C. G. PRITCHARD.

COMPOSING MACHINE.

APPLICATION FILED FEB. 8, 1910. RENEWED OCT. 10, 1911.

Patented June 11, 1912.

1,029,317.

4 SHEETS—SHEET 1.

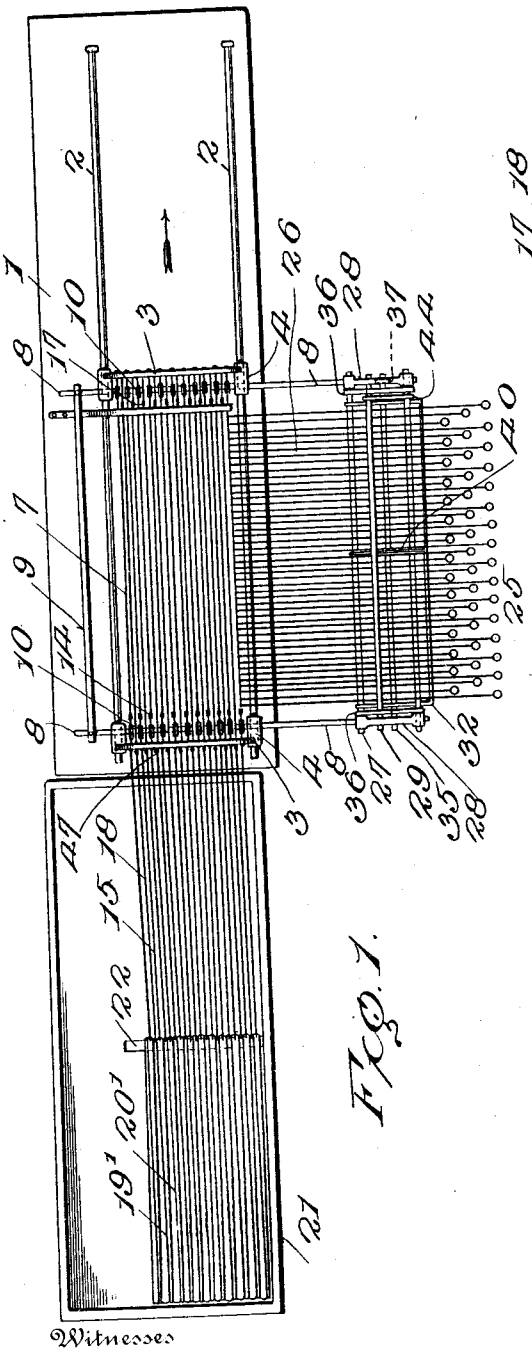

FIG. 1.

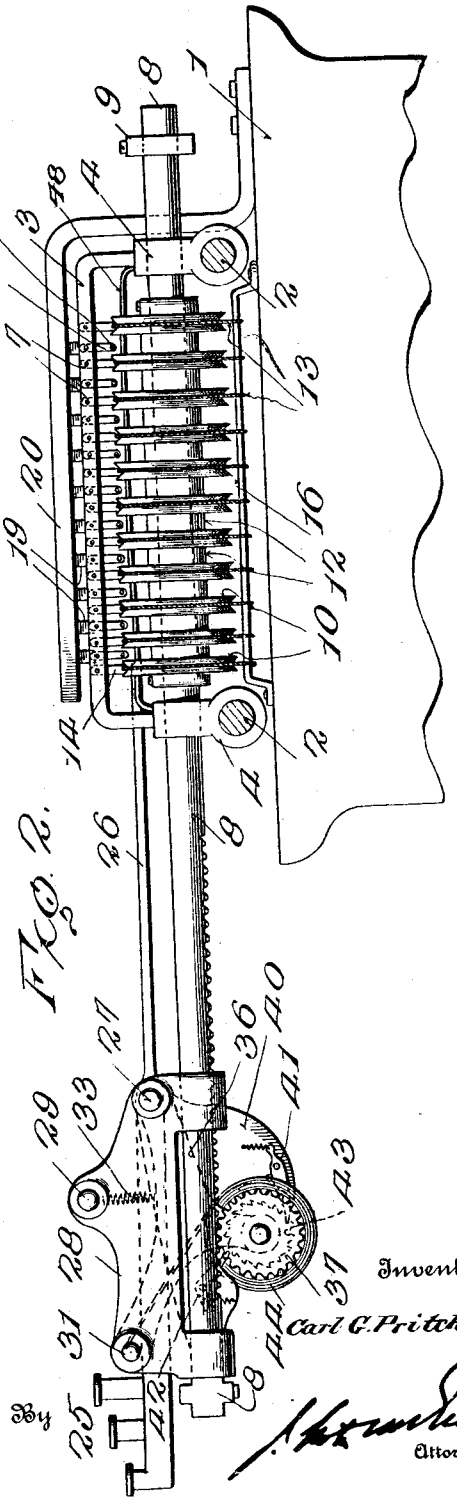

FIG. 2.

