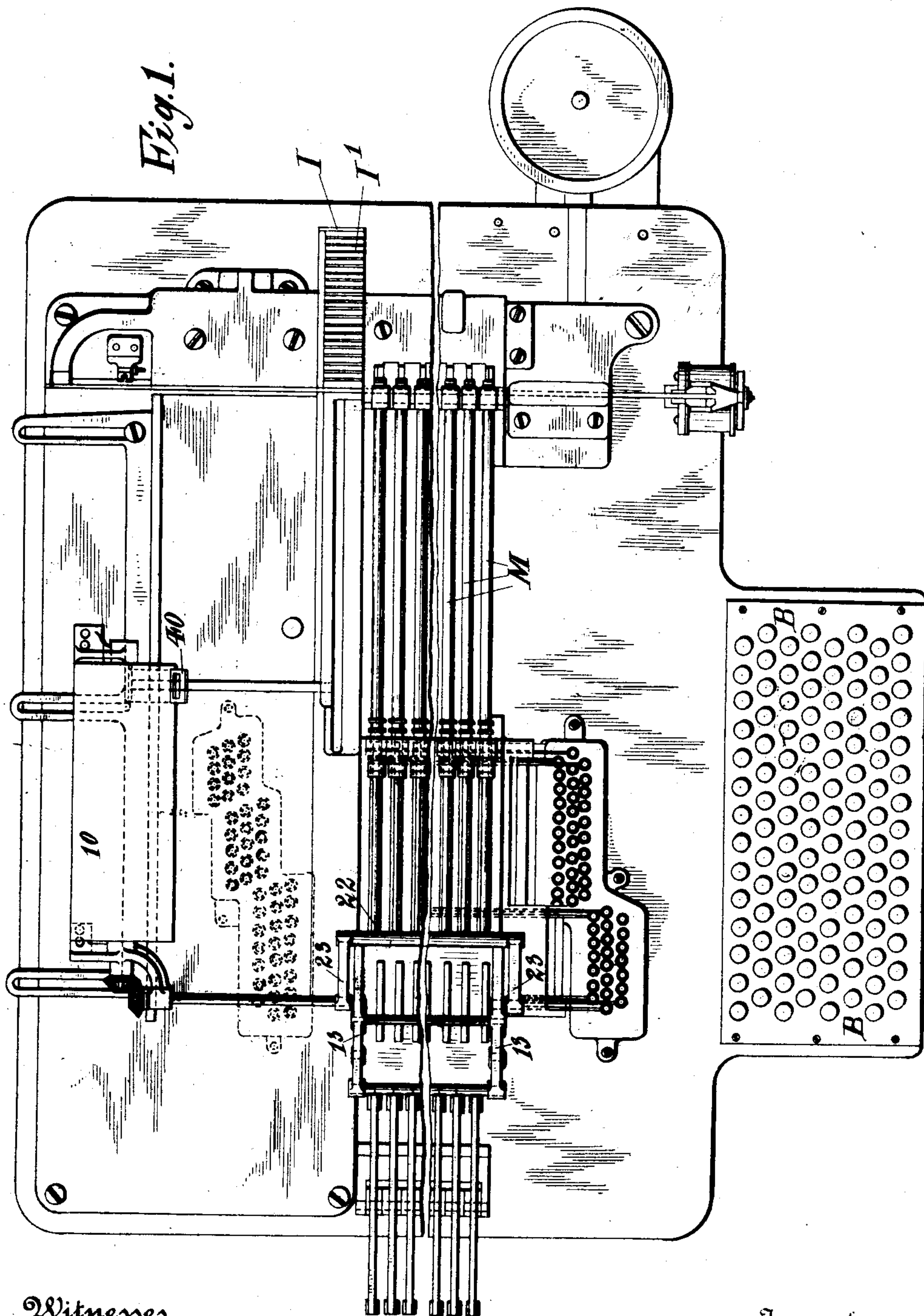


No. 871,020.

PATENTED NOV. 12, 1907.

L. ALLEN.  
COMPOSING MACHINE.  
APPLICATION FILED SEPT. 6, 1906.

5 SHEETS--SHEET 1.



Witnesses  
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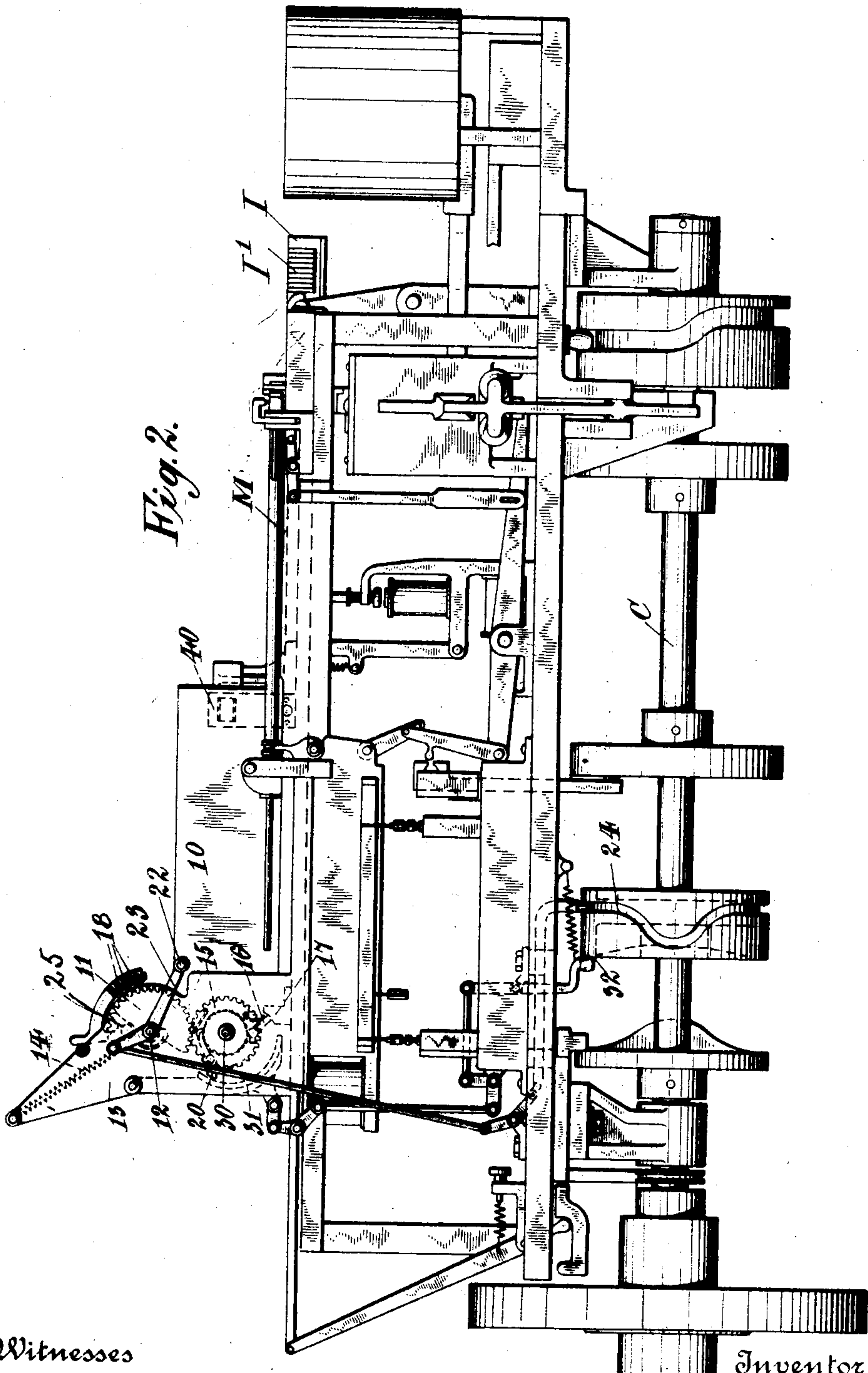
PATENTED NOV. 12, 1907.

