

(No Model.)

20 Sheets—Sheet 1.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.

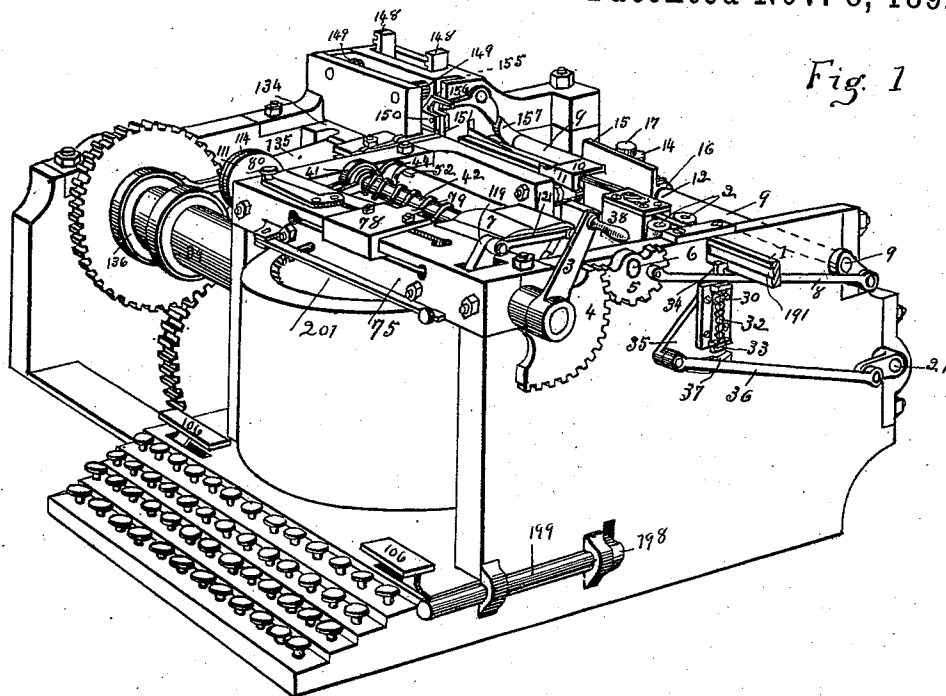


Fig. 1

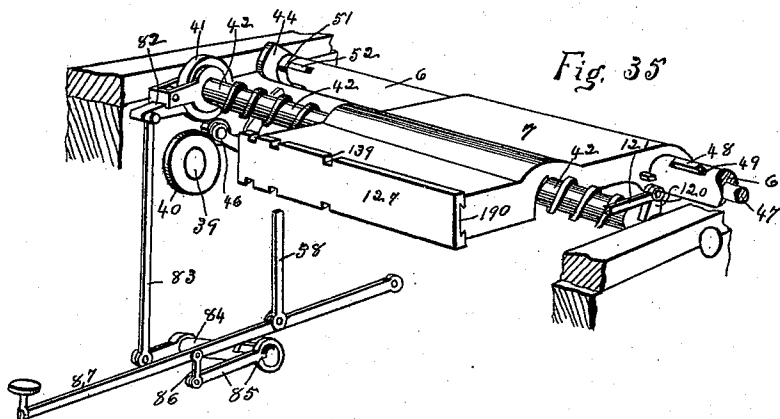
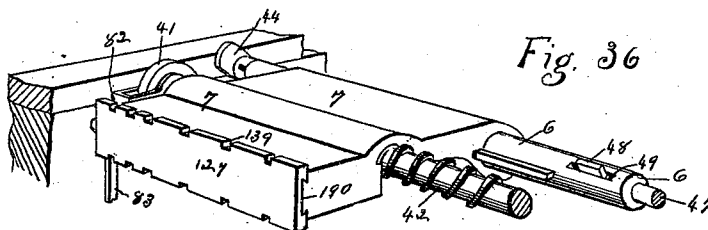


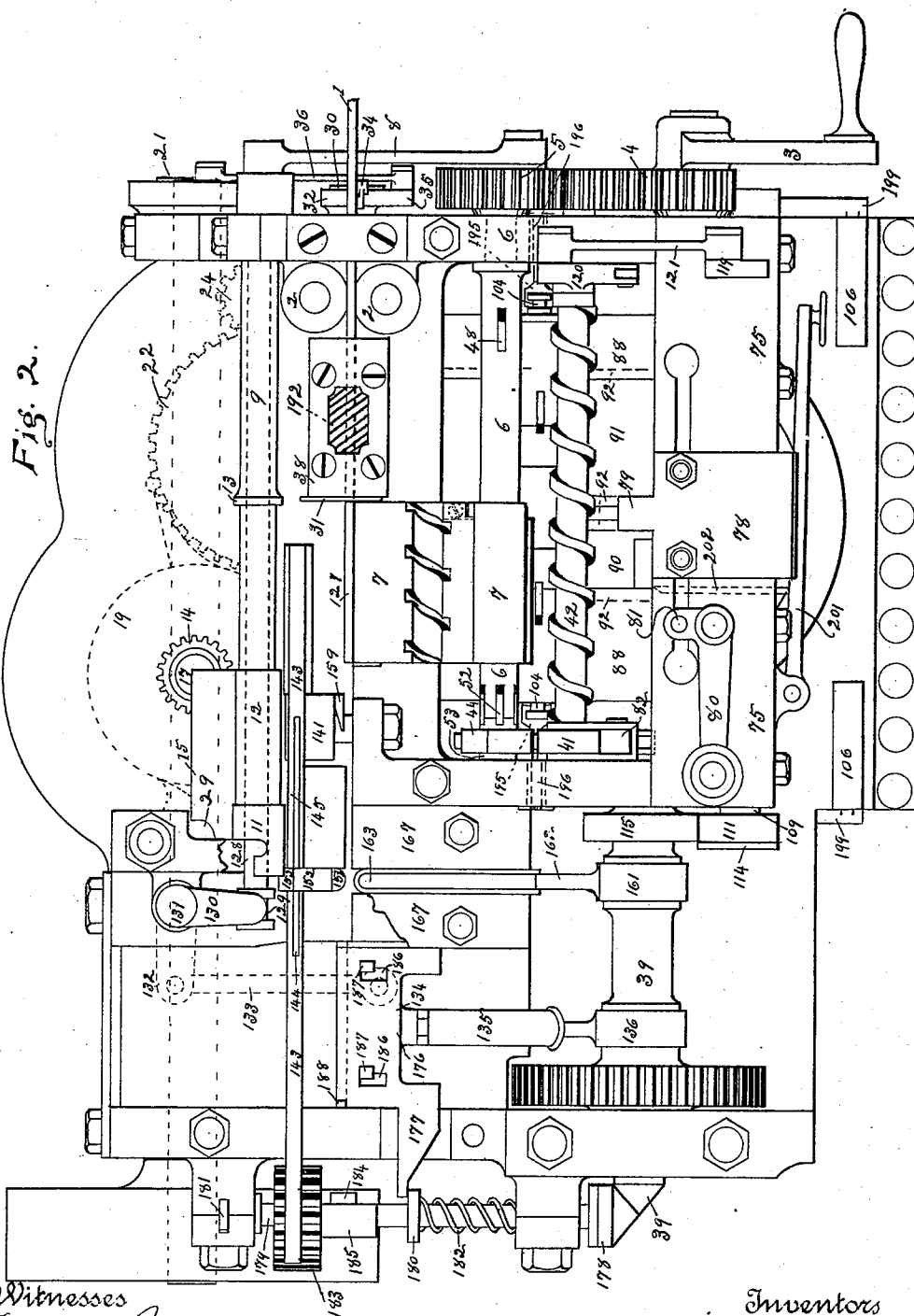
Fig. 35



L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.



Witnesses
Engine Ransom
A. S. Smith

Inventors
Louis Ransom.
Alexander W. Maynes

(No Model.)

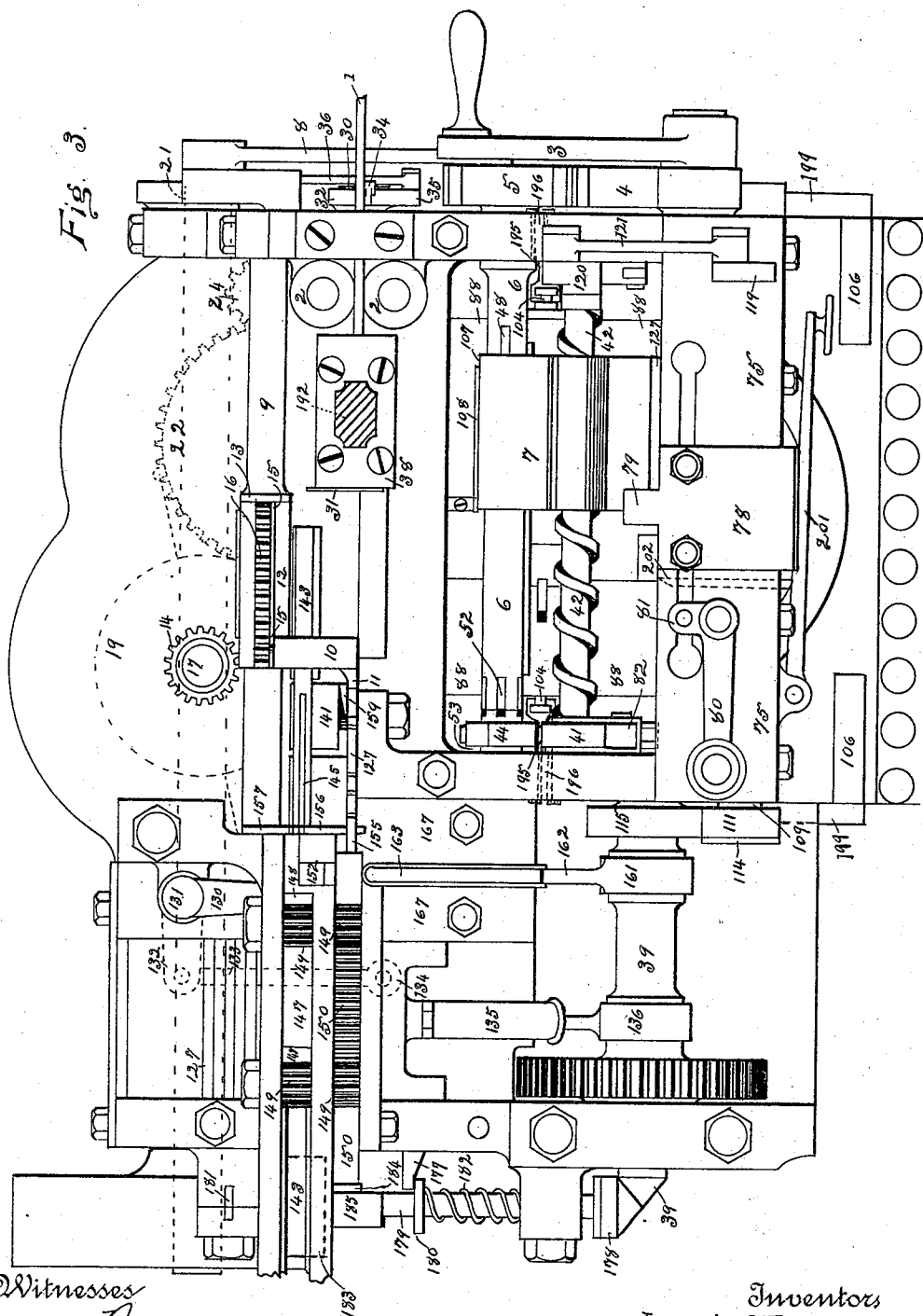
20 Sheets—Sheet 3.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.

Fig. 3.



Witnesses
Engene Ransom
A. S. Smith

Inventors
Louis Ransom.
Alexander W. Maynes

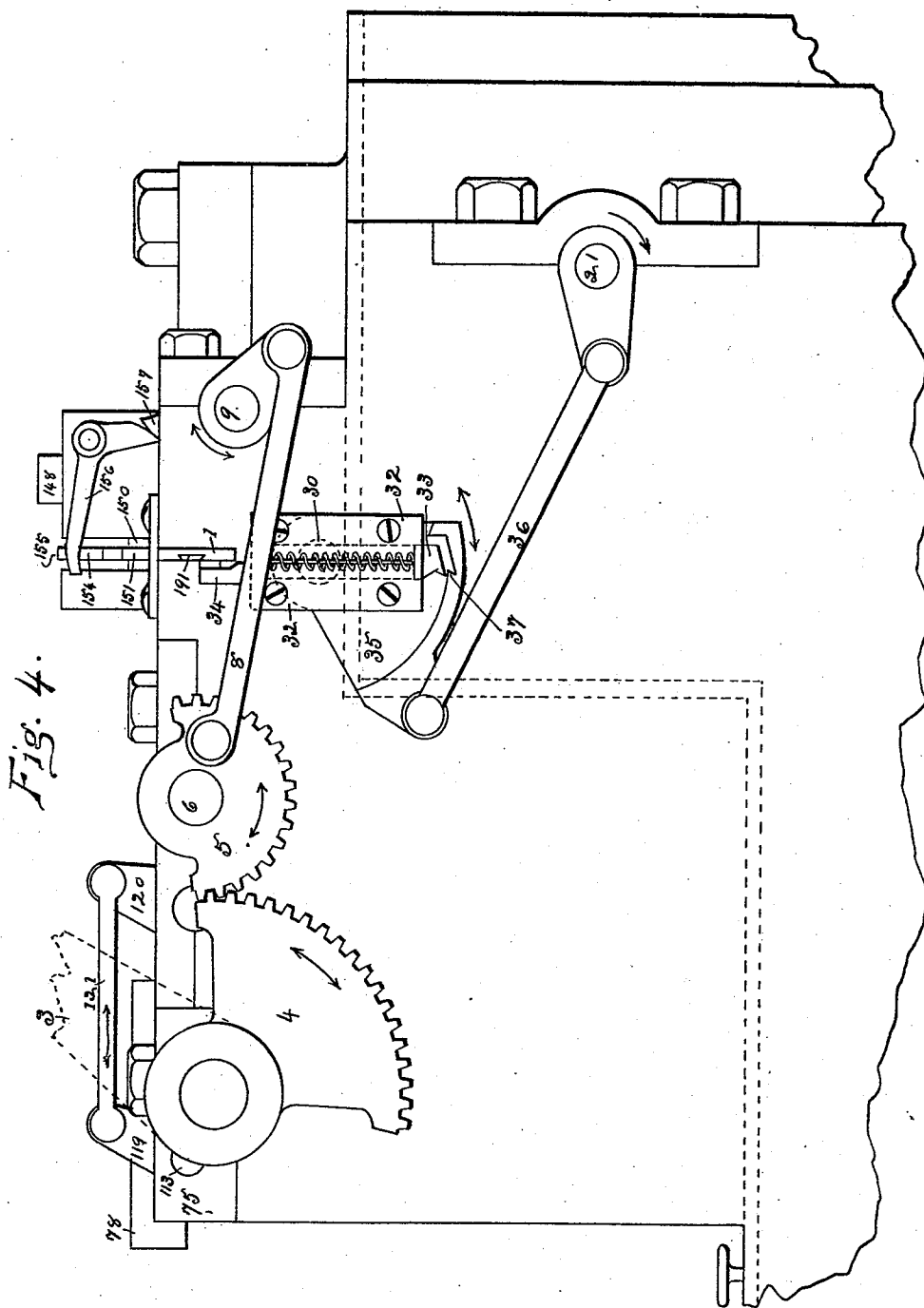
(No Model.)

20 Sheets—Sheet 4.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.



Witnesses
 Eugene Parsons
 H. S. Amstutz

Inventors
Louis Ransom
Alexander W. Maynes

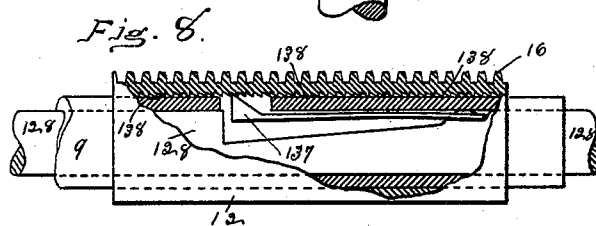
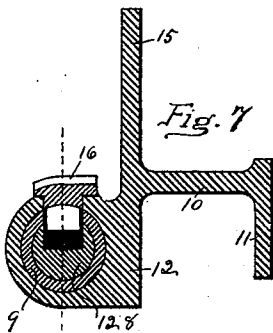
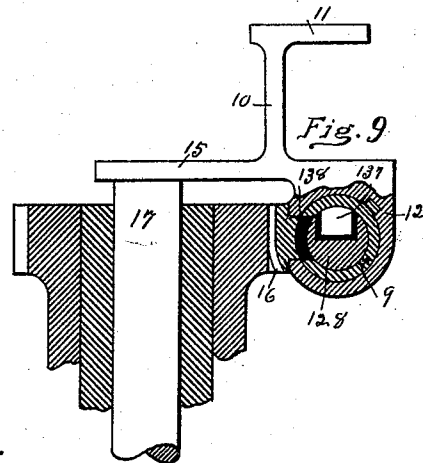
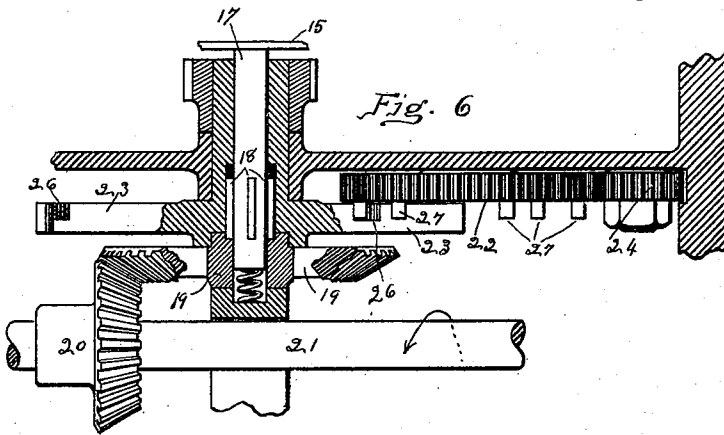
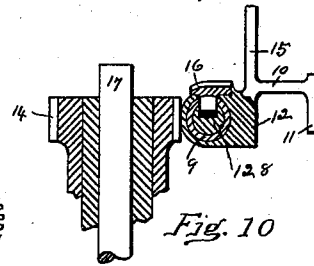
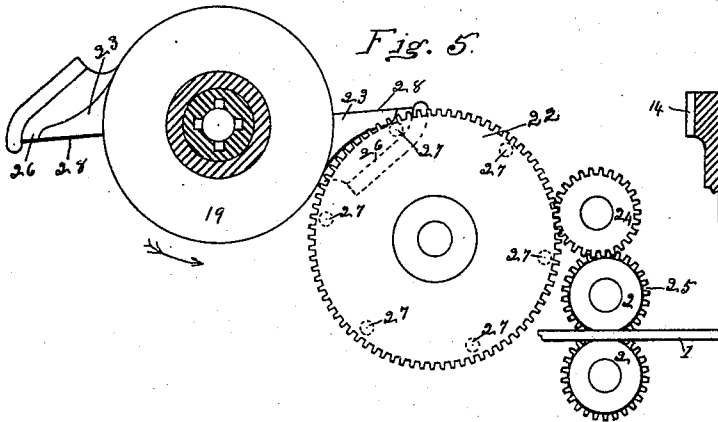
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20 Sheets—Sheet 5.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.