Witnesses

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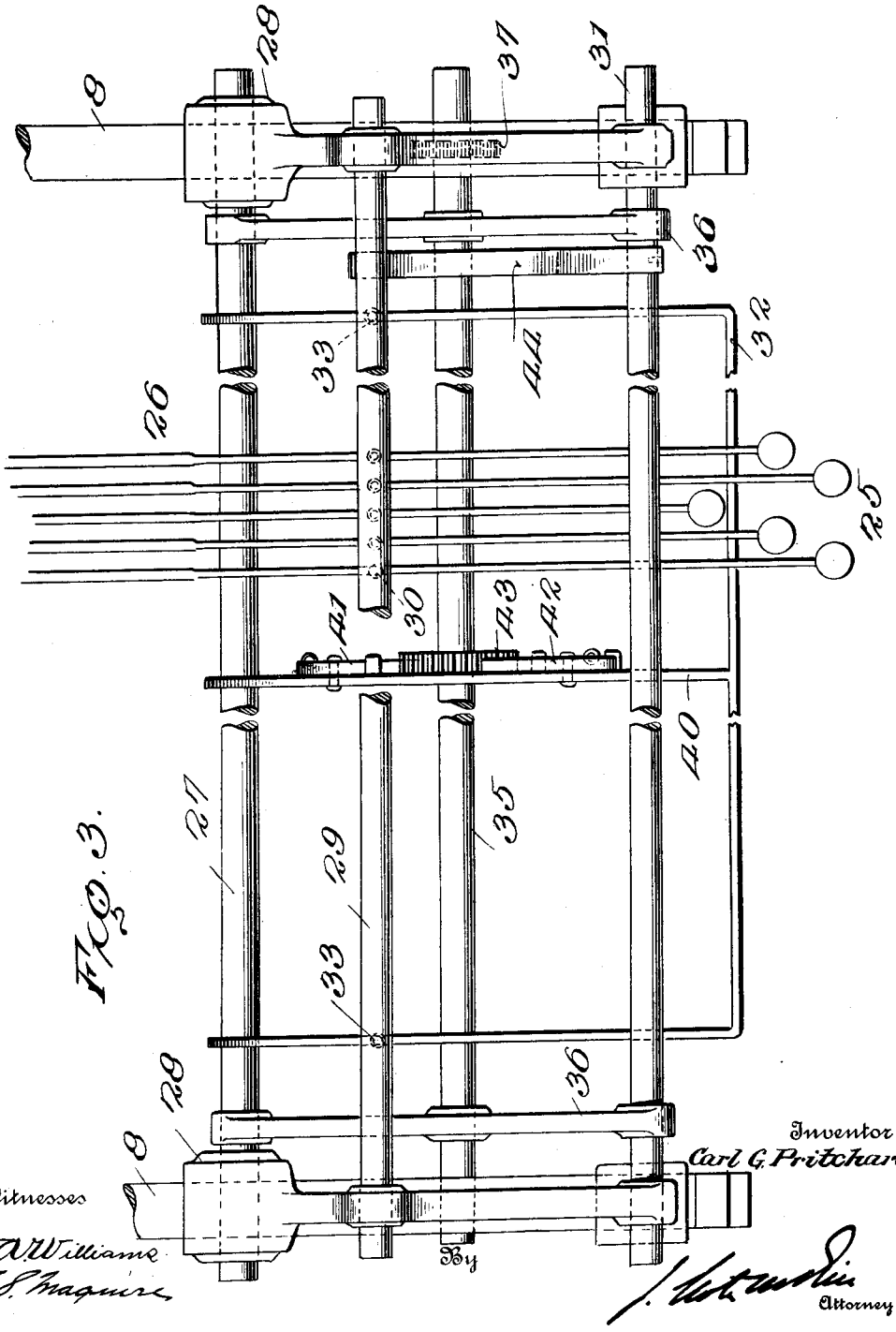

FIG. 3.