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5 SHEETS--SHEET 2.



Witnesses

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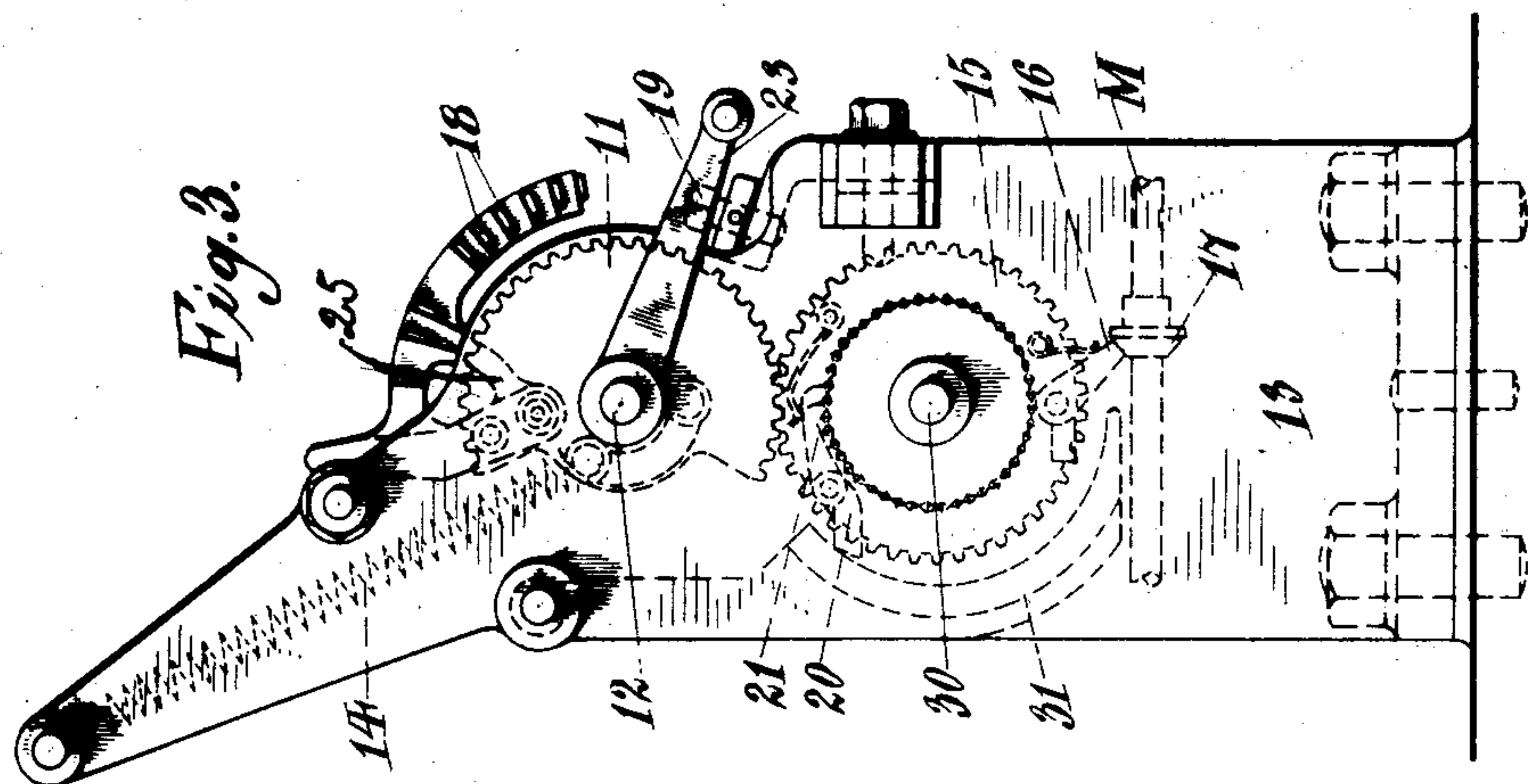
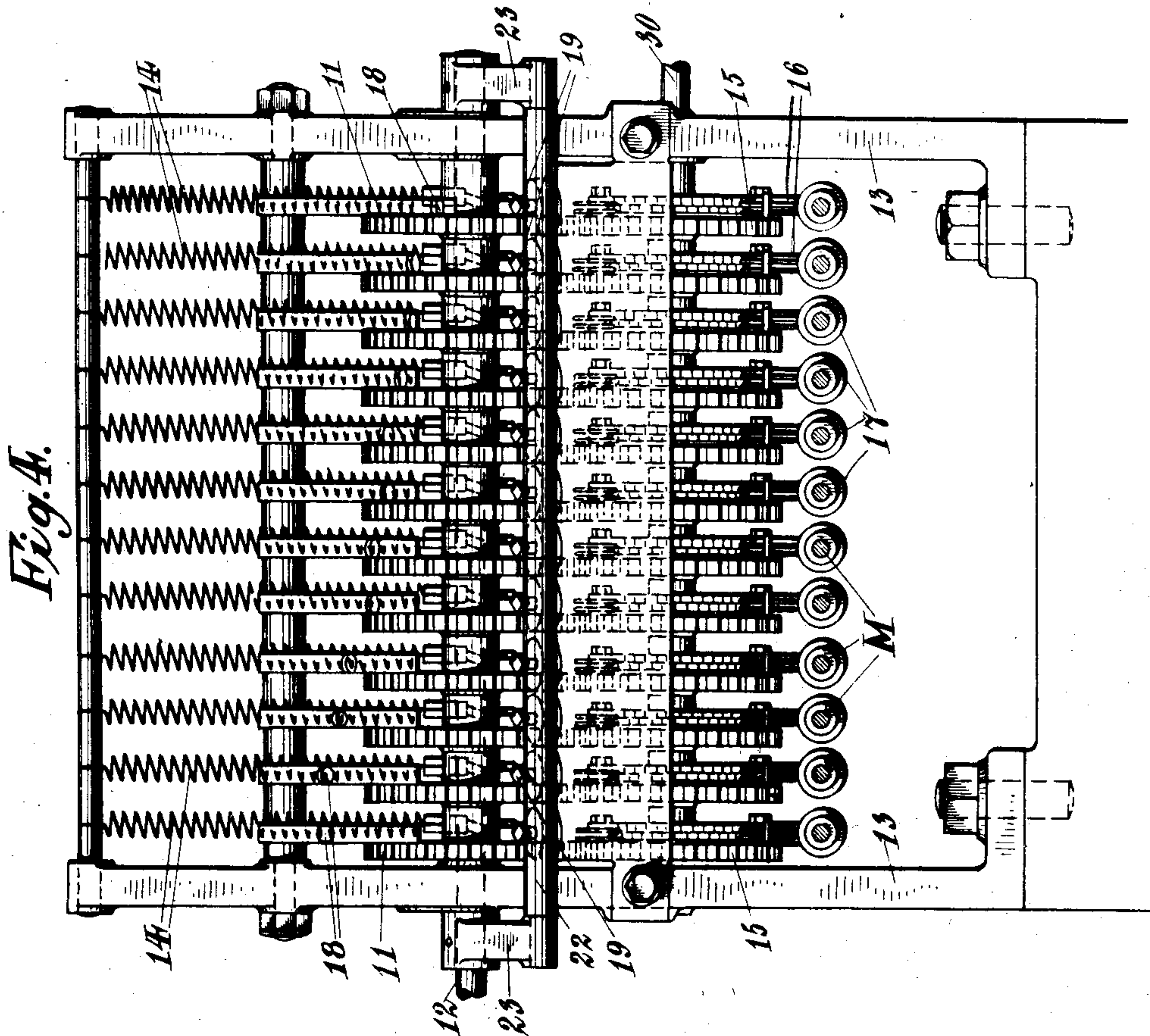
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6 SHEETS—SHEET 3.



