined ends of the cam-like pieces P⁷, which are attached to or integral with the carriage M.

Whenever the spaces existing in a given line may be exactly filled by a certain number of similar spacers or spacer combinations the position of the measuring-rack incident upon the measurement of that line is such that the latch-engaging steps N³ N⁴ N⁵ thereof are coincident upon the two racks, and in that case when the cross-head and its latches are let down into contact with those steps the correcting-slide P rests in such a position that the pin P⁶ of the lever P⁴ will pass between the cam-pieces P⁷ of the carriage M as the latter is caused to reciprocate in the operation of assembling the spacers; but when the result of the measurement is such that the steps of the rack G¹⁸ are held above those of the rack G¹⁷ the resultant position of the correcting-slide P and its levers P² P⁴ is such as to bring the pin P⁶ under the operation of the beveled face of that one of the cam projections P⁷ to which it is opposite. That operation causes a vertical oscillation of the lever P⁴ upon its pivotal connection with the lever P² at each backward stroke of the carriage M, the extent of that oscillation being in direct proportion to the amount of relative displacement of the racks G¹⁷ and G¹⁸.

Upon the left-hand end of the lever P⁴, as best seen in Fig. 24, is pivotally mounted the pawl P⁸. The point of that pawl is adapted to engage with teeth P⁹, made in the right-hand edge of the selector-slide N¹⁶, being capable of an oscillatory movement into and out of those teeth, and being limited in its forward movement away from the teeth by

means of the pin P^{10} , fixed in the cross-head. The pawl is further provided with a connecting-rod P^{11} , pivoted thereto, the opposite end of that rod passing through a clamping-swivel P^{29} on the carriage M, that hub being split and provided with a clamping-screw which is adjusted so as to engage the rod P^{11} with sufficient friction to carry the pawl P^8 into contact with the teeth P^9 upon the left-hand or backward movement of the carriage and to carry that pawl away from the teeth against the stop P^{10} upon the forward movement thereof.

From the foregoing description it will be seen that any upward movement imparted to the pawl P^8 while it is in contact with the teeth P^9 would operate to raise the selector-slide N^{16} a corresponding extent, and that extent is controlled by the amount which the racks G^{17} and G^{18} are displaced in relation to each other, as the result of a measurement of a line operating through the levers P^2 and P^4 to hold the pin P^6 to a corresponding extent above the adjacent slot between the cam-pieces P^7 . In Fig. 23 that pin is shown to be in the position to which it is carried by a displacement of five of the small notches of the rack G^{18} , the carriage being here shown in its forward position, while in Fig. 24 the cams P^7 are shown in their backward position, the progress toward which has caused the pin P^6 to be forced down by the inclined face of the adjacent cam-piece P^7 until it can enter the slot below that cam-piece, thus imparting to the selector-slide N^{16} an upward movement equal to five of the notches P^9 , which is also the equivalent of the extent to which the rack G^{18} has been displaced.

The selector-slide N^{16} is retained in the raised position to which it is moved by the pawl P^8 by means of the detent P^{12} , which is pressed into engagement with the teeth P^{13} , corresponding to the teeth P^9 , located on the opposite or left-hand edge of the slide N^{16} . By reference to Fig. 24 it will be seen that there are six of these teeth P^9 . After the fifth tooth occurs an interval, as though the sixth and seventh teeth were removed, the sixth tooth being therefore where the eighth tooth would be located if the teeth were continuous, and we will hereinafter refer to this isolated tooth as being the eighth on that side, regarding the sixth and seventh as being removed, for reasons hereinafter set forth.

It will be understood that the object of the mechanism at present under consideration is to raise the selector N^{15} from its lowest or normal position with respect to the cross-head so as to cause it to engage with and select the next larger size of spacer or combination of spacers whenever the deficiency between the size of spacer called for by the measurement and the size of spacer supplied by the selecting mechanism shall have amounted to the additional thickness represented by a larger size. Having supplied this deficiency by the insertion of one or more

spacers or combinations of the larger size, it is necessary that the selector shall be allowed to drop back to its former position until the deficiency resulting from the repeated selection of the spacer too small for the space to be filled shall again require the selection of the larger space. The mechanism by means of which the selector-slide is thus released and allowed to drop back to its normal position will now be described, reference being made to Figs. 24 to 27, inclusive.

The detent P^{12} is provided with an approximately lozenge-shaped projection P^{14} upon its face. That projection is adapted to engage with similar-shaped projections P^{15} P^{16} upon the escapement-pawl P^{17} , which is pivoted upon the selector-slide N^{16} . Upon that slide is also revolvably mounted the escapement-wheel P^{18} , which is urged in the direction of the arrow against the stop P^{19} by means of a coiled spring P^{20} . The escapement-pawl P^{17} is provided with a point which is pressed into engagement with the wheel P^{18} by means of the spring P^{21} . A rod P^{22} is fixed in a lateral member of the cross-head N and extends downward partially across the face of the escapement-wheel in line with a pin P^{24} , located upon that wheel, for the purposes hereinafter explained.

By again referring to the table shown in Fig. 43 it will be seen that the size of the smallest space is equal to one-fourth of an em, and that the spacers B C D progress in size above the A by one-sixteenth of an em. It therefore follows that where the measurement shows the spaces to be seven ninety-sixths of an em in width the insertion of an A spacer, which equals six ninety-sixths, or one-sixteenth of an em, leaves a deficiency of one ninety-sixth in each space. At the insertion of the sixth spacer this deficiency would therefore amount to six ninety-sixths, or one-sixteenth of an em, which is equal to the difference in size between the A and the B spacers, and that deficiency would therefore be made up if a B spacer were to be put into the sixth space instead of an A spacer. Therefore this mechanism is adapted to make this substitution, resuming, however, the insertion of A spacers in the succeeding spaces until the amount of the deficiency again requires the insertion of the larger size.

The mode of operation of this correcting mechanism differs with each of the five different amounts of corrections that may be required, and a description is therefore now given of its operation under each of these five possible conditions. The difference between these conditions and the difficulty in satisfying them are due chiefly to the circumstance that the selector must be allowed to return to its lower or normal position upon the completion of that stroke of the carriage at which the amount of correction then applied equals the amount of deficiency then accumulated. In correcting for a deficiency of one ninety-sixth of an em the slide must return at the

conclusion of the sixth stroke, because at that stroke the devices will have applied a correction of six ninety-sixths, or one-sixteenth of an em, equaling the accumulation of six deficiencies of one ninety-sixth of an em. Therefore in correcting for deficiencies of two ninety-sixths, three ninety-sixths, four ninety-sixths, and five ninety-sixths the selector must be returned to its lower or normal position at each third, second, third, and sixth stroke, respectively, of the carriage.

From the description already given it will be understood that the "deficiency" occurring in each space is added up or "tallied," so to speak, upon the notches P^9 of the selector-slide N^{16} , one notch for every deficiency of one ninety-sixth of an em. When that deficiency occurs in each space of a line, the selector will be raised one notch at each stroke of the carriage M by the operation of one of its cam-pieces P^7 , the slide being retained in its raised position by means of the detent P^{12} . Therefore upon the sixth stroke of the carriage the selector-slide will be raised six notches, causing the selector N^{15} to engage the next selecting-finger above that employed in the previous five strokes of the carriage. The escapement-pawl P^{17} , carried up by the elevation of the slide N^{16} , reaches at this point such a relation to the detent P^{12} that the lower point of the lozenge-shaped projection P^{16} of the pawl engages with the upper point of the similar projection P^{14} of the detent, exactly as the projection P^{15} is shown in engagement therewith in Fig. 24. Upon the forward stroke of the carriage M the pawl P^8 is withdrawn from the teeth P^9 , thus allowing the weight of the slide to operate through the lozenge-shaped point P^{15} of the pawl P^{17} to cam the detent away from the teeth P^{13} . The slide being thus left unsupported falls to its first position, (shown in Fig. 18,) carrying the selector N^{15} back to its former and normal position, when it resumes the selection of the smaller spacer until again elevated by the correcting device.

The operation of the mechanism in the correction for deficiencies of two ninety-sixths and three ninety-sixths of an em differs from that just described only in the respect that the selector-slide reaches its releasing-point at the third and second strokes, respectively, inasmuch as the numbers two and three are also even divisors of six; but four and five are not even divisors of six, and therefore the operations of the devices for the correction of deficiencies of four ninety-sixths and five ninety-sixths of an em become more complex.

Describing first the correction for a deficiency of four ninety-sixths, in this case the first stroke of the carriage will elevate the slide N^{16} four notches, which will be detained by the detent P^{12} . The next stroke will elevate the slide four more notches, bringing the eighth of the notches P^{13} above the detent P^{12} , where it remains until the third stroke of the carriage, when the pawl P^8 , en-

gaging the fifth of the notches P^9 , raises the slide, as shown in Fig. 24, so that the lozenge projection P^{14} of the detent P^{12} rides over the projection P^{15} of the pawl P^{17} , as shown in Fig. 24, allowing the slide to drop as before. It will be observed that the selector was in position to select the larger space at both the second and third strokes of the carriage, and therefore the "correction" amounted to twelve ninety-sixths of an em, just equaling the deficiency of four ninety-sixths occurring in each of the three spaces justified by the three strokes of the carriage.

In the case of a deficiency of five ninety-sixths of an em the first stroke of the carriage raises the slide N^{16} five notches, where it is held by the detent engaging the fifth of the notches P^9 . At the second stroke of the carriage the pawl P^8 engages with the fifth of the notches P^9 , and raising the slide higher than on any of the other corrections brings the pin P^{24} of the escapement-wheel P^{17} against the rod P^{22} , reacting upon the wheel to turn it to the position shown in Fig. 26, so as to engage with and hold the pawl P^{17} out of engagement with the detent P^{12} . That detent therefore remains against the slide N^{16} , supporting it in its raised position by means of the eighth one of the notches P^{13} . The partial revolution of the wheel P^{18} , caused by its contact with the rod P^{22} , serves to carry the first of the teeth P^{23} into the path of the pawl P^8 , which upon its third stroke engages with that tooth, as shown in Fig. 26, and advances it another notch. The fourth and fifth strokes of the carriage each operate thus to turn the wheel an additional notch without releasing the slide from the detent P^{12} ; but the sixth stroke of the carriage brings beneath the pawl P^{17} a portion of the wheel P^{18} , which is deeply recessed, thereby allowing that pawl to drop against its stop-pin P^{30} to the position shown in Fig. 27, thereby disengaging the detent P^{12} and allowing the slide N^{16} to drop to its normal position. As it approaches the bottom of its stroke the cranked spring-arm of the pawl P^{17} collides with the pin P^{27} , attached to the cross-head N , which serves to move the pawl to the position shown in Fig. 18, thus releasing the wheel P^{18} and allowing it to be returned by its spring P^{20} to its normal position, as shown also in the latter figure.

