

(No Model.)

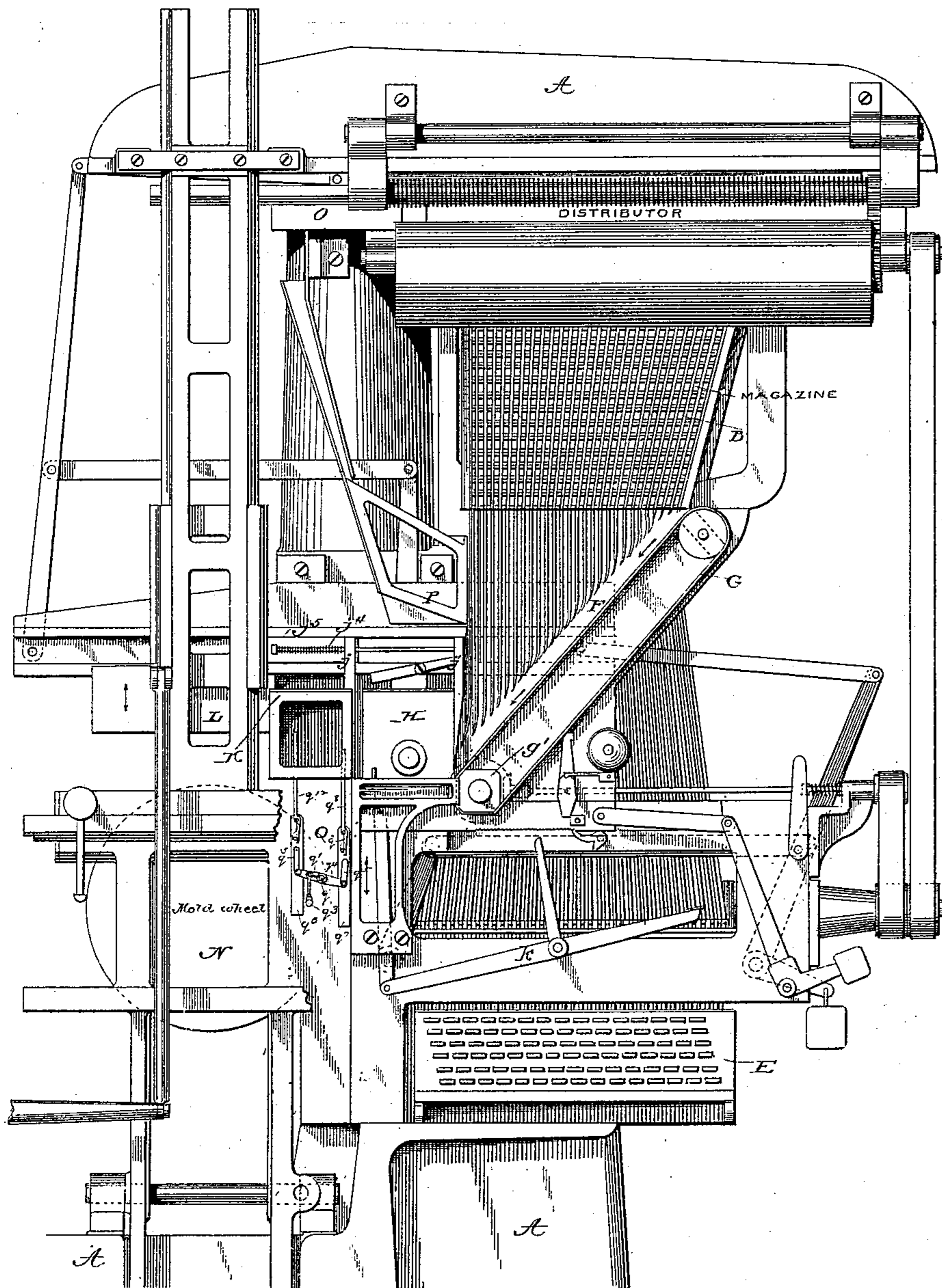
3 Sheets—Sheet 1.