Witnesses  
Joseph L. Brown  
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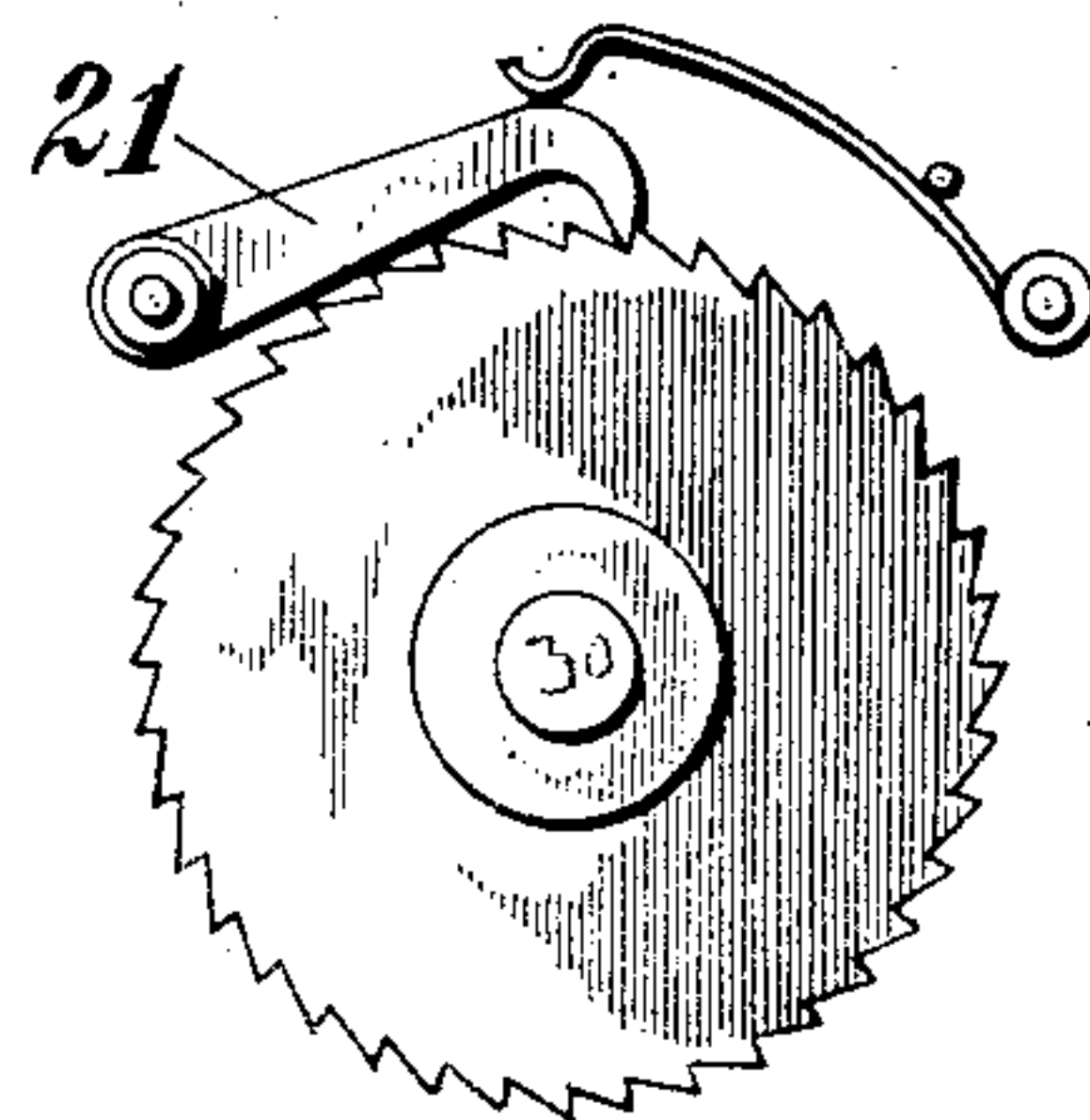
