B. CADE & A. HELDRICH.

LINE COMPOSING AND TYPE CASTING MACHINE.

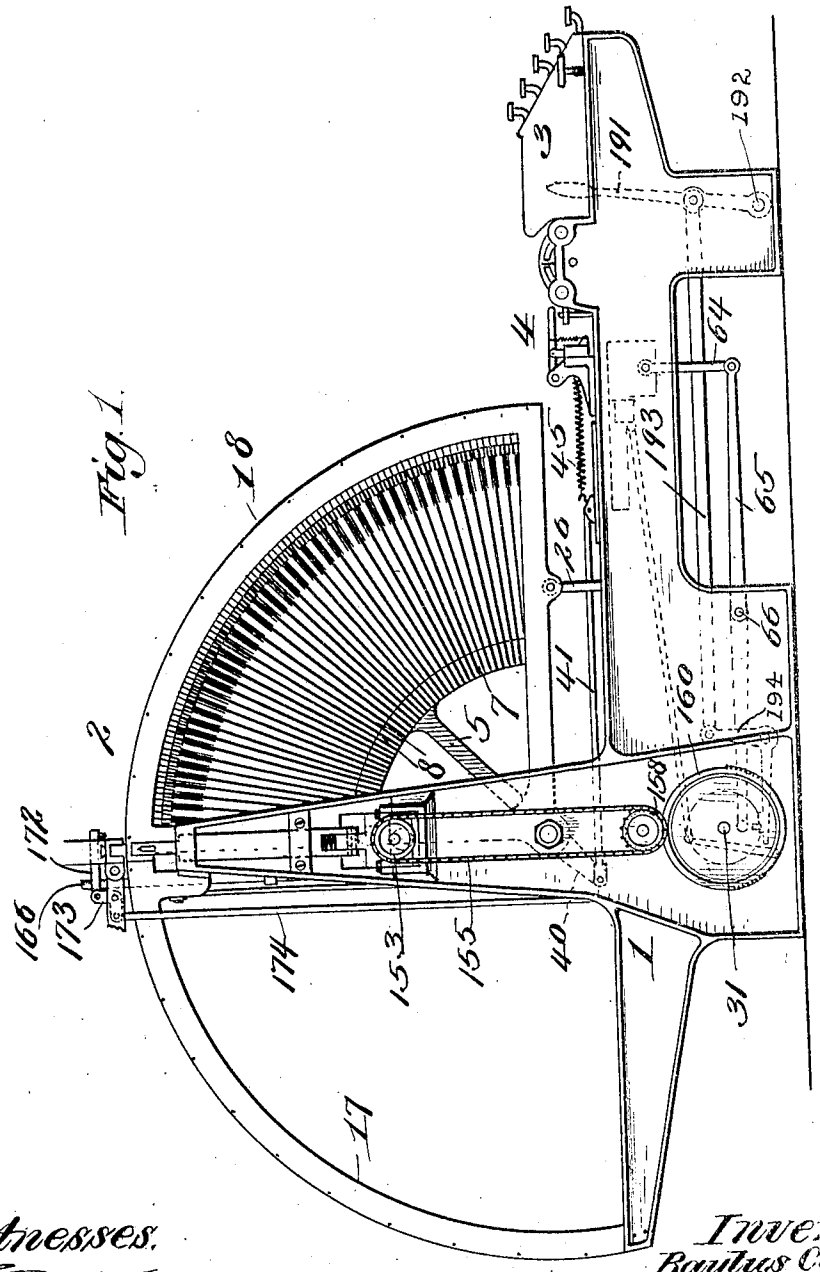
APPLICATION FILED JUNE 24, 1911.

Patented Aug. 13, 1912.

1,035,416.

10 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

Clarence A. Bateman.

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Baylus Cade,

Andrew Heldrich.

By James L. Norris

Atty

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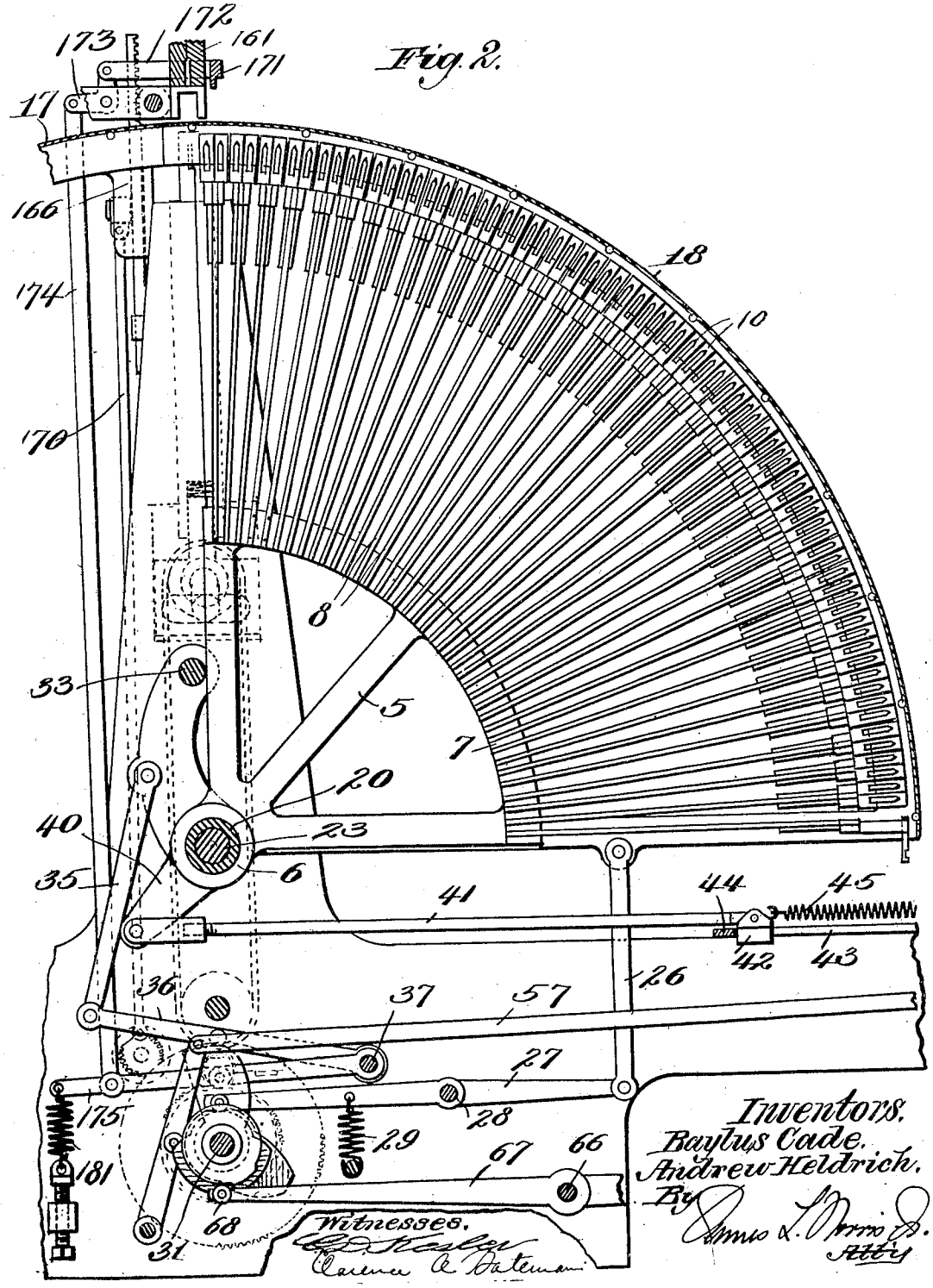
10 SHEETS—SHEET 2.

Fig. 2.



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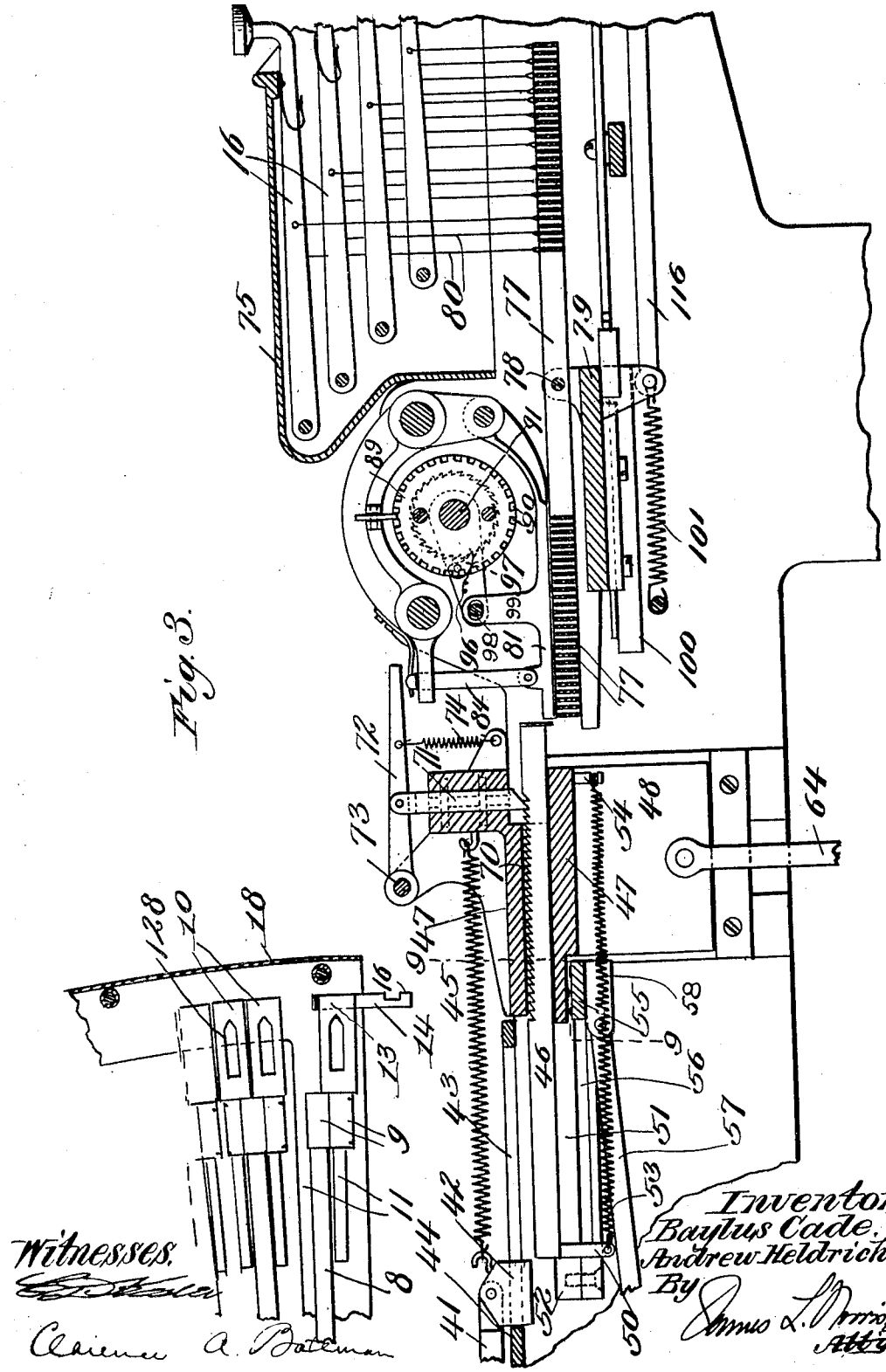

Fig. 3.