Witnesses

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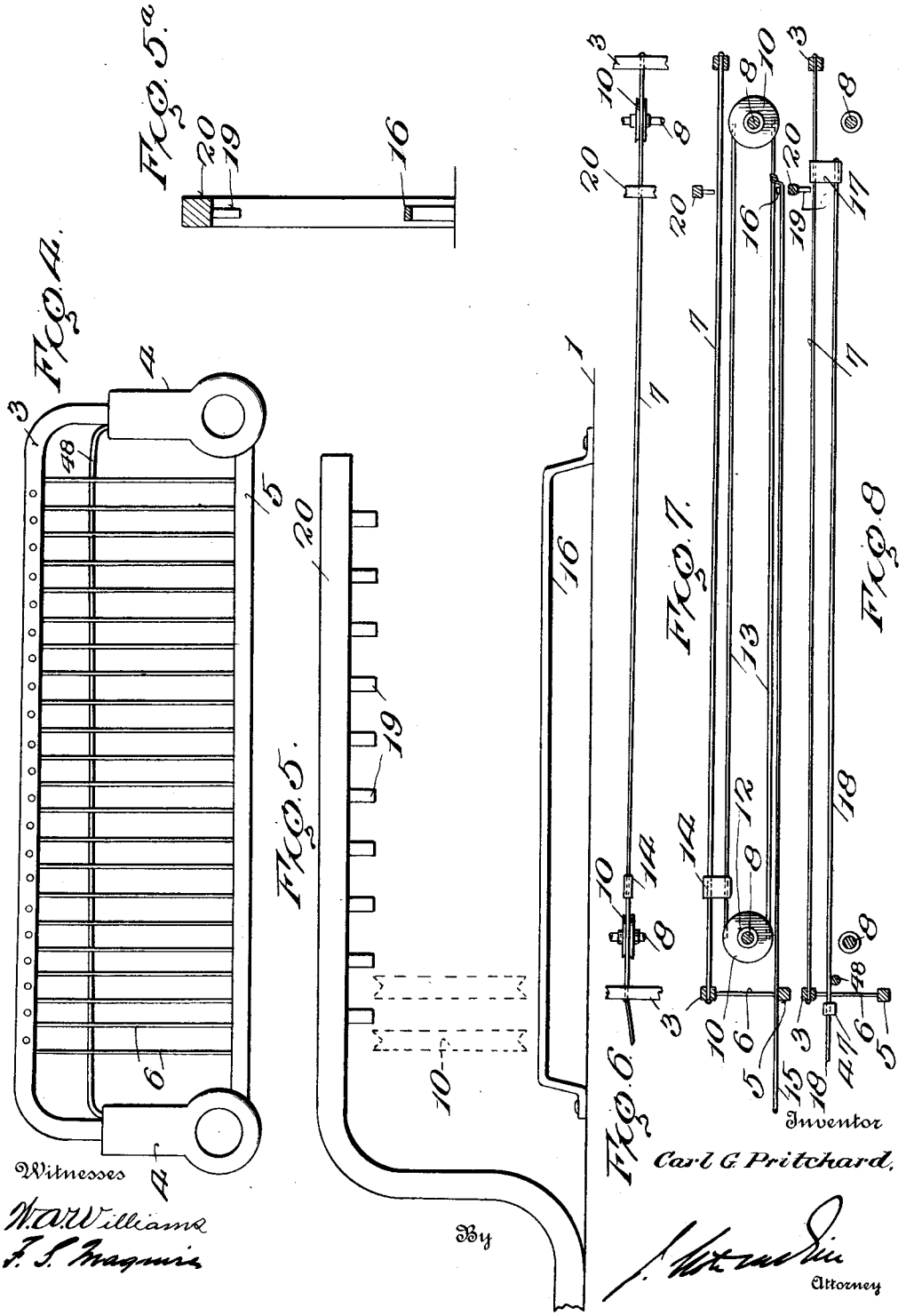

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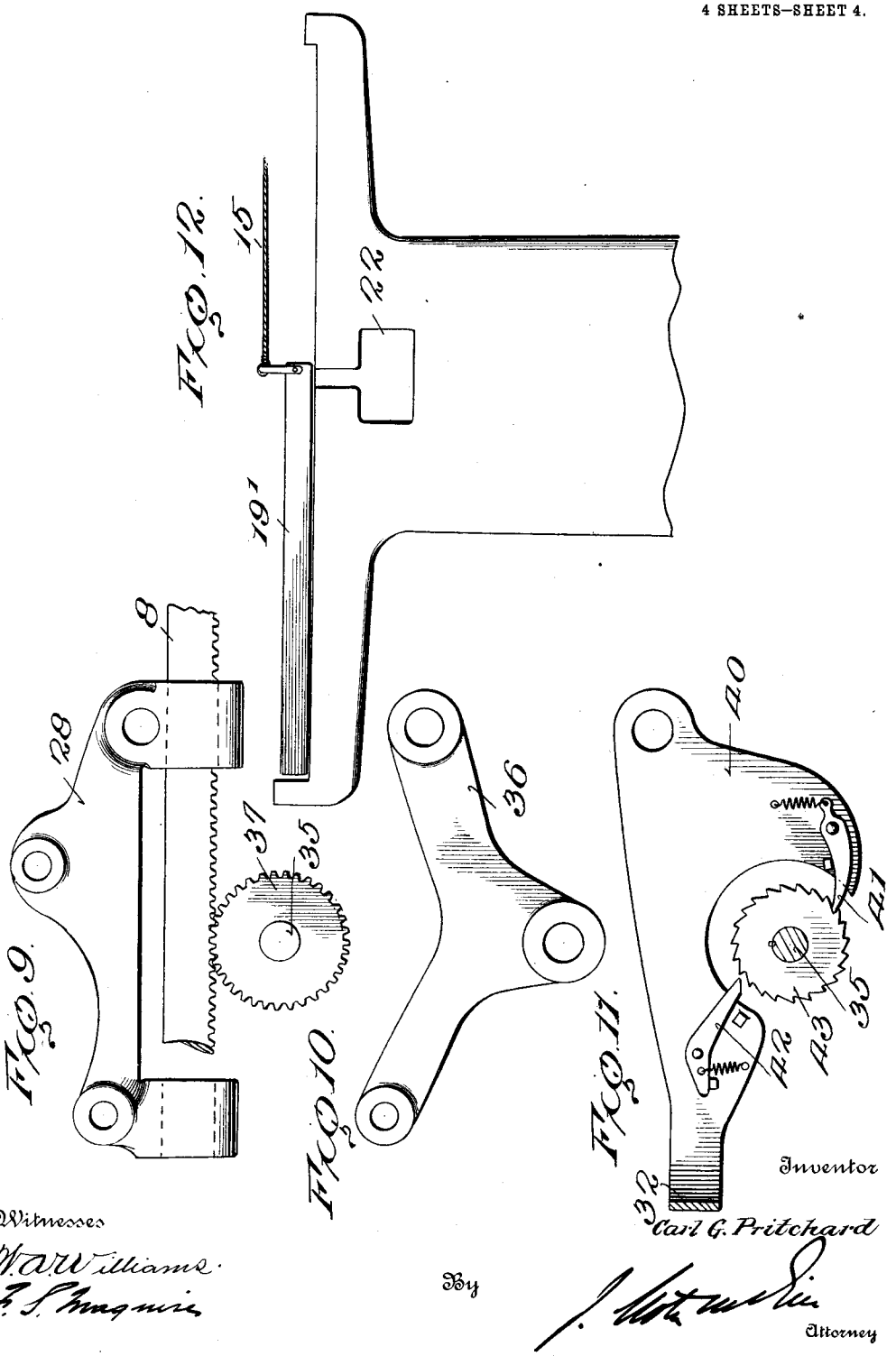