O. MERGENTHALER.
TYPE JUSTIFYING MECHANISM.

No. 565,483.

Patented Aug. 11, 1896.

Fig. 1.



Witnesses:

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Inventor:

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By his Atty
Phil. T. Dodge

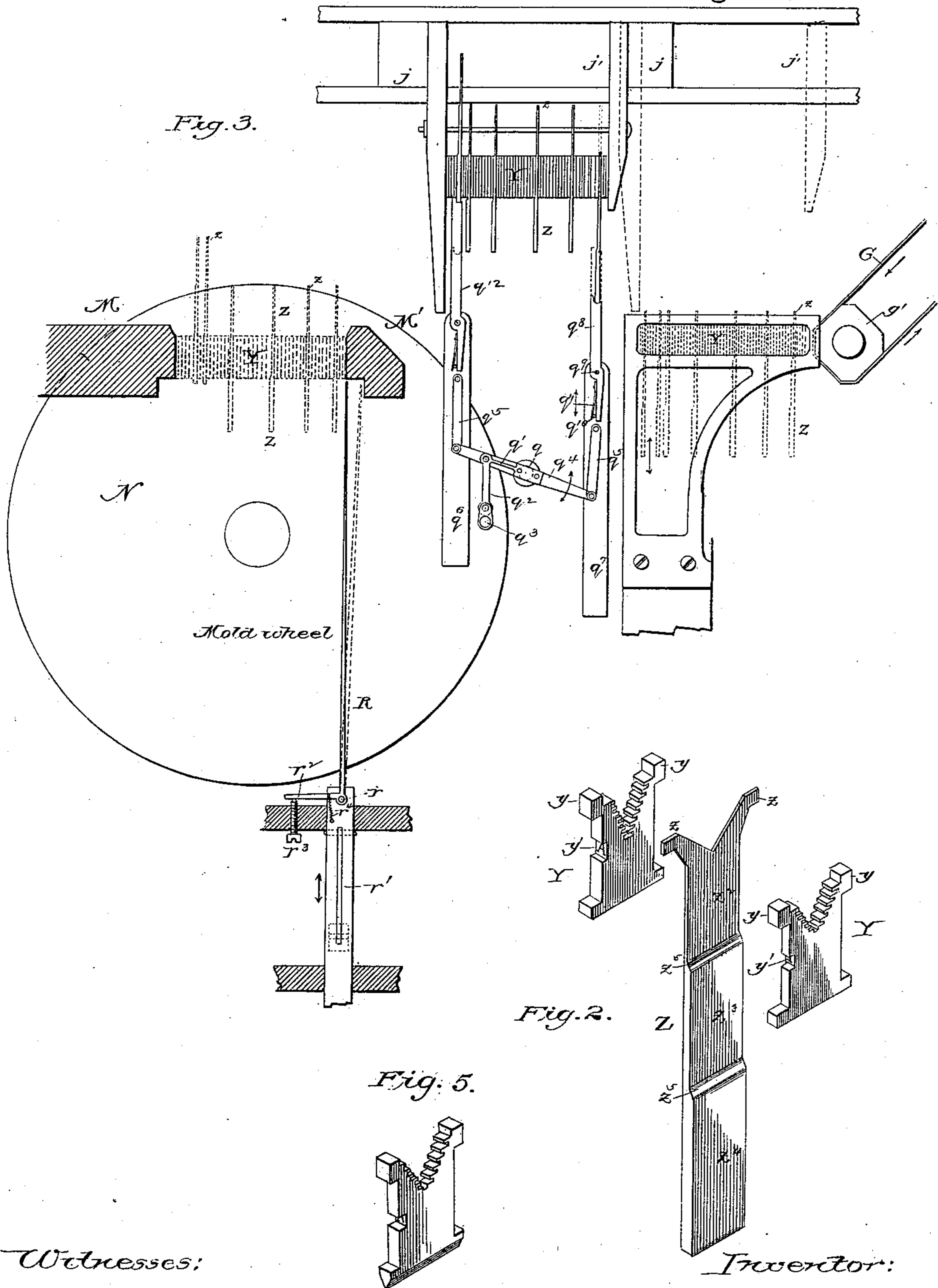
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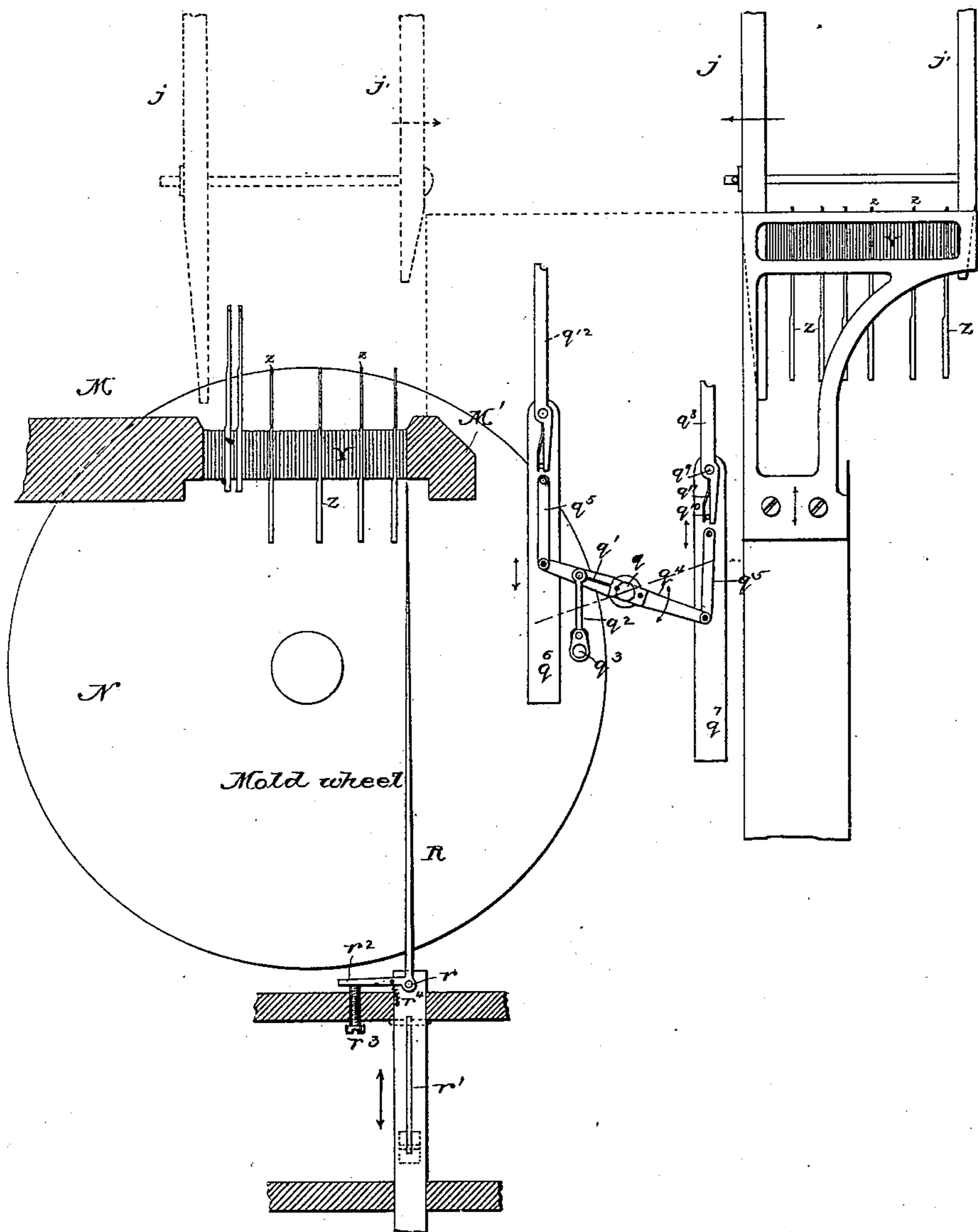
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Fig. 4.