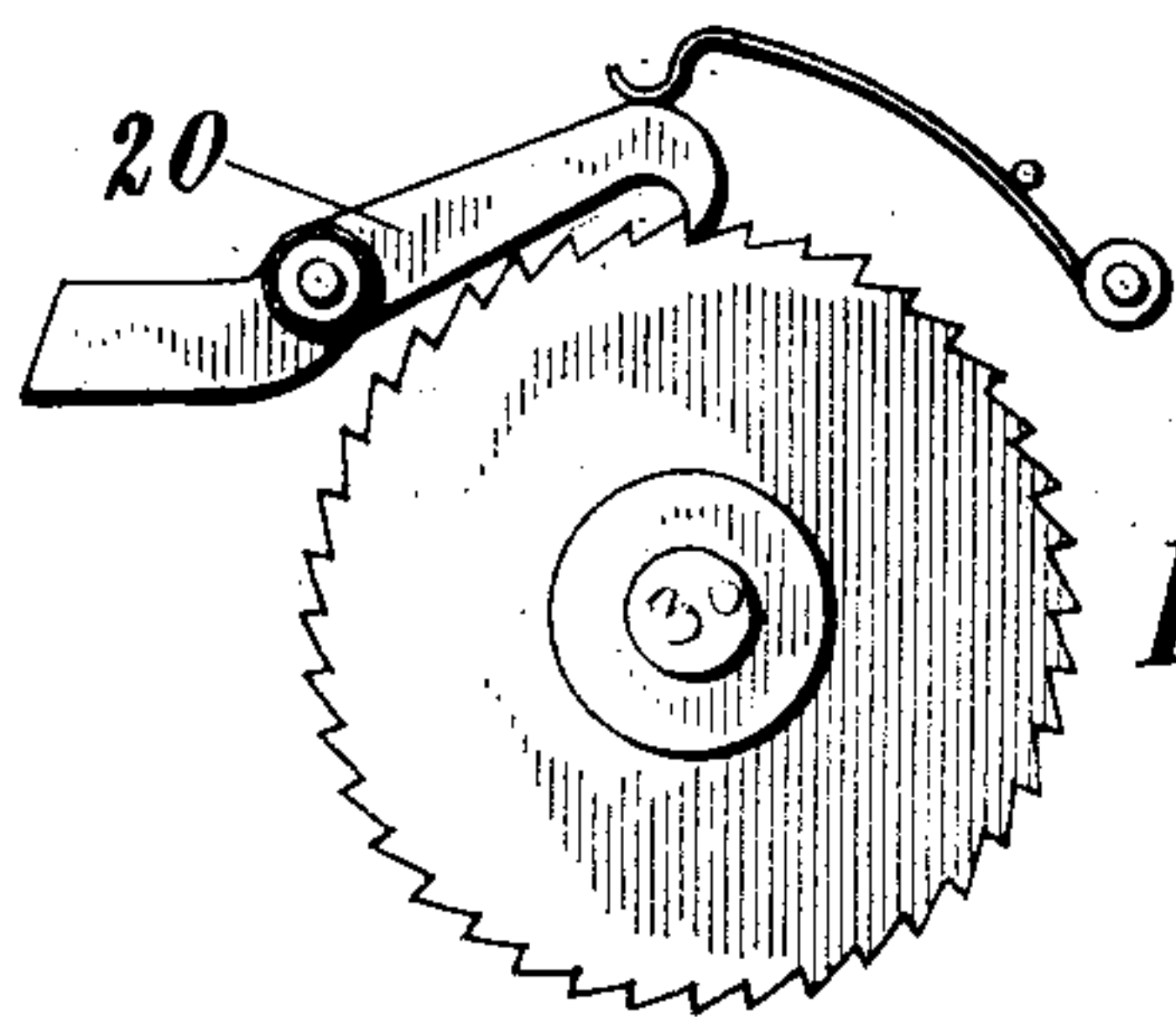
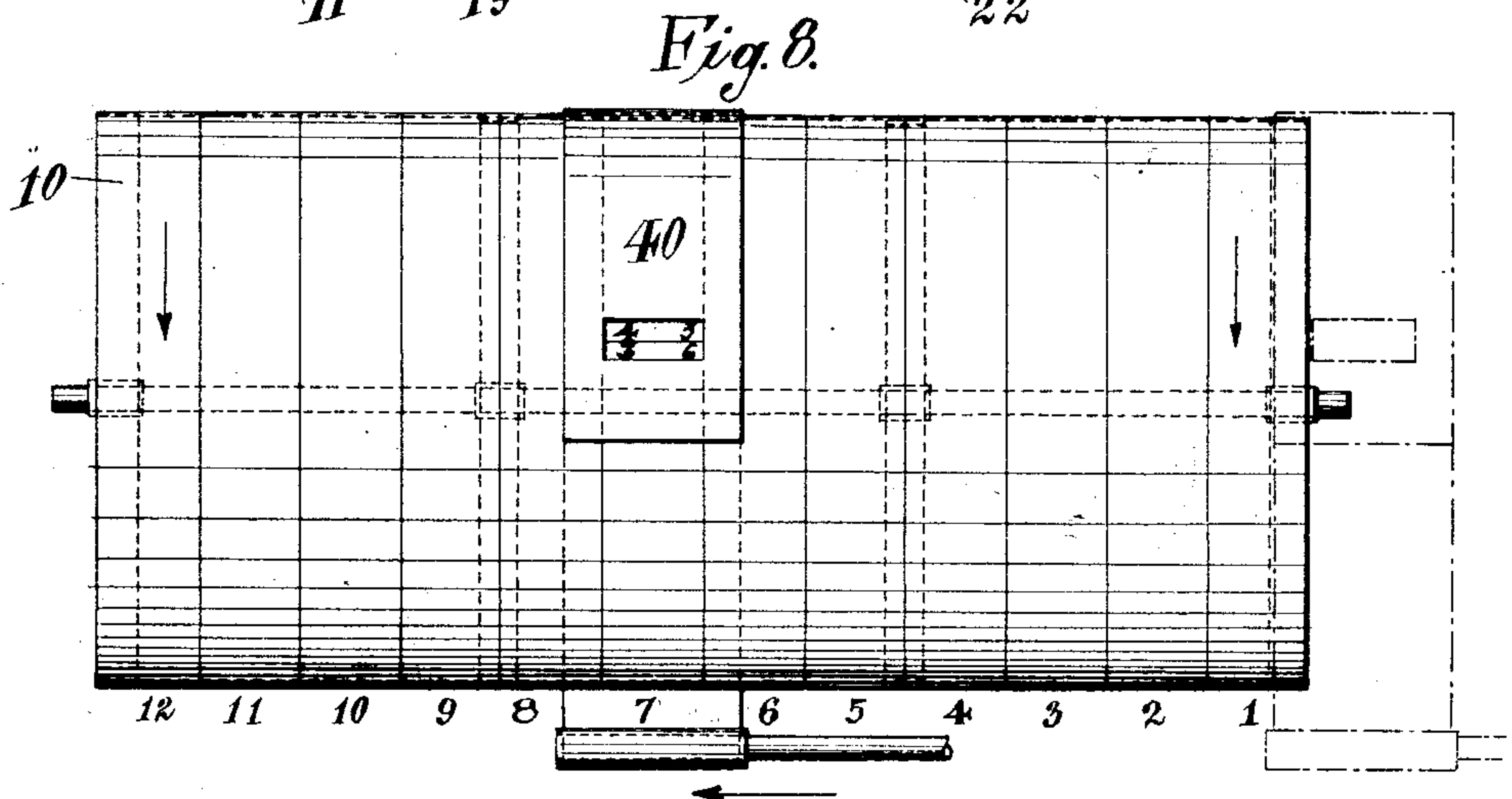