Witnesses

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UNITED STATES PATENT OFFICE.

CARL G. PRITCHARD, OF WARREN, OHIO.

COMPOSING-MACHINE.

1,029,317. Specification of Letters Patent. Patented June 11, 1912.

Application filed February 8, 1910, Serial No. 542,670. Renewed October 10, 1911. Serial No. 653,965.

To all whom it may concern:

Be it known that I, CARL G. PRITCHARD, of Warren, in the county of Trumbull and State of Ohio, have invented certain new and useful Improvements in Composing-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The primary object of this invention is to materially simplify and lessen the number of parts required in linotype or other composing machines of the character wherein the matrix bars are composed by the manipulation of a keyboard and a line of type is cast directly from the matrices. In this class of machine it has heretofore been necessary to provide as many individual stops as correspond in number to the aggregate of the characters of matrices on all the bars. By means of my invention this duplication is rendered unnecessary, and a single element may simultaneously control the positioning of as many different bars as the respective matrices thereof are repeated in the casting of a single line.

A further object is to increase the range of adaptability of the machine, that is to say, to permit the use of matrix bars of different sizes.

A further object is to effect a saving of time in the operation of the machine, the keyboard being capable of being operated for a second line while the preceding line is being cast. And a further object is to provide a machine of this character which will permit of easily correcting errors and for obtaining final justification of a line before casting.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of my improved composing machine, showing also the bed of a casting machine. Fig. 2 is a side elevation on an enlarged scale, with parts broken away. Fig. 3 is an enlarged fragmentary view of the keyboard. Fig. 4 is an end view of the carriage and guides. Fig. 5 is an enlarged cross-sectional view of the bed with the carriage removed. Fig. 5ª is an end view, partly in section, of the parts shown in Fig. 5. Fig. 6 is a plan view showing one of the stops of one series of matrix bars and its support. Fig. 7 is an elevation of Fig. 6. Fig. 8 is an elevation showing one of the stops of the other series of matrix bars and its support. Fig. 9 is a side elevation of the keyboard frame. Fig. 10 is a detail thereof. Fig. 11 shows the escapement. Fig. 12 is a sectional view through a portion of the casting bed.

In carrying out my invention I employ two series of tapered matrix bars of the type well-known in the art, and each bar is connected by a flexible connection to an individual stop. The flexible connections parallel one another and are at right angles to a series of bars as between which and the flexible connectors there is a relative step by step movement, one bar, in each operation of the keys being caused to project across the path of a stop or stops to which one or more of the matrix bars are flexibly connected. At the completion of the relative movement between the flexible connections and the bars the latter are moved at right angles in the plane of the initial relative movement between themselves and the stops, and upon engagement being had between the several keyboard-controlled-bars and the stops of the flexible connections the matrix bars are moved the necessary distances to position the characters relatively to the casting opening. While the line is being cast the keyboard and bars may be returned to their normal positions, and the flexible connections being in proper alinement relatively to the keyboard-controlled-bars the finger-keys may be again operated to position such bars relatively to the stops of the several matrix bars so that the machine may be manipulated to position the matrix bars for casting a second line as soon as the first line has been cast.

More specifically stated, my invention comprehends a series of stop bars and a series of finger-keys corresponding to the letters and characters on the matrix bars, each stop bar being capable of controlling any desired number of matrix bars, not being limited to any one particular matrix bar. In the style of construction herein described, which is only one of several practicable forms, the stop bars are designed to travel at right angles to the paths of movement of a series of stops, one for each matrix bar, flexibly connected to said matrix bars. The manipulation of the keys as the bars travel beneath and at right angles to the flexible

connectors, will cause the bars to successively engage such connectors, that is to say, to be projected across them in the plane of their respective stops so that when the travel of the bars transversely of the connectors is completed and the bars are moved at right angles to the line of such travel they will engage with the several stops and control the necessary movement of the several matrix bars.