Witnesses
Engene Ransom
N. S. Amstutz

Inventors
Louis Ransom
Alexander W. Maynes

(No Model.)

20 Sheets—Sheet 6.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.

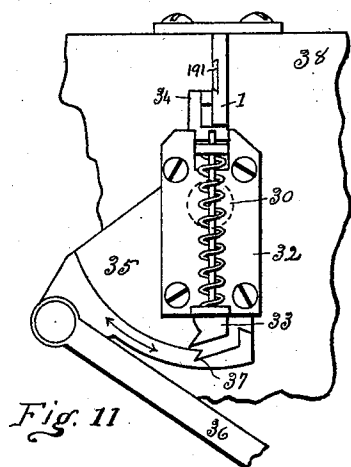


Fig. 11

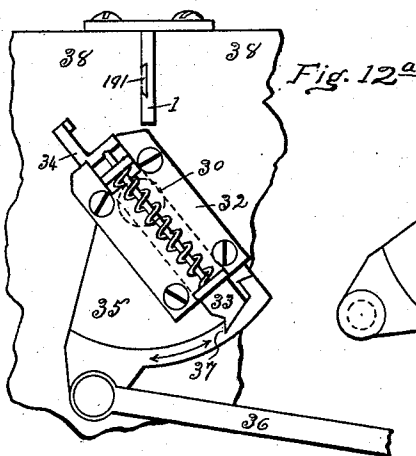


Fig. 12^a

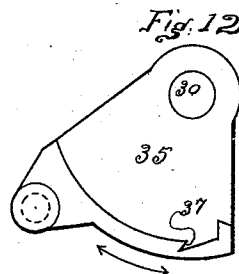


Fig. 12

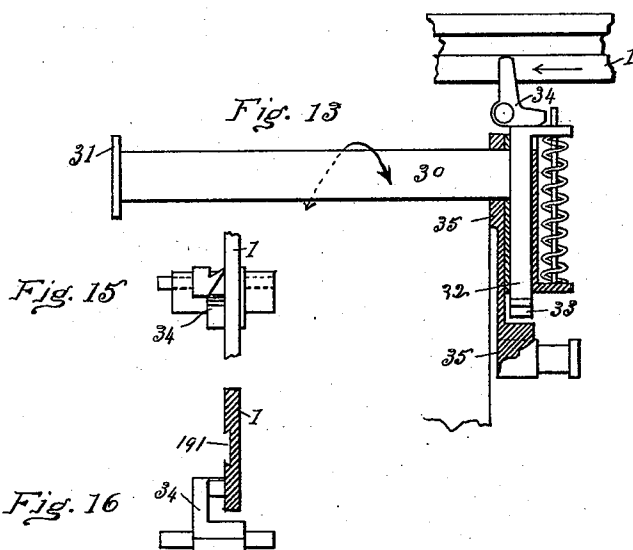


Fig. 13

Fig. 15

Fig. 16

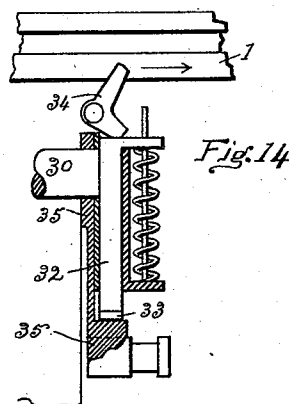


Fig. 14

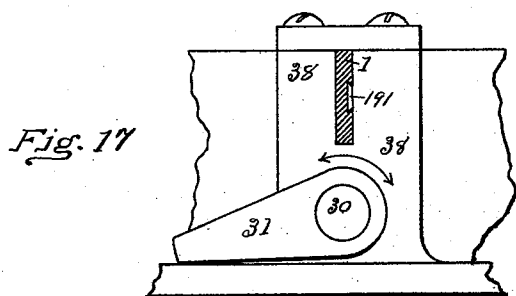


Fig. 17

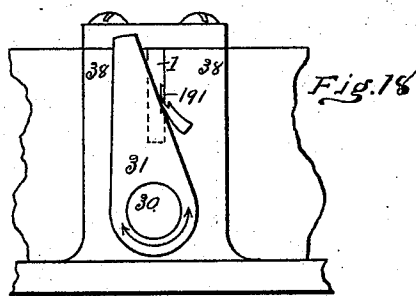


Fig. 18

Witnesses
Engene Ransom
N. S. Amstutz

Inventors
Louis Ransom
Alexander W. Maynes

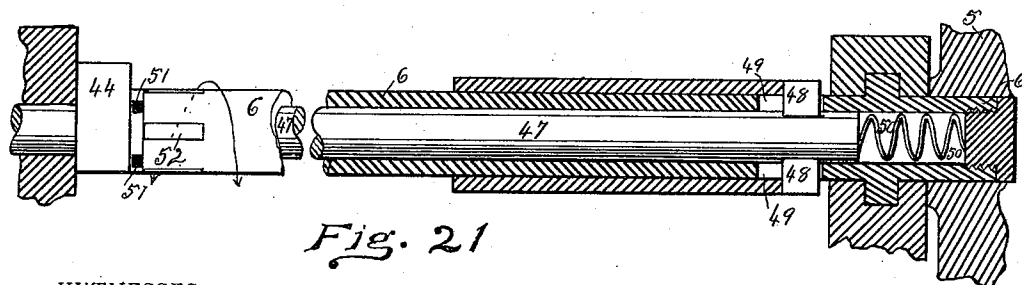
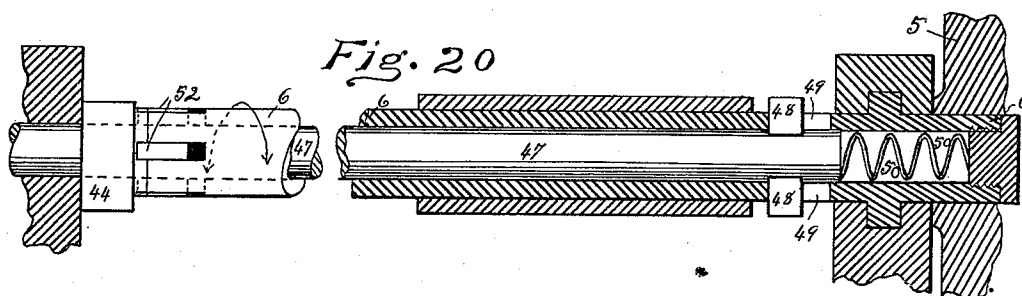
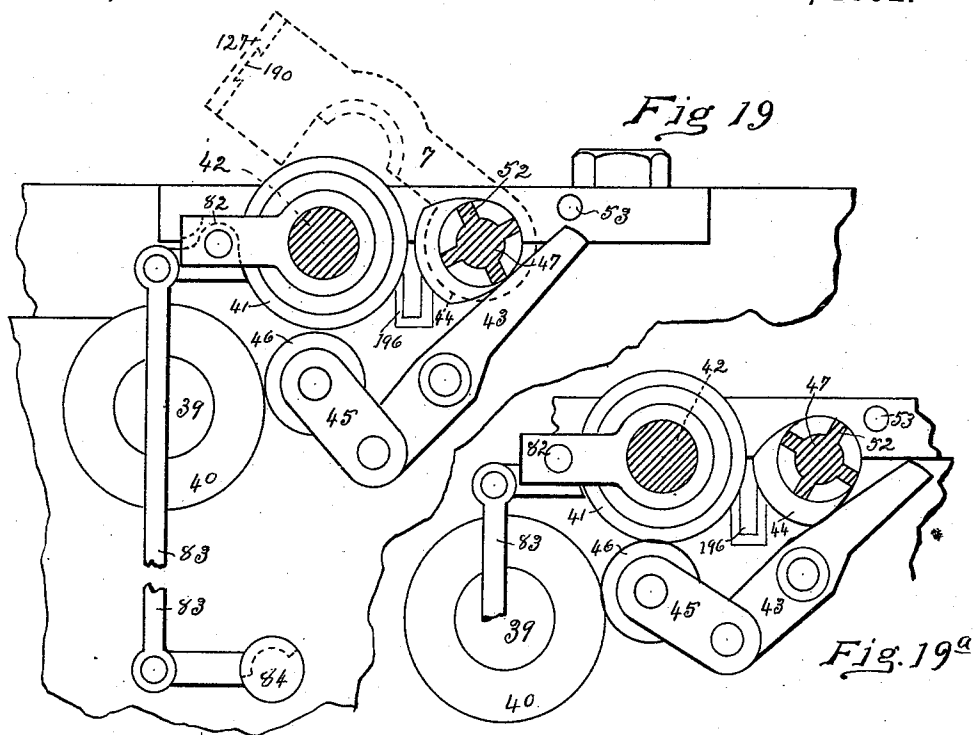
(No Model.)

20 Sheets—Sheet 7.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.



WITNESSES:

Engue Ransom
N. S. Amstutz

INVENTORS

Louis-Ransom.
Alexander W. Maynes

(No Model.)

20 Sheets—Sheet 8.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.

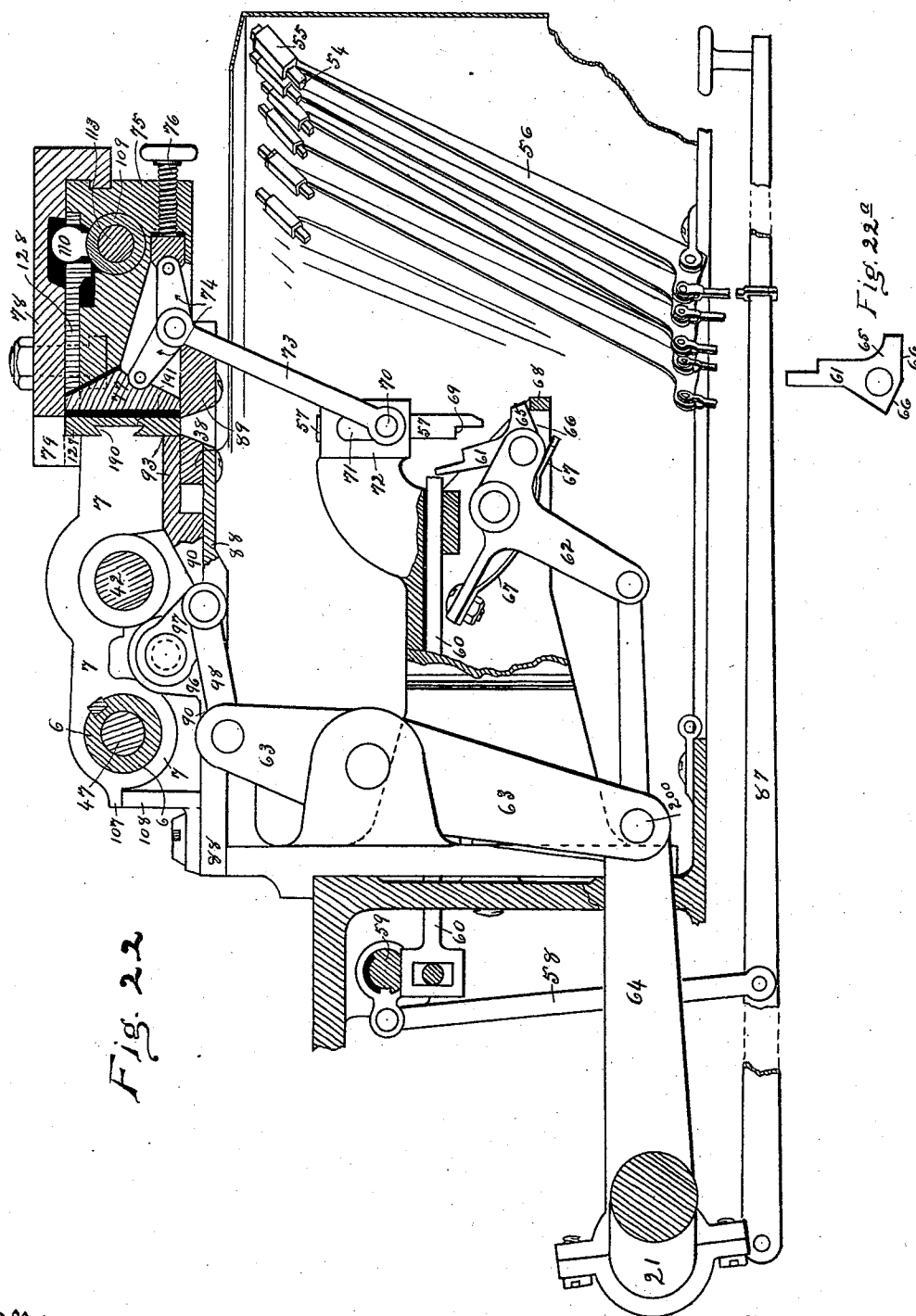


Fig. 22

Witnesses
Engine Room
v. s. Smith

Inventors
Louis Ransom
Alexander W. Maynes

(No Model.)