If either of these correcting operations should while yet unfinished be interrupted by the completion of the justification of the line, thus leaving the selector raised above its normal position on the cross-head, it will be released therefrom by means of the rod P^{28} , attached to the frame W , against which the cranked end of the pawl P^{12} is carried, as shown in Figs. 20 and 24, when the cross-head is moved to its highest position by its cam N^{13} . The movement of the detent P^{12} , due to this engagement with the rod P^{28} , serves to release the slide N^{16} and allow it to fall to its normal position. If the completion of the line finds the escapement-wheel P^{18} in an in-

complete stage of its operation—for example, as in Fig. 26—the movement of the pawl P^{17} , due to its engagement with the rod P^{27} , will serve also to disengage that pawl from the teeth of the wheel, allowing the latter to be rotated to its normal position by means of its spring P^{20} . This releasing of the respective devices at the completion of each line is necessary in order that they may be at their normal or starting point at the commencement of each new line.

Spacer-assembling mechanism.—The construction and relation of the devices which comprise this mechanism are best shown in Figs. 22, 28, 29, 30, and 31. The plunger O is attached to the carriage M , and is carried by the lateral reciprocations of that carriage along the raceway O^6 , (best shown in Figs. 22,) which lies immediately in front of the channels M^{28} , M^{29} , and M^{30} , containing the B C D spacers, respectively. Those spacers are ejected one at a time, as previously described, into that raceway at the end of the movement of the carriage toward the left, and while the plunger O is therefore in the position shown in dot-and-dash lines in Fig. 23. On the return or forward movement of the carriage toward the right, the spacer that has been ejected is moved forward into line with the type-containing channel into which it is to be injected by the injector-plunger R . In this position it is alongside of the channel L , containing the A spacers, as shown in Fig. 22, and in Figs. 28 to 30, inclusive.

The devices by means of which the A spacers withdrawn from the channel L are assembled in combination with the spacer ejected from either of the channels M^{28} , M^{29} , and M^{30} consist of a bifurcated plunger O' , which is fitted to slide in a boss W on the main frame W' , and is connected by means of the lever O^2 , also pivoted on the boss W , and best shown in Fig. 22. The opposite end of that lever is provided with a slot, by means of which the lever engages with a pin O^3 on the carriage M . This arrangement of the lever operates to impart to the plunger O' a movement contemporaneous with but in the opposite direction to that of the carriage M and the plunger O . The bifurcated ends of the plunger O' pass through corresponding slots in the basic table L' , as best seen in Fig. 22, the ends of the plunger being turned upward to form hooks, which, as the plunger is moved toward the left, operate to move along upon the basic table or raceway L' all of those A spacers which have been allowed to escape from below the level of the channel L by the lowering of the table, whether by the operation of the elevator L^6 or of the stop L^4 , as previously described. The upper surfaces of these hooks of the plunger O' are fitted against the lower surface of the channel L , so as to form a support for the column of spacers which remain in the channel, as shown in Fig. 30, the basic raceway-table L' remaining in its lowered position until the A spacers have been carried

to the position shown in Fig. 30, and until the B, C, or D spacer has been brought forward and pushed upon the stop of the A spacers, as shown in the last-mentioned figure. The basic table L' is then elevated to the position shown in Fig. 31, thus raising the combination of assembled spacers up to the level of the top of the detents J^6 , to which it is at that time lying immediately adjacent. This raising of the basic table is accomplished by means of the lifter O^4 . That lifter rests upon the ends of the plunger O' , and is provided with a beveled end which engages with a correspondingly beveled and hooked projection or extension O^5 of the basic table L' . (Shown also in side view in Fig. 9.) The opposite end of that lifter is supported by and slides in the bracket O^7 , attached to the frame W , and receives its motion from the spacer-injecting devices, as best shown in plan view in Fig. 22.

The consecutive order of operation of the assembling devices will best be seen by reference to Figs. 28 to 31, inclusive, Fig. 28 showing the basic table in its elevated position, the spacers assembled by its previous operation having been removed therefrom by means of the injecting mechanism. In Fig. 29 the basic table is shown in a lowered position, this time by the operation of the stop L^4 in being moved to its second or lowest step, thus lowering the column of A spacers far enough to permit of the two lower ones to be drawn away by the movement of the plunger O' , as shown in Fig. 30, where they rest ready for the spacer, which is therein shown as being advanced by the plunger O . After that spacer has been pushed by the completion of the movement of the plunger O upon the two A spacers all three are raised by the elevating movement of the basic table to the position shown in Fig. 31, whence they are injected into the line by the injecting mechanism. The parts are now again in the position shown in Fig. 28 and repeat the above operation for each of the spaces to be justified under the control of the governing mechanism.

Separator-extracting mechanism.—This is shown in Figs. 3, 4, 5, 9, 10, and 22. As previously described, the separators are extracted from the line while resting upon the top surface of the detents J^6 , which is coincident with the injecting-plane and with the surface of the raceway.

The form of the word-separators U and the line-separators T is best shown in plan view in Figs. 10, 12, and 22, differing from each other only in the respect that the ends of the line-separators T are made slightly longer than the ends of the word-separators U . Both kinds of these separators are provided with shoulders, corresponding to the length of the type, by means of which they are retained in the type-channel, their reduced ends passing through slots in the edges of the channel which are narrower than the thickness of the type, and thus extending a short distance on either side of the channel so as to enable them to be

rator T, inasmuch as the extracting of that separator is accomplished by the operation of the line-shaft mechanism.

Having thus completed a description of the devices comprehended under the general designation of "word mechanism," a description will be given of the third general division of the machine herein designated as the

Governor and actuating mechanism.—This is shown in Figs. 1, 2, and 6, and from Figs. 34 to 42, inclusive. The general line of shafting which has upon it the cams and other devices for operating the devices composing the line mechanism and which is herein referred to under the general designation of the "line-shaft" X, is composed of three sections, herein distinguished by the designations X', X², and X³, while the line of shafting, herein referred to as the "word-shaft" Y, is composed of two sections, distinguished by the designations Y' and Y², respectively. The section Y² is provided with the pulley Y³, and also has fixed upon it the pinion Y⁴, by means of which motion is communicated to the gear X⁴ on the shaft X'. All of these shafts are journaled in suitable brackets attached to the main frame W of the machine, and the sections X' Y' are driven continuously in opposite directions, as indicated by their respective arrows in Fig. 4, the line-shaft being rotated at a considerably-reduced rate of speed as compared with that of the word-shaft Y. The arrangement and connection of these shafts are best shown in the plan views, Figs. 5 and 6. The shaft X' has splined thereon the sliding clutch X⁵, which is adapted to engage with and be disengaged from a fixed clutch X⁶ on the shaft X², and that shaft is provided with the crank F⁵ for operating the line-grab. Beyond that crank the shaft X² is provided with the sliding clutch X⁷, which is adapted to be moved into and out of engagement with a corresponding fixed clutch X⁸ on the shaft X³. The end of the shaft X² is herein shown to extend into the adjacent end of the third section X³, but this is merely for the purpose of forming a supporting-bearing for that end of the shaft X². Referring now to Fig. 5, the governor-cam S¹⁰ is shown fixed upon the shaft X³, adjacent to the clutch X⁸, after which come the cams H⁷, I⁴, Q⁹, N¹³, J⁷, and G⁹, in the order named.

The shaft Y' is provided with a fixed clutch Y⁵, and the adjacent end of the shaft Y² is provided with a sliding clutch Y⁶, adapted to engage with and be disengaged from the clutch Y⁵. Toward the right-hand end of the shaft Y² are fixed the cams Q⁹ and M³, to the latter of which is fixed the crank-pin K⁷. These cams and cranks are thus located upon detachable sections of the shafts X and Y, in order that their respective groups of mechanism may be thrown into or out of operation by means of their clutches under the control of the governing mechanism, which will now be described.

The shaft Y' is provided with a worm Y⁷,

which is adapted to engage with the worm-wheel S, fixed on the governor-shaft S'. That shaft is journaled at its ends in suitable bearings in the frame W of the machine and has fixed upon it the ratchet-wheel S², (best shown in Figs. 40 and 41,) the relation of the worm, worm-wheel, and ratchet being such that the latter is rotated continuously in the direction of the arrow (shown upon the ratchet in Fig. 40) to an angular extent equal to that to which the notches are separated at each revolution of the shaft Y'. Upon the shaft S', adjacent to the ratchet-wheel S², is loosely mounted a controller S³, having integral therewith three flanges S⁴, S⁵, and S⁶. The flange S⁴ has pivoted upon the side thereof the pawl S⁷, in engaging relation to the ratchet-wheel S². Loosely supported upon the shaft S' on the opposite side of the ratchet is the pawl-releasing cam S⁸, having in its face, adjacent to the ratchet, a groove (best shown in Figs. 39, 40, and 42) into which extends a projection S⁹ of the pawl S⁷. A similar projection S¹⁰ on the opposite end of the pawl extends over the periphery of the cam S⁸, as shown in Figs. 39 and 41. The pawl-releasing cam S⁸ is provided with a secondary flange S¹¹, which is squared, as shown in Fig. 37, and engages with a corresponding mortise in the arm S²⁴ of the releasing-rod S²², so as to prevent the cam from rotating, the flange S¹¹ being provided with pins S¹², adapted to engage with the inclined slots S²⁵ of the arm S²⁴, as best shown in Figs. 37 and 38, the purpose of this arrangement being to move the pawl-releasing cam S⁸ endwise upon its shaft S' at the desired time, so as to release the projection S¹⁰ of the pawl S⁷ and allow the latter to engage with the teeth of the ratchet S², that pawl being urged toward its ratchet by means of its spring S³³, attached to a pin located in the side of the pawl-flange S⁴. That endwise movement of the cam S⁸ is never, however, sufficient to release the projection S⁹ of the pawl from its groove in the side of that cam. It will therefore be seen that the pawl S⁷ cannot engage with its ratchet S² unless partially rotated to some other position with relation to the groove of the cam S⁸ than that in which it is shown in Fig. 40, and when so moved to a position which allows of such engagement it is disengaged therefrom upon arrival at the position shown in that figure by the operation of the groove of the cam S⁸ upon the projection S⁹, which not only serves to disengage the pawl from the ratchet-wheel, but also serves to prevent any further motion of the pawl and its attached controller in the direction of rotation of the ratchet-wheel.