Witnesses.

Clarence A. Bateman

Inventors,
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B. CADE & A. HELDRICH.

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10 SHEETS—SHEET 4.

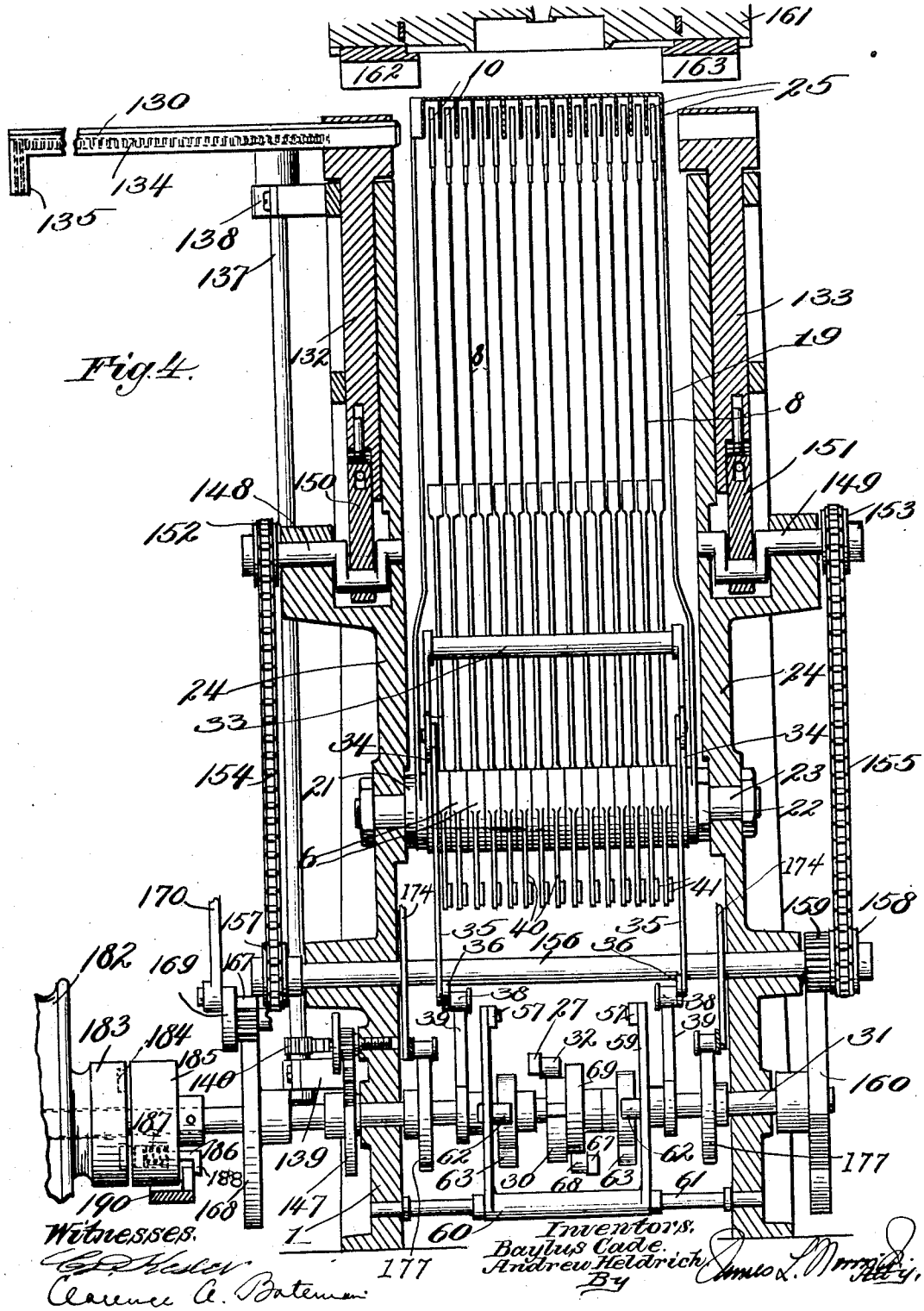

Fig. 4.

B. CADE & A. HELDRICH.

LINE COMPOSING AND TYPE CASTING MACHINE.

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1,035,416. Patented Aug. 13, 1912.

10 SHEETS—SHEET 5.

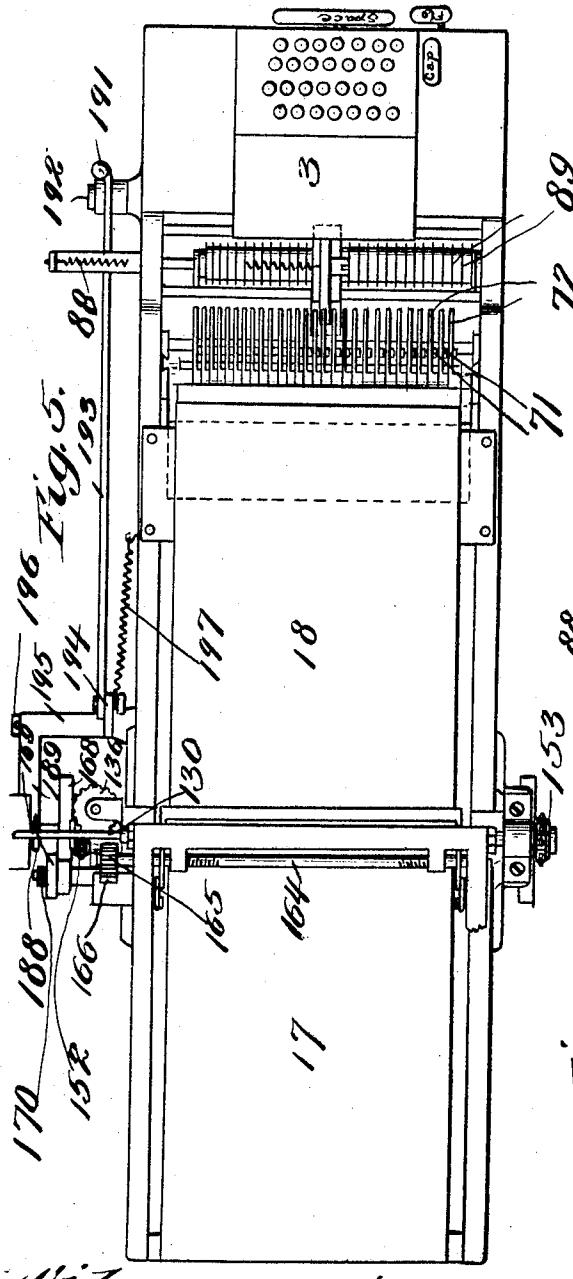

Fig. 5.

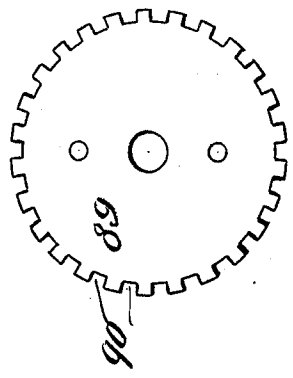

Fig. 8.

Fig. 7.

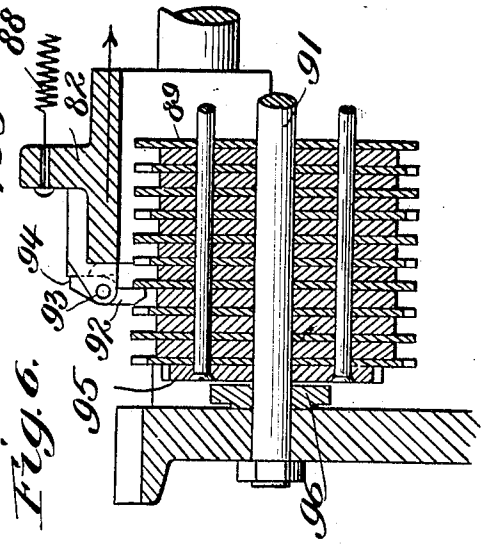

Fig. 6.

Witnesses:

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10 SHEETS—SHEET 6.

Fig. 9.

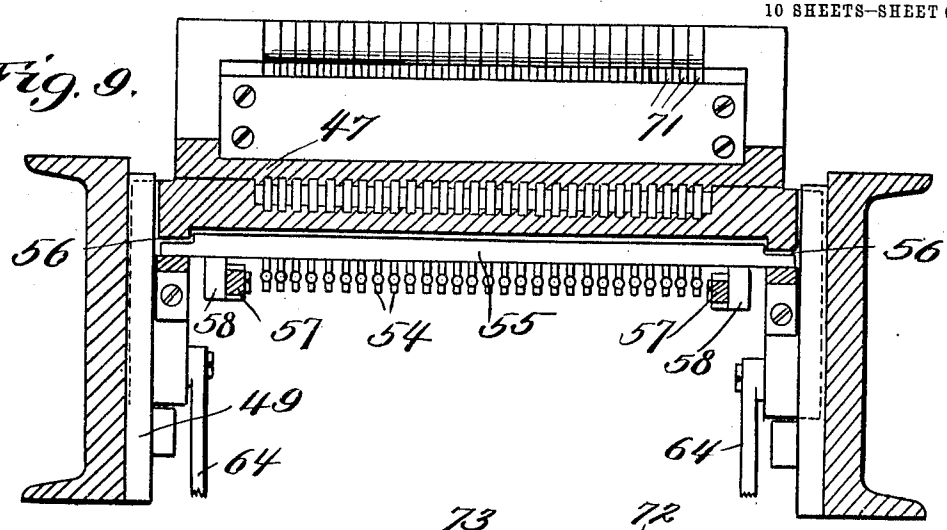


Fig. 10.