20 Sheets—Sheet 9.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.

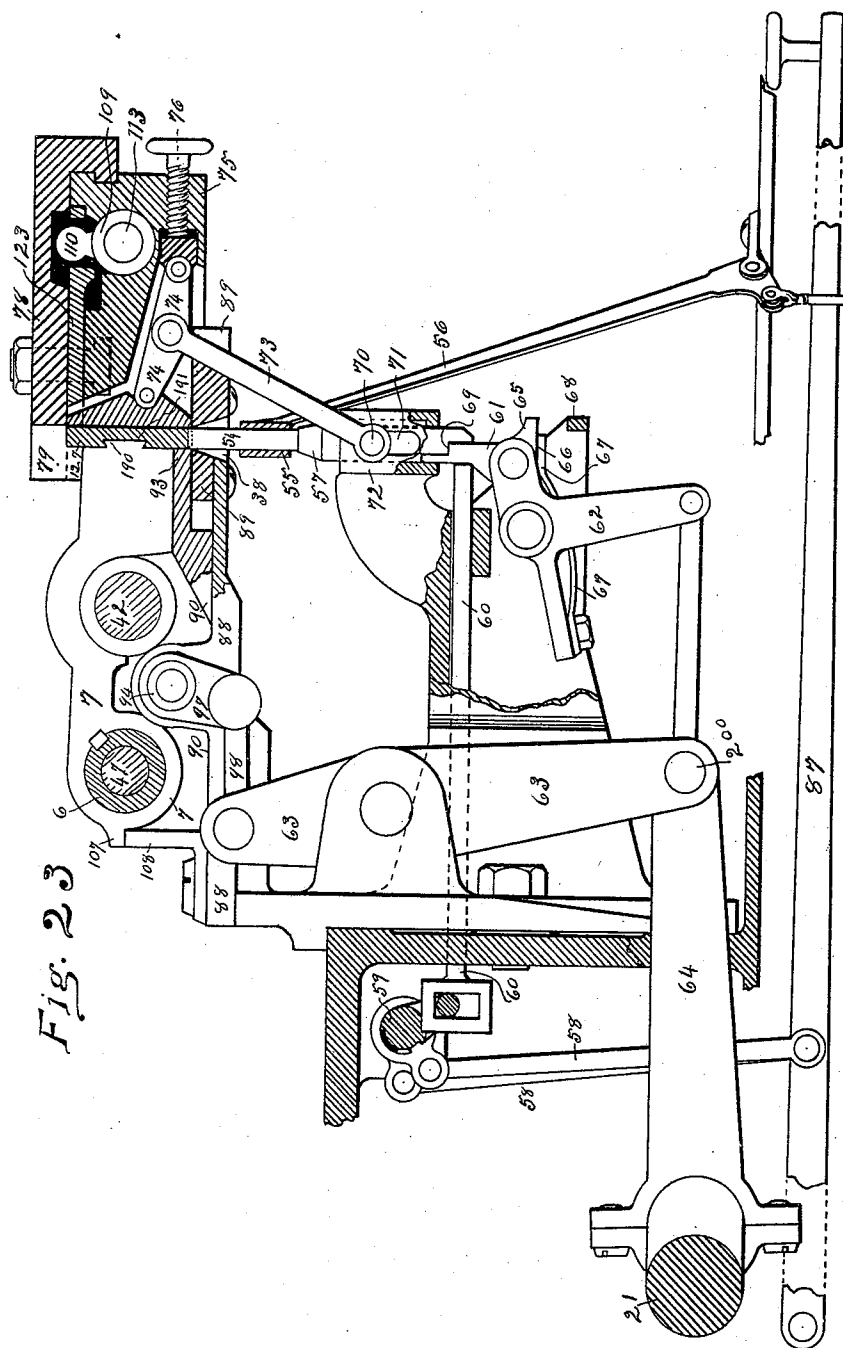


Fig. 23

Witnesses
Engene Ransom
W. S. Amstutz

Inventors
Louis Ransom
Alexander W. Maynes

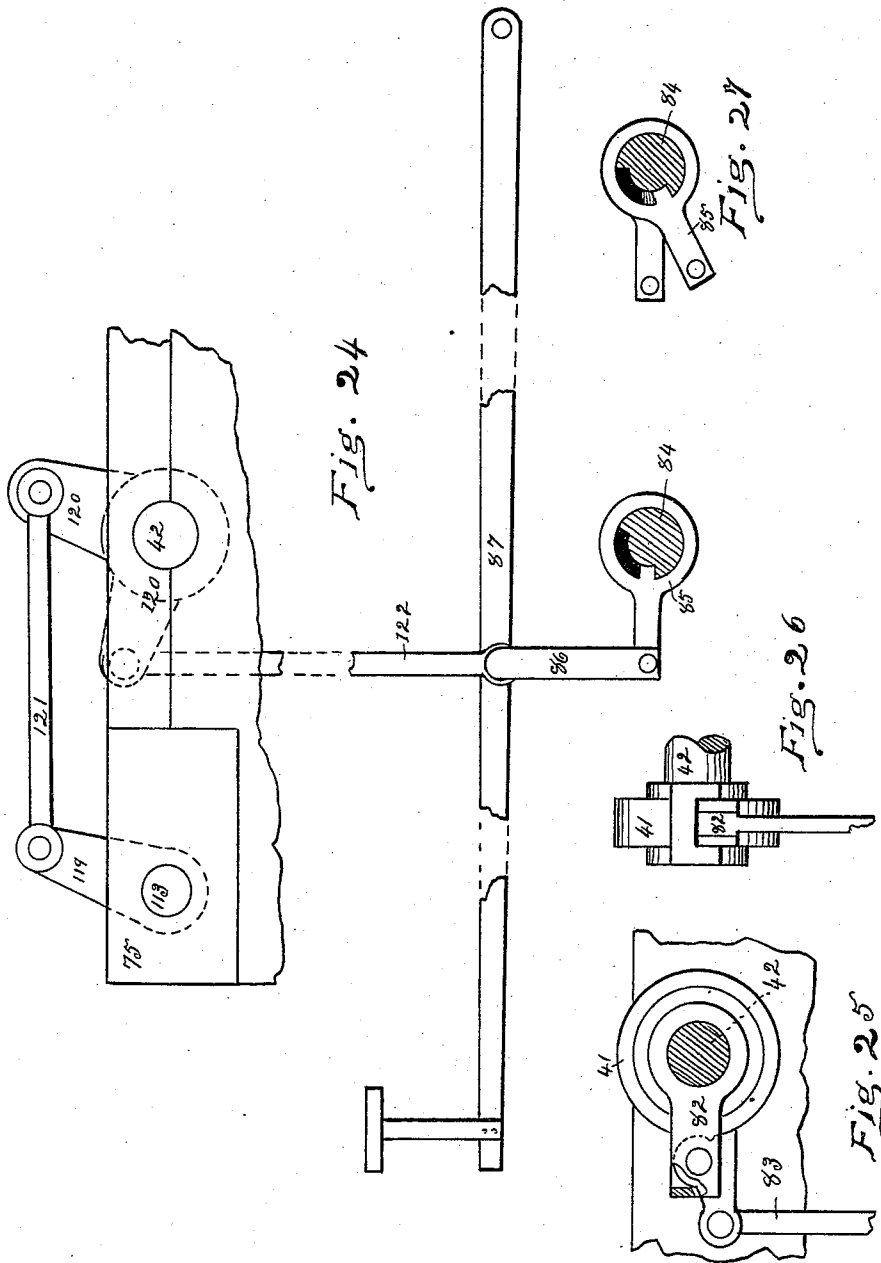
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20 Sheets—Sheet 10.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.



Witnesses
Engene Ransom
W. S. Smith

Inventors
Louis Ransom
Alexander W. Maynes

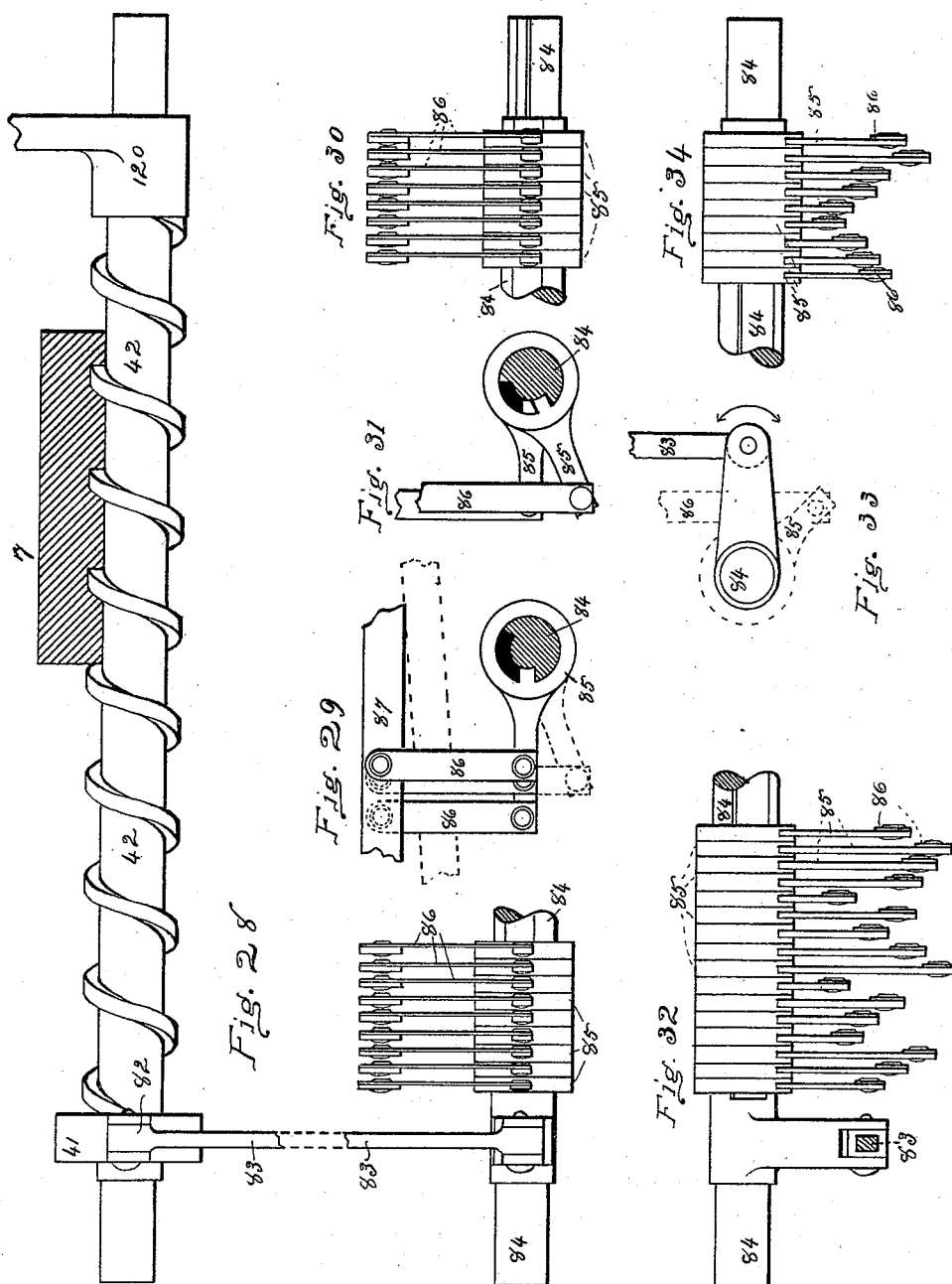
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20 Sheets—Sheet 11.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.



Witnesses
Eugene Ransom
A. S. Smith

Inventors
Louis Ransom
Alexander W. Maynes

(No Model.)

20 Sheets—Sheet 12.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.

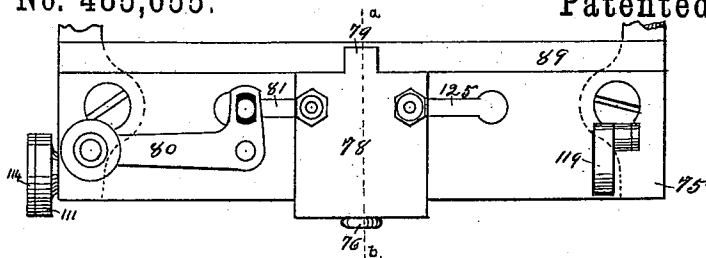


Fig. 37

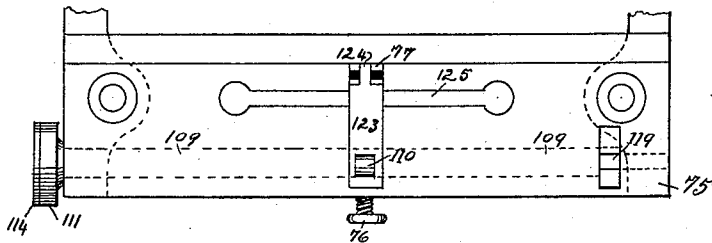


Fig. 38

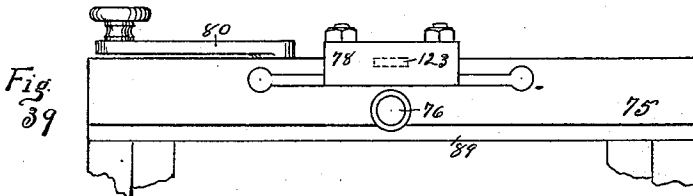


Fig. 39

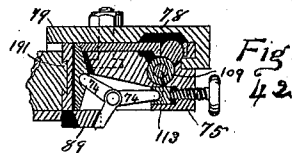


Fig. 42

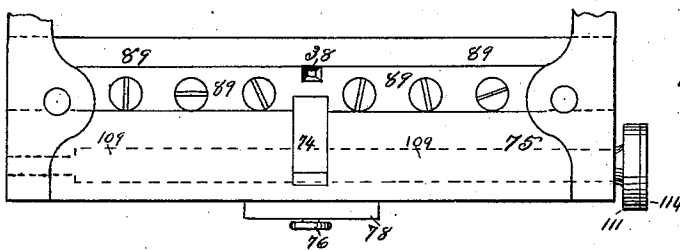


Fig. 40

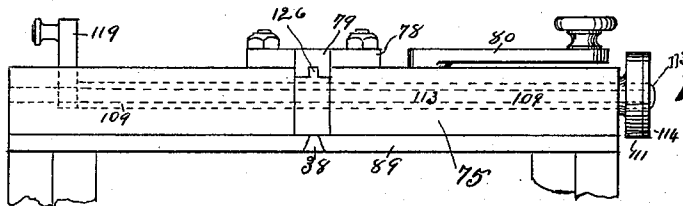


Fig. 41

Witnesses
Eugene Ransom
Residing at

Inventors
Louis Ransom
Alexander W. Maynes

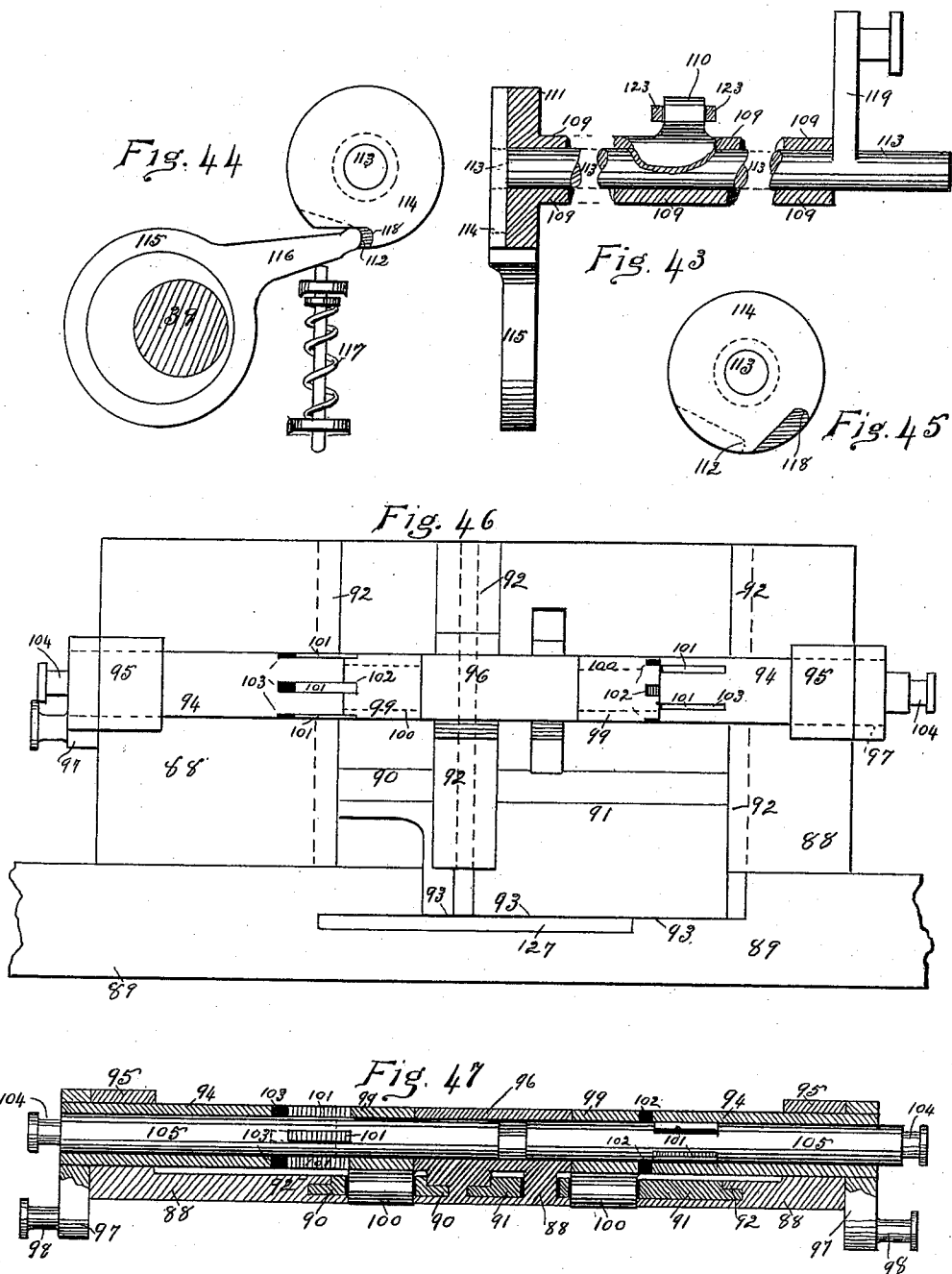
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L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.



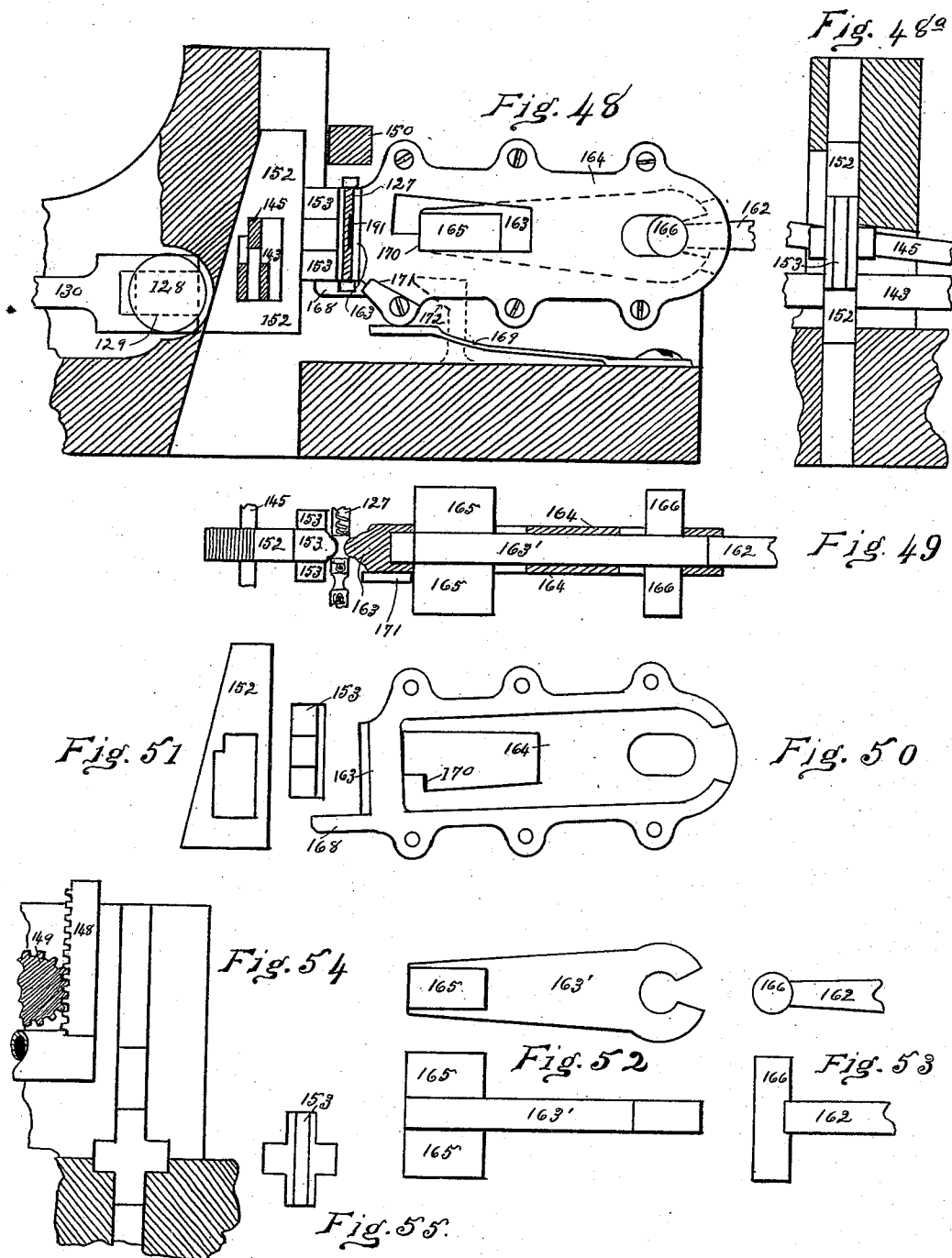
(No Model.)