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UNITED STATES PATENT OFFICE.

OTTMAR MERGENTHALER, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE
NATIONAL TYPOGRAPHIC COMPANY, OF WEST VIRGINIA.

TYPE-JUSTIFYING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 565,483, dated August 11, 1896.

Application filed October 15, 1889. Serial No. 327,079. (No model.)

To all whom it may concern:

Be it known that I, OTTMAR MERGENTHALER, of Baltimore, in the State of Maryland, have invented certain Improvements in Type-Justifying Mechanism, of which the following is a specification.

The present invention is intended more particularly for use in connection with the so-called "linotype-machines" for which numerous Letters Patent of the United States have been heretofore granted to me. In these machines a series of matrices representing the characters to be printed in one line of a page or column are assembled temporarily in line, properly separated by spaces, across the open front of a mold which is subsequently filled with molten metal, the result being the production in the mold of a bar or linotype bearing on its edge the characters or type produced by the matrices. The linotypes require to be of uniform length, and since the spaces between the matrices cannot be determined in the course of composition or assembly, so as to secure the requisite adjustment of the matrices, it is necessary to insert minimum spaces in the matrix-line in the course of its composition, and then, when the line is so nearly full that no additional word or syllable can be inserted, to increase the width of the spaces until the line is extended to the predetermined length. It is to secure this increase of the spaces and effect what is known in the art of type composition as "justification of the line," and at the same time effect the closure of the mold where the spaces occur, that my invention is designed.

In carrying my invention into practice I make use of a series of independent space-bars adapted to be set into the line of matrices and to be advanced endwise therethrough, each bar increasing in thickness step by step from one end to the other, so that as it is advanced it presents an increasing thickness in the line. By thus adjusting the space-bars endwise, equally or unequally, individually or in series, as circumstances may demand, I am enabled to secure a practically perfect justification of the line, but in order to secure exact justification I introduce, when demanded, a final space into the line either at the rear end or elsewhere.

The mechanism for assembling and operating the matrices and spaces and the casting and distributing mechanisms may be of any suitable construction, but I prefer to make use of the spacing mechanism shown in the accompanying drawings and forming part of the present specification.

For the purpose of illustration I have represented my present improvements applied to a machine such as shown in Letters Patent of the United States No. 436,532, issued to me on the 16th day of September, 1890, to which reference may be had for a detailed description of those parts foreign to the present invention, which are not described herein.

In the accompanying drawings, Figure 1 is a front elevation of the machine. Fig. 2 is a perspective view of one of the space-bars and matrices such as are used in connection therewith. Figs. 3 and 4 are front elevations showing in outline the composing, justifying, and casting mechanisms. Fig. 5 is a view on a large scale showing a matrix with a beveled lower end to facilitate the entrance of the spaces.

The matrices forming the basis of the machine consist, as shown in Fig. 2, each of a flat metal plate Y, provided with sustaining-shoulders y at its corners and with the intaglio character or matrix proper, y', on one edge, as in my previous machine. It is the principal function of this machine to assemble these matrices representing the required characters in line side by side and present them across the mouth of the mold.

Z represents the space-bar in the form such as I propose to use, made, preferably, in one piece, of an elongated form, with suspending-shoulders z at the upper end and of increasing thickness from one end to the other. It will be observed that the bar is not tapered after the manner of the wedge, but that it increases in thickness step by step, being composed of lengths or sections z² z³ z⁴, &c., each of uniform thickness, but of different thickness from the other sections. The several sections are united by inclined surfaces z⁵, which admits of the bar being forced endwise between the aligned matrices in order to introduce its succeeding sections into the line, and thus increase the separation

of the adjacent matrices and the length of the line.