Referring to the drawings, 1 designates a stationary bed or table whereon are mounted two parallel guide rods 2 which are supported at their extreme ends. Upon these rods is slidably mounted a carriage which comprises two end cross-bars 3; castings 4 movable on rods 2 and to which bars 3 are connected; a lower cross bar 5 at the left hand end of the frame; spaced apart vertical wires 6 connecting cross-bar 5 with cross-bar 3 immediately thereover; horizontally-disposed spaced-apart wires 7 connecting the two end bars 3; two parallel rods 8 which are passed through and supported by castings 4 at right angles to rods 2; and a cross-bar 9 which connects rods 8 at the rear and maintains the proper distance between the end cross-bars 3 and enables wires 7 to be held taut. On the rods 8 of the carriage are loosely mounted grooved rollers 10 which are spaced-apart by collars 12, as shown in Fig. 2, the distances between adjacent rollers representing the spaces between alternate wires 7. In other words, there is a roller beneath every other wire 7. Around these rollers 10 I pass a series of endless bands or cords 13, each band being carried by corresponding rollers at the opposite sides of the carriage. Each endless band 13 on its upper flight has secured thereto a stop 14 which is shown in the form of a narrow block which is guided by one of the wires 7 which preferably passes loosely through an opening therein. The wires 7 by which these stops 14 are guided are the wires directly above the several rollers 10. To the lower flights of bands 13 I connect flexible cords 15, and while the connections are fixed, yet at the commencement of the operation they are all near the right hand end of the lower flight, at which time stops 14 are at the left of the upper flights. At the beginning of the operation the point of connection of each cord 15 with the respective band 13 is immediately to the right of a stop 16 which is shown (Fig. 5) in the form of a bar extending horizontally above and mounted on bed 1. 17 designates a second series of stops which are likewise in the form of narrow blocks, and these stops are guided by those wires 7 intermediate the wires upon which stops 14 are mounted. To these stops 17 are connected a second series of flexible cords 18. When the keyboard is being manipulated these stops 17 are at the right hand side of the carriage, their movement toward the left being precluded by fingers 19 depending from an overhanging bar 20 mounted on the bed 1. (See Fig. 8.) The spaces between these fingers 19 allow of the free passage of stops 14, such fingers being directly above the wires by which stops 17 are guided.

I preferably employ tapered matrix bars arranged side by side in two series 19′ and 20′ and located on the bed of a casting machine 21 having a casting slot 22 therein. I have shown the two series of matrix bars as located almost wholly to one side of the casting slot so that in composing a line the bars will be moved longitudinally of their lengths transversely of the casting slot. To each of the bars of the series 19′ I connect one of the flexible cords 15, and to each of the bars of the series 20′ I connect one of the flexible cords 18. As stated, in composing the matrices it is necessary to move them longitudinally. To effect this movement I contemplate the shifting of the carriage on guide rods 2, and during such shifting to have lugs 14 and 17 of the several flexible connections of the various matrix bars engage with or be engaged by elements which have been previously projected across their respective paths and thereby control the extent of movement of each matrix bar. I will now describe the means which I have shown for bringing about this result.

25 is a keyboard which may be arranged in any convenient form, and is here shown as consisting of three rows of keys, but this is merely by way of illustration. Each key of the keyboard controls a bar or lever 26 all of which are in the present instance shown as formed with the key levers, that is, as prolongations of the latter, but I do not confine myself to this construction. I shall refer to these bars as the "key-levers" merely as a matter of convenience. They are fulcrumed on a shaft 27 which is mounted at its ends in side frames 28 of the keyboard, said frames being slidable on rods 8. A cross rod 29 likewise carried by frames 28 has secured thereto springs 30 of the several key-levers to return them to their normal positions, their return movements being limited by a cross bar 31. A universal bar 32, similar to that used in typewriting machines, is fulcrumed on shaft 27 and is normally held in its raised position by springs 33 connected to cross rod 29.

35 is the escapement shaft which is mounted near its ends in plates 36 located on shaft 27 and rods 29 and 31 adjacent to side frames 28. This shaft 35 at its ends carries gear wheels 37 which mesh with rack teeth on the underside of rods 8 so that each time a key-lever is operated the keyboard will travel inwardly toward the series of flexible connectors the extent of one tooth of the

escapement. The latter comprises a support 40, (see Fig. 3) which is fulcrumed on shaft 27 and secured to the universal bar 32, preferably at the center thereof. This support carries two escapement pawls, 41, 42, which engage with the escapement wheel 43 fixed on shaft 35. The escapement spring 44, (see Figs. 2 and 3) is coiled on shaft 35 and connected to cross rod 31. The constant tendency of this spring is to uncoil, and it will impart to shaft 35 a rotary motion when such shaft is released by the escapement.

It is understood, of course, that the keys are lettered or otherwise marked to correspond with the order in which the matrices are arranged on the underfaces of the several matrix bars. All bars of one series bear like characters in like order, and all bars of the other series bear the same characters in reverse order.