20 Sheets—Sheet 14.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.



Witnesses
 Eugene Pearson
 V. Schmalitz

Inventors
Louis Ransom
Alexander W. Maynes

(No Model.)

20 Sheets—Sheet 15.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.

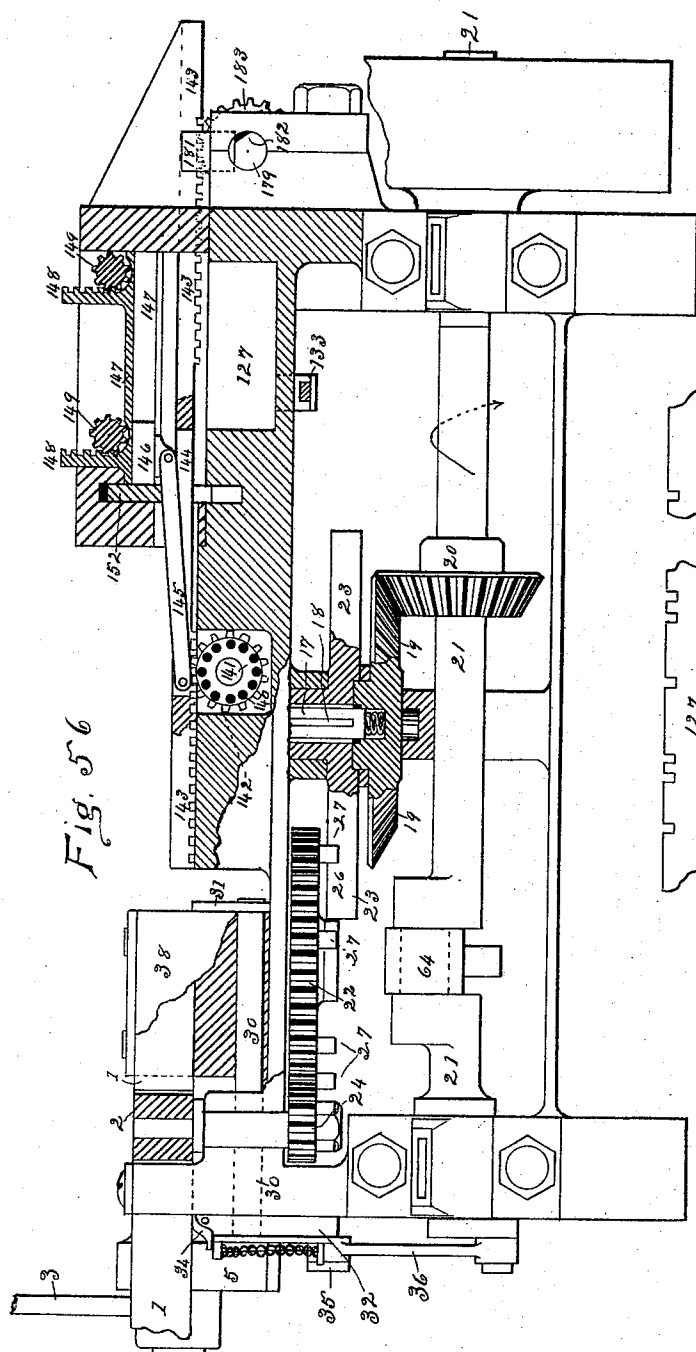


Fig. 56

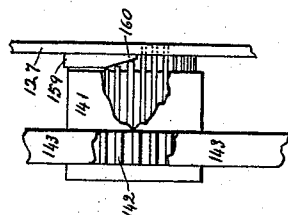


Fig. 67

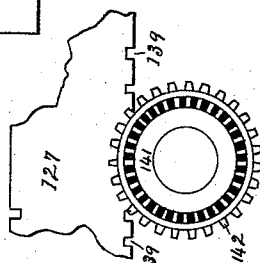


Fig. 60

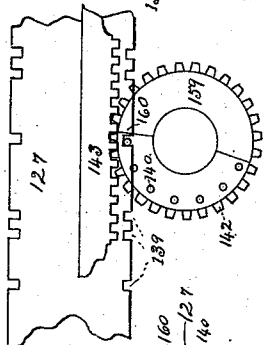


Fig. 59

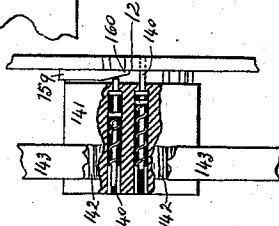


Fig. 58

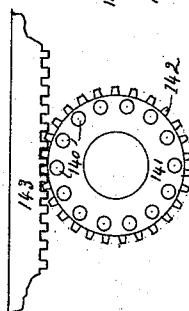


Fig. 57

Witnesses
Engene Ransom
N.S. Smolutz

Inventors
Louis Ransom
Alexander W. Maynes

(No Model.)

20 Sheets—Sheet 16.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.

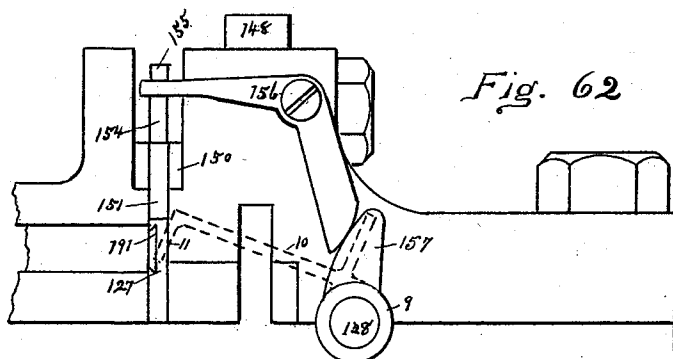


Fig. 62

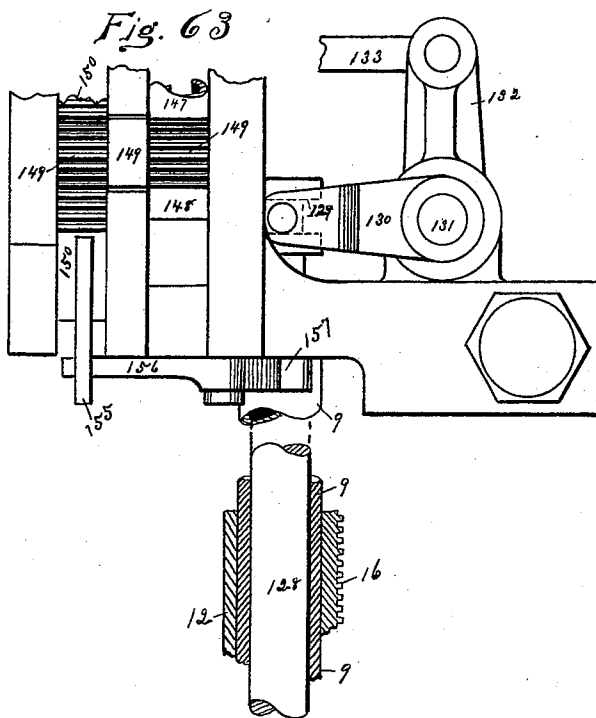


Fig. 63

Witnesses
Engene Ransom
W. Schuster

Inventors
Louis Ransom.
Alexander W. Maynes.

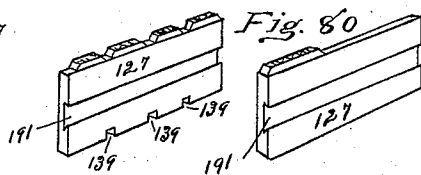
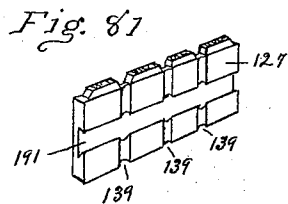
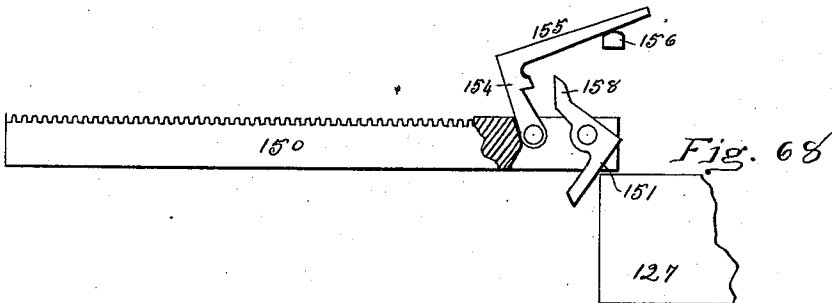
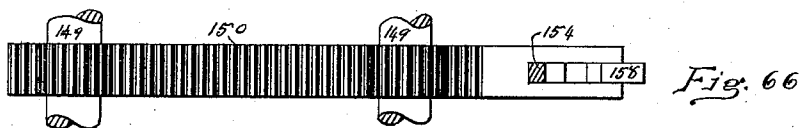
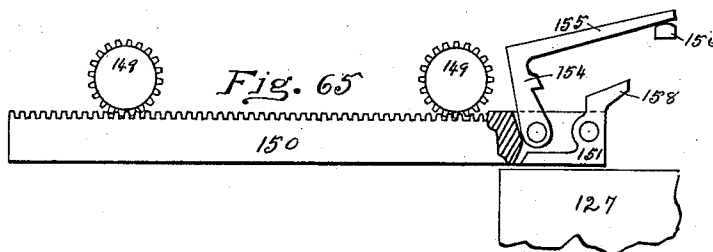
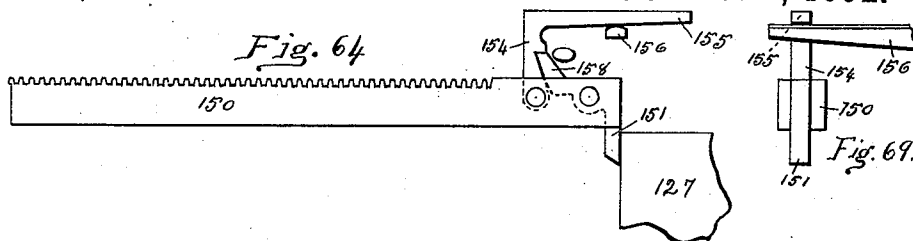
(No Model.)

20 Sheets—Sheet 17.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.



Witnesses
Eugene Ransom
Wm. H. Ransom

Inventors
Louis Ransom.
Alexander W. Maynes.

(No Model.)

20 Sheets—Sheet 18.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.

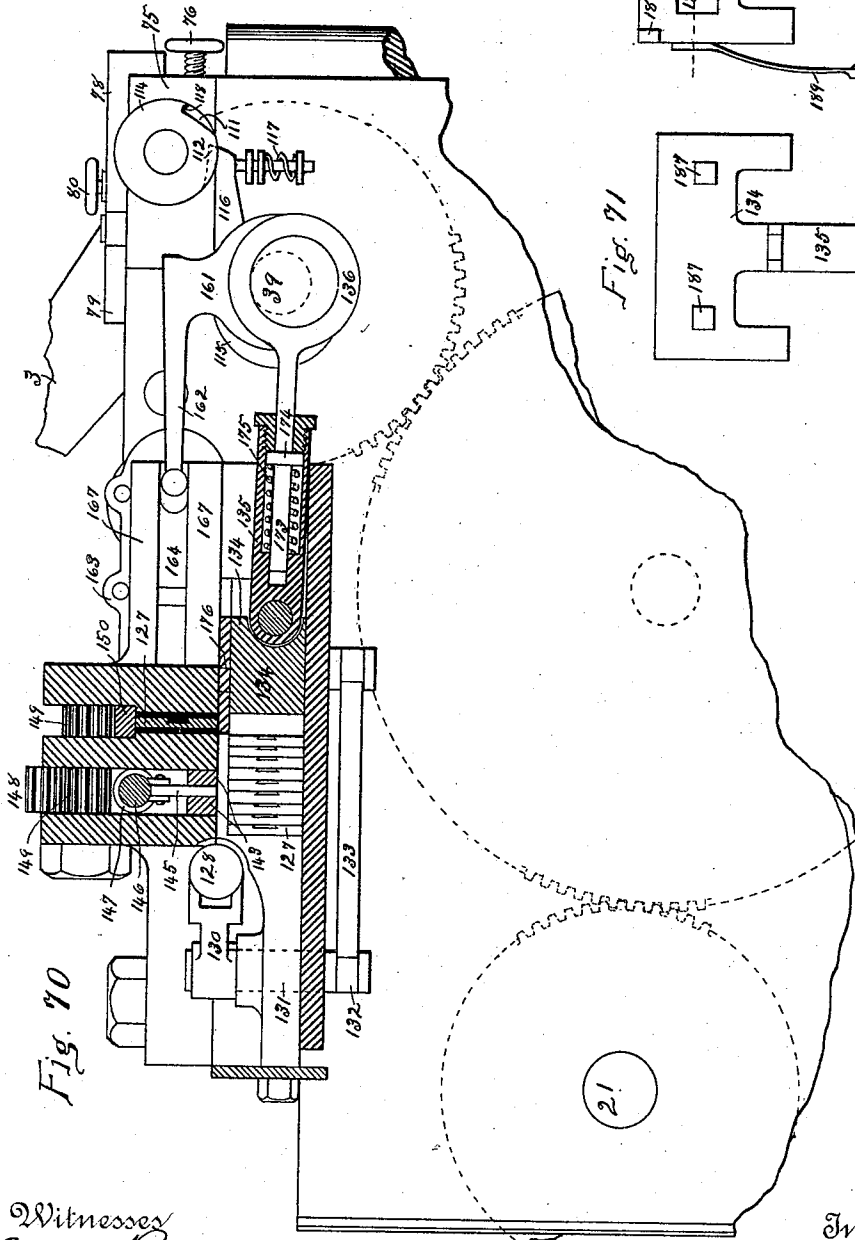


Fig. 70

Fig. 72

Fig. 71

Fig. 73

Witnesses
Engin Ransom
A. Schuchert

Inventors.
Louis Ransom
Alexander W. Maynes

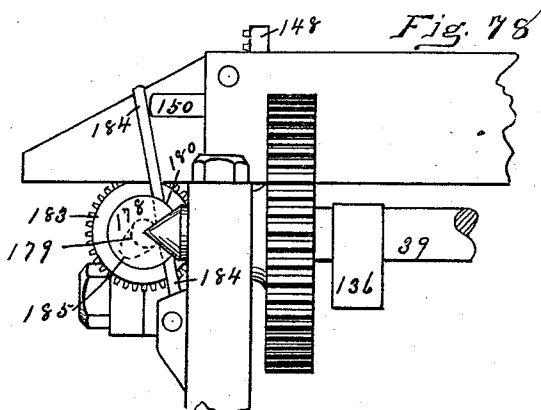
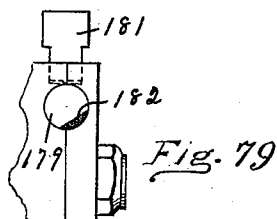
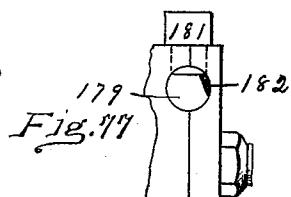
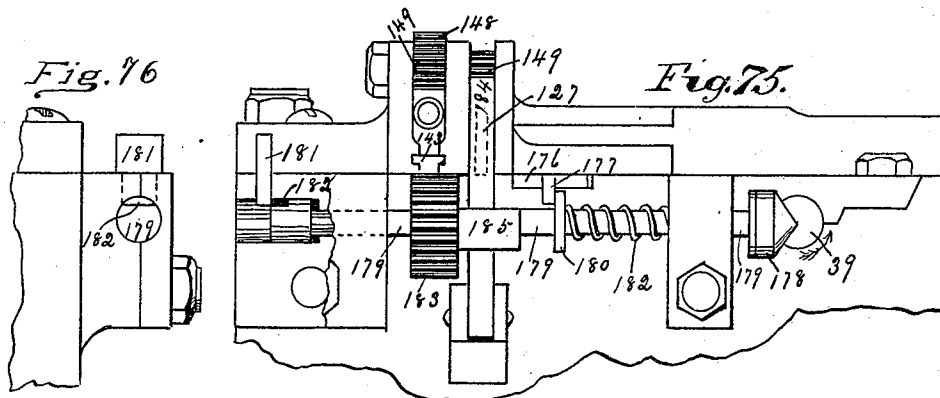
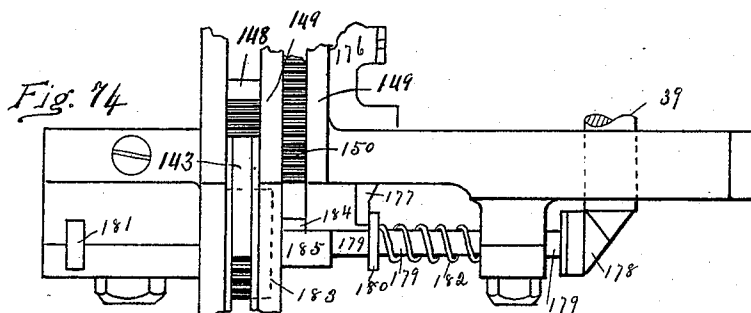
(No Model.)