The flange S⁶ of the controller S³ is stepped in the manner shown in Fig. 2, the steps being arranged in the form of a spiral. Adjacent to this stepped flange is the detent S¹³, fixed to the detent-shaft S¹⁴, which is journaled in bearings in the adjacent bracket and is provided with the arm S¹⁵, as best shown in Figs. 2, 6, and 35. The detent can engage only with

the last or highest step of the flange S⁶, as shown in the latter figure, thus serving to hold the flanges S⁴, S⁵, and S⁶ in the positions in which they are shown in Figs. 40, 36, and 35, respectively, during the operation of the measuring mechanism. The controller S³ is provided with a spring or weight, as shown in Figs. 2, 34, and 36, adapted to normally urge the sleeve and its appurtenant flanges in the direction indicated by the arrow in Fig. 36, which is the opposite direction to that in which the ratchet S² rotates.

The stop S¹⁶ is located above and in the plane of the stepped flange S⁶ and is connected with the rack S¹⁷ by means of a telescopic connection, as shown in Fig. 34. That rack is fitted in engagement with the pinion S¹⁸, fixed on the shaft H², which, as it is turned by the separators T and U, as described in connection with the fulcrum-adjusting mechanism, operates to lift the stop S¹⁶ to an extent equal to the height of one of the steps of the flange S⁶ for each of the separators in the line. Therefore after the line to be measured has passed into the measuring-zone the stop S¹⁶ stands in engaging relation to that step of the flange S⁶ corresponding in number to the number of spaces or U separators in the line to be justified. The single additional movement of the stop due to the line-separator T is compensated for by the position of the steps on the flange.

From the foregoing description it will be understood that the controller S³, if released from its detent S¹³, will make a partial rotation in the direction of the arrow shown in Fig. 36 by the operation of its weight or spring until one of the steps of the flange collides with the stop S¹⁶, carrying with it the flanges S⁴ and S⁵ and thereby moving the pawl S⁷ to a position relative to the releasing-cam S⁸ which permits of its engagement with the ratchet S², so far as the groove of that cam is concerned, being, however, still held out of engagement with the ratchet because of its projection S¹⁰ resting upon the periphery of that cam. If at this point, however, the cam were to be drawn endwise upon the shaft S¹, the pawl would be released and would be carried into engagement with the ratchet S², and would be released therefrom upon arriving at the position shown in Fig. 40.

The telescoping connection of the stop S¹⁶, with its rack S¹⁷, is for the purpose of enabling the rack to be returned to its lowest position by the releasing of the detent H¹² before the stepped flange S⁶ is returned to the position which allows the stop S¹⁶ to drop with the rack, a condition which may occur in the justification of a line having a large number of spaces.

The means whereby the releasing of the controller S³ and of the pawl is accomplished will now be described.

The governor-releasing cam S¹⁹ is fixed upon the shaft X³, and is best shown in Figs. 2, 6, 47, and 51. Its flanged left-hand edge is pro-

vided with two steps S²⁰ and S²¹, and is adapted to engage with the releasing-rod S²², which rests in suitable guiding-supports and is pressed into contact with its cam by means of a spring S²³. As shown in Fig. 6, the rod is bifurcated toward its left-hand end, the pawl-releasing arm S²⁴ being adapted to engage with the squared flange S¹¹ of the releasing-cam S⁸, the arm S²⁴ being provided with inclined slots S²⁵, adapted to engage with the pins S¹², as best seen in Figs. 37 and 38. The detent-releasing arm S²⁶ of the rod S²² is connected by means of the link S²⁷ with the arm S¹⁵, and the lower side of the arm S²⁶ is provided with a spur S²⁸, (best shown in Fig. 35,) that spur being in the path of movement of the pin S²⁹ on the flange S⁴. The releasing-rod S²² is adapted to engage with the clutch-fork S³⁰, which is fitted to slide in suitable supports of the frame W, by means of the shoulders S³¹ and S³², as best shown in Fig. 35, so as to move the fork to an extent sufficient to engage and disengage its clutch Y⁶ from the clutch Y⁵ of the shaft Y¹.

The step S²⁰ of the cam S¹⁹ is made high enough to move the rod S²² and its arms S²⁴ and S²⁶ toward the left from the position in which it is shown in Figs. 6, 35, 37, and 38 a sufficient extent to release the detent S¹³ from engagement with the stepped flange S⁶, and sufficient also to move the shoulder S³¹ into contact with the clutch-fork S³⁰. This movement, however, is not sufficient to carry the releasing-cam S⁸ away from the ratchet so as to release its pawl, the slots S²⁵ being straight, as shown in Fig. 34, for a distance equal to the movement imparted to the arm S²⁴ by the step S²⁰ of the governor-cam S¹⁹. The parts remain in this position while the stepped flange S⁶ is rotated by means of its weight until the proper step from which its return motion is to begin is brought against its stop S¹⁶. Meanwhile the cam S¹⁹ continues to revolve and brings its step S²¹ in contact with the rod S²², thus moving the clutch Y⁶ into engagement with the clutch Y⁵ by means of the shoulder S³¹ of the releasing-rod S²². This additional movement of the latter rod operates, also by means of the inclined portion of its slots S²⁵, to move the releasing-cam S⁸ away from the ratchet-wheel S², so as to allow its pawl S⁷ to engage therewith, it being remembered that the pawl has been carried back with the stepped flange S⁶. As the pawl drops into engagement with one of the teeth of the constantly-revolving ratchet-wheel the controller S³, with its flanges S⁴, S⁵, and S⁶, is carried with the movement of that wheel until the pawl again arrives at the position shown in Fig. 40, when it is disengaged from the ratchet by means of the cam S⁸, acting upon the projection S⁹. The last part of the return movement of the controller S³ operates, through the pin S²⁹, the flange S⁵, and the spur S²⁸, to move the releasing-rod S²² toward the right, that rod being at this time opposite to the lowest portion of the flange of the cam

S¹⁹. This movement of the releasing-rod S²² operates, through the inclined grooves S²⁵, to move the releasing-cam S⁸ toward the ratchet-wheel, so as to again support the projection S¹⁰ of the pawl S⁷ and hold it out of engagement with the ratchet-wheel during its subsequent resetting operation. That movement of the releasing-rod S²² toward the right also operates, by reason of the engagement of its shoulder S³² with the clutch-fork S³⁰, to move the clutch Y⁶ out of engagement with the driving-clutch Y⁵, thus permitting the word-shaft Y² to stand still until again reclutched by the operation of the step S²¹ in the next recurring revolution of the governor-cam S¹⁹.

The sliding clutch X⁵ upon the shaft X¹ is normally pressed toward the left or engaging position by means of its clutch-fork X⁹, urged by the spring X¹⁰. That clutch is provided with a spur X¹¹, (best shown in Figs. 6 and 52,) which is urged by the action of the spring X¹⁰ against the end of the flange of the adjacent bearing. That flange is provided with a recess, as shown in Fig. 52, into which the spur X¹¹ is forced by the action of its spring at each revolution of the shaft X¹, thereby disengaging it from the clutch X⁶. As the rotation of the shaft X² is continuous, the clutch X⁵ will, after passing by its engaging point with the clutch X⁶, be again forced out by means of the inclined leading surface of the spur X¹¹, so as to be in position to reengage its clutch at its next revolution if the conditions so require. The left-hand end of the clutch-fork X⁹ is located in the path of movement of the pin X¹², fixed in the flange S⁵, as shown in Fig. 36, and that pin is so located in the flange with relation to the pawl S⁷ as to hold the clutch-fork X⁹ and its clutch X⁵ into engagement with the clutch X⁶, as shown in Fig. 6, when the pawl is in its position of rest, as shown in Fig. 40, so that the clutch will not be disengaged from its mate X⁶ while thus supported by the pin X¹², even when its spur X¹¹ is passing by the recess shown in Fig. 52, at which point it would otherwise disconnect, as shown in the latter figure. The effect of thus holding the clutch X⁵ in its engaging position operates to continue the rotation of the shaft X², and thus causes the repetition of the movement of the line-grab mechanism by means of the crank F⁵.

The clutch X⁷ is splined to and fitted to slide upon the shaft X², and is operated by means of the fork X¹³. That fork is pivoted at X¹⁴ upon the main frame W, its opposite end being connected by means of the link X¹⁵ with the bell-crank arm X¹⁶, pivoted upon the frame W, as best shown in Fig. 5. That bell-crank is located adjacent to the indicator-arm X¹⁷, which is pivoted upon the main frame W, as shown in Fig. 3. One edge of that arm is located in the plane of movement of the line-grab separator-slide E, so that the latter, when moved up from its lowest position by an advancing line, operates to engage with the indicator-arm X¹⁷ and hold it in its verti-

cal position, (shown in Figs. 3 and 5,) thus operating, through the bell-crank X¹⁶, link X¹⁵, and fork X¹³, to hold the clutch X⁷ into engagement with the clutch X⁸. That part of the indicator-arm X¹⁷ which is adjacent to the separator-slide E when the latter is in its lowest position is cut away so as to allow the indicator-arm to swing toward the right from the position shown in Fig. 3, allowing the clutch X⁷ to be disengaged from the clutch X⁸ by the action of the spring X¹⁸. Thus the clutches are held in engagement whenever the separator-slide is raised above its lowest position by an advancing line, and are allowed to disengage only when the slide is in its lowest position, or, in other words, when no line is brought within the range of operation of the machine. By a comparison of this description with that of the operation of the line-grab it will be understood that whenever a line has been brought within the range of operation of the separators it will be engaged by the line-grab and carried up into the measuring-plane, and that the measuring devices, being actuated by the cam upon the shaft X³, will also be put in operation because of the engagement of the clutches X⁷ and X⁸.