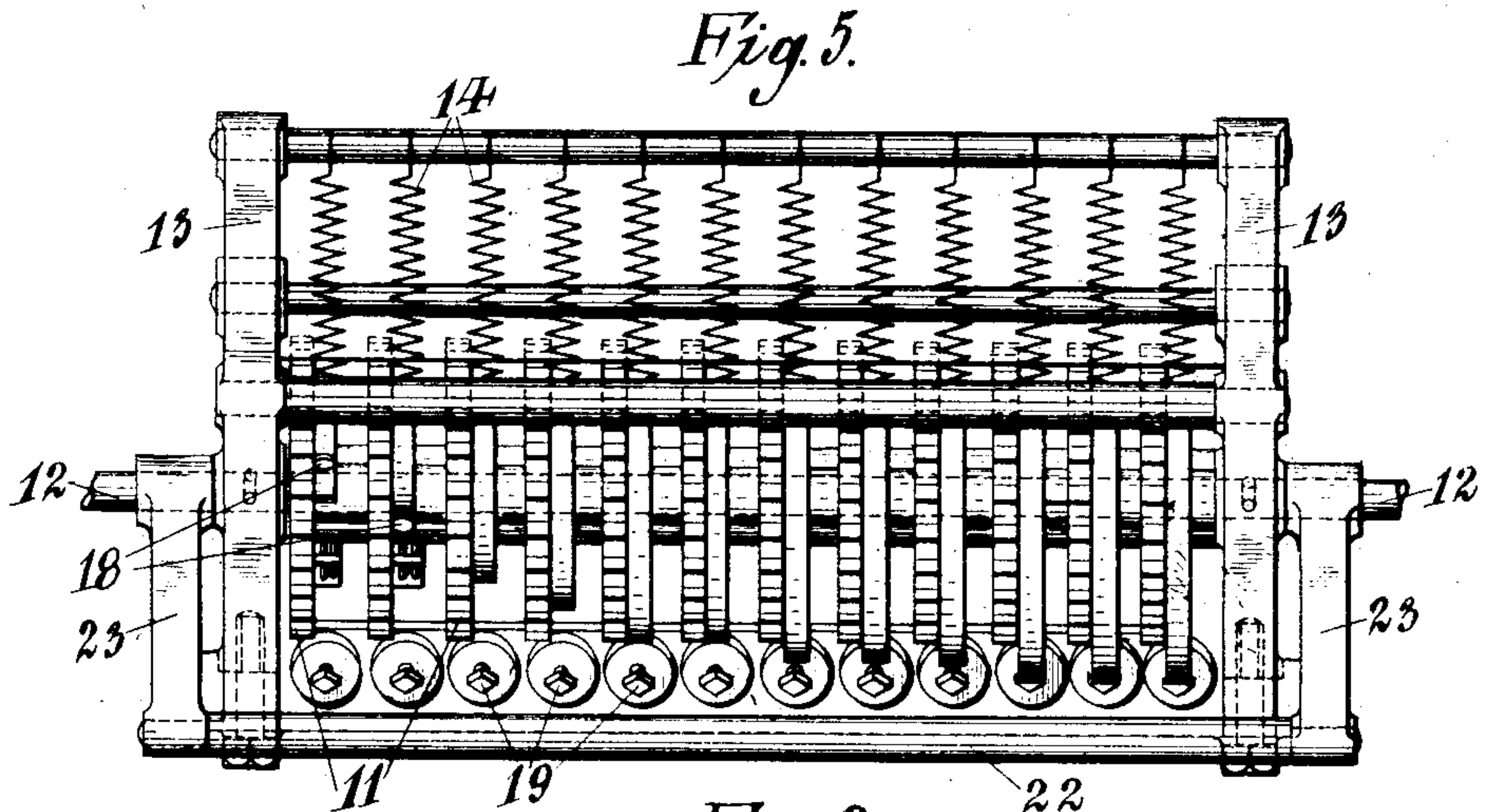
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5 SHEETS—SHEET 4.