20 Sheets—Sheet 19.

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.



Witnesses
Engene Ransom
W. H. H. H.

Inventors
Louis Ransom
Alexander W. Maynes

L. RANSOM & A. W. MAYNES.
TYPE LINE FORMING MACHINE.

No. 485,655.

Patented Nov. 8, 1892.

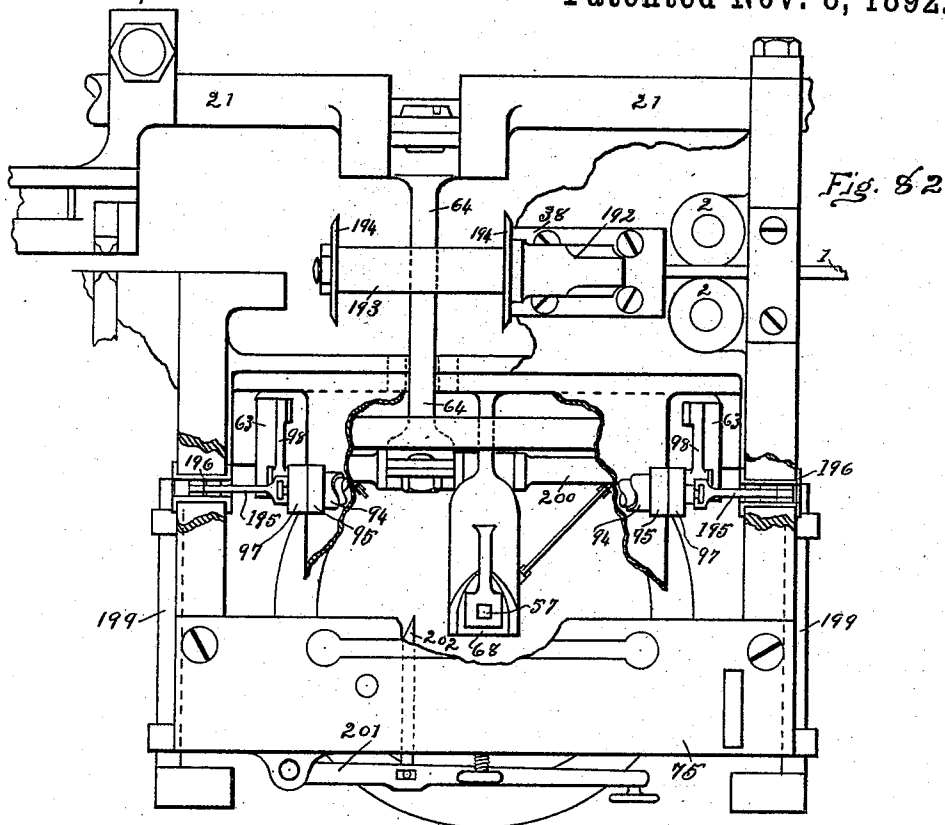


Fig. 82

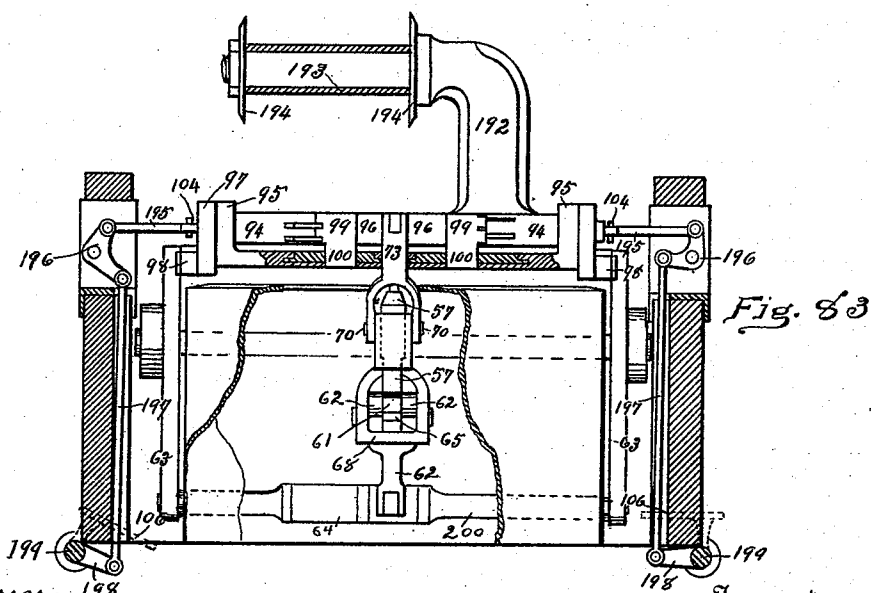


Fig. 83

Witnesses
Engue Ransom
W. S. Amstutz

Inventors
Louis Ransom
Alexander W. Maynes

UNITED STATES PATENT OFFICE.

LOUIS RANSOM AND ALEXANDER W. MAYNES, OF AKRON, OHIO, ASSIGNORS,
BY DIRECT AND MESNE ASSIGNMENTS, TO CHARLES W. SEIBERLING,
TRUSTEE, OF SAME PLACE.

TYPE-LINE-FORMING MACHINE.

SPECIFICATION forming part of Letters Patent No. 485,655, dated November 8, 1892.

Application filed September 3, 1891. Serial No. 404,613. (No model.)

To all whom it may concern:

Be it known that we, LOUIS RANSOM and ALEXANDER W. MAYNES, citizens of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented certain new and useful Improvements in Type-Line-Forming Machines; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to improvements in type-line-forming machines, and specially to that class of devices which form upon a strip of impressible material successively the different characters composing the words, as well as the spaces between the words, of an ordinary newspaper line of composition.

Our device, as illustrated in the accompanying drawings and specially described in the subsequent portion of this specification, consists in the main of the mechanism for performing certain functions, as pointed out in the key description immediately following this preamble.

There is provided a suitable compressible and non-elastic material, which in the present instance is in the shape of a continuous band of lead, though this is not absolutely necessary, or it may be of any analogous material, the only requirement which it is obliged to meet is that of being susceptible of receiving suitable impressions upon itself. This strip or band is automatically fed into the machine in an intermittent manner. The feeding into the machine of the strip ejects from the composition-stick an impressed line, the ejection being done by a new portion of the compressible material which is fed upon the composition-stick replacing the impressed line just removed, it being understood that the expression "non-elastic," when used in reference to the material upon which the line is to be formed, is not to be construed as specifically limiting us to the use of soft metals, such as lead, &c., but any material which, after receiving manipulations to change its form more or less, will so remain whether the same be compressed or elongated or whatever change of shape or form is given to it, in con-

tradistinction to elastic materials which are susceptible of having their form changed to suit various requirements by suitable means, but as soon as the means which have effected this change are removed the material will at once again assume its original form. Hence as the term "compressible and non-elastic material" is subsequently used herein its meaning will bear interpretation after the manner just set forth. After the stick has received a new line it is delivered to the forward part of the machine in proper position contiguous to the impression-orifice. The stick when in this position is engaged on its under side by a feed-screw. This feed-screw carries the stick and its line in a lateral direction upon a horizontal plane, the feeding of which, however, is not in uniform impulses. For instance, the keys of the machine, which represent the characters to be used, when they are played upon one after another bring into action suitable mechanism which feeds the stick through the movement of the feed-screw laterally just the distance of the width of the character to be formed, and since these characters are not of the same width—as, for instance, the letters I M N, being of different widths, require a different and variable amount of new material to be presented above the impression-orifice for the respective characters of which an impression is to be made. This is very simply arranged and accomplished by a suitable pawl-clutch, which engages the periphery of one end of the feed-screw or a suitable cylindrical section of the screw. This pawl-clutch is operated through a suitable connecting-link, which receives its impulses from a rock-shaft having a series of tumblers thereon, which are adapted to be moved independently of each other, there being as many of these tumblers as there are key-levers in the machine. The key-levers of the machine, corresponding to the characters of different widths, engage their respective tumblers of the rock-shaft irrespective of each other. The different or variable movement of the feed-screw corresponding to the variable widths of the several characters is obtained by making the tumblers for these several characters of different lengths, so as to cause

the rock-shaft to have more or less movement, according to the character being used. We also provide a suitable supporting-clamp, which abuts the line which is held upon the composition-stick and tightly holds the same against the stick. The spaces between words are produced by a key and its connections in the machine in a similar manner to the operation of any of the characters, the spaces upon the line being all of a uniform shape and of a minimum width.

In connection with the impression location of the stick we provide mechanism adjacent to the base of the line, which in this instance in the position that the line is now held in the stick would be the upper edge thereof. This mechanism serves to notch the line directly opposite and of a like width to the spaces between the words of the composition on the opposite edge of the line for the purposes hereinafter described.

Contiguous to the preceding mechanism we also provide what is denominated the "paragraphing device." This device serves the purpose of more quickly effecting the formation of long blank spaces upon the lines or of any spaces which exceed in width the ordinary spaces placed between the words of a sentence—as, for instance, the short space preceding the beginning of every paragraph and likewise the long spaces which are likely to occur in the ending of a paragraph, where the last word forms the beginning of the last line. These longer blank spaces could of course be made by the ordinary spaces of the machine; but the time used would very materially affect the rapidity of operation of the machine for the reason that the space-key would need to be operated as many times as were necessary to form the entire length of the blank space, while with our paragraphing device we are enabled to expeditiously form these extraordinary spaces at one operation.

As a means of support to the line directly opposite the impression-orifice we provide a suitable base extending from side to side of the machine, directly in front of the impression position of the composition-stick, and thus support the line firmly as against any displacement thereof during the operation of impressing the successive characters upon the same. When the entire line has received its proper and complete impressions, this support is moved laterally a slight distance, so as not to obstruct the free movements of the stick with the impressed line thereon from the forward or impression position to the rearward or delivery position thereof.

The character-keys in their connection are not unlike the mechanism of well-known forms of type-writing machines. The matrix-stems have lengthwise movements in the type-bars of the machine, the type-bars being arranged radially, so as to bring each letter or character of the machine to a uniform central position directly in line with the impression-orifice, and when a certain key is oper-

ated its corresponding type-bar, with its matrix-stem, is brought into position directly beneath the impression-orifice. To effect this position of the type-bar and its matrix, the first or greater portion of the movement of the key-lever is required, while the latter part of the movement of the key-lever throws into operation a suitable power mechanism, which operates a plunger that engages the matrix-stem from beneath and impresses the same upon the line which is directly above the impression-orifice, and upon the release of the keys this plunger is instantly retracted, allowing the matrix-stem to drop out of the impression-orifice, thus enabling the type-bar to again move back to its normal or inoperative position. When the line has received its entire impression, the composition-stick is moved rearward into the delivery position, where the impressed line is removed therefrom in a direction toward the justifying mechanism by reason of the feeding in of a new portion of the impressible material. It will be understood that in the delivery position of the stick, the impressed edge of the line is presented in an upward direction, while the base of the line is now upon the under side thereof, presenting the counterpart space-notches in a downward direction, and while the same is being ejected from the composition-stick these "counterpart space-notches," as they may be called, effect the movement of a counting-wheel, which when the line has passed entirely over the same will have counted, or, in other words, have summed up the aggregate number of spaces.

The blank line when being cut off is left the full length of the width of an ordinary newspaper-column, and if the composition impressed thereon fills up the entire line then obviously there is no need of any justifying; but suppose the line is shortened, say, one-fourth of an inch (more or less) by reason of a subsequent word following the last one which was impressed thereon being too long to be subdivided. The line will be cut off at this point before the composition-stick in its rearward movement delivers the line in front of the justifying mechanism, thus leaving the line short of the required length.

The lines as they are ejected from the composition-stick, as before stated, pass over the counting-wheel, and before they enter the justifying-chamber the forward end of the line engages with a suitable pawl of a rack-bar located directly in the path of the line. This engagement of the line with the pawl serves to move the rack-bar lengthwise, or with the line. By so doing the rack-bar actuates suitable pinions, which in turn move other rack-bars at right angles to the one just mentioned. These latter rack-bars are united by a tubular guide, which serves the purpose of raising and lowering a sliding cross-head. This cross-head has pivoted relation to a connecting-link, which at its other end is secured to a rack-bar which is placed to one side of the

path of the impressed line, the same being actuated by a pinion integral with the counting-wheel previously mentioned.

Upon the link which leads from the rack-bar to the cross-head in the tubular guide is placed a wedge-shaped block, which as the link, its cross-head, the tubular guide, and the racks thereof are raised or lowered the wedge-shaped block is correspondingly raised or lowered, and as it is raised or lowered by reason of the wedge-shaped portion the block is moved transversely toward or from the chamber through which the line passes while being justified. This wedge-shaped block by its forward face actuates a justifying-compressor. Upon the opposite side of the justifying-chamber is placed an intermittently-reciprocating justifying-compressor. This compressor is directly opposite the one just mentioned and is actuated by a suitable crank and connecting-link, which actuates a cross-head adapted to slide within the casing of the justifying-compressor without effecting any movement of the compressor. When this justifying-compressor is operated, which operation occurs only when the line with the space between words and the space-notches are directly between the two justifying-compressors, the line is compressed and elongated.

The mechanism which regulates the movements of the justifying-compressors as against the line of composition to justify the same at the proper time is effected through the medium of a projecting toe, which is integral with the casing of the reciprocating justifying-compressor, the same projecting across the path and underneath the line, being held in contact against the under edge of the line by a suitable spring. It will be observed that as the line passes above this toe the moment a space-notch is delivered above the same the toe will enter the said notch, and by reason of this upward movement of the toe, as well as the justifying-compressor casing, the constant reciprocations of the cross-head within the said casing are made operative, thus compressing the line directly opposite each space upon both of its sides to just the proper amount necessary to elongate the line sufficiently to take up the slack thereof. It will be understood that the justifying-chamber in cross-section is greater than the cross-section of the line to be justified. Thus if the wedge-shaped block be raised more or less the justifying-compressors will compress the line more or less, according to the direction given by the position of this block, the position of this block depending upon the number of spaces in the line and the amount of slack to be taken up. In other words, by reason of the counting-wheel recognizing the number of spaces in the line and the pawl and rack, which are placed in the path of the line as it enters the justifying-chamber, taking account of the amount of slack of the line the wedge-shaped block is placed in position accord-

ingly. The pawl of the rack-bar just mentioned is retracted at the proper moment, so as to leave the rack-bar standing idle while the line is moved into the justifying-chamber, and on a full-length line entering the justifying mechanism the rack-bar would be moved to its full extent, thus dropping the wedge-shaped block to its lowest point, hence making the justifying-compressors inoperative; but should a line pass into the justifying-chamber which was considerably shorter than the required length it would follow that the rack-bar would be moved but a little, if any at all, leaving the wedge-shaped block at its upper position, making the justifying-compressors to be operative to their full extent; or, on the other hand, should a line pass into the justifying mechanism that was any length about midway between the two examples cited the wedge-shaped block would stand at about a median position, thus allowing the justifying-compressors to be operative to about one-half their full extent. The lower wall of that part of the justifying-chamber over the galley is formed by a movable supporting-plate, upon which the line rests. This plate is made to snub back, so as to allow the line to drop clearly without any hindrance into the galley, the plate being supported upon a reciprocating cross-head, which moves the delivered line laterally in the galley a sufficient distance to make room for the delivery therein of a subsequent line.

The consecutive functions or operations of our device are as follows: First, feeding into the machine a continuous strip of impressible material, the strip being formed with a dovetail groove upon one side, the purpose of which is to receive a dovetail which is formed upon the forward side of the composition-stick, and thus hold the impressible line in operative position during the different movements of the said stick. Second, severing the continuous strip into the proper lengths one by one after the strip has passed upon the composition-stick. Third, consisting of certain movements of the composition-stick which in reality are not a complete step in themselves, the same consisting in the change of the composition-stick from its rearward to a forward position, the forward position placing the impressible "line" directly above the impression-orifice. The rear position may be denominated the "delivery location" of the stick, while the forward location of the same can be called the "impression position" thereof. This function includes the "idle feed" of the stick from the left-hand side of the machine to the right-hand side thereof, so as to present the "material" above the impression-orifice. Fourth, consisting, essentially, in operating the character-forming mechanism, its connections with the operating-keys of the machine, including the devices which serve to impress the character-matrices upon the impressible line, which is held upon the composition-stick directly

above the impression-orifice, as well as the means for firmly holding the line in position while it is being impressed. Fifth, after the line has been formed vibrating the stick rearwardly into the same position as it occupied in the third operation. While in this position of the stick the following changes in the line occur: The impressed line is ejected or removed from the dovetail guide-support of the composition-stick by reason of the delivery of a new portion of the impressible material (by the feed-rollers of No. 1) upon the composition-stick, thus moving the impressed line entirely from off the stick in a direction toward the justifying mechanism. Sixth, ejecting the impressed line from the composition stick. Seventh, justifying of the line and retracting or bringing the justifying devices to their normal or original position again after the justifying has taken place. Eighth, delivering the line in its complete state from the justifying mechanism directly into the galley and placing the successive lines in their proper order, so that when a suitable number of lines have been so delivered a proof of the entire series may be taken and, if correct, the matter delivered to the stereotyping department.

In numbers of instances the lines as assembled in the galley may be locked in a form and placed on a printing-press direct without the intervention of making a stereotype thereof.