The clutch X⁸ is provided with a flange in which is located a slot or recess X²⁰, (shown in Fig. 47,) that slot being large enough to allow of the entrance therein of the stop-arm X¹⁹. The remaining unnotched portion of the flange of the clutch X⁸ operates through the arm X¹⁹ to hold the clutches in engagement until the clutch, and hence the shaft X³, has completed its rotation, even though the indicator-arm X¹⁷ should fail to so hold them by reason of the absence of a line, as previously described. In such a case the spring X¹⁸ will press the arm X¹⁹ against the periphery of the flange of the clutch X⁸ until the latter reaches that part of its rotation shown in Fig. 47, bringing its notch X²⁰ opposite to the arm X¹⁹, which therefore enters the notch and allows the clutch to be released, and also serves to hold the shaft X³ and its mechanism in a certain definite position, it being desirable that all of the devices actuated by the cams upon this shaft should occupy the same definite position when at rest.

A brief description will now be given of the complete operation of the entire machine under normal conditions in which there is no interruption in the continuity of the advancing line of type, so that by the time the apparatus has completed that line the succeeding line is in position to be carried up by the line-grab. Under these circumstances the indicator-arm X¹⁷ is constantly held in the position shown in Figs. 3 and 5, thus operating through the bell-crank X¹⁶ and the clutch-fork X¹³ to hold the clutch X⁷ into engagement with the clutch X⁸ and keeping the shafts X² and X³ clutched together. While waiting for a line the governor is released and resting in the position shown in Figs. 35 and 40, the measured beam being in its hori-

zontal position, (shown in Fig. 1,) so that the setting-racks rest in their lowest position.

The position at which the line-grab rests with its new line while waiting for the completion of the justification of the previous line is preferably just below the measuring-zone, so that the leading end of the new line carried by it shall rest just below the star-wheels H^8 and I^9 . The first movement therefore of the line-grab upon the completion of the previous line is to carry the new line into the measuring-zone, moving the star-wheels as the separators pass by, so that their respective mechanisms are moved to the proper position corresponding to the number of separators contained in the line. The line is raised by the line-grab high enough to enable the measuring-pawl G^3 to engage beneath and support the line. The stepped jaw I , having been set in the manner already described by means of its star-wheel I^9 , now rests with its proper step in position to be engaged by the upper end of the line, while the fulcrum, having been moved to its proper point by the joint operation of its star-wheel H^8 and its cam H^7 , stands in proper relation to the beam. At the same time the selector cross-head N is raised to its uppermost position by means of its cam N^{13} , so as to hold the latches N^2 and P' out of the path of movement of their racks, as shown in Figs. 19 and 21.

The measuring operation now commences. The line-engaging end of the beam is moved upward by means of its cam G^9 until its upward movement is arrested by the closing up of the line between the pawl G^3 and the proper step of the jaw I , the cam G^9 being enabled to complete its full stroke by the yielding of the spring G^6 , as previously described. The upward movement of the beam, multiplied to its proper ratio by the position of the fulcrum, operates to lift the setting-racks to their required position, where they are retained by their detent N^7 . At this time the selector cross-head is allowed by its cam N^{13} to be lowered so that its latch N^2 rests against whichever one of the steps N^3 , N^4 , or N^5 of the setting-rack G^{17} may have been brought within its zone of action by the measuring operation. At the same time the correcting-slide P descends to a point where its latch P' is supported by one of the corresponding steps of the setting-rack G^{18} , and the spacer-selecting mechanism, being thus set to the position required by the measurement of the line, is ready to coöperate with the other mechanism to eject, assemble, and inject the proper spacers or spacer combinations and to extract the word-separators. The line-separator of each line is extracted by the operation of the cam Q^9 during the operation of the measuring devices upon the succeeding line. During this time also the stop S^{16} has been raised to its proper height by the operation of the star-wheel H^8 , so as to engage the proper step of the governor-flange S^6 corresponding to the number of spaces in the line to be justified,

and that step of the flange has been brought against the stop by the action of its weight upon being released from the detent S^{13} by means of the step S^{20} of the governor-cam S^{19} . At the conclusion of the measuring operation, the selector cross-head and the correcting-slide having come to their proper positions, the clutch Y^6 on the shaft Y^2 is brought into engagement with the clutch Y^5 by the operation of the step S^{21} , thus serving to set in motion the word-shaft mechanism. The same movement of the rod S^{22} which starts the shaft Y^2 also serves to release the pawl S^7 , which drops into engagement with the ratchet S^2 simultaneously with the starting of the word-shaft Y^2 , and the word mechanism being thus set in motion operates to eject, assemble, and inject the spacers or spacer combinations determined by the position and operation of the selecting and correcting devices, repeating its operation for each of the spaces in the line, under the control of the governor devices, which hold the clutch Y^6 in engagement until it has made the proper number of revolutions sufficient to bring the controller S^3 to the position shown in Fig. 40, at which time the pin S^{29} in the flange S^4 will have come in contact with the spur S^{28} and moved the clutch Y^6 out of engagement by means of the clutch-fork S^{30} , so as to allow the word-shaft Y^2 and the word mechanism actuated thereby to come to rest. At the same time the pin X^{12} , fixed in the flange S^5 , will have been brought against the fork X^9 , so as to keep the clutch X^5 in engagement with the clutch X^6 and thereby continue the rotary motion of the sections X^2 and X^3 of the line-shaft, thereby bringing up and measuring another line, repeating the operation as long as there is a line within the range of action of the indicator-arm X^{17} .

If no line has been brought within the range of action of the indicator-arm X^{17} , that arm, being unsupported, will oscillate toward the right from the position shown in Fig. 3, thereby allowing the clutch X^7 to be disengaged from its mate X^8 when the latter has reached that point in its rotation represented in Fig. 47, at which the notch X^{20} in the flange of the clutch is brought opposite to the arm X^{19} , which then enters the notch, serving then to hold the clutch, and hence the mechanism carried by the shaft X^3 , in a fixed position until again released by the operation of another line upon the indicator-arm X^{17} .

At the conclusion of the justification of each line the selecting and correcting devices remain in the position at which they stood at the time of justifying the last space in the completed line, and these devices remain in that position until the commencement of the measuring operation upon the next line, during the first part of which, as above described, the selecting cross-head N is raised to its uppermost position by the operation of the cam N^{13} , whereupon the correcting mechanism is released and allowed to return to its original or starting position, as explained in the

description of the selector-correcting mechanism.

The selecting devices herein shown can be operated independently of the correcting devices, which are in the nature of an auxiliary device thereto.

The measuring-beam is herein shown as being a compound structure consisting of the two principal members G and G¹⁶; but this is a constructive feature, merely devised to secure compactness. It is evident that the lever G, if made long enough at its left-hand end to secure the required multiplication of its movement, would give precisely the same results, the desired object being to multiply the deficiency existing in the measured line to such an extent as to enable the subdivisions thereof to be utilized in selecting the proper spacers, inasmuch as the indications of those deficiencies, if not enlarged, would be too fine to enable mechanism to act upon them with certainty in the practical operation of the machine.

Although the beam and the secondary lever both turn upon pivots, and their ends therefore would seem to describe circular arcs from those pivots, yet it will be observed that all of the measurements communicated through and multiplied or otherwise varied by the measurements of the beam invariably bear a constant relation to each other. This is due to the fact that the movements are communicated to and transmitted from the beam upon straight lines which are tangential to arcs struck from the respective pivots. In this way the measured deficiency of the line and the resultant movement of the racks are to each other as the altitudes of similar right-angled triangles. Inasmuch as the lever G is pivoted to the measuring-slide G², it follows that that lever G must move toward the right with relation to its fulcrum-block G¹¹ in moving from the position shown in Fig. 44 to those of Figs. 45 and 46 to an extent equaling that by which the secant exceeds the radius of the arc of its movement.

Many of the features of this invention, and particularly this one of the measuring-beam, are capable of a more extended application than is or can be herein shown. They may be employed, for example, in type-writing, type-casting, matrix-making, and linotype machines, and we desire for those features a protection commensurate with their novelty and usefulness in this as well as in other branches of the art to which they may be applicable.

Various mechanical equivalents may obviously be substituted for many of the devices herein shown and described, and different forms or various applications of springs may be substituted for those shown without essentially altering the nature of the function or the practical operation of these parts in their relation to the general scheme of the machine. For example, the beam may be bell-cranked in form, so as to transmit the measurement

of the shortage of the line in a direction at right angles or at any other angle to its present direction. The stepped jaw, which is herein shown as being incapable of movement in the direction of the length of the line, may be incorporated with or substituted for the pawl G³ upon the measuring-beam. In like manner many of the parts may be transposed as to position or direction or sequence of operation, and many similar modifications may be made in the various elements or equivalent elements may be substituted therefor without departing from the general scope and intent of this invention.

The operation of the measuring-beam may be varied by first moving its type-engaging end against the line of type to be measured and then moving the fulcrum to its desired position, which would of course operate to move the selector-setting devices to the same position that would be occupied by them if operated in the sequence described herein. This transposition of the relative times of movement of the parts may be obtained by suitably changing the form and adjustment of the cams G⁹ and H⁷, the adjusting-quills being rotated to their desired position in the same manner and at the same time as herein described.

The elevating raceway or table L' is utilized in a threefold capacity. It serves as a support for the basic or A spacers, by means of which the desired number of those spacers are lowered into the position which permits of their being removed from the channel by the assembling-plunger O', serving then in its second capacity as a raceway upon which those spacers are moved along to the position adjacent to the raceway O⁶, as shown in Fig. 30. As the level of the raceway O⁶ is coincident with that of the lower end of the channel L, it follows that the top surface of the A spacers thus removed from the channel will also be coincident with the surface of that raceway, as shown in the latter figure, thus enabling the spacers B, C, or D to slide from their raceway directly upon the A or basic spacers, as shown in Fig. 31. Immediately following this point in its operation the table-raceway L' serves in its third capacity by the operation of its lifter O⁴ to raise the assembled combination of spaces to the level of the injecting-plane.

The terms "space," "separator," and "spacer" are herein used advisedly in order to avoid the confusion of terms and of ideas which otherwise might occur in referring to the three particular features to which we have applied these designations. As herein used, the word "space" refers to the actual space occurring between adjacent words, regardless of the object which occupies the space or whether it is occupied at all. By the word "separator" we mean the pieces U and T, which are temporarily placed between the words and the lines, respectively, in order to temporarily maintain the separation be-

tween them, and by the term "spacer" we refer to the final type-body which is inserted in each of the spaces of a line.