Referring now to the machine, A represents the main frame; B, a magazine in which the 5 assorted matrices are contained and from which they are delivered through suitable escapement devices actuated by finger-keys E, representing the respective characters.

F are guides by which the falling matrices 10 are directed upon the inclined traveling belt G, on which they descend one after another into the open top of the assembling-block H, where they stand in line side by side, their advance being caused by the corners of the 15 rotating angular block g' , around which the belt passes.

P is the magazine in which the space-bars are suspended and from which they are discharged by finger-key mechanism one at a 20 time, so that they descend like the matrices into the assembling-block to take their places in the line.

The assembling-block H is mounted to slide upward under the influence of a hand-lever 25 k , to lift the composed line of matrices and space-bars to the level of a fixed guide K, which is suitably slotted to admit of the line being shifted horizontally therethrough into the vertically-movable yoke L, by which the 30 line is first lowered to the mold N, and finally, after the casting operation, raised to the distributing mechanism O, which acts to separate the space-bars and matrices and return them to the receptacles from which they 35 started.

j and j' represent two "shifting-fingers," so called, mounted on independent horizontal slides and connected by a rod j^5 , which limits 40 their separation and determines the length to which the line can be expanded by the space-bars. A spring j^4 applied to the rod urges the shifting-arms toward each other. Before the assembling-block leaves the matrices the shifter-arms are separated from 45 each other to allow the line to pass between them, after which they are moved to the left, carrying the line of matrices between them until the matrices reach the yoke L, as before referred to.

50 The matrices and space-bars, when lowered by the yoke, are suspended in front of the mold N, which is in the form of a vertical disk with a slot or mold proper therethrough. While the matrices are thus held in front of 55 the mold the elongation of the line is limited and the line of matrices held in firm contact side by side by horizontally-movable clamping-jaws M M'.

60 The foregoing parts are of essentially the same construction and operate in practically the same manner as in the application above referred to.

65 In fitting the machine to operate space-bars such as herein shown, which differ from the tapered bars of the previous machine, I provide means of any suitable character for forcing the space-bars endwise through the

line after the composition is completed, and also to provide means for introducing an additional wedge, to effect the final justification, 70 while the line is in front of the mold.

In Figs. 1, 3, and 4 the mechanism for advancing the space-bars (shown at Q) is located in or below the stationary guide K, (see Fig. 1,) and consists, as shown in Figs. 3 and 75 4, as follows: A horizontal rock-shaft q , mounted in a fore-and-aft direction in the frame, is provided at one end with a spring-arm q' , through which it receives a constant motion from pitmen q^2 , attached to a rotary 80 crank q^3 . A cross-arm q^4 is fixed on the rock-shaft and connected at opposite ends by links q^5 to two vertical slides q^6 and q^7 . The slide q^7 is provided at its upper end with an upwardly-extending finger q^8 , connected thereto 85 by a horizontal pivot q^9 , the finger being arranged to vibrate at its upper end from right to left, so that its upper end may move horizontally with the space-bars at the same time that it is being carried up or down by the 90 slide. The motion of this finger is limited by a stop-pin q^{10} , against which its lower end is held by a spring q^{11} , acting to resist the vibratory motion and to return the finger to its normal position whenever it is disengaged 95 from the space-bars. The second slide q^6 is provided with a pivoted finger q^{12} , mounted and operated in the same manner as the finger already described, but differing therefrom in that it extends to a greater height. By means 100 of the operating devices the two fingers are moved constantly upward and downward, one rising as the other descends, directly under the path traversed by the matrices and space-bars in the course of their passage from the 105 elevated assembling-block H to the yoke L.