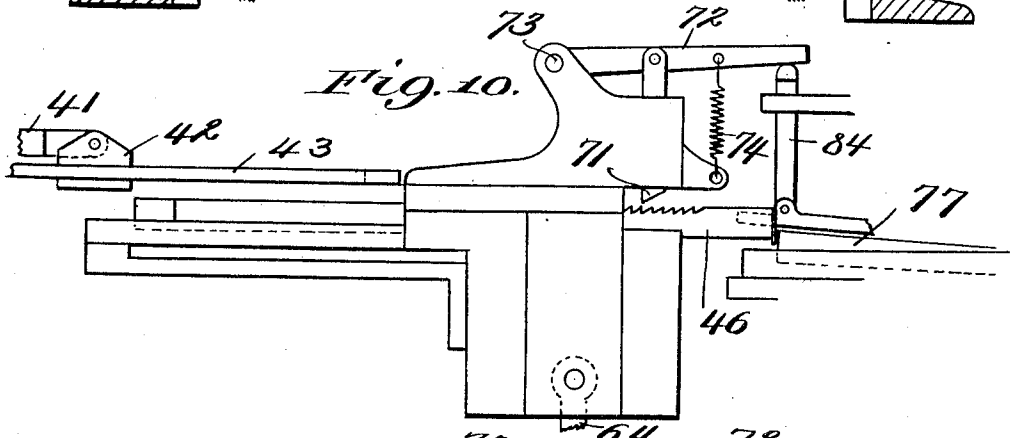
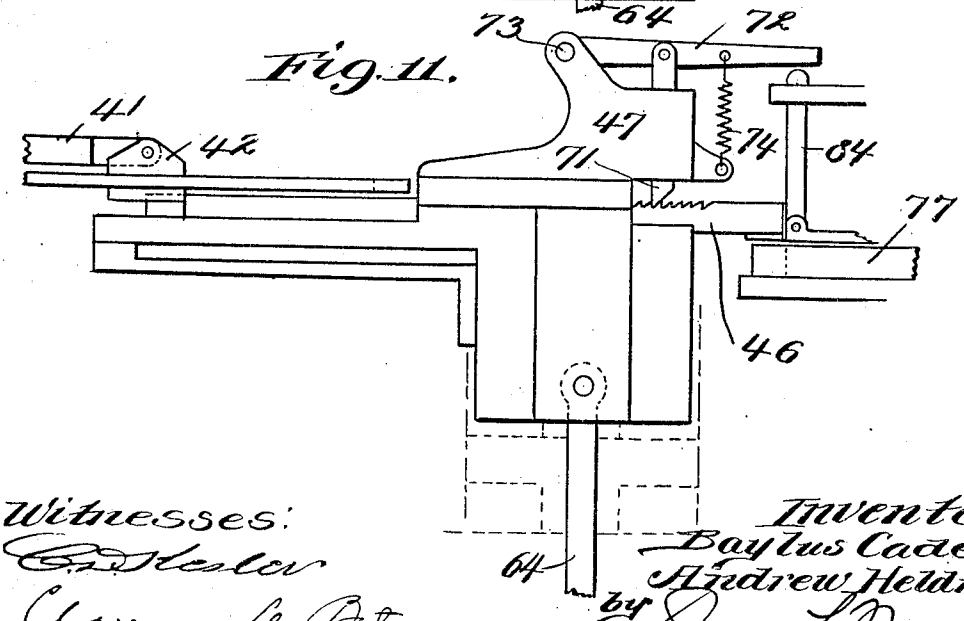


Fig. 11.



Witnesses:

C. F. Keller

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LINE COMPOSING AND TYPE CASTING MACHINE.

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10 SHEETS—SHEET 7.

Fig. 12.

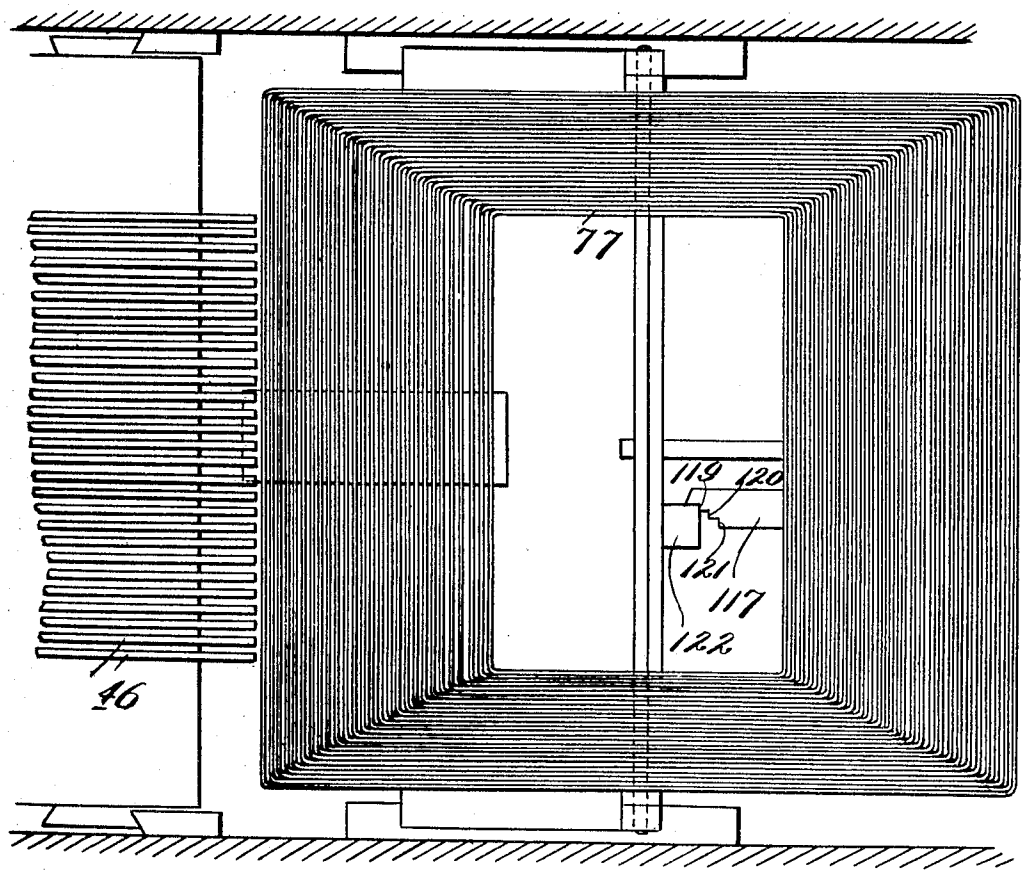


Fig. 13.

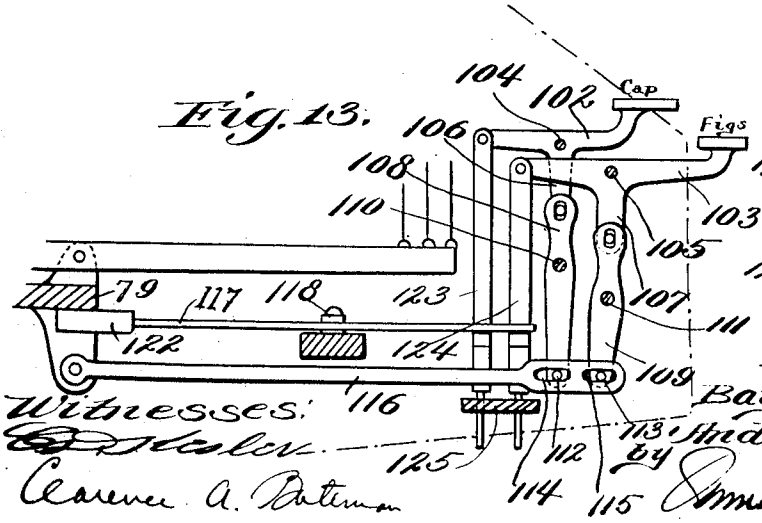
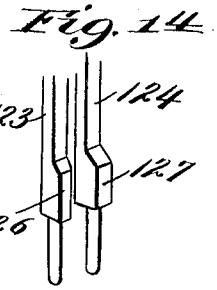


Fig. 14.



Witnesses:

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Andrew Heldrich

by James L. Norris Atty.

B. CADE & A. HELDRICH.

LINE COMPOSING AND TYPE CASTING MACHINE.

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10 SHEETS—SHEET 8.

Fig. 15.

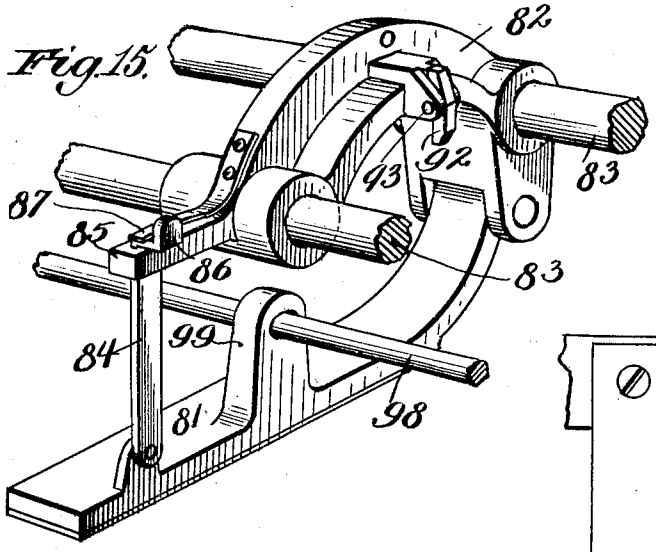


Fig. 16.

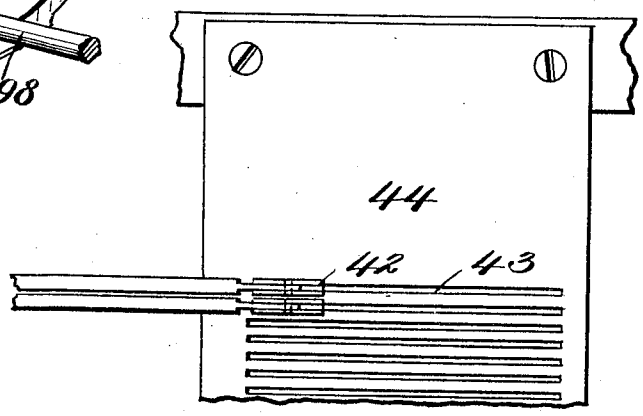


Fig. 17.

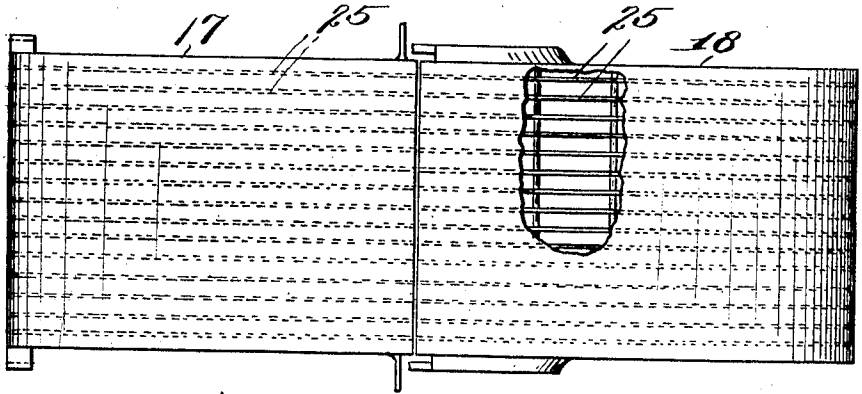
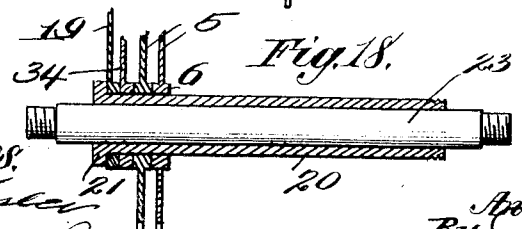


Fig. 18.