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PATENTED NOV. 12, 1907.

5 SHEETS—SHEET 5.

*Fig. 9.*

[illegible]

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# UNITED STATES PATENT OFFICE.

LEICESTER ALLEN, OF NEW YORK, N. Y., ASSIGNOR TO PEARSON TYPO-BAR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

## COMPOSING-MACHINE.

No. 871,020.

Specification of Letters Patent.

Patented Nov. 12, 1907.

Application filed September 6, 1906. Serial No. 333,445.

*To all whom it may concern:*

Be it known that I, LEICESTER ALLEN, a citizen of the United States, residing at No. 1073 Union avenue, in the borough of Bronx, of the city of New York, in the State of New York, have invented certain new and useful Improvements in Composing-Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to mechanism for justifying the lines of type or the like in composing machines, and its general object is to provide a mechanism for this purpose which shall make the operation of justification in these machines automatic and practically exact.

In composing machines, such as type setting machines for instance, if the operator is compelled, after the line has been set up, to perform a mental calculation to determine what spaces are necessary to justify and complete the line, the time required in making the calculation is a practical loss and the best possible typographic effects are not always secured. This is particularly so where there are a large number of different units and where therefore a correspondingly large number of different combinations of units is rendered possible or made necessary in order to fill out the shortage in the line.

In the following description and accompanying drawings I have described and illustrated my invention in association with a type casting and setting mechanism which is illustrated and described in Letters Patent of the United States No. 805,580, dated November 28, 1905, and granted to the Pearson Typo-bar Company. In that mechanism, as will appear upon reference to said Letters Patent, two dials were provided to indicate respectively the shortage in the composed lines and the number of words in the lines; and from the readings upon these dials the operator, after each line had been set up, determined by mental calculation the combination of spaces necessary for the justification. In the accompanying drawings, such portions of the mechanism of said Letters Patent have been re-produced as will enable the present invention and its particular application to such mechanism to be clearly understood. The drawings, furthermore, illustrate an embodiment of my invention that may conveniently be applied to said mechanism to take the place of the two dials and their operative connections just referred to.

In said drawings:—Figure 1 is a broken plan of the mechanism of the afore mentioned Letters Patent to which the present improvements have been applied. This figure corresponds to Fig. 1 of said Letters Patent. Fig. 2 is a view in side elevation corresponding with Fig. 2 of said Letters Patent. Fig. 3 is a view in side elevation on a larger scale of the mechanism for rotating the registering drum. Fig. 4 is a view of the same mech-

anism in front elevation. Fig. 5 is a plan view of this mechanism. Figs. 6 and 7 are respectively detail views of two ratchets and pawls forming a part of the rotating mechanism for the drum. Fig. 8 is a detail view in side elevation of the drum and a perforated screen therefor. Fig. 9 is a plan view of a portion of a chart for the periphery of the drum spread out flat.

Referring to Figs. 1 and 2, the bars M, which, as described in said Letters Patent, are arranged to slide longitudinally in guides and which carry the matrices for the type-faces, are preferably twelve in number as illustrated in Figs. 3 and 5, Fig. 1 being broken for simplicity and therefore showing only a few of these bars. The number of these bars is of course immaterial to the present invention, but twelve are preferred, eight of which are adapted for casting type and type spaces of 18, 15, 13, 12, 8, 7, 6 and 5 units respectively and four of which are adapted for casting type and type spaces of 9 and 10 units. This number and character of bars has been found to be particularly suitable for obtaining good typographic effects, for in practical work with this arrangement, the spaces between the words need never differ by more than one unit. The chart to be referred to hereinafter is constructed with particular reference to a mechanism for casting type and type spaces of the relative units just referred to. The mechanism for operating the matrix bars, the construction of the bars themselves, the casting of the type, the delivery of the type into the word magazine I, the construction of this magazine and all of the coöperating parts for these mechanisms are fully described and illustrated in said Letters Patent and are not necessary for a complete understanding of the present invention. Accordingly, they will not be described or further referred to herein.

It will be understood that upon the operation of the key-board B to cast a type or space, one of the matrix bars moves in order to bring the particular type face above a body mold for the type. Accordingly these matrix bars M will be designated hereinafter by the general term "movable member" or "movable members", it being obvious that when the invention is applied to some other machine, as say a type setting machine for instance, these movable members would correspond to some moving part other than a matrix bar.