By the terms "shortage" or "deficiency" of the line, as herein employed, we refer to the amount by which the measured line falls short of the required length, the shortage being therefore equal to the aggregate length of the justifying-spacers required to exactly fill out that line, as above explained.

For convenience and clearness of reference that part of the governing mechanism which is herein shown as an integral part, consisting of the flanges S, S, and S, is herein referred to as the "controller."

The governing devices herein shown are capable of application to other machines of this class which are either wholly or partly automatic. In the latter case the releasing devices of the governor may be so connected to the keyboard of the composing-machine as to permit of being released by the operator at the conclusion of the measurement of each line.

Many of the parts which are herein preferably arranged in pairs for practical reasons may by suitable modification, and in some instances without any modification, be used singly. Among the parts herein shown which may be thus used may be enumerated the word and line grab pawls, stop-fingers, and arms. One of the detents J⁶ might be omitted, the type-engaging lip of the other detent being adapted to extend across the channel far enough to support the separators, but such a pawl located on one side of the channel, and therefore coming in contact with one side only of the uppermost piece of type which is being pushed past it, might be liable occasionally to turn that leading piece upon its side. For safety and certainty we therefore prefer the double pawls, which react equally upon the two sides of the type and do not therefore tend to turn it. This remark would also apply to the star-wheels H⁸ and I⁹, which are arranged on opposite sides of the channel, so as to simultaneously engage with the opposite ends of the same separator and thereby prevent its being tilted. Were it not for this consideration the devices which are herein shown to be operated by those two star-wheels might be operated by one of them alone.

Some of the cams of this machine are herein shown with grooves in which is located the engaging pin of the connection or part to be operated, the two sides of the grooves serving, therefore, to positively control the operation of the connected part in both of its movable directions. Other cams are shown without such a closed groove, the engaging pin being held against the surface of the cam by means of a spring or a weight. These two well-known forms of cams are considered by us to be equivalent constructions, the spring or the weight used in connection with the so-called "open" cam serving as the equivalent

of one of the sides of the grooves of the closed cam. Both kinds of cam are shown herein in accordance with our preferences under the conditions controlling each cam-operated device.

The fulcrum-setting device herein shown may be modified by dispensing with one of the quills, a spring or weight being employed to bring the fulcrum back against the step of the slide, which has been previously moved to determine the position of the fulcrum; but we prefer to employ the two quills, as herein shown, inasmuch as we thereby provide a more positive means of operating the devices. We therefore do not desire to be limited in our claims to the employment of this double form of stepped quill excepting so far as that construction is specifically claimed herein.

We claim as our invention—

1. The combination of a type-containing channel provided with shoulders adjacent to the ends of the type, whereby the character-type are preserved in alinement, a separator, having a body corresponding substantially to the bodies of the character-type, and having shouldered ends agreeing with the length of the character-type, whereby it is retained in alinement therewith by the channel, and having thinner ends adapted to project through and beyond the end walls of the type-channel for the purposes specified.

2. The combination of a type-containing channel, provided with shoulders adjacent to the ends of the type, whereby the character-type are preserved in alinement, word and line separators having bodies corresponding substantially to the bodies of the character-type, and having shouldered ends agreeing with the length of the type, whereby they are retained in alinement by the channel, and having thinner ends adapted to project through and beyond the end walls of the type-channel, the ends of the line-separators projecting beyond the ends of the word-separators for the purposes specified.

3. Means for separating the line of type at predetermined points therein indicated by separators which extend beyond the character-type, consisting of a carriage or slide having pivoted thereto one or more stop-arms adapted to rest upon the projecting ends of the separators, and one or more stop-fingers adapted to engage beneath the projecting ends of the separators, with means for holding the stop arms and fingers into engagement with the separators, whereby their carriage or slide is moved with and by the type, the said means being adapted to disengage those arms and fingers at the desired point in the movement of the carriage.

4. Means for separating a line of type at predetermined points therein indicated by separators which extend beyond the character-type, in combination with the type-channel adapted to aline and guide the type and their inserted separators, a carriage or slide adapted to be moved parallel with the type-

channel, and having a stop-arm and a stop-finger pivotally mounted thereon with their working ends adapted to engage the separators between them, means for holding the arm and the finger in engaging relation with the end of the separator during a portion of the stroke of the carriage, and for removing it therefrom at the end of that stroke, for the purpose specified.

5. The herein-described means of separating a line of type at predetermined points therein indicated by separators, the ends of which extend beyond the ends of the type-bodies, consisting of a type-channel adapted to receive and guide a line of type, a carriage or slide adapted to slide upon ways parallel with the type-channel, a carriage having pivoted thereon on opposite edges of the channel a pair of oppositely-disposed stop-arms, and a pair of oppositely-disposed stop-fingers, each located adjacent to its corresponding stop-arm, with which it is adapted to cooperate in engaging the adjacent projecting end of one of the separators, means for holding the stop-arms within the path of movement of the ends of the separators during a portion of the movement of the carriage, and for moving them out of that path at the conclusion of the carriage stroke, with springs adapted to hold the stop-fingers in engaging relation to the separators during the carriage stroke, and means for removing them therefrom toward the conclusion of the stroke.

6. In combination with a type-channel adapted to receive and guide a line of type having separators projecting beyond the bodies of the character-type, means for separating the lines at the points indicated by these separators, consisting of a separating-carriage or slide, provided with stop arms and fingers adapted to engage with the projecting ends of the separators, whereby the carriage is carried along by the movement of the line, a reciprocating line grab or carrier adapted to engage with the separating-carriage mechanism, and to carry it with its engaged line away from the rest of the line, the line-carrier being provided with a pawl and with a spring adapted to move the pawl into the space formed by the separation of the line, whereby the separated line is transferred to the carrier.

7. In combination with a type-channel adapted to receive and guide a line of type having separators projecting beyond the bodies of the character-type, means for separating the lines at the points indicated by the separators, consisting of a separating-carriage or slide, provided with stop arms and fingers adapted to engage with the projecting ends of the separators, whereby the carriage is carried along by the movement of the line, a reciprocating line grab or carrier adapted to engage with the separating-carriage mechanism, and to carry it with its engaged line away from the rest of the line, the line-carrier being provided with a pawl and

with a spring adapted to move the pawl into the space formed by the separation of the line, whereby the separated line is positively engaged by the carrier, with means for moving the stop arms and fingers out of engagement with the carrier to release the carriage from the line when thus transferred therefrom to the carrier.

8. In a type-justifying machine, a measuring-beam provided at one end with type-engaging means movable to an extent represented by the aggregate shortage or required spacing of the line, and provided with an adjustable fulcrum, with means for moving the fulcrum to a suitable position relative to the beam in accordance with the number of spaces occurring in the line, whereby the aggregate shortage of the line is converted into a suitably-related movement of the opposite end of the beam.

9. In a type-justifying machine, in combination with the spacer-selecting devices thereof, the herein-described measuring-beam provided at one end with type-engaging means arranged to move to an extent representing the aggregate shortage or deficiency of the line, a movable fulcrum, with means for moving the fulcrum to a position on the beam suitably related to the number of spaces in the line, the other end of the beam being connected with the selecting devices whereby they are set to the proper positions for the selection of the required size of spacer or spacers.

10. In a type-justifying machine, a measuring beam or lever provided with a fulcrum, and operatively connected at its ends with a slide adapted to move in tangential relation to the movement of the beam upon its fulcrum, the slide being located adjacent to and adapted to engage with the line of type to be measured.

11. In a type-justifying machine, a measuring beam or lever provided with a fulcrum, and operatively connected at one end with the measuring devices, and at the other end with the spacer-selecting devices, the connections of the beam with those devices being such that the latter are enabled to move in tangential relation to the movement of the beam upon its fulcrum.

12. In a type-justifying machine, the combination of a measuring beam or lever, a fulcrum on which the beam is pivotally mounted, adapted to be moved to different positions with relation to the beam, a measuring-slide pivotally connected with one end of the beam, and a measuring-pawl mounted upon the slide and adapted to engage with the line of type.

13. In a type-justifying machine, the combination of a measuring-beam, a fulcrum adapted to pivotally support the beam, and to be moved to different positions with relation thereto, a measuring slide and pawl pivotally connected at one end of the beam and mounted to move in tangential relation there-

to, and a secondary lever pivotally mounted adjacent to the beam, and operatively connected therewith by means of a tangentially-moving slide.

5 14. In a type-justifying machine, in combination with the selector-setting devices thereof, a measuring-beam, a fulcrum adapted to pivotally support the beam and to be moved to different positions with relation thereto, a
10 line-measuring slide and pawl pivotally connected at one end of the beam, and mounted to move in tangential relation thereto, and a secondary lever pivotally mounted adjacent to the beam, and to the setting devices, and
15 tangentially connected with each of them, whereby the measured deficiency of the line and the resultant movement of the setting devices are to each other as the altitudes of similar right-angled triangles having bases
20 of the relative lengths established by the position of the fulcrum.

15. A device for moving a slide or other object in irregular sequence from point to point, consisting of a quill adapted to move longitudinally, having steps arranged longitudinally
25 thereon in accordance with the desired positions of the slide, means for rotating the quill so as to bring the desired step into the path of the object to be moved, and with means
30 for moving the quills longitudinally to the extent desired.

16. In combination with a measuring-beam, having a movable fulcrum, means for moving that fulcrum to desired points consisting
35 of two oppositely-stepped quills, the steps being located longitudinally thereof in accordance with the desired positions of the fulcrum, means for rotating the quills to bring the desired step into operative relation to the fulcrum, and means for moving the two quills
40 toward and from each other, for the purpose specified.

17. In a type-justifying machine, in combination with the measuring-beam thereof, having an adjustable fulcrum, means for adjusting that fulcrum irregularly to desired points, consisting of a pair of quills arranged adjacent to, and parallel with, the path of the fulcrum, means whereby the quills are rotated
50 to a proper position with relation to the number of spaces in the line, the quills being provided with correspondingly-located steps adapted to be brought into engagement with the fulcrum, with means for moving the quills
55 longitudinally toward and from each other.