Witnesses.

Clarence A. Bateman.

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Baylus Cade.

Andrew Heldrich.

By Innis L. Norris Atty.

B. CADE & A. HELDRICH.

LINE COMPOSING AND TYPE CASTING MACHINE.

APPLICATION FILED JUNE 24, 1911.

1,035,416. Patented Aug. 13, 1912.

10 SHEETS—SHEET 9.

Fig. 19.

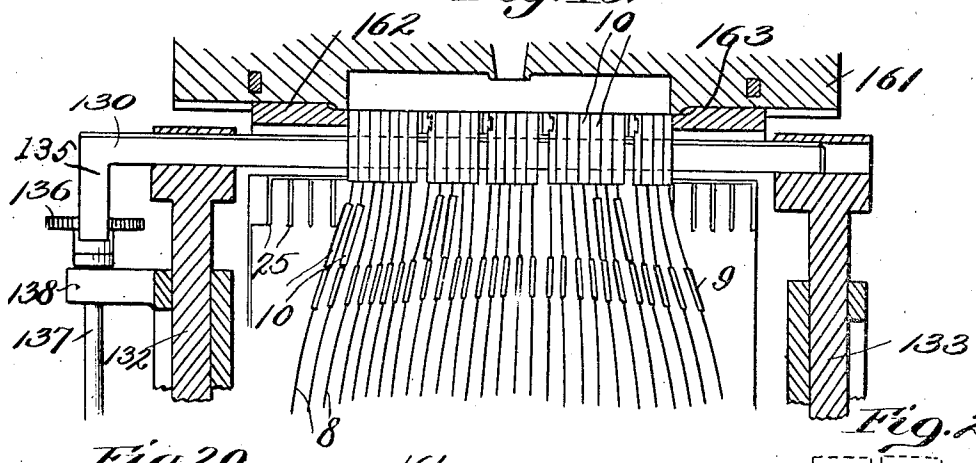


Fig. 24.

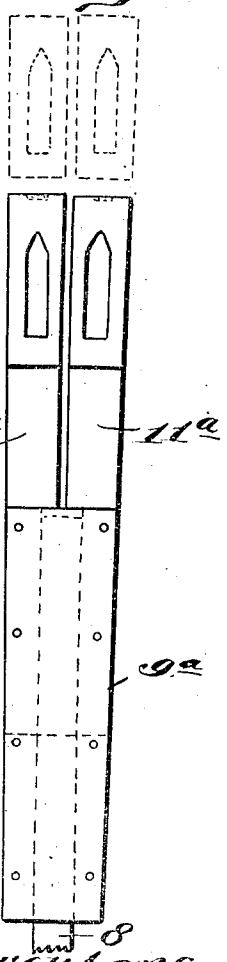


Fig. 20.

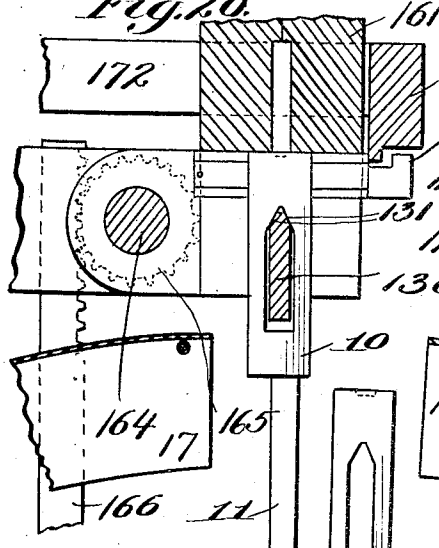


Fig. 21.

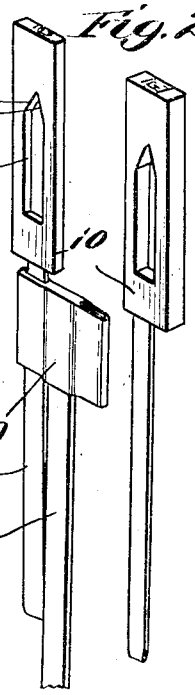
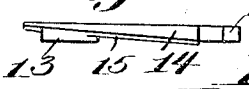


Fig. 22.

Fig. 23.



Witnesses:
E. Hosler
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Andrew Heldrich
by Orris L. Norris Their Atty.

B. CADE & A. HELDRICH.

LINE COMPOSING AND TYPE CASTING MACHINE.

APPLICATION FILED JUNE 24, 1911.

1,035,416.

Patented Aug. 13, 1912.

10 SHEETS SHEET 10.

Fig. 25.

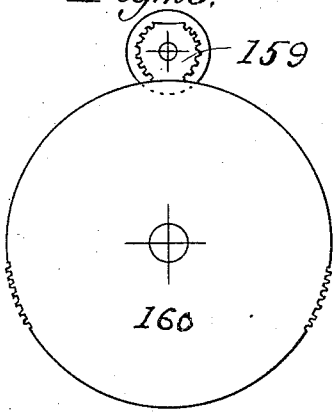


Fig. 26.

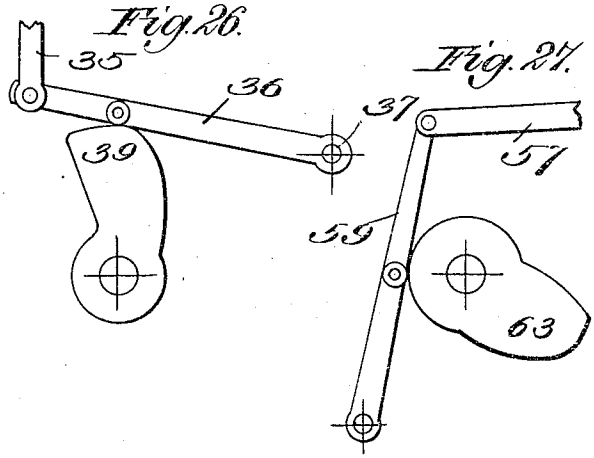


Fig. 27.

Fig. 28.

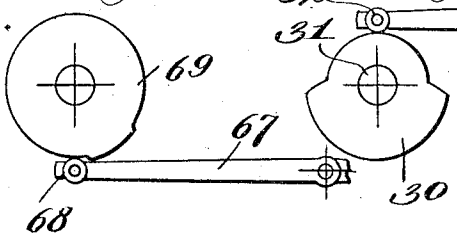


Fig. 29.

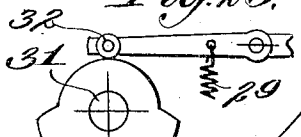


Fig. 30.

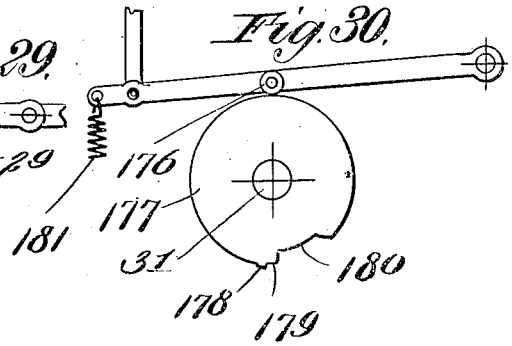


Fig. 31.

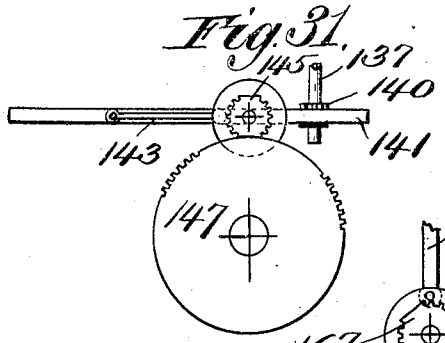


Fig. 32.

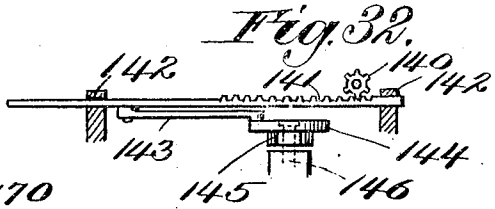
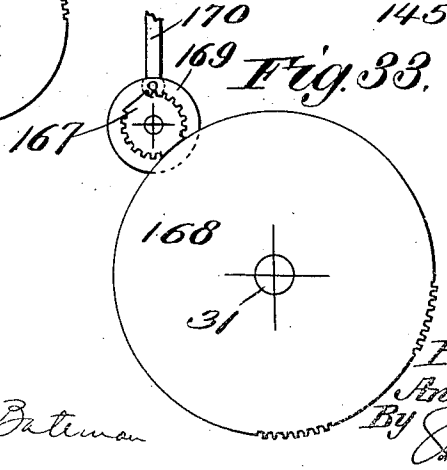


Fig. 33.



Witnesses

Clarence A. Bateman

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Baylus Cade.

Andrew Heldrich.

By James L. Norris Jr.

Atty.

UNITED STATES PATENT OFFICE.

BAYLUS CADE, OF SHELBY, NORTH CAROLINA, AND ANDREW HELDRICH, OF PHILADELPHIA, PENNSYLVANIA; SAID HELDRICH ASSIGNOR TO SAID CADE.

LINE-COMPOSING AND TYPE-CASTING MACHINE.

1,035,416. Specification of Letters Patent. Patented Aug. 13, 1912.

Application filed June 24, 1911. Serial No. 635,175.

To all whom it may concern:

Be it known that we, BAYLUS CADE and ANDREW HELDRICH, citizens of the United States, residing, respectively, at Shelby, in the county of Cleveland and State of North Carolina, and Philadelphia, in the county of Philadelphia, State of Pennsylvania, have invented new and useful Improvements in Line-Composing and Type-Casting Machines, of which the following is a specification.

The present invention relates to improvements in line composing and type casting machines of the kind wherein the type cast is made directly from matrices, and it has for its object primarily to provide a generally improved and simplified machine of this character which can be made and maintained at relatively small cost, and, moreover, rapidity in operation may be obtained, the matrices being mounted on movable sectors or carriers and the selected matrices being brought to the casting point under the control of a keyboard, the necessity of employing expensive and complicated circulating and distributing mechanisms being avoided.

Another object of the invention is to provide in a machine of this type means whereby the selected matrices automatically move to the casting point after a line has been composed, and while a cast is being made on one line, the composing of the next line may proceed, the sectors or carriers for the matrices being automatically restored after each cast has been made.

Further objects of the invention are to provide simple and improved means for assembling and alining the matrices and for moving them into casting position, to provide improved means for justifying a line of assembled matrices whereby a line of matrices will be accommodated between the line-gaging jaws whether the length of the line of matrices as originally assembled is somewhat greater or less than the length of the line, and to provide selecting mechanism of simple and improved construction whereby certainty and facility in the manipulation and operation of the machine are insured.