In accordance with the present invention the movements of the movable members M are registered by a moving chart each movement of the members M being communicated to suitable mechanism presently to be described through which the chart is moved. The construction of the mechanism is such that the chart is moved upon each actuation proportionately to the number of units to which the particular member M causing such actuation corresponds. It will thus be seen that when the line has been set, the sum total of



the movements of the chart will be proportionate to the length of the line which has been set. In the present case the chart is mounted upon a drum 10 and the mechanism for moving the chart is the mechanism for effecting the rotation of the drum. This mechanism will now be described. For each member M there corresponds a gear 11 which may be a gear wheel or a segment thereof as illustrated (Figs. 3, 4 and 5). These gear segments may be mounted loosely upon a rod 12 in a frame 13 and springs 14 are provided one for each of the gear segments. Each of these gear segments meshes with a corresponding gear 15 loosely mounted upon a shaft 30, journaled in the frame 13 and operatively connected with the indicator drum; and each of the gears 15 is provided with a stop pawl 16 which co-operates with a shoulder 17 upon a member which moves with the corresponding member M whereby the gear segments 11 are normally held from being moved by their springs. Upon the movement, however, of any one of the bars M, the shoulder 17 is moved out the way of the pawl 16 and the corresponding gear segment is actuated by its spring and turns upon the rod 12. The extent of its movement depends upon the position of a stop 18 fixed to the segment which is brought down upon the head of a corresponding adjustable screw 19 threaded into the frame of the mechanism. As will be obvious, there is a stop 18 and an adjustable screw 19 corresponding to each gear segment and therefore to each member M. The position of each of the stops, in the present case, with respect to its corresponding screw depends upon the particular number of units in the type cast through the operation of the corresponding bar M, so that each particular segment will be checked the sooner or the later according as the number of units in the corresponding bar M is smaller or greater. Upon each of the gears 13 there are provided two pawls which coöperate respectively with two ratchets having oppositely faced teeth and being rigidly secured to each other and to the shaft 30. One of these pawls, 21, which will be referred to as a push pawl, during the movement of the gear segment above described, will ride over its ratchet teeth, while the other pawl 20, which will be referred to as a check pawl, will be raised and held from engagement with the teeth of the other ratchet by suitable mechanism presently to be described. As soon however as the movement of the gear segment has been arrested by its corresponding stop, a bar 22 carried by arms 23 secured upon the rod 12 will be raised through the operation of a cam 24 upon the main shaft C and by engaging a suitable projection 25 fixed to the gear segment will return the gear segment to its first position where it will be held through the gear 15 and stop pawl 16, the corresponding member M in the meantime having returned to its first position. Thereafter the bar 22 will have been returned to its first position through the operation of cam 24. As the gear segment is returned to its first position, the gear 15 which, as will be obvious, will also be moved back to its first position, will cause the push pawl 20 to move its corresponding ratchet wheel and therefore the shaft 30 which is operatively connected with the indicator drum. In this way, it will be clear that the successive movements of the drum will correspond with absolute accuracy to the units which they

represent. For, the movement of the drum takes place only upon the return movement of the gear sectors 11 and therefore is a positive movement absolutely determined. The check pawl 20 absolutely prevents the drum from "running by" the position at which it should be checked, as will be obvious from the construction just explained. The mechanism for raising and holding the check pawl out of engagement with its teeth during the first movement of the gear sectors 11 may comprise a swinging frame 31 so positioned as to be capable of acting upon the heels of all of the pawls 20 and actuated at the proper time by a cam 32 on the shaft C through the interposition of suitable links and levers as illustrated in Fig. 2. The mechanism for operatively connecting the bar 22 with the cam 24 may also comprise a suitable system of links and levers such as are illustrated in Fig. 2, the arms 23 which carry the bar 22 being preferably arms of two elbow levers and the other arms of these elbow levers being operatively connected with the cam 24 through the system of links and levers referred to.

The word magazine I, as described in Letters Patent mentioned hereinbefore comprises a series of word chambers 'I', which are clearly illustrated in Fig. 1 of the present drawing. In said Letters Patent the mechanism is described for successively advancing the word magazine to present the chambers successively for the reception of the type forming separate words in the setting up of the line. In the present case, an indicator 40 which coöperates with the drum, is secured to the word chamber I so as to move therewith. The extent of the movement of this indicator from its first position will therefore be in accordance with the number of words in the line set up.

The gearing which operates the drum is preferably arranged so that the drum will be rotated just once during the composition of one complete line, although if the length of line makes it desirable that the drum should rotate more than once during the composition of each line, then it is preferably rotated exactly twice or thrice etc. so that at the completion of the line, the drum will be in the same position as at the beginning of the composition of the line. The chart, a portion of which is illustrated in Fig. 9, will now be described. It will be understood that besides indicating the number of words in the line, or what is the same thing, the number of spaces between the words, the purpose of the chart is to indicate the shortage of the line just previous to justification. Let it be assumed, for instance, that the line to be composed is a certain definite number of units length; as the operator begins to compose the line, the drum commences to rotate with the indicator 40 at the zero of the scale and when the justification of the line is to be effected, the indicator will show the number of units shortage in the line, inasmuch as the drum rotates the chart in the direction indicated by the arrows in Fig. 9.

Referring to Fig. 9 it will be seen that the chart is divided into columns and rows, the columns being arranged to run around the periphery of the drum, that is in planes perpendicular to the axis of the drum, and the rows to run longitudinally of the drum, that is parallel to the axis of the drum. It will be understood therefore, that the units of graduation of the columns will represent units in the line, while the division of



the rows, or in other words the columns themselves may correspond with the spaces between the words of the line. In the portion of the chart shown in Fig. 9, 44 units have been graduated upon the columns and this portion obviously represents the end of the scale or chart. The total number of units above 44 would correspond to the length of the line, but as the line may be of any length it is unnecessary to illustrate the beginning or first portion of the chart which would obviously vary for each particular case or length of line. If for instance there were 100 units in the line, the complete chart would contain 56 more units whereas if there were only 44 units in the complete line, the scale would be complete as illustrated in Fig. 9. As stated above, when the justification commences the indicator will indicate the shortage in the line. In order that the indicator may also point out the number of words in the line, it is adapted to move parallel to the axis of the drum, starting from the position indicated by the dotted lines in Fig. 8. As soon as the first word is set up and the magazine I moves to receive the second word, the indicator moves toward the left (as seen from Fig. 8) until the perforation therein registers with the first column of the chart. The indicator preferably comprises a perforated screen 40 and the size of the perforation in the screen is such as to coincide exactly with one of the tabulated divisions of the chart formed by the intersection of a column and row. As will be obvious, therefore, the length of the first word having determined the amount of movement of the chart, the particular tabulated space thereon which will be visible through the screen, or in other words which coincides with the perforation in the screen, will also be completely determined. In the present case, there being 12 columns, and each column representing a space between the words in the line, the chart is adapted to indicate a number of words up to and including 13. It is of course clear that the chart may be arranged to read for any number of words desired. When the justification is to be effected the exact combination of spaces which are necessary to fill out the line, that is to be inserted between the words which have been set up, can be read at once through the perforation in the indicator, all of the computation having been done previously in manufacturing the chart. If two words have been set up, the indicator perforation will register with the first column, if three words with the second column, etc.