18. In a line-measuring device, the combination of a pair of jaws for engaging the opposite ends of the line, one of the jaws being movable laterally of the line, and provided
60 with stepped engaging surfaces, for the purpose specified.

19. In a line-measuring device, a movable jaw provided with steps adapted to compensate for and eliminate from the resultant
65 measurement the extraneous matter contained in the line, with means operable by the

extraneous matter, adapted to move the proper step of the jaw into engaging position.

20. In a type-justifying machine, in the line-measuring devices thereof, a movable
70 jaw provided with steps each corresponding in height to the thickness of the special separators contained in the line, whereby the measurement of the said separators is eliminated from the resultant measurement.

21. In a type-justifying machine, in the line-measuring devices thereof, a movable jaw provided with steps corresponding in height to the thickness of special separators contained in the line, with means operable
80 by the said separators, adapted to move the proper step of the jaw into engaging relation to the line, whereby the measurement of the said separators is eliminated from the resultant measurement.

22. In a type-justifying machine, in the measuring devices thereof, the combination with temporary separators inserted at desired intervals in the line to be measured, of a jaw arranged and adapted to be moved transversely to the line, provided with steps each
90 corresponding in height to the thickness of the temporary separators of the line, a stop, and means operable by the separators adapted to move that stop to a suitable position relative to the stepped jaw, whereby the latter is held with its proper step in engaging relation to the line.

23. The herein-described galley-plunger, provided with a pawl which is adapted to
100 yield under the tension of a spring when the plunger is in its open or type-receiving position, with means for locking the pawl so as to form a fixed part of the face of the plunger when the latter is operated for the purpose
105 of pushing a line into the galley.

24. In combination with a galley, adapted to receive lines of type, the combination of a plunger having its type-receiving end beveled to allow of the entrance of the type, a
110 pawl pivoted upon the plunger, with its working edge in line with the general line of the face of the plunger, a spring or its equivalent adapted when the plunger is in its type-receiving position to press the pawl toward the
115 position in which it aligns with the plunger, whereby the pawl is enabled to yield to allow the type to be pushed into the galley.

25. In combination with a type-receiving galley, having its end wall located in line with
120 the side of the type-channel, and provided with a shoulder J^5 adapted to support the type, a plunger located with the general line of its front face adjacent to the end wall of the galley, and at a distance therefrom substantially less than the thickness of the type, the type-receiving end of the plunger being beveled to allow of the entrance of the type, and a spring-pressed pawl pivoted upon the
125 plunger with its type-engaging face completing the general line of the face of the plunger, arranged to yield sufficiently to allow the type
130

to enter, and operating to push the type upon the shoulder J⁵, as it is raised above that shoulder.

26. In combination with a type-receiving galley, having its end wall located in line with the side of the type-channel, and provided with a shoulder J³ adapted to support the type, a plunger located with the general line of its front face adjacent to the end wall of the galley, and at a distance therefrom substantially less than the thickness of the type, the type-receiving end of the plunger being beveled to allow of the entrance of the type, a spring-pressed pawl pivoted upon the plunger with its type-engaging face completing the general line of the face of the plunger, arranged to yield sufficiently to allow the type to enter, and operating to push the type upon the shoulder J⁵, as it is raised to the height of that shoulder, an auxiliary slide, with actuating means therefor adapted to lock the pawl before moving the plunger, whereby the line of type is held in a straight line while being pushed laterally into the galley.

27. In a machine of the class specified, in combination with the type-receiving galley thereof, a line-carrying plunger having a portion of its face beveled to allow of the entrance of the type, a pawl pivotally mounted thereon, with its front face normally held coincident with the true or unbeveled portion of the face of the plunger, and adapted to yield to the extent of the beveled portions thereof, an auxiliary slide adapted to first engage with and lock the pawl in its normal position and then to move the plunger with its locked pawl, for the purpose specified.

28. In a machine of the class specified, in combination with the galley mechanism thereof, a rule and a plunger between which the forming line is received, an auxiliary slide, and devices appurtenant thereto, adapted to withdraw the rule, to move the completed line behind the plane of the rule, to release the rule and to withdraw the plunger, whereby they resume their original or type-receiving positions.

29. In a machine of the class specified, employing separators between the words, in combination with the extractor therefor, a detent located adjacent to the type-containing channel, and adapted to support the separator until extracted.

30. In a machine of the class specified, employing separators between the words, in combination with a grab or lifter for the words, a detent located adjacent to the type-containing channel and adapted to receive the separators from the word-grab.

31. In a machine of the class specified, employing separators between the words, in combination with the receiving-galley, and with the word grab or lifter, adapted to engage with the separator, and to carry its word into the galley, a detent located adjacent to the

type-channel and to the galley, adapted to receive the unloaded separator and to support it until extracted.

32. The herein-described word-grab, consisting of a carriage or slide adapted to reciprocate in a direction substantially parallel with the line, provided with a stop-finger, adapted to be held in engaging relation to the line during a portion of its reciprocatory movement, with means for moving the stop-finger out of engaging relation to the line at one end of that movement.

33. A word-grab, consisting of a carriage or slide having a stop-finger pivotally mounted thereon, with means adapted to hold the stop-finger in engaging relation to the line during a portion of its stroke, and to release it therefrom at the end of the stroke, with means for reciprocating the carriage or slide, adapted to move it positively toward the upper or releasing end of its stroke, provided with a connecting-spring or its equivalent adapted to enable the word-grab to remain where stopped by the leading word of the line while its operating means makes its full stroke.

34. In a type-justifying machine, in combination with the measuring and spacer-selecting devices thereof, a selector-setting rack operatively connected with the measuring devices, provided with teeth spaced in coincident relation to the location of the spacer-selecting fingers, and with a detent adapted to engage with the teeth and support the rack in substantially the highest position to which it is moved by the measuring devices.

35. In a type-justifying machine, in combination with the measuring and spacer-selecting devices thereof, a rack operatively connected with the measuring devices, and provided with teeth corresponding in pitch to the separation of the selector-fingers, and provided with steps adapted to engage with and support the spacer-selecting devices in positions suitably related to the movements of the measuring devices.

36. In a type-justifying machine, in combination with the spacer-selecting fingers thereof, a rack adapted to be moved by the measuring devices, provided with teeth corresponding in pitch to the separation of the selecting-fingers, and provided also with steps, a selector adapted to be supported by the steps of the rack in engaging relation to the required selecting-finger.

37. In a type-justifying machine, in combination with a series of selecting-fingers, adapted to communicate with the channels of the justifying-spacers, a selector capable of being moved into engaging relation with each of the series of selecting-fingers, provided with a pawl adapted to engage with that step of the setting-rack which has been brought within its zone of movement by the operation of the measuring devices, whereby

the selector is held in engaging relation to the selecting-finger of the spacer required by the measurement.

38. In a type-justifying machine, a selector provided with a pawl adapted to engage with the steps of a setting-rack, with means operatively connected with the pawl adapted to raise the selector to the top of its zone of movement, and to hold its pawl out of engagement with the setting-rack while the latter is being moved to its place by the measuring mechanism, and adapted at the conclusion of the measuring operation to allow the selector-pawl to move into engagement with and be supported by that step of the setting-rack which has been brought within its zone of movement.

39. In a type-justifying machine, in combination with a series of spacer-selecting fingers, connected respectively with a series of justifying-spacer channels, a selector having a zone of movement extending across the path of the series of selecting-fingers, a setting-rack provided with steps located at a distance apart equal to the zone of movement of the selector, and provided also with teeth of a pitch corresponding to that of the selecting-fingers, a detent adapted to engage with the latter teeth, and to support the rack in the position to which it is moved by the measuring devices, the selector being provided with means adapted to engage with that step of the rack which is within the zone of movement of the selector, all arranged and operating to support the selector in engaging relation to that one of the selecting-fingers representing the spacer required by the measurement of the line.

40. In a type-justifying machine, in combination with the measuring devices, and with the spacer-selecting mechanism thereof, a selector-setting rack provided with a progressively-stepped cam-surface along one edge thereof, with means operatively connected with the described basic-spacer channel, whereby an additional basic spacer is brought into extracting relation at each progressive step of the cam-surface of the setting-rack.

41. In a type-justifying machine, in combination with the measuring devices, and with the described basic table or elevating-raceway thereof, adapted to support a column of the described basic spacers, a setting-rack operatively connected with the measuring devices, and provided with a progressively-stepped cam-surface, and an elevator adapted to engage with the cam-surface of the rack, and with the basic table, whereby the latter is lowered to an extent allowing of the extraction of an additional spacer at each suitably-related extent of movement of the measuring devices.

42. In a machine of the class specified, in combination with a spacer-containing channel, and a supporting-table therefor, a stop connected with the table and provided with steps agreeing in height with the thickness

of the spacers contained in the channel, means for moving the stop to different positions wherein the table is supported by the desired step, and a lifter adapted to raise the supporting-table to its uppermost position at each operation of the devices, whereby the stop is left free to be reset to its desired position for the succeeding operation.

43. In a machine of the class specified, in combination with the measuring devices and the spacer-selecting devices thereof, a spacer-containing channel, and supporting-table therefor, means operatively connected with the measuring devices adapted to lower the table to an extent suitably related to the movement of those devices, with means operatively connected with the selecting devices, adapted to vary the height of the table in accordance with the requirements thereof.

44. In a type-justifying machine, in combination with the measuring devices and with the spacer-selecting devices thereof, a spacer-containing channel, a supporting-table therefor, an elevator adapted to govern the height of the table in suitable relation to the movement of those devices, and a stop operatively connected with the selecting devices, whereby the general position of the table as determined by the measuring devices is modified by the requirements of the selecting devices.

45. In a machine of the class specified, in combination with the spacer-containing channel, an elevator-raceway adjacent to the channel and adapted to serve as a supporting-table for the spacers contained therein, means for lowering the raceway-table to a suitable extent, assemblers for withdrawing the spacers thus exposed to its action, and a lifter adapted to raise the raceway-table to its original position for the purposes specified.

46. The combination of a spacer-containing channel, an elevating table or raceway adapted to support the spacers contained therein, a stop provided with steps adapted to engage with a suitable support and to hold the table at the different heights represented by the steps, with means operatively connected with the spacer-selecting devices, adapted to engage with and move the stop so that its proper stepped face shall engage with its support, whereby one or more of the spacers are lowered into extracting position.