To these and other ends, the invention consists in certain improvements, and combinations and arrangements of parts, all as will be hereinafter more fully described, the novel features being pointed out particularly in the claims at the end of the specification.

In the accompanying drawings:—Figure 1 is a side elevation of a line composing and type casting machine constructed in accordance with one embodiment of the invention; Fig. 2 represents on an enlarged scale a vertical section through the matrix magazine and showing the main operating shaft and related parts; Fig. 3 represents an enlarged vertical section of that portion of the machine containing the selecting mechanism, including the keyboard; Fig. 4 represents an enlarged vertical section as viewed from the rear of the magazine, the section being taken in a plane transverse to the length of the machine; Fig. 5 represents on a small scale a top plan view of the complete machine; Figs. 6, 7 and 8 are detail views of the escapement mechanism for the traveling carriage which forms part of the selecting mechanism; Fig. 9 represents on an enlarged scale a section on the line 9—9 of Fig. 3 and looking toward the right, certain parts of the machine, however, being omitted; Figs. 10 and 11 are side elevations of the setting bars of the selecting mechanism which are controlled by the keyboard and serve to position the respective matrix sectors or carriers; Fig. 12 is an enlarged top plan view of the lower part of the keyboard mechanism showing the coöperative ends of the setting bars; Figs. 13 and 14 are detail views of a portion of the keyboard shift which enables the keyboard to be set so as to select matrices belonging to lower and upper cases and special characters; Fig. 15 is a detail perspective view of the traveling escapement carriage; Fig. 16 is a top plan view of a portion of the comb which guides the sector-setting links with respect to their corresponding setting bars; Fig. 17 is a top plan view of the magazine housing for the matrices; Fig. 18 is a detail sectional view of the support upon which the sectors and certain other parts of the machine are mounted; Fig. 19 is a sectional view of the mechanism for assembling and alining the matrices and for moving them to casting position with respect to the mold, a portion of the mold being shown as well as the jaws which determine the length of the line; Fig. 20 is a detail sectional view of the mechanism for assembling, alining and justifying

the matrices, the relation of the mold to these parts being also indicated; Fig. 21 is a perspective view of one of the matrix carrying members, one of the matrices being shown in position thereon while the other matrix is shown as removed; Figs. 22 and 23 are detail views of one of the justifying spacers; Fig. 24 shows the end of one of the matrix carrying members wherein the matrices are mounted thereon in a manner somewhat different from that shown in Fig. 21; Fig. 25 is a diagrammatic view of the gearing for operating at appropriate intervals the mechanism which carries the line of assembled and alined matrices to the casting position; Fig. 26 is a diagrammatic view of one of the cams and its respective lever for resetting the matrix sectors; Fig. 27 is a diagrammatic view of the cam and its coöperating lever for restoring the sector-setting bars; Fig. 28 is a diagrammatic view of the cam and its coöperating lever for shifting the sector-setting bars in cooperative relation with the setting links of the sectors; Fig. 29 is a diagrammatic view of the cam and its coöperating lever for opening the magazine housing to permit a line of assembled matrices to be shifted to casting position; Fig. 30 is a diagrammatic view of the cam and its coöperative parts for justifying a line of assembled matrices; Figs. 31 and 32 are diagrammatic views of the gear mechanism for introducing and removing the assembling and alining bar with respect to the matrices; and Fig. 33 is a diagrammatic view of the gearing for opening and closing the jaws or abutments which determine the length of the line.

Similar parts are designated by the same reference characters in the several views.

One embodiment of the invention is shown in the accompanying drawings as an example of a line composing and type casting machine constructed in accordance with the present invention. It will be understood, however, that modifications or changes may be made in the construction or relative arrangement of the parts in applying the invention to the different intended purposes.

In the present instance the machine comprises generally a suitable base frame 1 which supports a matrix magazine 2, a suitable keyboard 3, and selecting mechanism 4, the latter being controlled by manipulation of the keyboard and operative to set the selected matrices in proper position preparatory to a cast. In the present form of the invention the matrices are supported by a suitable number of sectors or equivalent carriers which are placed side by side so that a matrix bearing any desired character or a spacer on each sector may be brought to the assembling point during the composing of a line, the several sectors being for this purpose capable of independent movement while carrying the selected matrix or spacer to the assembling point. In the present instance a plurality of sectors are employed which may be duplicates, each sector 5 having a hub 6 and a rim 7, the rim being adapted to receive and secure the inner ends of a suitable number of matrix or spacer-carrying stems 8. The matrices and spacers are carried on the outer or free ends of the stems 8, the stems for this purpose being arranged radially of the axis of the sector, thereby enabling the desired number of matrices to be accommodated within a comparatively small space, the sector and its matrices in the present instance conforming approximately to a quarter of a circle. To enable the matrices to be deflected laterally with respect to their respective sectors during the clamping and justifying thereof, each matrix supporting stem 8 is preferably composed of a strip of flat steel or other flexible material, the strip being presented edgewise to the plane of rotation of the sector so as to maintain the matrices in proper spaced relation circumferentially but permitting lateral movement of the outer ends of these stems for the purposes just stated. Any suitable means may be provided for mounting the matrices and spacers upon the respective stems. In Figs. 20 and 21 the outer end of each stem has a head 9 secured rigidly thereto, and the bodies of the matrices 10 have shanks 11 which are slidably engaged in the head 9 at either side of the stem 8 so that the matrices are movable in a direction substantially parallel to the length of the stem. In the present instance each stem 8 is shown as provided with two matrices one of which may bear a character belonging, for instance, to the lower case, while the other on the same stem may bear a character belonging to the upper case and the adjacent matrix on the next stem may bear a special character. In Figs. 20 and 21 the matrices on each stem are independently movable. In some cases, however, it may be desirable or advantageous to employ a construction wherein the matrices on each stem are connected so as to move together. Such a construction is shown in Fig. 24 wherein the shanks 11^a of the matrices are secured rigidly to a head or slide 9^a, the latter being slidable longitudinally on the end of the stem 8. In this form of construction both matrices move simultaneously to and from the casting position as indicated by the dotted and full lines in the figure just named. It will be understood that the matrices are grouped appropriately on each sector, each group comprising a set of three matrices for the lower case, the upper case, and special characters respectively. One of the stems 8 carries a spacer which also serves for justifying purposes. We have shown one form of spacer in Figs. 22 and 23, it being

carried by one of the outermost stems 8 of each sector and in the present instance comprises a body 12 having a dove-tailed groove 13 toward its outer end, which groove extends at an incline to the plane of the keyboard of the spacer so as to form a wedge or taper, and an adjustable section 14 is provided which has a rib 15 to operate in the dove-tailed and inclined groove in the body of the spacer, that face of the section 14 which coöperates with the body of the spacer being also inclined to form a wedge surface. Normally, the body of the spacer engages the adjustable section 14 at a point removed from the narrower end of the latter and when the section 14 is moved in one direction it will diminish the lateral dimension of the spacer and when moved in an opposite direction it will increase the lateral dimension of the spacer and, during the justification of the line of matrices, the expansion of each spacer in the line will compress the line of matrices so as to effectively fill out the length of the line. The adjustable section 14 of the spacer is provided with an upturned projection 16 by means of which the spacer is adjusted, as will be hereinafter described.

The magazine space or chamber which contains the matrices and their respective sectors is preferably inclosed substantially by a housing. In the present instance, the housing is shown composed of two sections 17 and 18, each section being in the form substantially of a quarter circle. The section 17 is secured in stationary position upon one end of the machine as shown in Fig. 1. The housing section 18, however, is movable relatively to the section 17 and in the present instance the sides 19 of the housing section 18 are rotatably mounted on the opposite ends of a sleeve 20. This sleeve has a shoulder or flange 21 at one end and a nut or threaded collar 22 is applied to the opposite end of the sleeve to serve as a shoulder. The sleeve 20 is also utilized in the present instance as a journal for the hubs 6 of the several sectors. The sleeve 20 is supported upon the machine by a shaft 23 which extends axially through the sleeve and has its ends engaged in two uprights 24 which rise from the base frame 1 of the machine, it being understood that the matrix carrying sectors operate in the space between these uprights. The movable housing section 18 is concentric and continuous with the stationary housing section 17 when the housing section 18 is in elevated position, one end of the housing section 18 then abutting against the adjacent end of the housing section 17. Moreover, both sections of the housing are preferably formed with circumferential flanges 25 which form channels to maintain proper separation of the matrices of the different sectors, the matrices of each sector operating in one of the channels. By providing these channels, lateral deflection and interference between the matrices of the different sectors are avoided. Upon referring to Fig. 17 it will be observed that the flanges 25 which form these channels are in alinement in the two sections of the housing. By lowering the adjustable housing section 18, an opening is formed between the two housing sections through which the line of selected matrices may pass to the casting position. The machine is provided with suitable means for automatically shifting the housing section 18 to permit such passage of matrices at the proper time, the housing section 18 being normally supported in elevated position in the present instance by a link 26 fitted thereto, a lever 27 which is mounted to rock on a pivot 28, and a tension spring 29. The housing section 18, however, is lowered at appropriate intervals by a cam 30 of appropriate shape and adjustment which is fixed to the main operating shaft 31, this cam coöperating with a roller or projection 32 carried by the lever 27.

The matrix carrying sectors are normally contained in the housing section 18 as shown in Fig. 2, but these sectors swing toward the rear and enter more or less the housing section 17 as the selected matrices move to the assembling point. After a cast has been made from one line of matrices, all the matrix carrying sectors are restored to their original position in the housing section 18. The restoring means for the sectors comprises in the present instance a cross bar 33 which extends across the rear of the several sectors, this cross bar being supported by bearing arms 34, each of which has a hub which is journaled on the sleeve 20 between the respective sides 19 of the adjustable housing section and the outermost matrix carrying sector. A pair of links 35 are pivotally connected to the bearing arms 34 and the lower ends of these links are pivotally connected to a corresponding pair of operating levers 36 which are mounted to swing on axes 37. The levers 36 are provided with rollers or projections 38 which bear upon cams 39, these two cams being duplicates and are fixed to the main shaft 31. These cams are so shaped and timed as to operate the cross bar 33 to reset all the matrix carrying sectors after each casting operation.