The action of these parts is as follows: As the composed line is moved gradually to the left through the guide K the space-bars stand in their lowermost positions and as their lower 110 ends pass over the finger q^8 it acts upon them one after another and pushes them upward through the line the length of one section, causing each bar to present in the line a thicker portion than it did in the first in- 115 stance.

Owing to the fact that the finger is pivoted its upper end may move laterally with the space-bar while acting thereon, so as not to interrupt the advance of the line. If the ad- 120 vance of the space-bars one step is sufficient to space out the line to the predetermined length, a further movement will be unnecessary; but if, as is usually the case, a further advance of the bars or part of them is neces- 125 sary it will be automatically effected by the action of the second finger q^{12} , which in its turn acts upon the space-bars in succession, as they are carried thereover, and which by reason of its greater length lifts them above 130 the level to which they were lifted by the first finger.

If it happens that the required extension of the line is effected by the advance of a part

of the space-bars only, it will manifestly be impossible to crowd the remaining bars farther into the line. In this event the spring q' will yield and allow the crank to turn without lifting the fingers, although they will encounter the lower ends of the space-bars, as before. The only essential feature of the invention in this regard lies in introducing a yielding connection between the upper ends of the fingers and the mechanism by which they are operated, the fingers being also mounted to move laterally, or in the direction of the length of the line, and it is manifest that the details in this regard may be varied at will.

It is also to be understood that the number of fingers may increase to any extent desired and that they may be modified in form and arrangement at will provided only they are adapted to move the space-bars upward successively through the line.

After the line has been approximately justified by the operations just described, and after it has been lowered to its position opposite the mold, a final and complete justification is effected by a vertically-movable wedge R, with an easy or gradual taper, arranged with its upper end in position to ascend through the line adjacent to the last space-bar, that is to say, between the last space-bar and the next succeeding matrix. The wedge is pivoted at r to a vertically-moving slide r' , mounted in the frame. At the lower end the wedge has a lateral finger r^2 , which on the descent of the slide encounters a stop-screw r^3 , by which the upper end of the wedge is thrown to the right out of an operative position. When the slide rises with the wedge, the finger is lifted out of contact with the stop and a spring r^4 acts to throw the upper end of the wedge to the left and against the space-bar with which it operates, so that the continued upward motion causes the wedge to pass through the line, thus completing the justification. The lower ends of the matrices may be slightly beveled or rounded to facilitate the entrance of the wedge.

In Fig. 3 the dotted lines indicate the position of the line at the time of its composition, while the full lines illustrate the manner in which the line is carried over the lifting-fingers and the space-bars acted upon by said fingers.

In Fig. 4 the full lines illustrate the matrices in their final or casting position in front of the mold.

While I have illustrated my improvements in connection with the linotype-machine, it is to be understood that they may be used in any machine in which a series of matrices, type, or dies require to be assembled in line and justified.

In Letters Patent issued to me on the 16th day of September, 1890, No. 436,532, I have shown a series of continuously-tapered spaces, the spaces without steps, combined with means by which they are started through the

line successively and advanced unequal and uncertain distances. The present mechanism is distinguishable from said patent, among other things, by the fact that the present spaces increase in thickness step by step, and by the fact that the present mechanism advances the stepped spaces through the line successively, so that as justification progresses the number of spaces which may have their shoulders partly entered in the line is reduced in number, usually to a single space, so that the final space to be filled to complete exact justification will be very small.

I believe the present to be the first instance in which any mechanism has been devised for successively and automatically introducing into the line spaces of predetermined thickness in order to reduce the final space as far as possible and admit of final justification being readily effected.

Having thus described my invention, what I claim is—

1. In a justifying mechanism, a line of matrices or type and a series of stepped space-bars, in combination with mechanism for inserting said bars in the line, in the course of composition, mechanism for thereafter advancing said bars endwise to effect approximate justification, and means for introducing into the line, a wedge to complete the justification.