It will be seen from the chart that the space represented by the intersection of each column and each row is divided into two portions and that in most cases, there are readings in each portion. As was stated hereinbefore, the particular system of units which has been adopted in the present case enables lines to be justified without necessitating a special difference between the words of more than one unit. In some cases where the shortage in the composed line is exactly divisible by the number of spaces between the words, the spaces, as is obvious, will all be of the same size. The reason therefore for dividing up each tabulated space on the chart into two portions is to indicate clearly the number of each set of spaces where two different units length are required to fill out the line; the cases where only one unit's length is required being clearly indicated by leaving half of a tabulated space blank. As an illustration of the facility with which the readings may be

taken off the chart, one may refer to Fig. 8 in which through the perforation in the screen it is seen that four 5 unit spaces are required and three 6 unit spaces. As soon as the readings are taken the spaces may be cast and the type transferred to the galley as described in the Letters Patent hereinbefore referred to.

It will be clear that by my invention the justification will be effected not only with the saving of a great deal of time but will be adapted to produce the best typographic effects in a minimum of time. For instance, in the illustration above given, it will be obvious that several other combinations of spaces would serve to fill out the line, but the combination indicated is the only one in which the spaces do not differ by more than one unit's length. While therefore it would not be a simple matter to determine any combination to meet a particular case, it is obvious that it would be a still more difficult matter to determine the combination which would produce the best typographic effects. The invention has been illustrated, as was said before, in connection with a particular type casting and setting machine. It will be clear that the application of the invention may be extended to cover various kinds of composing machines and similar devices.

I claim as my invention:—

1. In an automatic calculating mechanism for justifying a line of type and the like, the combination of a chart, means to move the chart proportionately to the length of the line as it is being set, an indicator for the chart, and means to move the indicator in accordance with the number of words in the line.
2. In an automatic calculating mechanism for justifying a line of type and the like, a chart having tabulated thereon such combinations of spaces as may be employed to fill out different lengths in the line, means to move the chart proportionately to the length of the line as it is being set, an indicator for the chart, and means to move the indicator in accordance with the number of words in the line.
3. In an automatic calculating mechanism for justifying a line of type and the like, the combination of a drum having tabulated upon its periphery such combinations of spaces as may be employed to fill out different lengths in the line, means to turn the drum proportionately to the length of the line as it is being set, a perforated screen for the drum, and means to move the perforated screen in accordance with the number of words in the line.
4. In a type setting machine, the combination of a drum, means to rotate the drum proportionately to the length of the line of type as it is set, an indicator for the drum, and means to move the indicator parallel to the axis of the drum in accordance with the number of words in the line.
5. In a type setting machine, the combination of a drum having tabulated upon its periphery such combinations of spaces as may be employed to fill out different lengths in the line, means operatively connected with the type setting mechanism to rotate the cylinder proportionately as the type is set, a word magazine, and an indicator for the drum adapted to move parallel to the axis thereof and operatively connected with the word magazine so that its movement is controlled by the number of words in the magazine.
6. In a type setting and casting machine, the combination of a drum having tabulated upon its periphery such combinations of spaces as may be employed to fill out different lengths in the lines, a plurality of casting bars corresponding to different length spaces; operative connections between the casting bars and the drum to rotate the drum, a word magazine having a separate channel for each word, an indicator for the drum adapted to move parallel to the axis thereof, and operative connections between the magazine and the indicator whereby the indicator is moved each time the magazine is advanced to receive a new word.



7. In a type setting machine, the combination with a rotating drum and a member upon the machine the movements of which are to be registered by the drum, of a spring actuated gear normally held in check by said member, operative connections between the gear and drum whereby the gear may move in one direction actuated by its spring without moving the drum but in the other direction only by moving the drum correspondingly, means to gage the first movement of the gear, and means to move the gear back to its first position.
8. In a type setting machine, the combination with a rotating drum and a member upon the machine the movements of which are to be registered by the drum, of a spring actuated gear normally held in check by said member, a ratchet and pawl connection between the gear and drum whereby the gear may move in one direction actuated by its spring without moving the drum but in the other direction only by moving the drum correspondingly, means to gage the first movement of the gear, and means to move the gear back to its first position.
9. In a type setting machine, the combination with a rotating drum and a member upon the machine the movements of which are to be registered by the drum, of a spring actuated gear adapted to have a predetermined movement in one direction under the actuation of its spring, means to move the gear back into its first position, a second gear meshing with the first gear and loose upon the drum shaft, a stop pawl between the second gear and said member, a ratchet wheel secured to the shaft, and a pawl upon the second gear cooperating with the ratchet wheel.
10. In a type setting machine, the combination with a

rotating drum and a member upon the machine the movements of which are to be registered by the drum, of a spring actuated gear adapted to have a predetermined movement in one direction under the actuation of its spring, means to move the gear back into its first position, a second gear meshing with the first gear and loose upon the drum shaft, a stop pawl between the second gear and said member, two ratchet wheels secured to the shaft and having oppositely facing teeth, a push pawl for one ratchet wheel, a check pawl for the other ratchet wheel, both pawls being pivoted upon the second gear, and means to hold the check pawl out of engagement with its ratchet wheel during the first movement of said spring actuated gear.

11. In a type setting machine, the combination with a plurality of movable members corresponding to different type and space units, and a drum to register the movements of said members, of a spring actuated gear for each member normally held in check by that member, operative connections between the gear and drum whereby the gear may move in one direction actuated by its spring without moving the drum but in the other direction only by moving the drum correspondingly, means to gage the first movement of the gear, and means to move the gear back into its first position.

This specification signed and witnessed this first day of September, A. D., 1906.

LEICESTER ALLEN.

Signed in the presence of—  
CARL B. LARSON,  
HERMAN WINTER, Jr.