The positioning of any selected matrix is accomplished by rotation of its respective sector about the sleeve 20 as an axis, and the selection of the different matrices is governed by the degree of rotation of the sector under the control of a keyboard and appropriate selecting mechanism. In the present instance each sector has an arm 40 rigidly attached thereto, a link 41 is pivotally con-

nected to said arm, and each link 41 is operatively connected to a head 42, there being one head 42 for each sector, and these several heads operate in slots 43 formed in a comb-like guide 44 which guide is preferably secured to the side members of the machine frame or to any other appropriate stationary part. A tension spring 45 is also provided for each sector, this spring having a tendency to shift its respective sector and thereby carry a selected matrix to the assembling point. In the present instance, one end of each spring 45 is attached to the corresponding reciprocable head 42, the other ends of these springs 45 being attached to suitable stationary parts of the machine. The matrix carrying sectors, however, are held from operation under the influence of the springs 45 for an appropriate period by a group of setting bars, and these setting bars also operate under the control of the keyboard to govern the degrees of rotation of the several sectors whereby the selected matrices will be brought to the assembling point. In the present instance, a group of setting bars 46 is shown which may be arranged in parallel relation and are guided to reciprocate in slots formed in a cross head 47, this cross head being movable vertically with respect to the guide 44 which supports the reciprocatory heads 42. For this purpose, the cross head 47 is provided with uprights 48 at its ends and these uprights coöperate with vertical guides 49 which in the present instance are arranged between and on the side members of the frame. When the cross head 47 is in its lower position, the setting bars will be in coöperative relation with the keyboard mechanism and will be in inoperative position with respect to the reciprocatory heads 42 which are connected to the several sectors, and when the cross head 47 is in elevated position, the setting bars will be in inoperative condition with respect to the keyboard mechanism and will be in cooperative relation with the heads 42 which control the positioning of the sectors. Each of the setting bars 46 is provided with a projection 50 which extends downwardly through a longitudinal slot 51 formed in a rearward extension 52 of the cross head, and a tension spring 53 is attached to each of these projections 50, one spring being provided for each setting bar, the opposite ends of the spring 53 being attached to individual posts 54 secured to the body portion of the cross head 47. A slide 55 also operates longitudinally of the cross head and in slots 56 which are provided for this purpose at opposite ends of the cross head, this slide 55 being normally clear of the paths of the several projections 50 during the setting of the bars 46, but after such bars have been set and the sectors have been positioned by the aid of the bars 46, the slide 55 is shifted rearwardly in its slots 56 and, by engaging the projections 50 on the several setting bars 46, the latter are restored to initial or normal position. The slide 55 is operated at appropriate intervals by a pair of links 57 which are pivotally connected to the lugs 58 formed on the under side of the slide 55 and the opposite ends of the links 57 are pivotally connected to a pair of arms 59 the lower ends of which are fixed to a sleeve 60, the latter being mounted to rock on a cross bar 61 secured to the side frames of the machine, and the arms 59 are provided with rollers or projections 62 which cooperate with a pair of cams 63 both of which are fixed in appropriate positions on the main shaft 31. The elevating and lowering of the cross head 47 is accomplished by a pair of links 64 which are pivotally connected to the uprights 48 at the ends of the cross head, these links 64 being pivotally connected at their lower ends to a pair of levers 65 which are secured to a rock shaft 66, and this shaft in turn has an arm 67 fixed thereto and provided with a roller or projection 68 which coöperates with a cam 69 of appropriate shape, this cam being fixed to the main shaft 31.

Appropriate means is provided for locking the setting bars 46 in different positions as determined by the keyboard mechanism. In the present instance the upper edge of each setting bar 46 is formed with a set of ratchet-shaped teeth 70, and a pawl or dog 71 is provided for each bar, the lower end of the pawl being adapted to coöperate with the teeth of the respective bar and to thereby lock the bar in set position. It will be understood that one of these pawls 71 is provided for each bar 46, the upper end of each pawl being operatively connected to an operating arm 72, the several operating arms for the group of setting bars being arranged in a row and preferably mounted to rock on a common shaft 73. Each pawl 71 is yieldably held in locking engagement with its respective setting bar by a tension spring 74.

Keyboard mechanism of any suitable kind may be used. It is preferable, however, to use keyboard mechanism such as that shown in the present instance, it embodying a suitable casing 75 containing appropriate key levers 76. Preferably the keyboard is of the universal type, the number of key levers being thereby reduced materially. A set of nested frames 77 are arranged beneath the key levers, these frames being preferably of rectangular form and varying progressively in size. These frames are all mounted on a common pivot 78 and this pivot is supported by suitable lugs carried by a horizontally shiftable slide 79. One of the frames 77 is connected to each key lever of

the keyboard, wires or equivalent devices 80 being used for this purpose, the construction being such that when any one key lever is operated or depressed, it will cause its corresponding frame 77 to be depressed at one side of the pivot or axis 78 and to be elevated at the opposite side of its axis, the elevated side of the frame being thereby placed in the path of movement of the forward ends of the setting bars 46, the cross head carrying these bars being in lowered position during manipulation of the keyboard and the elevated part of the frame thereby acting as a graduated stop to arrest the forward motion of any one of the setting bars 46 operating under the influence of its spring 53, this action being illustrated diagrammatically in Fig. 10. In order, however, to permit any one of the setting bars 46 to move forward and engage any one of the frames 77, it is first necessary to retract or disengage its respective pawl 71. The present invention provides an escapement for this purpose which shifts progressively from the operating arm 72 of one pawl to the next during the composing of a line. This escapement in the present instance consists of a foot 81 which bears upon the tops of the frames 77 in a zone between the pivot 78 and the group of setting bars. This foot 81 is pivotally connected to a head 82 in such a way as to permit the foot 81 to rise and fall, and the head 82 is slidable on a pair of guide bars 83 which bars are preferably secured rigidly to the sides of the main frame, the head 82 being capable of a sliding or traversing movement in a direction transversely of the machine. The foot 81 is also pivotally connected to the lower end of an actuating member 84, the upper end of this member being guided in a lug 85 carried by the head 82 and is provided with a laterally offset projection 86 which is successively positioned beneath each operating arm 72 for the several pawls, being transferred from one to the other by the traversing movement of the head 82 which, together with the foot 81, constitutes a carriage. The actuating member 84 and the foot 81 are returned to initial or depressed positions by a suitable spring 87.

Different means may be provided for imparting a traversing movement to a carriage composed of the head 82, the foot 81 and related parts. In the present instance, a spring 88 serves to shift this carriage under the control of an appropriate escapement mechanism. The escapement mechanism consists in the present instance of a roll or cylinder which may be conveniently built up of a suitable number of circular disks or plates 89, these disks or plates being toothed or provided with notches 90 in their peripheries and the disks or plates are so assembled that the notches of one disk are presented opposite to the solid or unnotched portions of the next adjacent disk, as shown in Fig. 7. The roll or cylinder embodying these notched disks is rotatably mounted on a suitable shaft 91 which may be supported between the side members of the frame. The head 82 of the carriage is provided with a dog 92, the dog being pivoted to the head at 93 and has one end shaped to form an abutment 94 which will permit pivoting movement of the dog in one direction and will prevent such movement in a reverse direction. In operation the slide 82 of the escapement carriage is placed at the left hand side of the machine and will be held in such position by the engagement of the dog 92 with the disk at the extreme left of the roll or cylinder, and after each operation of a key lever of the keyboard, the carriage will be permitted to move one step toward the right. This is accomplished by imparting successive rotations to the escapement roll or cylinder so as to permit the dog on the carriage to pass through the notch of one disk and abut against the unnotched or solid portion of the next disk to the right. In the present instance, a ratchet wheel 95 is fixed to one end of the escapement roll or cylinder, an arm 96 is loosely mounted on the shaft 91 adjacent to the ratchet wheel, the arm 96 carries a spring-pressed pawl 97 which cooperates with the teeth of the ratchet wheel, and a rod 98 is fixed to the pawl-carrying arm 96 and is operatively engaged by a lug 99 on the vertically movable foot 81. If desired, one of these ratchet wheels 95 and the coöperating pawl-carrying arm may be arranged at each end of the escapement roll or cylinder. The ratchet teeth of the wheel 95 are so shaped that upward movement of the foot 81 will cause the pawl 97 to ride over the teeth and downward movement of the foot 81 will cause the pawl to coöperate with the ratchet wheel to rotate the escapement roll one step, thereby permitting the actuating member 84 to shift from beneath the pawl-operating arm 72 which it has just operated, to the next pawl-carrying arm to the right. Of course the retaining pawl of each setting bar will not release such setting bar until one of the frames 77 has been tilted so as to present itself as a stop to properly position the setting bar, each pawl 71 operating to release the setting bar, and after the latter has moved into such position, the pawl relocks the bar and holds it in proper position until the matrix carrying sectors have been positioned under the control of the setting bars. The setting of the matrix carrying sectors is controlled by the setting bars 46, the cross head 47 which carries the setting bars being first elevated so as to position these bars in the paths of movement of the respective heads 42, and subsequently, the cam 39 will operate to permit the cross

bar 33 to move rearwardly under the stress of the springs 45 which are individual to the matrix carrying sectors. The springs 45 serve to move the respective sectors until the heads 42 abut against the rear ends of the setting bars 46, the motion of the sectors being thereby arrested and the selected matrices will be in assembling position.

In order to permit the use of a universal keyboard in selecting matrices from more than one case, the slide 79 is guided to move longitudinally on supports 100 arranged between the sides of the main frame. The slide 79 is ordinarily in rearmost position or occupies a position to the left, as shown in Fig. 3, and is held in such position by a tension spring 101. In order, however, to shift from a lower case to, for example, an upper case, or to enable matrices bearing special characters to be selected, a pair of shift keys may be added to the keyboard, a shift key 102 being provided in the present instance to set the machine to select a matrix from an upper case and a shift key 103 being provided to enable the machine to select a matrix bearing a special character or figure. These two shift keys are mounted to rock on pivots 104 and 105 respectively, and they have angular arms 106 and 107 which coöperate respectively with levers 108 and 109, these levers being fulcrumed on pivots 110 and 111 respectively and carrying pins 112 and 113 which engage in slots 114 and 115 formed in one end of a link 116, the latter being connected to the slide 79. In using two shift keys, the slide 79 is capable of occupying any one of three positions for the selection of matrices from the lower case, the upper case, and special characters when the latter are employed, and in order to insure a proper setting of the slide in the desired position, a pivoted stop lever 117 is used which is fulcrumed at 118 and has a set of three shoulders 119, 120 and 121 formed on its forward end and in such position that any one of these stops may coöperate with an abutment 122 which is secured to and movable with the slide 79. Ordinarily in selecting matrices belonging to the lower case, the abutment 122 on the slide 79 will rest against the first stop 119 of the stop lever 117. In selecting matrices belonging to an upper case, for example, the abutment 122 will rest against the stop or shoulder 120, and in selecting matrices bearing special characters when such are employed, the abutment 122 will rest against the third stop or shoulder 121. In order to properly position the stop lever 117, according to which of the shift keys is actuated, a pair of setting bars 123 and 124 are employed, the upper ends of these bars being operatively connected to the shift keys 102 and 103 respectively, and their lower ends are guided in a suitable cross bar 125. The lower portions of the setting bars are also formed with lateral cams 126 and 127 which are adapted to bear against one side of the stop lever 117 and thereby position it so that the appropriate shoulder or stop thereon will engage the abutment 122.