2. In a mechanism for justifying a composed line of matrices or type, the combination of a series of stepped space-bars adapted to be introduced into the line during its composition, a guide to sustain and permit lateral movement of the line of type and space-bars, mechanism for moving said line laterally and a reciprocating finger or pusher arranged in position to act upon the space-bars and move them successively through the line as they are brought within reach of said pusher by the advance of the line through the guide.

3. In combination with a line of type, stepped space-bars in said line and means for guiding and advancing the line of matrices and space-bars laterally, a series of reciprocating fingers or pushers located in the path of the space-bars and arranged to act successively on said bars to advance them different distances through the line.

4. In a mechanism for justifying aligned matrices or type, the combination of the stepped space-bars adapted to be inserted in the line, one or more reciprocating fingers or pushers to advance the space-bars endwise through the line, supporting or clamping devices to hold the line after the space-bars have been thus advanced, and a wedge adapted for insertion into the line substantially as described and shown.

5. In combination with the guide for sustaining a line of matrices and stepped space-bars therein, and shifting devices to move the line laterally, a reciprocating finger to push the space-bars endwise through the line,

said finger being pivoted and adapted to move laterally with the space-bars.

6. In combination with a line of matrices and intermediate space-bars thicker at one end than at the other, means for shifting the line laterally, a finger to act upon the space-bars successively and advance them through the line as they pass thereover, and a yielding mechanism to reciprocate said finger: whereby the bars may be advanced one after another until the line is approximately justified and certain of the bars advanced beyond the others if demanded.

7. The combination with the series of matrices and stepped space-bars of the composing mechanism, the vertically-movable assembling-block, the laterally-movable shifter, the vertically-reciprocating pushers or fingers, the vertically-movable yoke to receive the line of matrices and space-bars, the clamping-jaws to confine the line, and a vertically-reciprocating wedge to enter said line.

8. The combination of the clamping-jaws and the yoke to sustain the line of matrices, the vertical slide, the wedge mounted on said slide and adapted to move laterally as well as longitudinally.

9. The combination of the justifying-wedge, the slide to which it is pivoted, the stop to throw the wedge laterally when retracted and the spring to throw it in the opposite direction when advanced.

10. In a justifying mechanism, a device unattached to the spaces for adjusting the spaces endwise in the line, and adapted to move in the direction of the length of the line.

11. In a justifying mechanism, as a means of adjusting tapered or expansible spaces endwise through the line, a pushing or advancing device independent of the spaces movable in the direction of the length of the space, and also movable laterally, that is to say, in the direction of the length of the type-line.

12. In combination with a series of type matrices or dies, and a series of stepped spaces, means for advancing the spaces successively definite distances through the line, whereby the line is elongated step by step predetermined amounts.

13. In combination with a line of type matrices or dies a series of spaces each thicker at one end than the other, and means for advancing the spaces through the line step by step predetermined distances to effect justification.

14. In a justifying mechanism, and in combination with a series of stepped spaces, mechanism for advancing said spaces through the composed line predetermined distances.

15. In a justifying mechanism and in combination with stepped spaces, a reciprocating space-advancing finger mounted to yield both laterally and longitudinally.

16. In a justifying mechanism, and in combination with a series of stepped spaces, mechanism for advancing part of the spaces in the line to predetermined points, without advancing the remainder.

17. In a justifying mechanism in combination with a series of stepped spaces, a plurality of fingers acting successively to advance the spaces different distances into the line.

18. In a justifying mechanism, the combination of a series of stepped spaces, mechanism for advancing these spaces to predetermined points to give approximate justification, and means for giving final exact justification.

In testimony whereof I hereunto set my hand, this 14th day of October, 1889, in the presence of two attesting witnesses.

OTTMAR MERGENTHALER.

Witnesses:

PH. H. HOFFMAN,
THOS. FRELAND ELLIOTT.