In the accompanying drawings, Figure 1 is a perspective view of the entire machine. Fig. 2 is a top plan view showing the stick in its delivery position. Fig. 3 is a top plan view showing the stick in its impressed position. Fig. 4 is an elevation of the right-hand end of the machine. Fig. 5 is a plan view of the mechanism which feeds the strip of material into the machine. Fig. 6 is an inside elevation, partly in section, of the same. Fig. 7 is an end elevation, in section, of the justifying feed device detached and enlarged. Fig. 8 is a side elevation, partly in section, of the same. Fig. 9 is an inside elevation of the justifying feed mechanism, showing the same in its raised position in engagement with the strip-feeding mechanism. Fig. 10 is a similar view to Fig. 7, excepting that in addition is shown contiguous thereto a portion of the strip-feeding device. The position of the justifying feed mechanism in this figure is opposite to that shown in Fig. 9. Fig. 11 is a right-hand elevation of the mechanism for operating the shear which severs the continuous length of the material. Fig. 12 is a detailed elevation of a rocking segment forming part of the severing device. Fig. 12^a is a view similar to Fig. 11, showing the parts in their opposite and engaged position. Fig. 13 is an elevation of the cutter-shaft and its connections, partly in section. Fig. 14 is a view similar to Fig. 13, showing the parts in their opposite position. Fig. 15 is a plan view of the toothed bell-crank and its relation to the strip of material. Fig. 16 is an end elevation of

the same. Fig. 17 is an inside end elevation of the shear, showing its relation to the material to be cut. Fig. 18 is a view similar to Fig. 17, showing the shear in the operation of severing the material. Fig. 19 is an inside elevation of the mechanism which effects the idle feed of the composition-stick, showing the same in a position of rest. Fig. 19^a is a view similar to Fig. 19, showing the parts in their operative relation. Fig. 20 is an elevation, partly in section, of the idle-feed device, showing the parts in operative relation. Fig. 21 is a similar view to Fig. 20, showing the parts in a position of rest. Fig. 22 is a cross-section view of the machine about central thereof, showing the parts in their normal position of rest. Fig. 22^a is a detached elevation of a latch forming part of the impression device. Fig. 23 is a similar view to Fig. 22, showing the parts in their opposite positions. Fig. 24 is a side elevation showing the relation between the space-key and the space-notching device. Fig. 25 is an end elevation of the feed-screw, showing the relation of the pawl-clutch for effecting the rotation thereof. Fig. 26 is a side elevation of the same. Fig. 27 is a detailed section of the rock-shaft and the tumblers thereon. Fig. 28 is a front elevation of the feed-screw and a portion of a back of the tumblers in their relation to the key or character levers. Fig. 29 is a side elevation of the same, while Fig. 30 is an elevation of the right-hand portion of these tumblers upon their rock-shaft. Fig. 31 is an end elevation of the rock-shaft, showing the tumblers thereon. Fig. 32 is a plan view of a series of tumblers, showing the variable lengths of their projecting arms. Fig. 33 is an end elevation of the crank upon the rock-shaft, which is connected with the pawl-clutch. Fig. 34 is a plan view of the right-hand end of the rock-shaft, showing the tumblers thereon. Fig. 35 is a perspective view showing the relation of the feed-screw, its pawl-clutch, and one of the character-keys. Fig. 36 is a perspective view showing the stick at its extreme left end position. Fig. 37 is a top plan view of the forward support of the machine, which carries the space-notching device, as well as the impression-support for the line. Fig. 38 is a top plan view with this latter feature removed. Fig. 39 is a rear elevation of the entire support. Fig. 40 is a bottom plan view of the same. Fig. 41 is a front elevation thereof, while Fig. 42 is a cross-section of the same on the line *a b* of Fig. 37. Fig. 43 is an elevation, partly in section, of the space-notching device; and Fig. 44 is an end elevation and means for actuating the same. Fig. 45 is an end elevation of the actuating space-notching disks. Fig. 46 is a top plan view of the paragraphing device. Fig. 47 is a detailed elevation in section of the same. Fig. 48 is an elevation, partly in section, of the justifying-compressors. Fig. 48^a is an end elevation, partly in section, of the wedge justifying-compressor. Fig. 49 is a top plan view of

the justifying-compressors. Fig. 50 is a detailed elevation, partly in section, of the casing of the reciprocating justifying-compressor. Fig. 51 is an elevation of a wedge and compressor therefor forming the stationary part of the justifying mechanism. Fig. 52 is a side elevation and plan of the reciprocating cross-head. Fig. 53 is a plan and side elevation of its operating-link. Fig. 54 is a front elevation of the recess for the stationary justifying-compressor, while Fig. 55 is a front elevation of the die itself. Fig. 56 is a longitudinal section of the machine, showing the feed-rollers, the justifying mechanism, &c. Fig. 57 is an elevation showing the counting-wheel, its pinion, and the rack therefor. Fig. 58 is a detailed plan view, partly in section, of the counting-wheel. Fig. 59 is a detailed view of the same, showing the relation between the counting-wheel and the impressed line. Figs. 60 and 61 are modifications of the counting-wheel shown in the three preceding figures. Fig. 62 is an inside elevation of the mechanism which is adapted at the proper time to bring the justifying mechanism to rest. Fig. 63 is a plan view thereof. Fig. 64 is a detailed side elevation of the device shown in Fig. 63. Fig. 65 is a view similar to Fig. 64, showing the parts in their opposite position. Fig. 66 is a plan view of the rack-bar and the pinions which impart its motion to another portion of the justifying mechanism. Fig. 67 is a view of the under side of the rack-bar detached. Fig. 68 is a view similar to Fig. 65, showing the parts in about an intermediate position. Fig. 69 is a front elevation of the rack-bar and the connections therein. Fig. 70 is an end elevation of the mechanism for delivering the impressed line into the galley. Fig. 71 is a top plan view of the reciprocating cross-head which delivers the formed lines into the galley. Fig. 72 is a top plan view of the reciprocating supporting-plate which rests upon the cross-head shown in Fig. 71. Fig. 73 is a section of the same. Fig. 74 is a plan view of the device for retracting the justifying mechanism. Fig. 75 is a left-hand end elevation of the same. Figs. 76, 77, and 79 are detailed views of the same. Fig. 78 is a front elevation of this mechanism. Fig. 80 is a view showing the two impressed lines, the one at the beginning of a paragraph and the other at the ending thereof. Fig. 81 is a perspective view of a justified impressed line of composition. Fig. 82 is a top plan view showing portions of the machine removed. Fig. 83 is a front elevation of the same, partly in section.

The machine in the main consists of a frame not unlike a type-writer in form, having a keyboard upon its forward side, and about midway between its front and rear edges is placed the feed mechanism, at which point also occurs the delivering of an impressed line from the composition-stick into the justifying mechanism.

To the rear side of the machine is placed

the main shaft which drives the entire mechanism, power being supplied thereto in any suitable manner. Upon the left-hand side is placed the justifying device and the galley, while upon the right-hand side are located the handle for changing the position of the stick and the mechanism for cutting off the continuous length of the material.

The mechanism for feeding in the continuous impressible strip, which composes the first function, is described as follows, viz: It will be borne in mind that the feed mechanism must be in action only when the composition-stick is in its delivery position, where an impressed line is being forced out and a new blank fed in. To accomplish this result, a feed-roller 2, of some yielding material, is placed on each side of the continuous blank 1. The means for setting these rolls in motion and so feeding the proper length of material into the stick are as follows: The operator draws the arm 3 toward him, and this movement through the toothed segments 4 and 5, the shaft 6, and its feather throws the stick 7 over into its rearward or delivery position on the rear side of the shaft 6, Fig. 6. This brings the stick directly in line with the strip 1, which when the stick is in this position has a straight and almost continuous channel reaching from the right side of the machine quite through to the left side of the galley. It will be seen that the arm 3, by gears 4 5, is connected with the rod 8. Through this connection the movement which shifts the stick from one position to the other turns the shaft 9 about ninety degrees, raising the attached arm 10 to an upright position, thus removing its head 11 from the type-channel, the use of which will be hereinafter explained. Now, while the arm 10 is made to turn with the shaft 9 by means of a feather, it is yet adapted by its sleeve 12 to slide freely upon the said shaft from the flange 13 to the left-hand end. Having reached the end of the shaft, the shaft 9 and sleeve 12 are rocked about ninety degrees, as before described, in a rearward direction, when the rack-teeth 16, which are plainly shown on the sleeve 12, are at once engaged by the gear 14, Figs. 9 and 10. At the same time the flange 15, integral with the sleeve 12, engages the top of the spindle 17, thus depressing the same, causing the clutch 18 near its lower end to engage the bevel-gear 19, which is driven by a companion bevel-gear 20 on the main shaft 21. A suitable driving-pulley is secured to the shaft 21. Until the clutch 18 engages the gear 19 the gear 14, the spindle 17, cam-wheel 23, gears 24 and 25, and feed-rollers 2 are quiescent. Now being operatively connected to the gear 19 they move. The grooves 26 engage the pins 27 on the gear-wheel 22, causing said wheel to revolve. These pins touch first on the outer edge of the face 28, and as the gear 19 moves in the direction of the arrow the pin 27 first slides along the face 28 toward the center of gears 19 and 22, when it again

moves farther away from the center of gear 19 until it reaches the toe or extension of the outer side wall of the groove 26, which projects beyond the face 28. As the pins 27 engage this side wall of the groove 26 they are drawn into the groove itself, thus moving the wheel 22 in a backward direction until the pin has passed out of the rear side of the cam-groove, where it remains until a half-revolution of the gear 19 brings the other face 28 of the cam against another pin 27, when the same set of movements occur again for purposes hereinafter described. The pin being in the position shown, as the cam 23 revolves the pin slides along the face as the wheels are moved. When the pin is disengaged at the outer end of the face 28, it is caught by the groove 26, as shown, which causes the wheel 22 to move backward a short distance for purposes hereinafter described.

The motion of the wheel 22 is communicated to the feed-rollers 2, which not only feed the strip 1 upon the stick 7, but they also force the impressed line off, and as it must be moved so as to present its trailing end directly over the center of the counter the new strip, whose forward end is in the same position, must be withdrawn until it is even with the end of the composition-stick. Hence the necessity of this slight backward motion of the feeding mechanism by reason of the gear 22 upon the strip 1. The moment the gear-wheel 14 engages the rack on sleeve 12 the clutch 18 engages the gear 19. This carries the sleeve 12 back against the flange 13. As it reaches this position a notch 29 in the rib or flange 15 allows the spindle 17 to move upward, and thereby disengage the clutch 18 by the spiral spring under the spindle 17. All of these members are so timed in their movements that the exact length of lead is left in the stick the length of a full column width. A shaft 30 is placed directly beneath the line of movement of the impressible material 1 and parallel to it at the right-hand side of the machine. On the inner end of this shaft is a cutter 31, while its outer end carries a rock-arm 32, in which is placed a spring-actuated pawl 33. At the upper end of this rock-arm 32 is pivoted a small toothed bell-crank 34, presenting one of its arms against the pawl, while its other or upwardly-projecting arm has a tooth upon its side adjacent to the material as it passes into the machine. (See Fig. 15.) An idle rocking segment 35 is pivoted on the cutter-shaft 30 just inside of the rock-arm 32, which carries the pawl 33. It is connected by a link 36 to the main shaft 21 and has constant oscillations as long as the main shaft is actuated. Its operation is as follows: When the continuous length of the impressible material 1 is at rest or moving into the machine, the idling segment 35 is oscillated without imparting movement to any of the adjacent parts; but as soon as the material 1, which is ejecting a formed line from off the stick has passed a little beyond the edge of the same,

in order that the trailing end of the line should be left central over the counting-wheel, the new material being required to be withdrawn again just this distance by the feed-rollers 2. As soon as this motion of material 1 commences, the toothed bell-crank 34 bites into the material 1 just as long as the same is moving rearwardly, thus depressing the pawl 33 as against its spring into a recess 37 of the idling segment 35, which then carries the rock-arm 32 with it, and through this movement the cutter 31 is brought against the material 1 between the stick 7 and the feeding-in housing 38 from beneath, thus severing the same flush with the face of the stick 7.

By referring to Figs. 17 and 18 it will be observed that the knife 31 has some distance to move before it engages the material 1, which in connection with the undercut recess 37 in idling segment 35, which is engaged by the pawl 33, serves to make the knife 31 inoperative until the material 1 has been withdrawn the proper distance and has stopped. The toothed bell-crank 34 serves only to latch the pawl 33 and the segment 35 together, and since the movement of these parts when cutting is such as to hold them together it will be apparent that when they again move in the opposite direction the pawl 33 will pull out from under the recess 37 and by its spring be again raised ready for a subsequent operation. The pawl 33, though withdrawn from the recess 37, remains in the path of movement of a rear flange or lug of the recess 37, which serves as the segment 35 is rocked in a forward direction to carry with it the rock-arm 32, as well as the knife 31, into an inoperative position ready to be again set in action by the bell-crank 34, as previously described.

The stick 7 being filled and the material being cut off from the continuous strip 1, which may be of indefinite length, the operator by means of the arm 3 and a movement thereof in a rearward direction moves the stick 7 into its impression or second position over the impression-orifice 38 of the character-forming mechanism to receive its impressions similar to any previous lines. As the stick swings forward it occupies the same position as when a line was entirely impressed. Now in order that the characters may begin at the proper line it is necessary to move the stick to the extreme right-hand portion of the machine, so that the left-hand end is just over the impression-orifice 38. This movement may be called the "idle feed" of the stick, since its reverse movement is directly associated with the impression of the characters upon the line, while the movement referred to simply effects the delivery in a horizontal direction of the line of compressible material. Hence the term "idle feed" in contradistinction to the periodic feed between the impressions being made.

The idle feed of the stick 7 is accomplished in the following manner: Inside of the frame, upon the end of the eccentric shaft 39, which

actuates the justifying-dies and the galley cross-head, is placed a disk 40, which is adjacent to the pawl-clutch disk 41 upon the feed-screw 42. At its left-hand end, in front of the eccentric-shaft disk 40, is a rock-arm 43, which is pivoted to the frame. The free end of this arm is actuated periodically by a cam 44 upon the oscillating shaft 6, which serves to swing the stick 7 from its one position to the other. The depending end of this rock-arm 43 has pivoted thereto a link 45, whose free end carries, preferably, a rubber roller 46, which as the free end of the rock-arm 43 is depressed by the cam 44 will come into engagement with the disk 40 on the constantly-rotating eccentric shaft 39 and also with the pawl-clutch disk 41, thus imparting a rapid rotation to the latter, and with it move the feed-screw 42 and carry the stick 7 laterally to its starting position over the impression-orifice 48. Figs. 19 and 19^a show the two positions of this rock-arm.

When the stick 7 is moved into its impression position, the cam 44 is latched or held upon the shaft and moves with the stick, thus throwing into operation the "back-feed" apparatus. When the stick 7 has reached the extreme right-hand position, it engages with projections 48 of a rod 47, which extend through slots 49 of the hollow shaft 6, and thus move the rod 47 endwise against a spring 50, disconnecting the other end of this rod from the cam 44, which, being free, is raised up by the gravitating rock-arm 43, throwing the cam and its notches 51 between the clutch projections 52 of the rod 47. (See Fig. 21.) As the stick is moved to a rear position the cam turns with it, because the clutch-rod 47 is held against the face of the cam 44 by the spring-tension 50, thus carrying the cam 44 rearwardly, where it strikes a projecting pin 53, which stops the cam, while the stick 7 continues to move into its delivery position. The stopping of the cam 44 allows the clutch-rod 47 to pass into engagement with the notches 51 of the clutch. Thus as the stick 7 moves forward the cam 44 is locked to its shaft 47 and moves with it, thereby throwing into operation the idle feed mechanism, as described. The clutch-rod 47 and its connections are shown in Figs. 20 and 21.

The matrix-stem 54 slides freely through the socket 55 at the end of the type-arm 56, presenting itself directly over the plunger 57. Each letter, space, and character in the keyboard is connected by suitable links 58 to the rock-shaft 59 in such a manner that whenever a key is actuated the shaft by its rock-arm reciprocates the rod 60 against the latch 61 (which when not in action has the position indicated in Fig. 22) and forces it into operative relation beneath the plunger 57, as represented in Fig. 23. This latch 61 is pivoted in the short arm of the bell-crank 62, which is actuated through the rock-shaft 200, this being connected back to the main shaft 21 through the connecting-rod 64. The rocker-arms 63 are connected to the rock-shaft 200

at their lower ends and pass upon each side of the paragraphing device.

It will be observed that on the bottom of a projection 65 from the hub of the latch 61 are two flat faces 66, located at an angle with respect to each other, the one resting on the end of the spring 67. When not in action, the latch 61 is held on the face to the rear of the one now occupied by the spring 67, the said spring holding the same upon either face by its pressure thereon. When the latch 61 is in action, it is held on the other face 66 by the same pressure. As the latch 61 is thrown into gear by the rod 60 the power transmitted from the main shaft 21 through the bell-crank 62 and plunger 57 to the matrix-stem 54 makes the impression, forming a raised letter or character upon the line of impressible material held upon the stick 7. As the latch 61 is only thrown into position by the character-keys, the keys will work very easily, and the impression, being made by power, as described, will be uniform and as deep as required. The forward lower face of the latch 61, it will be observed, projects beyond the spring 67 as the plunger 57 is retracted. When the bell-crank 62 is rocked, the latch 61, moving with it, engages the projection above mentioned with the stop 68, and is thereby thrown out of connection with the plunger 57, disengaging its long arm from the notch 69 in the plunger 57 and remaining out of engagement until moved in again by a subsequent key. This arrangement of parts is made so that only one impression upon the line will result from one movement of the key, the latch being thrown into connection by the key and disengaged again on the return stroke of the plunger-actuating mechanism, as described.