The present invention provides suitable means for assembling and alining the selected matrices and for properly positioning them with respect to the mold. In the present instance the body of each matrix and the body of each spacer has an aperture 128 the upper end of which is formed with oppositely inclined surfaces 129. When a set of matrices and spacers are assembled, these apertures are in alinement. It is necessary, however, to aline the faces of the matrices accurately and this is accomplished in the present instance by an assembling and alining bar 130 the upper edge of which has reversely beveled or inclined surfaces 131 conforming to and adapted to coöperate with the inclined surfaces at the upper ends of the apertures in the bodies of the matrices and spacers. This assembling and alining bar is introduced longitudinally through a line of matrices and is then shifted to extend the matrices and spacers with respect to the sectors and to carry the matrices and spacers to the casting position. For this purpose the assembling and alining bar is slidably engaged in the upper end of an elevator member 132 which is guided to reciprocate in one of the uprights 24 of the frame, and one end of the bar is also adapted to enter a slot in the upper end of a corresponding elevator member 133 which is guided to reciprocate vertically in the other upright of the frame. One side of the bar 130 is formed with a rack 134 and one end of the bar has a downturned extension 135 which is also formed with rack teeth which are a continuation of those on the body of the bar. A gear wheel 136 coöperates continuously with the rack teeth on the bar and its extension, the gear wheel being non-shiftable with respect to the frame of the machine while the assembling and alining bar is shiftable both vertically and laterally. The gear wheel 136 is fixed to a shaft 137 mounted in a bearing 138 formed on one of the uprights of the machine frame and the lower end of the shaft is supported by a bearing 139 and carries a pinion 140 which coöperates with a rack 141. The rack 141 is mounted to reciprocate in bearings 142 and is periodically shifted alternately in reverse directions by a pitman 143 which is connected to a crank disk 144, the latter being fixed to turn with a mutilated gear 145, the latter and the disk being journaled on a shaft 146. The mutilated gear 145 coöperates with a second and larger mutilated gear 147 which is fixed to the main shaft 31, rotation of the main shaft causing the mu-

tilated gear 145 to make a half revolution intermittently periodically and to thereby shift the rack alternately in reverse directions. Reciprocation of the rack causes rotation of the shaft 137 and the latter operating through the gear wheel 136 will cause the assembling and alining bar 130 to be introduced and withdrawn with respect to a line of matrices and spacers.

The elevator members 132 and 133 are alternately raised and lowered between the periods of operation of the assembling and alining bar. The elevator members may be operated in any suitable way, a pair of crank shafts 148 and 149 being journaled in the present instance in the uprights of the frame and are provided with pitmen 150 and 151 which are suitably connected to the lower ends of the respective elevator members 132 and 133. The outer ends of the shafts 148 and 149 are provided with sprocket wheels 152 and 153, chains 154 and 155 coöperate with the respective sprocket wheels on the crank shafts, a countershaft 156 is journaled in the frame and provided with sprocket wheels 157 and 158 which coöperate with the chains 154 and 155 respectively, and the countershaft is operatively connected to the main shaft of the machine through the medium of a mutilated pinion 159 on the countershaft and a larger mutilated gear 160 on the main shaft, this mutilated gearing causing intermittent movements at appropriately timed intervals for the elevator members. Upward movement of the assembling and alining bar through the medium of the mechanism just described causes the matrices and spacers to be drawn outwardly with respect to the several sectors, such movement being permitted the matrices and spacers owing to the slidable connections between these parts and their stems.

A portion of the mold 161 is shown in Figs. 19 and 20, this mold being arranged directly above the opening which is formed between the two sections of the magazine housing when the adjustable section is lowered. The mold is preferably split or formed in sections in order that it may be opened by any suitable or well known means to permit the slug or type to be removed therefrom, provision being thereby made for the casting of perfect slugs which do not require subsequent trimming. Jaws 162 and 163 are mounted adjustably at the bottom of the mold, these jaws serving to gage the length of the line and to sustain the compression upon the line when justified. Any suitable means may be employed for separating the jaws to facilitate removal and insertion of the line of matrices between them and for closing the jaws to set the length of the line. In the present instance, these jaws are operatively connected by a screw 164 having right and left hand threads engaging the jaws, the screw is provided with a pinion 165, and a vertically movable rack 166 coöperates with the pinion whereby the screw is turned to close and open the jaws. This rack may be operated intermittently and at appropriate intervals by a mutilated pinion 167 and a mutilated gear 168 which is fixed to the main shaft 31, the mutilated pinion 167 being fixed to a crank disk 169 and a link 170 is connected to the crank disk and to the rack 166.

Justifying of the line is accomplished by a bar 171 which is arranged adjacent to the mold and is guided to move toward and from the mold by arms 172, these arms being operatively connected to a pair of bell-crank levers 173 and the latter are operatively connected by links 174 to a pair of levers 175, each of the levers 175 carrying a roller or projection 176 which coöperates with a cam 177 fixed to the main shaft 31. Each cam 177 has a high part 178, an intermediate part 179, and a low part 180, these parts successively engaging the roller 176 in the order named, and as the lower edge of the justifying bar 171 is in position to coöperate with the adjusting projections 16 of the justifying spacers, the spacers will be adjusted first to contract them and diminish their thickness, thereby enabling an assembled line of matrices to enter between the jaws 162 and 163 even though the line of matrices may be slightly longer than the space provided between these jaws when set to gage the length of the line, and the bar 171 will subsequently operate to expand the spacers and thereby justify and lock the line, the bar 171 being operated yieldably under the action of springs 181 which have screws, as shown, for adjusting the tension thereof.

In the machine shown in the present instance, the main shaft with the cams and driving mechanisms thereon makes one revolution to perform the various functions constituting a cycle of the machine. Clutch mechanism under the control of the operator is employed in the machine as shown for setting the main shaft in operation and for arresting its movement after the cycle of operations has been completed. For this purpose, the main shaft has a pulley or equivalent driving device 182 mounted loosely thereon, the hub 183 of the pulley having its inner side formed with a suitable number of circularly spaced notches 184, a clutch collar 185 is secured in fixed position on the main shaft, and the clutch collar is provided with an axially movable dog 186, the head of which is adapted to engage one of the notches 184 in the hub of the pulley and thereby form a driving connection between the pulley and the shaft. A spring 187 tends to move the dog into engaged position and to hold it in such po-

sition, one end of the dog being exposed and formed with a tail 188 whereby the dog may be withdrawn from engaged position. Preferably, the dog is automatically disengaged to interrupt the operation of the main shaft each time this shaft completes a revolution, and to accomplish this result, an arm 189 is provided which is formed with a foot 190, the latter having an inclined face to engage the tail of the dog and thereby retract the latter, assuming the arm 189 to occupy its ordinary elevated position, and while said arm occupies such a position, the operation of the main shaft will be interrupted. Lowering of the arm 189 will, however, release the tail of the dog, permitting the latter to operate under the influence of its spring to establish a driving relation between the driving pulley and the main shaft. The position of the clutch-controlling arm is governed by a handle 191 which is located at a suitable point within convenient reach of the operator, it being shown pivoted at 192 to one side of the keyboard and is operatively connected by a link 193 to an arm 194, the latter being fixed to a sleeve 195 to which sleeve the clutch-controlling arm 189 is also fixed, said sleeve being pivoted on a suitable support 196. A spring 197 connected to the arm 194 serves to yieldably retain the clutch mechanism in disengaged condition.

The cycle of operations of the machine hereinbefore described is as follows: The line of matter is composed by manipulation of the keyboard, the depression of each key causing the rear portion of its corresponding frame 77 to rise and occupy a position in front of the group of selecting bars 46, the rocking of such frame causing the foot 81 to rise whereby the actuating member 84 connected thereto will operate to release the pawl 71, and allowing the corresponding selecting bar 46 to move forwardly under the action of its spring until arrested by the elevated part of the frame 77. When the depressed key of the keyboard is permitted to rise or return to normal position, the foot 81 will return to its lower position, thereby permitting the pawl 71 to relock the actuated bar 46 in its set or adjusted position, and the escapement roll or cylinder will also be rotated one step, thereby causing the escapement carriage to shift one step to the right so as to position the actuating member 84 in coöperative relation with the next pawl-operating arm 72 to the right of the one just operated. The keyboard is manipulated in the usual way until the line has been composed, it being understood that during the composing of the line, the main shaft of the machine is at rest, and the selecting bars occupy their lower position. After the selecting operation has been completed, the handle 191 is operated to set the clutch in driving condition, whereby the main shaft is caused to make a complete revolution. The first operation of the main shaft is to elevate the adjusted selecting bars so as to set them in coöperative relation with the sliding heads 42 for the different matrix carrying sectors. The next function performed by the main shaft is to allow the matrix carrying sectors to adjust themselves to the adjustments of their respective selecting bars while the latter are in elevated position, this function being performed by a receding movement of the cross bar 33, the sectors adjusting themselves to bring the selected matrices to the assembling point, under the influence of their respective springs. After the sectors have been adjusted in this way, the assembling and alining bar 130 is caused to enter the apertures in the bodies of the matrices and spacers, and before the assembling and alining bar has been so introduced, the housing sections are relatively separated to provide an opening therein. The assembling and alining bar is next elevated to carry the line of matrices and spacers through the opening in the housing and into coöperative relation with the mold, the alining bar insuring perfect alinement of the line of matrices. The selecting bars are next lowered to return them to coöperative relation with the keyboard mechanism and these selecting bars are then reset, permitting the keyboard to be manipulated to compose the next line of matter by readjusting the selecting bars. While the composing of the next line is proceeding, the previously composed line of matrices on the assembling and alining bar is closed by approaching movement of the end jaws which determine the length of the line, the line of matrices is justified, and a cast is made from the matrices. After the cast has been made, the justifying wedges composing the spacers are withdrawn, the line of matrices is released by the end jaws, the assembling and alining bar is lowered to return the matrices to their usual or normal positions with respect to the different sections, the assembling and alining bar is withdrawn, and the sectors are then reset and the housing closed, the rotation of the main shaft being then automatically interrupted by opening of the clutch.

We claim as our invention:—

1. In a line composing and type casting machine, the combination of a mold, and a set of movable carriers, each having a plurality of matrices shiftably mounted to shift endwise thereon, means for selecting matrices on the different carriers, and an assembling and alining bar coöperative with the matrices to aline and shift them into casting position with respect to the mold.

2. In a line composing and type casting machine, the combination of a mold, a plu-

rality of movable carriers, each supporting endwise shiftable matrices, keyboard controlled means for causing movement of the different carriers to bring the selected matrices to an assembling point, and means for shifting and alining the assembled matrices in coöperative relation with the mold.

3. In a line composing and type casting machine, the combination of a plurality of rotatable members, each carrying a plurality of radially shiftable matrices, keyboard controlled means for causing independent movements of said members to position selected matrices at an assembling point, and a bar for assembling and alining the selected matrices.

4. In a line composing and type casting machine, the combination of a mold, a set of rotatable members, each carrying a plurality of radially shiftable matrices, keyboard controlled means for causing movement of the different members to position selected matrices at an assembling point, an assembling and alining bar, and means for operating said bar to first assemble the selected matrices and to subsequently shift and aline the matrices in coöperative relation to the mold.

5. In a line composing and type casting machine, the combination of a mold, a set of rotatable sectors, each having a plurality of radially shiftable matrices thereon, selecting means for causing rotation of the different sectors to position the selected matrices at an assembling point, and means cooperative with the selected matrices to shift them outwardly with respect to the different sectors and to position and aline them in cooperative relation to the mold.