The operation is as follows: The parts are in the relative positions shown in Fig. 1 with the carriage at the extreme left end of bed 1, the matrix bars at the left end of the casting bed, and the keyboard at the outer ends of rods 8. The forward ends of the bars or key-levers are now in juxtaposition to the first of the series of flexible connectors, and on a plane slightly below that of cords 18 and the upper flights of bands 13. The desired line of matter is indicated by the operator on the keyboard the same as in the use of ordinary typewriting machines. As each key is successively depressed it raises the forward end of the corresponding key-lever 26, and at the same time through universal bar 32 releases the escapement so that shaft 35 acting through wheels 37 on rack rods 8 will advance the entire keyboard the distance represented by one tooth of the escapement wheel 43. This distance corresponds to the spaces between the parallel flexible connectors of the two series of matrix bars. The key-lever, elevated by the depression of its key, will by the forward movement of the keyboard pass transversely over one of the flexible connections, to wit, the one nearest the keyboard, be it either 13 or 18, while all of the remaining levers will pass transversely beneath such connection. Another key is then operated in like manner and its respective lever will be passed transversely over the next flexible connector as the keyboard advances, the remaining levers passing beneath such connector as in the first instance. This operation is continued until the entire line is written and the keyboard has advanced until the series of levers are threaded over and beneath all of the flexible connectors, or as many of them as are required to fill the line. It will be remembered that each time a key is operated to raise the forward end in the space between adjacent flexible connectors the keyboard is moved forward so that such lever will pass over the flexible connector immediately adjacent to its forward end. As soon as pressure is released from the key the lever resumes its normal position under the influence of its spring 30. After the entire line has been written, and the keyboard is, step by step, advanced on a plane transversely of the line of connectors the operator then moves the carriage longitudinally of guide rods 2 in the direction indicated by the arrow, Fig. 1, the keyboard traveling with the carriage. When this movement begins the flexible cords 15 and 18 cannot partake thereof by reason of the inertia of the matrix bars to which they are connected, but the stops 14 on the endless band 13, forming part of the flexible connection between such stops and the matrix bars 19, are caused to travel toward the right, at right angles to the key-levers by reason of the connection of cord 15 with band 13. As soon as any one of the stops 14 engages the stop-lever threaded over its respective connector the rotation of band 13 is arrested, and the further movement of the carriage produces a corresponding movement in the respective matrix bar which will be advanced a distance determined by the location of the controlling key-lever. Likewise, as the carriage is being moved, when the stops 17 are engaged by the key-levers threaded over the flexible connections 18 the matrix bars 20' will be advanced the necessary distance. When the carriage reaches the end of its travel on rods 2 each matrix bar will have been advanced the required distance to bring the desired matrix over casting slot 22. The matrix bars are then pressed together sidewise, by hand, and if any characters are needed to complete the line, they may be added by hand and the line justified in the customary manner. At this point in the operation the matrix bars will occupy portions of the spaces both to the right and to the left of the casting slot, the matrices themselves being across the slot, and after being properly locked in position the casting machinery will be set in motion to cast the line. It is not necessary, however, for the operator to await the completion of this operation, but he may immediately return the carriage and keyboard to their original positions and begin the indication of a new line of matter, the stops 14 being returned to their normal positions at the left of the carriage when the points of connection of cords 15 with bands 13 engage stop 16, and likewise the flexible connections 18 will be drawn taut so as to return stop 17 into position against the overhanging fingers 19. For this latter purpose cords 18 are provided with weights 47 at the left of wire 6 so as to exert a gravity influence on such cords over a cross rod 48 to draw the stops 17 against fingers 19 and keep cords 18

properly stretched, said cross rod being mounted on castings 4. After the casting is completed the matrix bars may be released and returned to their normal positions by any suitable means, not shown, but the keyboard having been operated in the meantime to thread the key-levers over the flexible connections for a second line of matter, the carriage may, as soon as this line is completed, be again shifted to the right as before described. In this way the operation of the machine is practically continuous.

The advantages of my invention will be apparent to those skilled in the art.

The size or thickness of the matrix bars is immaterial, and bars of any size may be used with equal facility.

The machine is exceedingly simple and embodies a comparatively small number of parts as compared with previous devices employed for a similar purpose. It is not necessary, in order to control the movements of the matrix bars, to employ a separate series of individual stops for each individual matrix bar. By employing the flexible connections any one of the key-levers may be utilized as frequently as necessary, that is to say, if a given letter occurs more than once in a line the corresponding key-lever may be threaded over as many connectors as necessary to reproduce such letter the required number of times, and in proper sequence. Furthermore, by reason of the flexible connections between the stops and the matrix bars a great saving in time may be effected, since the operator may return the carriage and keyboard to their original positions irrespective of the location of the matrix bars so that the keyboard may be operated for a new line while the preceding line is being cast. If any matrix bar should be found to be misplaced, through error in striking a key, the bar may be shifted longitudinally by hand to the correct position without disarranging the other bars.

In machines wherein the matrix bars are wholly set by hand by means of an index showing the arrangement of characters it is necessary to use two indexes, one for each series of bars, on account of the reversed arrangement of the matrices. This requires the operator to change from one index to the other for each individual bar, resulting in much confusion. According to my invention this difficulty is overcome, and by the alternately arranged flexible connections, the operator is enabled to manipulate both series of matrix bars through the instrumentality of a single keyboard. These connections are preferably of such design that the matrix bars may be readily attached and detached from the flexible cords, thus permitting easy substitution of different size matrix bars when desired.

While I have shown and described one form of carrying out my invention, I wish it understood that I do not restrict myself thereto, as changes may be made not only in the construction and arrangement of the special parts but the relative movements may be obtained in different ways from that which I have described. The principal feature of my invention resides in the use of a series of stop bars each of which is adapted to control one or more stops connected to one or more matrix bars, such stop bars having an initial movement relatively to the stops or vice versa, so that when a second relative movement is produced as between the stop bars and the stops the matrix bars will be properly positioned in reference to the casting slot. This second relative movement may be produced by action upon the carriage, or upon the matrix bars, as desired.