47. In a machine of the class specified, in combination with the described basic-spacer channel, and with a table adapted to support the spacers contained in the channel, a supporting-stop for the table provided with steps corresponding to the thickness of the spacers contained therein, and with means operatively connected with the spacer-selecting devices whereby the stop may be moved to its different step positions for the purpose specified.

48. In a machine of the class specified, in combination with the spacer-containing channel, and supporting-table therefor, a stop connected with the table and provided with steps agreeing in height with the thickness of the

spacers contained in the channel, means for moving the stop to different positions, whereby it is supported by the desired step, consisting of a frame provided with spurs arranged in suitable relation to the steps of the stop, and with selecting-fingers adapted to engage with one or the other of the spurs.

49. In a machine of the class specified, in combination with the basic table and with the spacer-selecting mechanism thereof, a stop connected with the table and provided with steps agreeing in height with the thickness of the basic spacers, means operatively connected with the stop, provided with spurs or engaging shoulders, selecting-fingers adapted to be moved into engagement with one or the other of the spurs, whereby the stop may be changed to either one of its stepped faces, for the purpose specified.

50. In a machine of the class specified, in combination with a spacer-containing channel and with the spacer-selecting mechanism thereof, a table adapted to support the spacers contained in the channel, a stop connected therewith, and provided with stepped supporting-faces, differing in height to an extent equal to the thickness of the spacers contained in the channel; a frame or its equivalent connected with the stop, and provided with spurs located thereon corresponding in number and relative position to the stepped surfaces of the stop, a series of selecting-fingers corresponding in number to the spurs and stepped faces, adapted to reciprocate adjacent to their respective spurs, and each adapted to be moved by the spacer-selecting devices into engaging relation with its spur, whereby the stop is moved to a distance which allows the basic table to rest upon the desired step of the stop.

51. In combination with ejecting devices of a type-channel, and with a controllable selector therefor, a selecting-finger adapted to reciprocate in the plane of the ejecting device, and adapted to be raised into engaging relation thereto by the selector.

52. In combination with the ejecting device for a type-channel, and with a controllable selector therefor, a selecting-finger normally held out of engaging relation with the ejecting device, and adapted to be moved into engagement therewith by the selector.

53. In combination with a series of spacer-channels, provided with a corresponding series of ejecting devices, and with a controllable selector therefor, a corresponding series of selecting-fingers each adapted to be moved by the selector into engaging relation with the ejecting devices.

54. The combination of a series of spacer-ejecting levers, a corresponding series of selecting-fingers, adapted to reciprocate in engageable relation to the spacer-ejecting levers, and a selector adapted to move across the paths of the selecting-fingers, whereby any one of them may be moved into engaging relation with its ejecting-lever.

55. In a type-justifying machine, the combination of a series of spacer-channels, and of a series of ejecting devices therefor, a corresponding series of selecting-fingers adapted to reciprocate in engageable relation to the levers, a controllable selector movable transversely in the paths of the reciprocating selecting-fingers, and adapted to engage with one of those fingers whereby it is moved into engaging relation with its corresponding spacer-ejecting device.

56. In a type-justifying machine, in combination with a spacer-channel, and with an ejecting device therefor, a selecting-finger, and a reciprocating carriage upon which that finger is pivotally mounted in engageable relation to the ejecting device, and a spring or its equivalent, adapted to yieldingly hold the finger out of engaging relation to its spacer-ejecting device during the reciprocation of the carriage.

57. In a type-justifying machine, in combination with a series of spacer-channels, and with ejecting devices therefor, a corresponding series of selecting-fingers, and a reciprocating carriage on which those fingers are pivotally mounted in engageable relation to their respective ejecting devices, each finger being provided with a spring or its equivalent adapted to yieldingly hold the finger out of engaging relation to its ejecting device.

58. In a machine of the class specified, in combination with the selector-setting rack thereof, a correcting-rack provided with a series of teeth relatively finer than those of the selector-setting rack, and a detent adapted to engage those teeth, whereby the correcting-rack may be detained in a displaced position with relation to the selector-setting rack, for the purpose specified.

59. In a machine of the class specified, in combination with the measuring devices and with the spacer-selecting devices thereof, a setting-rack provided with teeth of a pitch corresponding with the location of the selecting-fingers for the different sizes of spacers, a correcting-rack provided with teeth finer than those of the setting-rack, and arranged serially in relation to each of the teeth thereof, and a detent adapted to engage with and support the racks in the relatively-displaced position to which they may be moved by the operation of the measuring devices.

60. In a type-justifying machine, a spacer-selector, provided with teeth suitably related to the amount of the desired correction, a pawl adapted to engage with the teeth, and to actuate the selector, and a detent adapted to detain the selector in its intermediate positions, and adapted to release the selector when the desired amount of correction is obtained.

61. In a machine of the class specified, in combination with the spacer-selecting fingers, and with a selector therefor, means for moving the selector from one finger to another for the purpose specified, the selector being provided with teeth suitably related to the de-

sired amount of movement, a pawl adapted to move the selector to the extent determined by the measuring operation, and a detent adapted to retain the selector in its intermediate positions and to release it when the desired correction is secured.

62. In a type-justifying machine, in combination with the measuring devices thereof, a correcting-rack, operatively connected therewith and adapted to be detained in the extreme position to which it is moved by the measuring devices, provided with a series of supporting-steps, a correcting-slide provided with a pawl adapted to engage with the supporting-steps of the correcting-rack, whereby the correcting-slide is supported in a position suitably related to the movement of the measuring devices.

63. In a type-justifying machine, in combination with the measuring devices, and with the spacer-selecting devices thereof, means operatively connected with the measuring devices, adapted, when the indicated measurement of the line does not exactly require one of the regular spacers, to hold the selector in engaging relation to the next smaller spacer, a correcting-slide and means substantially as described for holding that correcting-slide above the selector to an extent suitably related to the correction required.

64. In a type-justifying machine, in combination with the measuring devices, and with the spacer-selecting devices thereof, a pair of setting-racks provided with similarly-stepped supporting-surfaces, with means adapted when the spaces in the measured line will not be exactly justified by either size of justifying-spacers, to support one rack above the other to an extent suitably related to the indicated discrepancy, a pawl or its equivalent attached to the selector, and adapted to rest upon the steps of its rack, and a correcting-slide provided with a similar pawl adapted to engage with the correcting-rack, whereby the correcting-slide is elevated above the selector to an extent corresponding to the relative displacement of the setting-racks.

65. In a machine of the class specified, in combination with the selector cross-head and the correcting-slide, a pair of setting-racks controlled by the measuring devices of the machine, provided with a series of steps adapted to support the cross-head and the correcting-slide in suitable relation to each other according to the desired amount of correction.

66. The combination of a pivotally-mounted correcting-lever, a pawl-lever pivotally mounted thereon, and a cam adapted to engage with the pawl-lever, with means operatively connected with the movable end of the correcting-lever, adapted to carry the pivot of the pawl-lever to a suitable position relative to the cam, for the purpose specified.

67. In a machine of the class specified, in combination with the selector thereof, provided with suitable engaging teeth, a pivotally-mounted correcting-lever, a pawl-lever

pivotally mounted thereon, the latter being provided with a pawl adapted to engage with the teeth of the selector, a cam adapted to engage with the pawl-lever, with means substantially adapted to support the correcting-lever in suitable relation to the cam, whereby the desired amount of motion may be communicated to the selector by means of the cam.

68. In a machine of the class specified, in combination with the selector and with the cross-head on which the selector is mounted, a correcting-lever pivotally mounted upon the cross-head, a pawl-lever pivotally mounted thereon and provided with a pawl adapted to engage with the teeth of the selector, a reciprocating cam adapted to engage with the pawl-lever and a correcting-slide adapted to support the pivot of the pawl-lever in a position with respect to the cam suitably related to the desired amount of movement of the pawl.

69. In a machine of the class specified, in combination with the selector cross-head adapted to be set to different positions, a correcting-lever mounted upon the cross-head, a pawl-lever pivotally mounted upon the correcting-lever and provided with a pawl adapted to engage with suitable teeth on the selector, a series of reciprocating cams arranged in coincidence with the several positions of the cross-head, with means substantially as described adapted to support the pivot of the pawl-lever in a relation to the actuating-face of the adjacent cam suitably adapted to the amount of correcting movement required of the pawl.

70. In a machine of the class specified, in combination with the selector cross-head, the correcting-slide and the setting-racks therefor controlled by the measuring devices of the machine, a correcting-lever having its ends pivotally mounted upon the cross-head, and the correcting-slide respectively, a pawl-lever pivotally mounted upon the correcting-lever, provided at one end with a pawl adapted to engage with suitable teeth on the selector, with a reciprocating cam adapted to engage with and operate the pawl-lever.

71. In a machine of the class specified, in combination with a series of spacer-selecting fingers, a selector and its cross-head adapted to be moved into coincident relation to either of the fingers, correcting devices mounted upon the cross-head, and a series of cams arranged in corresponding relation to the fingers, and adapted to actuate the correcting devices, all arranged and operating to advance the selector to the next selecting-finger.

72. In a machine of the class specified, in combination with a series of selecting-fingers, and a corresponding series of cams, a reciprocating carriage on which the fingers and the cams are mounted, a selector and its cross-head adapted to be moved into operative relation to each of the fingers, and a correcting device mounted in the cross-head, and adapted to engage with the adjacent cam of the series,

whereby the selector is advanced into engaging relation with the next higher finger of the series in accordance with the required correction.

73. In a machine of the class specified, in combination with the spacer-selector thereof, provided with suitable engaging teeth, a pawl pivotally mounted adjacent to and adapted to engage with the teeth of the selector, a reciprocating carriage provided with a cam adapted to move the pawl to the desired extent, the carriage being operatively connected with the pawl, whereby it holds the latter into operative engagement with the teeth of the selector during the operation of the cam.

74. In a machine of the class specified, in combination with the spacer-selector thereof, provided with suitable engaging teeth, an actuating-pawl mounted adjacent to and adapted to engage with the teeth, and a reciprocating carriage, provided with a cam, all arranged and operating during the stroke of the carriage in one direction to hold the pawl into engagement with its teeth and to actuate it to the desired extent, and operating to withdraw the pawl from the teeth during the return movement of the carriage.