6. In a line composing and type casting machine, the combination of a mold, a set of rotatable sectors, each carrying a plurality of laterally and endwise movable matrices, selecting means for causing movements of the sectors to position the selected matrices at a given point, an assembling and alining bar coöperative with the matrices to move them in an endwise direction to position them in coöperative relation with the mold, and means for moving the matrices laterally of their respective sectors to form a line of determined length.

7. In a line composing and type casting machine, the combination of a set of movable members, each member having means for supporting a plurality of matrices and to permit lateral and endwise movement of the matrices, selecting mechanism for causing movements of said members to assemble the selected matrices, an assembling and alining bar having means for moving it into coöperative relation with the assembled matrices and to cause endwise movement thereof, and a pair of relatively movable jaws having means for drawing them toward one another to shift the matrices in a direction laterally of the planes of movement of said members to form a line of determined length.

8. In a line composing and type casting machine, the combination of a set of movable carriers, each supporting a plurality of matrices, the body of each matrix having an aperture formed with alining surfaces toward its face, selecting means for permitting said carriers to operate and assemble the selected matrices, an assembling and alining bar having alining surfaces corresponding to those of the matrices, and means for moving said bar longitudinally to introduce it into the apertures of the assembled matrices and for shifting the bar laterally to aline the matrices.

9. In a line composing and type casting machine, the combination of a mold, coöperative relatively adjustable jaws adjacent thereto, a set of movable carriers, each supporting a plurality of longitudinally and laterally shiftable matrices, selecting means for assembling selected matrices, a bar having means for operating it to assemble the selected matrices thereon and for shifting the line of assembled matrices relatively to their carriers to position them relatively to the mold, and means for operating the jaws to shift the assembled matrices laterally to form a line of determined length.

10. In a line composing and type casting machine, the combination of a set of rotatable sectors, each sector embodying a plurality of radial laterally flexible stems and having a plurality of matrices slidably mounted on said stems, selecting means for assembling selected matrices on the different sectors, an assembling and alining bar, means for operating said bar to assemble the selected matrices and to subsequently aline them, and means for locking the matrices assembled on said bar to form a line of predetermined length.

11. In a line composing and type casting machine, the combination of a mold, matrices and spacers, each spacer being composed of wedges for expanding and contracting it, selecting mechanism for assembling selected matrices and spacers, jaws cooperative with the assembled line of matrices and spacers to form a line of determined length, and means for manipulating the spacers to first reduce their width and to subsequently expand them.

12. In a line composing and type casting machine, the combination of a mold, a set of sectors, each carrying a plurality of radially shiftable and laterally movable matrices, a housing composed of relatively shiftable sections, the housing sections being normally continuous and provided with guides to prevent lateral deflection of the matrices on each sector, selecting means for

assembling selected matrices, means for relatively shifting the housing sections to provide an opening therein, an assembling and alining bar, and means for operating said bar to shift the assembled matrices radially of their sectors and through the opening provided in the housing and to position the assembled matrices in coöperative relation with the mold.

13. In a line composing and type casting machine, the combination of a set of matrix carriers having individual devices tending to move them toward actuated position, a set of selecting bars, each individual to a matrix carrier, means for setting said bars in different positions corresponding to the selected matrices on the respective carriers, and means operative to permit the different matrix carriers to assume at one operation positions determined by the positions occupied by the respective selecting bars after all of said bars have been set.

14. In a line composing and type casting machine, the combination of a set of matrix carriers, a corresponding set of selecting bars having means for positioning them according to the different matrices selected from the respective carriers, spring-operated controlling members for the different carriers normally tending to move the different carriers to bring the selected matrices into assembling position, and means for normally holding said carriers from movement and subsequently permitting the different carriers to assume different positions determined by the engagement of their controlling members with the corresponding selecting bars.

15. In a machine of the class described, the combination of a set of rotatable sectors, each having a plurality of circumferentially arranged matrices, a spring-operated reciprocating head for each sector normally tending to move such sector to bring the selected matrix into assembling position, a set of selecting bars having means for setting them in different positions determined by the matrices selected on the different sectors, and means for normally holding said sectors from movement and permitting, by a subsequent operation, simultaneous movement of the sectors until said reciprocating heads abut against the corresponding selecting bars.

16. In a machine of the class described, the combination of a set of rotatable sectors, each carrying a plurality of circumferentially spaced matrices, a spring-operated reciprocatory head for each sector normally tending to move such sector to bring the selected matrix into assembling position, selecting mechanism adapted to coöperate with said heads to limit the movements thereof according to the matrices selected on the different sectors, and means normally holding the sectors from movement and operative subsequently after a set of matrices has been selected, to permit operation of the sectors to assemble the selected matrices and also operative to restore the sectors.

17. In a machine of the class described, the combination of a set of matrix carriers, keyboard mechanism, and a set of selecting bars having means for positioning it in cooperative relation with the keyboard during the setting of said bars and for bodily shifting said set of bars from an operative position relatively to the keyboard and into cooperative relation with the carriers to accordingly adjust the positions of the carriers to assemble the selected matrices.

18. In a machine of the class described, the combination of a set of matrix carriers having means for controlling the setting thereof, keyboard mechanism, and a set of selecting bars controlled by the keyboard and coöperative with the controlling means of the matrix carriers for positioning the latter according to the selection of the matrices, said selecting bars having means for bodily positioning them alternately in cooperative relation with the keyboard and the controlling means for the matrix carriers.

19. In a machine of the class described, the combination of a set of matrix carriers having means for controlling the positioning thereof, keyboard mechanism, a set of longitudinally adjustable selecting bars, the adjusting of said bars being controlled by the keyboard mechanism, means for locking each selecting bar in different set positions, and means for shifting the adjusted selecting bars to an operative position with respect to the controlling means for the matrix carriers.

20. In a machine of the class described, the combination of a set of matrix carriers having members for controlling the positioning thereof, keyboard mechanism, a set of selecting bars controlled by the keyboard and having means for retaining them in different adjusted positions, the selecting bars being adapted to coöperate with the controlling members of the matrix carriers to position them accordingly, means for permitting the matrix carriers at one operation to assume positions corresponding to the adjustments of the selecting bars and to subsequently restore the matrix carriers, and means for restoring the selecting bars after each setting of the matrix carriers.

21. In a machine of the class described, the combination of a set of matrix carriers having members for controlling the positioning thereof, keyboard mechanism, a set of selecting bars controllable by the keyboard and capable of controlling the setting of the matrix carriers, means also controlled

by the keyboard for locking the selecting bars in different adjusted positions, and means for bodily positioning the set of selecting bars alternately in coöperative relation with the keyboard and with the controlling members of the matrix carriers.

22. In a machine of the class described, the combination of a set of matrix carriers having members for controlling the setting thereof, keyboard mechanism, a set of individually reciprocable selecting bars controllable by the keyboard mechanism, a cross head supporting the selecting bars, dogs carried by said cross head and controllable by the keyboard for locking the selecting bars in different adjusted positions, and means for operating the cross head at intervals to position the selecting bars alternately in coöperative relation with the keyboard and with the controlling members of the matrix carriers.

23. In a machine of the class described, the combination of a set of matrix carriers having means for controlling the setting thereof, keyboard mechanism, a set of independently operative selecting bars having a normal tendency to move toward actuated position, said bars being controllable by the keyboard mechanism, a set of dogs also controllable by the keyboard mechanism for locking the selecting bars in different adjusted positions, the selecting bars being also coöperative with the controlling means of the matrix carriers to position the latter, and resetting means common to all the selecting bars for restoring them to normal positions.

24. In a machine of the class described, the combination of matrix carrying means, matrix selecting means coöperative therewith, a set of controlling devices for normally locking the matrix selecting means, keyboard mechanism, and escapement mechanism actuated by the keyboard mechanism and operative to progressively unlock and release the individual controlling devices for the matrix selecting means, the escapement mechanism being movable longitudinally of said set of controlling devices.

25. In a machine of the class described, the combination of matrix carrying means, matrix selecting means therefor, a row of controlling devices for normally locking the selecting means, and mechanism embodying an escapement actuated by the keyboard mechanism and movable longitudinally of said row of controlling devices to successively unlock and release the controlling devices.

26. In a machine of the class described, the combination of matrix carrying means, matrix selecting means therefor embodying a set of adjustable bars, a row of controlling devices for said bars of the selecting means, keyboard mechanism embodying means for arresting said bars at different points in their movements, and means for successively releasing the controlling devices from the keyboard comprising a member operative by each character key of the keyboard and having a part to engage one of the controlling devices, a carriage movable longitudinally of the row of controlling devices, and an escapement actuated by said member for imparting a step by step movement to the carriage.

27. In a machine of the class described, the combination of matrix carrying means, selecting means therefor, controlling devices for the selecting means, keyboard mechanism for controlling the adjustments of the selecting means, mechanism also controlled by the keyboard for locking the selecting means in different adjusted positions, and means for permitting the matrix carrying means to adjust themselves at one operation, according to the adjustments of the locked selecting means.

28. In a machine of the class described, the combination of matrix carrying means, selecting mechanism including a set of reciprocatory selecting bars, and keyboard mechanism including keys and nested shiftable frames corresponding thereto and having abutment portions spaced in a direction longitudinally of the selecting bars, said frames being adapted to obstruct the movements of the selecting bars at different points according to the matrices selected.

29. In a machine of the class described, the combination of matrix mechanism, selecting mechanism including a set of reciprocatory selecting bars, controlling devices for locking the selecting bars in different adjusted positions, keyboard mechanism including a set of graduated frames having portions movable across the paths of said selecting bars to serve as stops, and means actuated by said frames for releasing and relocking the controlling devices for the selecting bars.

30. In a machine of the class described, the combination of matrix mechanism, selecting mechanism including a set of reciprocatory selecting bars, keyboard mechanism including a set of graduated members adapted to arrest the selecting bars at points in their movements, and means for altering the relation between the graduated members of the keyboard mechanism and the selecting bars of the selecting mechanism.

31. In a machine of the class described, the combination of matrix mechanism, selecting mechanism therefor including a set of reciprocatory selecting bars, keyboard mechanism including key levers, and a set of graduated members having portions adapted to engage and arrest the selecting bars at different points in their movements, a slide carrying said graduated members

and movable to alter the relation between them and the selecting bars, and shift mechanism coöperative with said slide to adjust and position the same.

32. In a machine of the class described, the combination of a set of carriers, each carrying groups of matrices arranged in alternating relation, selecting mechanism for said carriers including a set of reciprocatory selecting bars, keyboard mechanism including a set of key levers and a corresponding set of frames spaced longitudinally of the selecting bars and adapted to serve as stops for the latter, and shift mechanism for altering the relation between said frames and selecting bars whereby matrices belonging to one or another of said groups may be selected at will from the keyboard.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

BAYLUS CADE.
ANDREW HELDRICH.

Witnesses:
ARNOLD NACKE,
ARNOLD KATZ.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."