I claim as my invention:

1. In a composing machine, a series of longitudinally movable but normally idle matrix bars, a series of controlling elements, each adapted to move longitudinally at right angles to the matrix bars and to control any desired number of such matrix bars, means for first positioning said elements to control the matrix bars while the latter are idle, and means for permitting a relative movement between the matrix bars and the controlling elements, after the latter have completed their longitudinal movement, to synchronously position such matrix bars, said controlling elements being capable of being then returned to their initial position and again operated for a new line before the matrix bars are returned to their original position.

2. In a composing machine, a series of longitudinally movable but normally idle matrix bars, a series of controlling elements, each adapted to control any desired number of matrix bars, means for first positioning said elements to control the matrix bars while the latter are idle, and means for permitting the controlling elements to be moved relatively to the matrix bars in a different direction from their positioning movement to synchronously position the matrix bars.

3. In a composing machine, a series of movable but normally idle matrix bars, a series of stops corresponding in number to the matrix bars, one for each bar, connections between such matrix bars and the stops, a series of controlling elements each adapted to directly coöperate with and control any desired number of said stops and through them their respective matrix bars, means for first positioning said elements in coöperative relation to said stops, means for permitting a relative movement between the stops and the controlling elements to synchronously position the stops and the ma-

trix bars, said controlling elements being capable of being returned to their initial position and again operated for a new line before the matrix bars are returned to their original position.

4. In a composing machine, a series of movable but normally idle matrix bars, a series of stops, one for each matrix bar, connections between such matrix bars and the stops, a series of controlling elements, each adapted to control any desired number of stops and through them the matrix bars, means for first positioning said elements in relation to said stops, and means for permitting the controlling elements a movement relative to the stops to synchronously position the stops and the matrix bars.

5. In a composing machine, a series of movable but normally idle stops, a corresponding series of movable but normally idle matrix bars, a connection between each matrix bar and one of the stops, a series of elements designed to intersect the plane of the stops and extended at right angles thereto, means for successively projecting said elements across the planes of the stops while the latter and said matrix bars remain idle, and means for permitting a relative movement between the stops and the elements for synchronously positioning the stops and the matrix bars.

6. In a composing machine, a series of movable but normally idle stops, a corresponding series of movable but normally idle matrix bars, a connection between each matrix bar and one of the stops, a series of elements designed to intersect the plane of the stops and extended at right angles thereto, a series of finger keys for actuating said elements, means for successively projecting said elements across the planes of the stops at each operation of such finger keys while the stops and the matrix bars remain idle, and means for permitting a relative movement between the stops and the elements for synchronously positioning the stops and the matrix bars.

7. In a composing machine, a series of movable but normally idle matrix bars, a corresponding series of movable but normally idle stops, means flexibly connecting each matrix bar to one of the stops, a support for said stops between which and the stops there is a relative movement, and means for synchronously controlling, during such movement, the position of each stop and through it its respective matrix bar.

8. In a composing machine, a series of movable but normally idle matrix bars, a corresponding series of movable but normally idle stops, means flexibly connecting each matrix bar to one of the stops, a carriage for said stops designed to be moved to synchronously shift any number of said stops and matrix bars, and means for controlling, during such movement, the positions of the stops and through them the respective matrix bars.

9. In a composing machine, a series of movable but normally idle matrix bars, a corresponding series of movable but normally idle stops, means flexibly connecting each matrix bar to one of the stops, a carriage for said stops designed to be moved to synchronously shift any number of said stops and matrix bars, a series of controlling elements for coöperating with any number of said stops for controlling the positions thereof and through them the positions of the respective matrix bars, and means for actuating said controlling elements.

10. In a composing machine, a series of movable but normally idle matrix bars, a corresponding series of movable but normally idle stops, flexible connections between the matrix bars and the stops, a series of bars each adapted to simultaneously position any number of the movable stops and through them the positions of the matrix bars, a keyboard for actuating said bars and positioning them relatively to the stops, and means for permitting a relative movement between the stops and the series of bars after the latter have been positioned relatively to the stops.

11. In a composing machine, a series of movable matrix bars, a corresponding series of stops therefor, a carriage movable relatively to said stops, and a series of elements, for controlling said stops, mounted on said carriage, which latter is designed to have an additional movement to shift said matrix bars.

12. In a composing machine, a series of movable matrix bars, a corresponding series of stops therefor, flexible connections between said matrix bars and said stops, a carriage movable relatively to said stops, and a series of elements, for controlling said stops, mounted on said carriage, which latter is designed to have an additional movement to shift said matrix bars.

13. A series of longitudinally-movable matrix bars, in combination with a series of stops, flexible connections between the stops and the matrix bars, a series of finger-keys, a series of bars operated by the finger-keys to project across said flexible connections to position said bars in the paths of said stops, means for moving said bars across said connections, and means for moving said bars at right angles to their initial movement for coöperating with said stops to change the positions of the matrix bars.

14. A series of longitudinally-movable matrix bars, in combination with a movable carriage, stops mounted on said carriage,

flexible connections between said stops and said matrix bars, a series of finger-keys mounted on said carriage, and a series of stop bars operated by said finger-keys to coöperate with said stops, said bars being movable at right angles to said connections across the paths of said stops for coöperating with the latter to effect the shifting of the matrix bars upon the operation of the carriage.