75. In combination with the selector, provided with suitable engaging teeth, and with an actuating-pawl therefor, a detent adapted to engage with the teeth of the selector and an escapement-pawl pivotally mounted upon the selector, and adapted to release the detent from the teeth of the pawl at predetermined points thereof.

76. In combination with the selector, provided with suitable teeth and with an actuating-pawl therefor, a detent adapted to engage with and support the teeth of the selector, and an escapement-pawl pivotally mounted upon the selector, the detent and the escapement-pawl being provided with interengaging portions adapted to release the detent from the teeth of the selector at suitable predetermined positions of the latter.

77. The combination of a selector, a detent therefor and an escapement-pawl for the detent, pivotally mounted upon the selector, an escapement-wheel rotatably mounted on the selector and provided with teeth adapted to engage with and support the escapement-pawl in a non-engaging relation to the detent, with actuating means adapted to rotate the escapement-wheel to a position which permits the escapement-pawl to come into releasing engagement with the detent.

78. In combination with a type-containing channel, means for extracting matter therefrom and distributing it in two or more different locations, consisting of an extractor adapted to engage with the matter to be extracted, and arranged in operative connection with two or more cams or their equivalents, adapted respectively to move the extractor to the desired locations.

79. In combination with a type-containing

channel, and with the type-separators thereof, means for extracting the separators therefrom and distributing them in different channels, consisting of an extractor adapted to engage with the separators, arranged in operative connection with two independent cams, or their equivalents, adapted respectively to move the separators into distributing relation to their respective receiving-channels.

80. In a machine of the class specified, in combination with separators adapted to indicate the separations between the words and between the lines respectively, an extractor adapted to engage with the separators, two cams or their respective equivalents, arranged in operative connection with the extractor and adapted to move that extractor so as to carry the two kinds of separators to their respective receiving-channels.

81. In an assembling device for type matter, the combination of a fixed and a movable raceway located side by side, with means adapted to depress the movable raceway relative to the fixed raceway to an extent corresponding to the amount of type matter on the movable raceway, for the purpose specified.

82. In an assembling device for type matter, the combination of a fixed raceway and of a movable raceway adjacent thereto, means for moving the type matter along those raceways toward their meeting edges, and with means for depressing the movable raceway to an extent corresponding to the amount of type matter thereon, whereby the surface of that type matter is substantially coincident with the plane of the fixed raceway, for the purpose specified.

83. In an assembling device for type matter, the combination of a fixed raceway, a channel for the type matter having its lower open end located in the plane of the fixed raceway, a movable raceway located adjacent to the fixed raceway, and having a portion of its surface underlying the open end of the channel, and adapted to support the type matter contained therein, means for depressing the movable raceway so as to permit the withdrawal from the channel of the desired amount of matter, and an assembling-plunger adapted to move the type matter thus withdrawn from beneath the channel toward the fixed raceway.

84. An assembling device for type matter, consisting of a fixed raceway, a channel for the type matter having an open end located in the plane of the fixed raceway, a movable raceway located adjacent to the fixed raceway, and having a portion of its surface underlying the channel and adapted to support the type matter contained therein, means for depressing the movable raceway so as to permit the withdrawal therefrom of the desired amount of type matter, an assembling-plunger adapted to move the type matter thus withdrawn from the channel toward the fixed raceway, and an assembler adapted to move

type matter along the fixed raceway, and upon the matter contained on the movable raceway.

85. In a machine of the class specified, in combination with a fixed raceway, and with spacer-containing channels adjacent thereto, a basic-spacer channel having its lower open end located in the plane of the fixed raceway, a movable raceway located adjacent to the fixed raceway and having a portion of its surface adapted to serve as a supporting-table for the spacers contained in the basic-spacer channel, means adapted to select and eject the desired spacer upon the fixed raceway, and adapted to depress the movable raceway so as to allow of the withdrawal from the channel of the desired number of basic spacers, with means adapted to assemble the two kinds of spacers along their respective raceways into a single pile.

86. A controller for the purpose specified, operatively connected with the line and word shaft clutches of the machine with actuating means for moving the controller to predetermined starting positions.

87. A controller for the purpose specified, operatively connected with the line and word shaft clutches of the machine provided with a stepped flange for regulating the backward setting of the controller, and with actuating means for setting the controller backward to the predetermined step of the stepped flange.

88. A controller for the purpose specified, adapted to engage with the clutch-operating devices, provided with a stepped flange or its equivalent adapted to regulate the backward setting of the controller, and a stop adapted to be moved into engaging relation with the different steps of the flange.

89. A controller for the purpose specified, adapted to engage with the clutch-operating devices, provided with a stepped flange or its equivalent adapted to regulate the backward setting of the controller, a stop adapted to be moved into engaging relation with the different steps of the flange, and with means for setting the controller back to the extent predetermined by the stop.

90. A controller for the purpose specified, adapted to engage with the clutch-operating devices, provided with a pawl located thereon in engaging relation to an actuating-ratchet, a stepped flange or its equivalent adapted to regulate the backward setting of the controller, and a stop located in the path of travel of the stepped flange and adapted to be moved into engaging relation with the step of the controller corresponding to the number of spaces in the line.

91. In a machine of the class specified, in combination with the controller, and with the separators thereof, the controller being provided with a stepped flange or its equivalent, a stop located in the plane of the flange, and adapted to be moved across the path of the steps thereof, with means substantially as described adapted to be actuated by the sep-

arators whereby the stop is moved into engaging relation with that step of the flange corresponding with the number of separators in the line.

92. In a machine of the class specified, in combination with the controller and with the separators thereof, the controller being provided with a stepped flange or its equivalent, a stop located in the plane of the flange and being capable of movement across the path of the series of steps thereof, with a star-wheel or its equivalent located in engaging relation to the separators, and operatively connected with the stop, whereby the latter is moved into engaging relation with the successive steps of the flange as the star-wheel is intermittently rotated by the successive separators.

93. A controller for the purpose specified, adapted to engage with the clutch-operating devices, provided with a pawl, a rotating ratchet located in engaging relation to the pawl, with means substantially as described for moving the pawl into and out of engagement with the ratchet.

94. A controller for the purpose specified, adapted to engage with the clutch-operating devices, a pawl pivotally mounted thereon, a rotating ratchet located in engaging relation to the pawl, with a cam or its equivalent adapted to disengage the pawl from the ratchet when the controller has operated its clutches.

95. In combination with a controller for the purpose specified, a pawl pivotally mounted thereon, a rotating ratchet located in engaging relation to the pawl, a spring or its equivalent adapted to press the pawl toward engaging relation with the ratchet, and a cam or its equivalent adapted to disengage the pawl at the desired position of the controller, and adapted to hold the pawl out of engagement while the controller is being reset.

96. In a controller for the purpose specified, in combination with means for moving the controller backward the desired distance, and with means for moving it forward to its clutch-operating position, a pawl, and a cam adapted to engage with the pawl, with means for actuating the cam whereby the pawl is moved into and out of engaging relation with the ratchet.

97. In a machine of the class specified, in combination with the controller and with the measuring mechanism thereof, provided with a stepped flange or its equivalent, a detent adapted to engage with and hold the controller in its forward position, and operatively connected with the measuring mechanism, whereby the controller is released from the detent at a suitable stage in the operation of the measuring mechanism.

98. In a machine of the class specified, in combination with the controller and with the measuring mechanism thereof, the controller being provided with a pawl located thereon in engaging relation to an actuating-ratchet,

a cam or its equivalent located in engaging relation to the pawl and operatively connected with the measuring mechanism, whereby the controller is put in operation at the desired point in the operation of the measuring mechanism.

99. In a machine of the class specified, in combination with the measuring mechanism and with the word mechanism thereof, the latter being provided with a clutch adapted to be moved into and out of engagement with the actuating mechanism therefor, means operatively connected with the measuring mechanism adapted to move the word-mechanism clutch into engagement with its actuating devices at a suitable time in the operation of the measuring mechanism.

100. In a machine of the class specified, in combination with the measuring mechanism, and with the word mechanism thereof, the latter being provided with a clutch adapted to be moved into and out of engaging relation with its actuating means, a controller provided with a pawl located thereon in engaging relation to an actuating-ratchet, and a cam or its equivalent located in engaging relation to the pawl, with means substantially as described operatively connected with the cam, and with the word-mechanism clutch, and located in engaging relation to the measuring mechanism, whereby the controller and the word mechanism are put in operation simultaneously at the desired point in the operation of the measuring mechanism.

101. In a type-justifying machine, in combination with the spacer-inserting mechanism thereof, provided with a clutch located in operative relation to a moving actuating-shaft, the herein-described controller or its equivalent adapted to disconnect the clutch of the spacer-inserting mechanism at a given position, with means for setting the controller back from its clutch-operating position to an extent suitably related to the number of spaces in the line to be justified.

102. In a type-justifying machine, in combination with the spacer-inserting mechanism thereof, provided with a clutch located in operative relation to a moving actuating-shaft, the herein-described controller or its equivalent adapted to disconnect the clutch

of the spacer-inserting mechanism at a given position, with means for setting the controller back from its clutch-operating position to an extent suitably related to the number of spaces in the line to be justified, with means for simultaneously engaging the controller and the spacer-inserting mechanism with their respective actuating-shafts.

103. In a type-justifying machine, in combination with the actuating mechanism, and with the measuring devices thereof, means adapted to be operated by the type matter to be justified, and adapted to cause the measuring devices to be engaged by the actuating mechanism.

104. In a type-justifying machine, in combination with the actuating mechanism thereof, a line-measuring device, a latch, and means disposed in the pathway of the type matter adapted to hold the measuring devices into engagement with the actuating mechanism while the type matter is present.

105. In a machine of the class specified, in combination with the measuring mechanism and with the actuating means therefor, provided with a clutch adapted to engage and disengage the measuring mechanism therefrom, an indicator-arm located in engaging relation to the type-containing channel, and operatively connected with the clutch, whereby the clutch of the measuring mechanism is held in engaging relation therewith at all times while type matter is contained in the channel.

106. In a machine of the class specified, in combination with the line-grab mechanism and with the measuring mechanism thereof, provided with a clutch adapted to engage the two mechanisms together, an indicator-arm located in engaging relation to the type matter contained in the channel, with operative connection between the indicator-arm and the clutch whereby the word and the line mechanisms remain clutched together during the presence of matter in the type-channel.

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