The plunger 57 has a projecting pin, which extends through a slot 71 of its housing 72. To this pin is pivoted a link 73, which connects with a toggle-joint 74, located in front of the stick 7 and under the frame 75, which supports the paragraphing device. The one member of this joint is adjustably secured to the said frame by a set-screw 76, and the other has pivotal connection with a supporting-wing 77, which serves to securely hold the line of impressible material against the composition-stick 7 during the impression of each character. This is effected by the movement of the plunger 57, which as it moves upward carries the link 73, above mentioned, in the same direction, thus tending to straighten the toggle-joint 74 and move the supporting-wing 77 firmly against the line on the stick 7, and thus insure a clean and sharp impression of the characters and avoid any bulging or increasing of the line's thickness while being impressed.

On the upper side of the support 75, which carries the paragraphing device, is placed a movable plate 78, having a toe or rearward projection 79, which as the stick is moved into the impressible position is situated con-

siderably to one side of its path, so that as the stick is idly moved to the right hand of the machine the impressible material on the stick will pass thereunder. Before commencing to form characters upon the line the toe 79 by means of a handle 80 and connecting-link 81 is moved entirely to the left-hand end of said line. As the successive characters are formed the line is supported upon its edge opposite the one being impressed by the toe 79, and is thus held securely against the movement of the plunger 57, which forces the matrix-stem 54 into the material. When the stick 7 is fed along, the line simply slides beneath this toe 79. After the line is completed the toe is yet over the one end thereof. Now in order that the stick 7 may be swung into its delivery position the toe 79 is moved from above the line in a lateral direction by a hand-lever 80, previously described, and it remains in this position until the stick with a new line is brought from the delivery to the impression position. Then when the stick 7 is moved to the right-hand side the toe 79 does not quite cover the extreme left-hand end of the line. Before the keys are used the toe 79 is moved entirely over this part of the line, as already described. By referring to the stick 7 while in its impression position it will be seen above and in engagement with the feed-screw 42. The face now engaged by the feed-screw becomes its upper side in the delivery position.

As represented, the stick 7 upon its one side has a semicircular groove, in which is formed a half-nut fitting the feed-screw 42. Since the stick 7 engages only a portion of the circumference of the feed-screw, the same can be readily engaged and disengaged therefrom. At the left end of the screw 42 is a pawl-clutch 82, which is connected by a link 83 with the rock-shaft 84. This shaft 84 is provided with tumblers 85, projecting therefrom at unequal lengths. These are connected by links 86 with the key-levers 87, located slightly above. Any one of these key-levers and links will actuate the shaft 84; but those remaining idle will not be disturbed by the movement of any adjacent keys. As the key-levers have an equal movement, the variable length of the tumblers 85 will cause a greater or less degree of rotation in the rock-shaft 84, and consequently a like variation of movement in the feed-screw 42 and the stick 7. This arrangement of parts with a proper length of the tumblers 85 will give each character its proper space—i. e., a given space of the impressible line to a narrow character and a larger amount of the material to a wider character, so that as the width of characters varies the amount of material presented for each subsequent impression likewise varies if subsequent characters demand the same, in contradistinction to the ordinary regular feed of type-writers.

The beginning of a paragraph is usually some distance in from the edge of a column,

and the last word thereof may occur so near the edge as to leave almost a whole line blank, Fig. 80. Unless the metal is cut away to some depth at this blank space the ink-roller is liable to touch the metal at this point and the subsequent impression will reach the ink, thus making an unsightly blur in the line.

The removal of the surplus metal is effected as follows: A plate 88, preferably of steel, is secured to the plate 89 and also to the supporting-bar 75, which spans the space between the side frames and also supports the space-notching mechanism. On this plate 88 the slides 90 and 91 are fitted between suitable guides 92. These slides, as shown, are placed with their cutting ends 93 contiguous to the line of impressible material, being adjacent to that portion which projects below the composition-stick 7. A rock-shaft 94 is supported by the plate 88 in the bearings 95, as well as the central bearing 96. On its ends are placed the rock-arms 97, which are connected to and actuated by the rock-arm 63 through links 98. The shaft 94 is hollow and in different sections. On each side of the middle bearing 96 is a loose tubular piece 99, having arms 100 on the lower side, which engage the slides 90 and 91 through slots made in them for that purpose. On each piece of the solid shaft feathers 101 are fixed, and notches 102 to engage these feathers are cut in the loose pieces 99, and also corresponding slots 103 in the hollow shaft 94, from which the feathers 101 are never disengaged. A groove is turned at 104 in the outer end of each piece of the solid shaft 105, by which it is connected through links 195, bell-cranks 196, connecting-rods 197, cranks 198, and shafts 199 with the paragraphing-keys 106. The solid shafts or cores 105 slide easily within the hollow shaft 94. The hollow shaft and its core receive a constant rocking motion from the arm 63, which receives its motion from the crank 110 on the main shaft 21. (See Fig. 22.)

To make the blank space at the beginning of a paragraph, the left-hand key 106 is moved, and through its connections it thrusts the solid shaft 105, Fig. 47, into the hollow one so far that the feathers 101 engage the notches 102 in the loose tube 99, when it rocks with the rest of the shaft and by its projection 100 thrusts forward the slide 90, which cuts the desired space out of the line. A similar movement of the right-hand key 106 cuts away the surplus lead at the conclusion of a paragraph. The clutches 101 are disengaged at once as the keys return to their normal position.

It will be observed that the slide 91 is much wider than its companion 90. This is owing to the fact that the space at the beginning of a paragraph is quite narrow and very uniform, while that at the close may vary from a fraction of an inch to nearly the entire line. (See Fig. 80.) Therefore 91, the wider slide, is made wide enough to remove the greater part of a line which for any reason may be left

blank. As these paragraph-blanks are formed close to the first or last letter of the paragraph, the slides are placed close beside the center piece 79, which presses its end against the edge of the line at the point where the impression is being made upon its edge.

When any composition is not divided into paragraphs and full lines are to be formed, it often occurs that words and spaces will not perfectly fill the line, or, in the printer's term, they will not "justify." In such cases a piece of unused lead will remain at the end of the strip, which must be cut off and the line filled out by subsequent justifying. This work is accomplished in the following manner: By striking a suitable key 201 a chisel 202 is driven into the line, which is yet held upon the stick. By operating the spacing-key the stick is moved to expose the unimpressed portion of the line, the line during such movements remaining stationary, the stick sliding thereon. When the stick has moved the required distance, the surplus lead projects and it is cut off by a knife 194, supported by parts 193 192 in the path of the line as it is vibrated into its delivery position. When the stick has moved along the amount of the unimpressed portion of the line, it has not yet moved its full distance toward the left of the machine, and it is not vibrated rearwardly until it has moved into the position where the knife 194 will register with the rear edge of the stick as the stick is vibrated rearwardly, so as to insure the cutting off of the unimpressed portion of the formed line, which portion varies in length upon different lines. Hence the necessity of moving the stick to a determined position before it is vibrated or rocked rearwardly. Should the line for any reason project beyond the stick, the knife 194 will trim the same. The chisel referred to serves to hold the line while the stick is being fed along.

On the stick 7 a rib 107 is formed. (See Fig. 22.) Under it a standard 108 is fixed to the frame. This prevents the raising of the stick before it reaches the end of the line. The line being impressed, the stick is fed along until its right-hand edge is in the position which it occupied when the stick was vibrated forward. Lying across the front and top of the frame is the support 75 for the paragraphing device. This support not only carries the supporting-wing 77 and projecting toe 79 for holding the line firmly upon the stick 7 while being impressed by the matrix-stem 54, but it also supports the hollow shaft 109, provided with a short arm 110 about midway of its ends. This hollow shaft has thereon a disk 111 at the end toward the shaft 39, and this disk is provided with a notch 112, cut in its periphery. Through the hollow shaft passes a hollow shaft 113, which has a disk 114, similar to that on the hollow shaft 109, the same being located adjacent thereto. On the shaft 39 an eccentric 115 is placed, with a projecting arm 116, whose end is held in contact with the disks before mentioned

by the spring 117 beneath it. When the notches 112 and 118 in the disks coincide, the end of the eccentric's arm 116 will engage and impart motion to them; but when they do not coincide a smooth periphery will be presented and the end of the arm 116 will slide thereon without imparting motion thereto. On the end of the solid shaft 113 opposite the disk is an arm 119, which is connected by a link 121 with a bell-crank 120, idly pivoted near one end of the feed-screw 42, and this bell-crank by its other arm is connected with the spacing-key through a suitable link 122. In the center of the support 75 a recess is cut, and in this recess is the slide 123, having its forward end 124 narrowed for a cutter. (See Fig. 38.) A slot in this slide near its rear end is engaged by a short arm 110 on the hollow shaft 109, and therefore a rocking motion of the shaft communicates a reciprocating motion to the slide. Resting over the slide is a movable plate 78. This plate is held in place by the T-headed lugs projecting from its under side, which engage the T-slots 125 in its support. The opposite end is held in the slot in the front of the support 75. (See Fig. 22.) This arrangement allows the plate 78 to slide lengthwise of the line of composition; but it has no other movement. A small projection 79 will be observed on the plate upon its rear edge, which when in operative position is directly over the impression-orifice, and one of its offices is to prevent any raising of the material from the movement of the impressing apparatus. By referring to Figs. 22 and 23 it will be seen that the projection hooks over the lead, while Fig. 41 shows a notch 126 cut through its bottom portion. The object of the projection is to afford a support for the slide 123 to cut against and the notch to allow the portion that is cut out to be discharged.

When a spacing-key is touched, the key-lever 87 by its connection 122 with the bell-crank 120 actuates the arm 119 on the end of the shaft 113. This motion causes the disk 114 to revolve far enough to make the notches 112 and 118 on the two companion disks coincide. The eccentric-arm 116, acting as a pawl, drops into the notches so exposed and rocks the shafts 109 and 113, causing the short central arm 110 to thrust the cutting end 124 of the slide 123 through the head 79, thus cutting a notch directly opposite the space between words. As will be seen, these notches are the means by which a portion of the justifying apparatus is directed in its operation. The projection or toe 79 on the plate 78 is over the stick and holds it firmly in place while the line is receiving its impressions. That it may be removed easily and quickly when the position of the stick is to be changed the handle 80, attached to a prolongation 81 of one of the T-shaped lugs, shifts it either to the right or left, clearing the stick.

When the stick 7, with its impressed line, has moved laterally over the impression-ori-

fice a sufficient distance to be moved into its delivery position, the operator draws the arm 3 toward him, which movement swings the stick rearward ready for the ejection of the impressed line by the feeding in of a new portion of the continuous length of impressible material 1. The impressed line 127, which was ejected from the stick by the feeding in of a new blank, is moved toward the left hand into the justifying-chamber in a straight line between the justifying-compressors. This is accomplished as follows: When the stick 7 is thrown forward into its impression position to receive impressions from the character-dies on its impressible line 127, the arm 10 on the sleeve 12 is moved from a vertical to a horizontal plane, where the foot 11, which is at right angles to its supporting-arm 10, is delivered into the type-channel, which just precedes the justifying-chamber. The foot 11 in this position engages an impressed line 127 upon its rear edge, and as the arm 10 is attached to the sleeve 12, which slides on the shaft 9, the same is fed toward the left side of the machine. The shaft 9 is hollow, and inside of it is placed a solid shaft 128, which terminates in a groove 129, which is engaged by the arm 130, attached to the top of a short shaft 131, which has the arm 132 at the bottom, the two arms and shaft forming a bell-crank. This bell-crank, through the rod 133, is connected with the cross-head 134, which receives a reciprocating motion through its connection 135 with the eccentric 136 on the shaft 39, and this reciprocating motion is communicated to the sleeve 12 lengthwise thereof by the following connections: On the solid shaft 128 is a pawl 137, which engages a ratchet 138 on the inside of the sleeve 12, and thus feeds this sleeve lengthwise of the shaft 9 when it is in the position corresponding to the lowered position of the arm 10, Figs. 7 to 10. The rotation of the sleeve 12 and the hollow shaft 9 in a rearward direction about ninety degrees disengages the ratchet 138 and pawl 137 as they are moved about a quarter-circle from each other. Since the solid core 128 does not rotate with the hollow shaft 9, when these parts are in operative relation the foot 11 of arm 10 feeds the line 127 along to the end of the type-channel and into the justifying-chamber. As the forward end of the line 127 is ejected from the stick 7 the notches 139, which are opposite the spaces and on the bottom edge of the line 127, engage the spring-actuated dogs 140 of the counting-wheel 141, which is so called because it counts the number of notches on the bottom edge of the line as the line is moved along by the blank-strip-feed mechanism as it takes the impressed line from the stick. These notches 139 engage the dogs 140 in consecutive order, causing the counting-wheel 141 to revolve on its axis. A gear 142 is formed upon one end of the counter 141 in its periphery. This meshes with a rack-bar

143, and to this bar is pivoted in a slot 144 the link 145, which at its opposite end is pivoted to the cross-head 146, which slides freely in the cylindrical guide 147. To the upper side of this cylinder two short rack-bars 148 are fixed, and these racks mesh with the pinions 149. The pinions 149 also mesh with the rack-bar 150. This rack 150 lies directly over the justifying-chamber. A slight projecting pawl 151 depends from the under side of the rack-bar 150 into the justifying-chamber. As previously described, it was set forth that when a line 127 on the stick 7 was entirely impressed and the line did not justify the surplus or blank portion of the line was cut off. The length of the surplus material is the space to be taken up by justifying. If the line be full, needing no justifying, then the rack 150 will be forced to the extreme inner end of its travel by the engagement of the line 127 with the pawl 151 on the under side of the rack-bar 150 and the pinions 149 thereby actuated by its movement, and they in turn imparting motion to the short vertical rack-bars 148, which carry the cylindrical guide 147 and its slide 146 downward until the link 145 is on a horizontal plane. This link 145 passes through an opening in the wedging-block 152, which when the link 145 is inclined directs the position to be occupied by the inner justifying-compressor 153 with respect to the passing line 127, the wedge 152 thus sliding it laterally, on account of its inclined rear wall, toward the line 127, which passes across its path, and the extent of this lateral displacement in its effect on the line will be proportional to the inclination of the link 145 and the position of the wedge 152 and its attached justifying-compressor 153 on this link 145. The wedge 152 rests upon the link 145, which slides freely back and forth, as directed by its rack-bar 143.

Supposing the line to be short, the rack 150 will stop short of its full travel, and therefore leave the bar 145 inclined. The degree of this inclination indicates the amount of blank space to be taken up by justifying. The manner in which the motion of the rack 150 is arrested at the proper point is as follows: The justifying is done by compressors compressing the line 127 opposite each space between the words and in a direction which will reduce the thickness of the line, as shown in Fig. 81, thus elongating the line as a blacksmith would draw a bar of iron. A line may have two spaces, and it may have ten, and as enough compressing must be done so as to elongate the line just enough to fill out or justify the same it is manifest that the depth or amount of the compression will depend on the number of spaces in the line. To illustrate, if the line has but three spaces the compression must be deep enough opposite these three to elongate the line to the full length of a column width or other predetermined length. If there are ten spaces, then less compression will sufficiently elongate the

same. In brief, the amount of the compression must be proportional to the blank space to be taken up and the number of such compressions to be made.

5 As set forth, it is shown how the space to be taken up is indicated by the degree of inclination of the link 145. Now in order to preserve the connection we will describe how the number of spaces are counted and the
10 depth of the compression regulated in accordance therewith. When the impressed line 127 is expelled from the stick 7 by the entrance of a new blank 1, the impressed line is moved along until its trailing end in contact with the
15 new blank coincides with the center of the counting-wheel. The pawl of the rack-bar 150 must then be released from engagement with the line. Otherwise as the line would be moved along by the justifying-feed the inclined link 145 would be still further depressed, whereas it should remain stationary. This release is effected by the device represented on Sheet 17, Figs. 64, 65, &c. The end
20 of the rack 150 is forked and the pawl 151 pivoted in the end, so that it plays freely therein. Behind it, pivoted in the same fork, is a catch 154, having a projecting tongue 155, and upon its under side, in engagement therewith, is the arm of a bell-crank 156, which is
30 engaged by the cam 157 on the rock-shaft 9, the parts being so adjusted that the cam engages with and actuates the bell-crank just before the arm 10 moves into position directly to the rear or trailing end of the impressed
35 line. The manner of operation is as follows: As the rack 150 has moved the proper distance and remains therein and after a line has passed beneath the pawl 151, the said pawl by reason of its lip 158 engaging with a fixed
40 pin is forced back and again latched, leaving the pawl 151 projecting down into the path of a subsequent incoming line, where it can again be engaged, and thus move the rack-bar 150. When the line stops with its trailing
45 end over the center of the counter, the arm 10 of the justifier-feed is dropped into the type-channel by the partial rotation of the rock-shaft 9. This brings the cam 157 into engagement with the bell-crank 156,
50 which lifts the tongue 155, thus unlatching the pawl 151, when the advance of the line moves the same out of its path.

The counting-wheel 141 rotates upon its axis and is perforated with many holes near
55 its circumference, placed concentric with respect to each other, not unlike the chambers of a revolver. In these chambers are pistons or spring-pressed dogs 140. These dogs are made to project from the working face of the
60 wheel by suitable spring-pressure, as shown in Fig. 58. Contiguous to the working face of the counting-wheel 141 is a stationary shield 159. This shield is beveled at the edge 160, (see Fig. 58,) the lower edge 30 being extended so far from the wheel that the projecting dogs are not engaged thereby. The
65 ends of the pistons 140 engage on the bevel

160, and are forced back into their chambers as the counter revolves and are held there by the shield until they reach the
70 upper side, where they snub out and ride along the side wall of the lower edge of the line 127, where they engage the space-notches 139, as represented in Fig. 59. As the line is moved along by its feed one notch
75 after another engages the pistons, causing the counting-wheel to revolve, and the extent of its rotation is determined by the number of notches in a line, which correspond in number to the spaces therein. The pinion on
80 the counter meshes with the rack-bar 143, and as the counter is revolved this rack-bar and its pivoted link 145 are moved toward the right, each movement imparted by a notch bringing the leading end of the line 127 nearer
85 to the justifying-compressors, and when the rack-bar 150 has moved entirely in the justifying-compressors have no effect on the line, because the wedge 152 has dropped so low down as to remove the justifying-compressor
90 153 from out of the field of the passing line. To recapitulate, the length of the line determines the inclination of the link 145. The number of notches in the line determine the point on the inclined link 145 to be occupied
95 by the wedge 152, and this point, together with the inclination of the link 145, regulates the amount of the compression to be made in the thickness of the line opposite its space.