15. A series of longitudinally-movable matrix bars, in combination with a movable carriage, stops mounted on said carriage, flexible connections between said stops and said matrix bars, said connections being arranged parallel with one another, a series of finger-keys mounted on said carriage, a series of stop bars operated by said finger keys to coöperate with said stops, and means for moving said stop bars transversely of said flexible connections, step by step, as each finger key is operated to cause said stop bars to project across said flexible connections into the paths of the stop for cooperating with the latter to effect the shifting of the matrix bars upon the operation of the carriage.

16. A series of longitudinally-movable matrix bars, in combination with a movable carriage having a series of spaced-apart horizontally-disposed guides, stops movable on said guides, flexible connections between said stops and said matrix bars, a series of finger keys, a series of stop bars operated by the finger keys and movable at right angles to said flexible connections to coöperate with said stops, said carriage being designed to be moved, together with the bars, on a plane at right angles to the plane of the initial movement of the bars, to effect the shifting of the matrix bars by the engagements between the stop bars and the stops.

17. A series of longitudinally-movable bars tapered alternately in opposite directions, in combination with a carriage having a series of parallel guides, two series of stops movable on said guides, two series of flexible connectors between the matrix bars and stops, a series of finger keys, a series of stop bars operated by said finger keys and having a step by step movement at right angles to said flexible connections, said stop bars being designed when operated by the finger keys to project across the path of the stops of one or more matrix bars, and means for effecting a relative movement between the two series of stops and the series of stop bars to change the positions of the matrix bars.

18. A series of longitudinally-movable bars tapered alternately in opposite directions, in combination with a carriage having a series of parallel guides, two series of stops movable on said guides, a series of flexible connections between one series of stops and one series of matrix bars, a second series of flexible connections between the other series of stops and the other series of matrix bars, the two series of stops being located at opposite sides of the carriage, a series of finger keys, and a corresponding series of stop bars operated by said finger keys and movable transversely of said connectors and designed to be projected across the paths of said stops in a step by step movement, said carriage at the termination of the latter movement being moved at right angles to the line of such movement to cause the stop bars to coöperate with said stops to effect the shifting of the matrix bars.

19. A series of longitudinally-movable bars tapered alternately in opposite directions, in combination with a carriage having a series of parallel guides, two series of stops movable on said guides, a series of flexible connections between one series of stops and one series of matrix bars, a series of endless bands mounted on said carriage and carrying the other series of stops, a series of flexible connections between said endless bands and the other series of matrix bars, the two series of stops being located at opposite sides of the carriage, a series of finger keys, and a corresponding series of stop bars operated by said finger keys and movable transversely of said connectors and designed to be projected across the paths of said stops in a step by step movement, said carriage at the termination of the latter movement being moved at right angles to the line of such movement to cause the stop bars to coöperate with said stops to effect the shifting of the matrix bars.

20. A series of longitudinally-movable bars tapered alternately in opposite directions, in combination with a carriage having rollers arranged in series on its opposite sides, endless bands passed around said rollers, a series of stops mounted on said bands, flexible connections between said bands and one series of matrix bars, a second series of stops, a second series of flexible connections between said second series of stops and the other series of matrix bars, a series of finger keys, a corresponding series of stop bars operated by said finger keys, and means for moving said stop bars at right angles to said connectors to project them across the paths of said stops, said carriage being moved, at the termination of the movement of the stop bars, at right angles to the line of such movement to control the shifting of the matrix bars through the engagements between the stop bars and the stops.

21. In combination with a bed, a carriage movable longitudinally thereof, two series of longitudinally movable bars tapered alternately in opposite directions, rollers

mounted on said carriage, parallel guides also mounted on said carriage, endless bands passed around said rollers, a series of stops carried by said bands and held by said guides, cords connecting said bands to one series of matrix bars, means mounted on said bed for limiting the movements of said bands and series of stops in one direction, a second series of stops also held by said guides, cords connecting said second series of stops to the other series of matrix bars, means mounted on said bed for limiting the movements of said second series of stops in one direction, a series of finger keys mounted on said carriage, and a series of stop bars actuated by said finger keys and designed to project across the paths of said stops, said carriage being movable at right angles to the travel of the stop bars, at the completion of such travel, to effect the shifting of the matrix bars through the coöperation of the stops and the stop bars.

22. In combination with a bed, a carriage movable longitudinally thereof, two series of longitudinally movable bars, rollers mounted on said carriage, parallel guides also mounted on said carriage, endless bands passed around said rollers, a series of stops carried by said bands and held by said guides, cords connecting said bands to one series of matrix bars, means mounted on said bed for limiting the movements of said bands and series of stops in one direction, a second series of stops also held by said guides, cords connecting said second series of stops to the other series of matrix bars, means mounted on said bed for limiting the movements of said second series of stops in one direction, a series of finger keys mounted on said carriage, and a series of stop bars actuated by said finger keys and designed to project across the paths of said stops, said carriage being movable at right angles to the travel of the stop bars, at the completion of such travel, to effect the shifting of the matrix bars through the coöperation of the stops and the stop bars.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

CARL G. PRITCHARD.

Witnesses:
HENRY A. PORTER,
ARCHIE D. LOOP.