The reciprocating portion of the justifying
100 mechanism consists of the following connections: 39 is a shaft, on which is placed an eccentric 161, with its strap and rod 162. These impart a reciprocating motion to the compressor 163, which comprises a cross-head 163',
105 moving easily between the guides 167. This cross-head consists of a square head 165 and a pin 166, united by the plates 163. 166 also forms a joint with the eccentric-rod 162. This cross-head slides easily not only between the
110 guides 167, but also between the plates 164, which constitute the side walls of the compressor. These plates terminate in a die adjacent to the impressed line 127, similar to the compressor 153 on the opposite side of the
115 line. An opening is cut through the plates 164, having the location and form as shown in Figs. 48 and 50. The opening in the plates 164, through which the pin 166 passes, is slotted, as shown, it being obvious that the said cross-head 163' can slide between the plates 164
120 without moving them while they occupy the position shown with the compressor end depressed. (See Fig. 50.) The plates are held in this position by the toe 168, a projection
125 from the under side of the compressor, which is held against the lower edge of the line 127 by a spring 169. When a notch 139 passes above the toe 168, the spring 169 moves the same into the notch 139, thus raising the com-
130 pressor end of the plates 164. This raises the offset 170 so high that it is engaged by the cross-head 165 and is thrust forward and, in conjunction with its companion 153, effecting the

compression of the line 127 directly opposite the notches 139 and inevitably between the words constituting the composition of the line, the amount of the compression, and consequently the extent of the elongation of the line, being determined, as before described, by the position of the opposite compressor 153 in relation to its proximity to the same. As the cross-head 163' and plates 164 are withdrawn by the motion of the eccentric 161 the beveled projection 171 encounters 172, which is secured stationarily on the adjacent frame, is moved down and disengaged from a notch 139, and remains inactive until another notch allows it to enter.

It is manifest that if the line were fed into the justifying apparatus by a rigid appliance it might be badly damaged while held by the toe 168 and dies 153 and 163. To obviate this difficulty, we make the justifying feed apparatus as follows: The shaft 39 carries the eccentric 136 and strap, the eccentric-rod 135 being composed of a tube, in which a rod 173 is fitted, having a piston 174, which is acted upon by the spiral spring 175, (represented in the tube.) This eccentric-rod 135 is pivoted to the cross-head 134, which has a pin on its under side, to which the rod 133 is attached, and this rod in turn is attached to the bell-crank at 132, 131, and 130, imparting motion to the sleeve 12 and its arm 10, as hereinbefore described. The spring in the rod 135 is stiff enough to hold the piston 174 against the head of the tube when its work is simply to move the line 127 in the justifying-chamber; but when it is being compressed and held by the compressors 153 and 163 and the toe 168 the spring 175 yields, and so protects the line from injury.

The justifying rack-bar 150, as well as the rack-bar 143, is retracted—that is, moved into its initial position—by the following means: From the movable plate 176, which supports the line 127 as it is being justified, and which slides upon the cross-head 134, that moves the delivered lines laterally in the galley, is a projecting arm 177 toward the left-hand side of the machine, which serves to throw into action the means for retracting the justifying devices. The eccentric-shaft 39 projects from the left-hand end of the machine and terminates in a beveled friction-roller, which rotates constantly. Contiguous to this roller is a second or companion roller 178, which is mounted upon a short shaft 179, which is supported in suitable bearings along the left-hand side of the machine at right angles to the eccentric-shaft 39. This shaft has a collar 180, which is periodically engaged by the plate projection 177 from the galley cross-head 134, and when so engaged the two beveled friction-rollers are brought together and the retracting-shaft 179 is rotated. The engagement of the collar is not long enough to allow the shaft to entirely retract the justifying devices, and in order that the rollers may be maintained in engagement the proper length of time a grav-

ity-pawl 181 is provided, which drops beyond the end of the shaft 179 and holds the shaft and its roller 178 in operative relation to the eccentric shaft 39 until a flattened face 182 at the rear end of the shaft 179 comes adjacent to the depending end of the pawl 181, when a coil-spring 182 moves the shaft 179 under this pawl 181, thus disengaging the friction-rollers and stopping the mechanism. The retracting-shaft 179 is provided with a pinion 183, which meshes with an extension of the "counting" rack-bar 143, thus imparting motion to the same at the proper time. The rack-bar 150, which is placed directly in the path of the entering formed line 127, has a stem projecting from its forward end, which is periodically engaged by a lever 184, having its lower end pivoted to the machine-frame and its free end rocked by a cam 185 upon the retracting-shaft 179, which arrangement serves to move this rack-bar into its initial position. (See Figs. 74 to 79.)

It will be understood that we do not limit ourselves to the manner and means of justifying the impressed line as hereinbefore set forth, since it is obvious that by suitable means a groove could be cut upon the sides of the line of a maximum width corresponding in width to the spaces used, which would also be of a maximum width in contradistinction to those of a minimum width, as heretofore described. A groove would be cut upon each side of the line of such a depth as to leave the line at this point of a minimum thickness, and the length of the line would be greater than a column width. Of course any lines that might just fill out a column, as indicated by a suitable gage, would, as in the mechanism described, need no justifying; but if a line, instead of running short of the full length, would slightly run over it, so that it would be longer than required, the justifying would be accomplished by moving the line through a chamber whose side walls would support the line. The end of the line would abut the end of this chamber, and as the plunger which moves the line has a predetermined length of movement, so as to always leave a space between its forward face and the end wall of the chamber, which would be just the width of a column, it is evident that the line would be compressed endwise of itself until it was entirely justified.

We believe ourselves entitled to any means and devices which justify a line of composition upon suitable material subsequent to the forming of characters thereon, whether the line be of incompressible material, cast, or formed otherwise, the material being of a non-elastic order, as set forth in the preamble of this specification.

We do not in this application lay claim to a formed line as an article of manufacture, but embody the same in a separate application filed by us on the 6th day of June, 1892, bearing Serial No. 435,730.

When the lines are justified, they drop into

the galley, and after coming to rest they are moved along by the cross-head 134, thus leaving a space for a subsequent line; but as it is desirable that they drop through instantly without any lagging, not tipping down at one end, &c., they are evenly held in the justifying-chamber by the plate 176, upon which they rest. L-shaped slots 186 are cut through the plate, in which the square pins 187 on the top of the cross-head 134 work back and forth. While a line is being fed in these pins do not move the plate; but when the line has moved to near the end of the chamber it engages the projecting rib 188 and moves the plate laterally, so that the square pins 187 engage the offset of the L-slot and draw the plate from under the justifying-chamber, thus allowing the line 127 to drop freely through into the galley. As the cross-head 134 returns, having no line to hold the plate 176 in engagement with the square pins 187, the said plate is moved into a position of rest by the spring 189. If in dropping the line should fail to descend fully into the galley, it is protected from injury by the same provision in the eccentric-rod 135 which serves a like purpose when the strip is between the justifying-dies.

To retain the impressible material on the stick, there is provided thereon a dovetailed projection 190, which registers with a dovetail groove 191 upon the one side of the continuous length of impressible material as it is fed upon the stick by the feed-rolls 2.

We claim—

1. In a type-forming machine, a composing-stick or holder adapted to receive a strip of compressible and non-elastic material, keys representing characters, mechanism for impressing said characters one by one upon said material, and means for automatically justifying the formed line subsequent to the forming of characters thereon, substantially as set forth.

2. In a type-forming machine, character-keys and connections therewith adapted to move character-dies adjacent to a piece of compressible non-elastic material, means for impressing said dies upon said material, and means for justifying the impression after the same has been taken, substantially as set forth.

3. In a type-forming machine, mechanism for forming characters upon a compressible non-elastic material and means for elongating said material subsequent to the forming of characters thereon, substantially as set forth.

4. In a type-forming machine, mechanism for forming characters—such as words and the like—upon suitable compressible non-elastic material, means for forming spaces between such words, and suitable mechanism adapted to enlarge said spaces, if desired, subsequent to the forming of said characters, substantially as set forth.

5. In a type-forming machine, mechanism for forming characters—such as words and the like—upon compressible non-elastic material,

suitable means for spacing said words, and mechanism for elongating said material at said spaces, substantially as set forth.

6. In a type-forming machine, mechanism for forming characters—such as words and the like—upon impressible material and mechanism adapted to notch said material either before or after a word formed or to be formed thereon, so as to make portions of said material not occupied by any word or character blank, substantially as set forth.

7. In a type-forming machine, type-forming dies, mechanism for operating same against suitable impressible material, space-forming mechanism adapted to notch said material between words or the like, and a suitable actuating mechanism adapted to likewise notch the body of said material when the width of said notch exceeds an ordinary space, substantially as set forth.

8. In a type-forming machine, mechanism for forming characters on suitable material, comprising a compressible and non-elastic blank and mechanism adapted to compress said blank to elongate the same, substantially as set forth.

9. In a type-forming machine, mechanism comprising periodically-actuated feed-rollers adapted to feed intermittently line-blanks of impressible material upon a holder, a pivotal support for said holder, and means adapted to vibrate said holder upon its pivotal support, and thereby deliver the same adjacent to an impression-orifice, mechanism for impressing said line with characters, as words and the like, and means for variably feeding said line over said orifice, and other means for delivering said holder, with its formed line, contiguous to a justifying mechanism, substantially as set forth.

10. In type-forming machines, a vibrating holder or carriage, a line of impressible material thereon, and means for vibrating said carriage, thereby delivering the line, first, adjacent to character-dies, and, second, to a justifying mechanism, substantially as set forth.

11. A carriage or composition-stick adapted to vibrate upon its support, means for feeding thereon a blank of impressible material, and means for moving the said carriage adjacent or contiguous to an orifice or opening, feeding mechanism in operative relation to said carriage, character-dies, and key-operating mechanism therefor, means in connection with said key mechanism adapted to variably actuate the carriage-feeding device and subsequently moving the said character-dies consecutively into the said orifice, and means for impressing the same upon said blank, substantially as set forth.

12. A continuous length of impressible material, feed-rollers periodically operative, thereby adapted to feed said material intermittently upon a holder, and mechanism set in motion by the movement of said material adapted to sever the same adjacent to the holder therefor, substantially as set forth.

13. A continuous band of impressible material provided with a groove, a carriage or composition-stick and a projection upon the same, and an intermittent feeding device adapted to feed the said material upon the said projection, substantially as set forth.

14. A suitable carrier or composing-stick, a dovetail projection thereon, impressible blanks having a dovetail groove thereon, and an intermittent feeding device adapted to feed said blanks upon the projection of said carrier, substantially as set forth.

15. A carrier or composing-stick supporting a line of impressible material having formed characters thereon, means for vibrating said carrier, thereby delivering the same contiguous to justifying and feeding devices, a continuous band of blank impressible material, and means for feeding the same upon the carrier, thereby delivering the formed line to the adjacent justifying mechanism, substantially as set forth.

16. Character-forming devices, feeding and justifying mechanism, a carrier supporting a line of impressible material, a pivotal support for said carrier, and means whereby said carrier is vibrated, thereby delivering the said line from the character-formers to the feeding mechanism, in combination with means for periodically feeding upon said carrier a new blank from a continuous band, thereby delivering the formed line to the justifying mechanism, and other means set in action by the movement of said band adapted to sever the same into required lengths, substantially as set forth.

17. In a type-forming machine, a suitable blank and means for pressing successive character-dies upon one of its edges to form words upon said blank, spacing mechanism adapted to separate the words of the composition, and means adjacent to the opposite edge of said blank adapted to notch the same in duplication and in opposite relation to the respective word-spaces, substantially as set forth.

18. An impressed blank comprising the line of composition upon one edge thereof and spaces separating the words of said composition, niches or notches directly opposite the spaces upon the opposite edge of said blank, justifying-compressors and means for operating the same, a projecting toe or the like from one of the said compressors adapted to engage the impressed blank upon its under side, means for feeding the blank between such compressors, and mechanism for moving the projecting toe and its compressor into the notches of the said line, thereby making operative the justifying-compressor to compress the blank opposite each of the spaces of the said blank, substantially as set forth.

19. An impressed blank comprising a line of composition upon one edge thereof, spaces separating the words of said composition, and means for elongating or compressing the said

line opposite said spaces, thus justifying the same, substantially as described.

20. In a type-forming machine, mechanism for forming characters upon a compressible non-elastic material and means adapted to change the form of said material without disturbing the characters thereof, thereby justifying the same subsequent to the forming of characters thereon, substantially as described.

21. In a type-forming machine, mechanism for forming characters upon a compressible non-elastic material and means for justifying the same subsequent to the forming of characters, substantially as described.

22. In a type-forming machine, a justifying-chamber and means adapted to move into the same a formed line of composition, justifying-compressors contiguous to said chamber, and means in connection therewith adapted to automatically justify said line, substantially as described.

23. In a type-forming machine, a justifying mechanism comprising justifying-compressor contiguous to the formed line and operating means in operative connection with the line, said means being adapted to make said compressors operative or inoperative, as directed by the varying lengths of line to be justified, substantially as described.

24. In a type-forming machine, a justifying mechanism comprising suitable dies contiguous thereto and adapted to justify a line of composition and means in connection therewith adapted to make said dies operative upon said line in a variable manner in accordance with the varying length of the lines to be justified, substantially as described.

25. A formed line of composition comprising characters, as words and the like, upon its one edge and suitable notches on its opposite edge, said notches occurring at the end of each word of said composition, substantially as described.

26. A formed line of composition comprising characters and the like upon its one edge and suitable notches on its opposite edge, said notches occurring at the end of each word of said composition, and a justifying mechanism regulated by said notches, substantially as set forth.

27. A formed line of composition upon a compressible non-elastic material, comprising characters, as words and the like, thereon, spaces between said words of a minimum width, and means adapted to increase this width, and thus justify the same, substantially as described.

28. A compressible and non-elastic formed line of composition comprising characters, as words and the like, thereon, spaces between said words of a maximum width, and means adapted to decrease this width, and thus justify the same, substantially as described.

29. A formed line of composition upon a compressible and non-elastic material, com-

prising characters, as words and the like, thereon, spaces between said words, and means whereby said spaces may be increased or decreased to justify the line, substantially as described.

30. A formed line of composition upon compressible non-elastic material, comprising characters thereon, said line being of a length dissimilar to that of a newspaper-column width or other arbitrary size, and means adapted to justify said line, so as to be of a similar length as a predetermined size, by lengthening or shortening the same, substantially as described.

31. In a type-forming machine, a formed line of composition upon a suitable blank, the length of said blank being greater than that of the composition, means for severing off said blank, and mechanism for subsequently lengthening said line to a predetermined size, substantially as set forth.

32. In a type-forming machine, a justifying mechanism comprising suitable compressors adapted to compress formed lines of composition and means in operative relation therewith adapted to make said compressors operative in a variable manner, according to the varying number of words or the like upon said lines and the varying length of the lines themselves, substantially as set forth.

33. In a type-forming machine, a justifying mechanism, suitable compressors adapted to justify formed lines of composition comprising words and the like, mechanism in operative relation therewith adapted to variably cause said compressors to become operative upon said lines to compress the same according to the variation in the length and number of spaces of said lines, substantially as set forth.

34. In a type-forming machine, a justifying mechanism comprising suitable compressors adapted to justify lines of composition and mechanism in connection therewith adapted to vary the operation of said compressors in proportion to the varying slack of said lines and the variable number of words or spaces thereon, substantially as set forth.

35. In a type-forming machine, key-operating mechanism in operative connection with suitable character-dies, a feeding device and a key-actuating mechanism therefor, and suitable power connections adapted to impress suitable dies of said character devices upon a strip of compressible and non-elastic material carried upon said feeding device when so directed by the key-operating mechanism, substantially as set forth.

36. In a type-forming machine, justifying mechanism and means in operative connection therewith adapted to variably regulate suitable justifying-compressors, a movable support or plate upon the lower side of said justifying mechanism, and mechanism in connection therewith adapted upon the movement of said plate to retract or withdraw the justifying-compressor-regulating mechanism, substantially as set forth.

37. In a type-forming machine, a feeding device, a carrier, a line of impressible material therein, a severing-knife, and mechanism in operative relation thereto adapted to cause said severing-knife to become operative by the movement in one direction of the line of material and to cause the same to become inoperative by a reverse movement of the feed device, substantially as set forth.

38. In a type-forming machine, a stick or carrier adapted to detachably hold a blank of suitable material, a feed-screw adapted to operate or move said carrier in one direction by the movement of a suitable key-operated mechanism, suitable power connections in operative relation with the said screw, and means in connection therewith adapted to move the said feed-screw in an opposite direction, substantially as set forth.

39. In a type-forming machine, a carrier or carriage, a pivotal support therefor, feeding mechanism adapted to feed a blank line of impressible material upon said carrier, means for vibrating said carrier upon its support, a carriage-feed mechanism to which the carrier is thereby delivered, power connections for operating said feed mechanism in one direction, a key for connecting said power feed mechanism, whereby said carriage is automatically moved in one direction, and keys for moving said carriage in the opposite direction, substantially as set forth.

40. In a type-forming machine, feed-rollers, means for periodically actuating the same, impressible blanks, each having a dovetail groove, a holder, means for feeding said blank upon said holder, and means comprising a dovetail formation thereon for retaining the blanks, substantially as set forth.

Witness our hands to the foregoing specification this 26th day of August, 1891.

LOUIS RANSOM.
ALEXANDER W. MAYNES.

Witnesses:

EUGENE RANSOM,
N. S. AMSTUTZ.