O. V. SIGURDSSON.

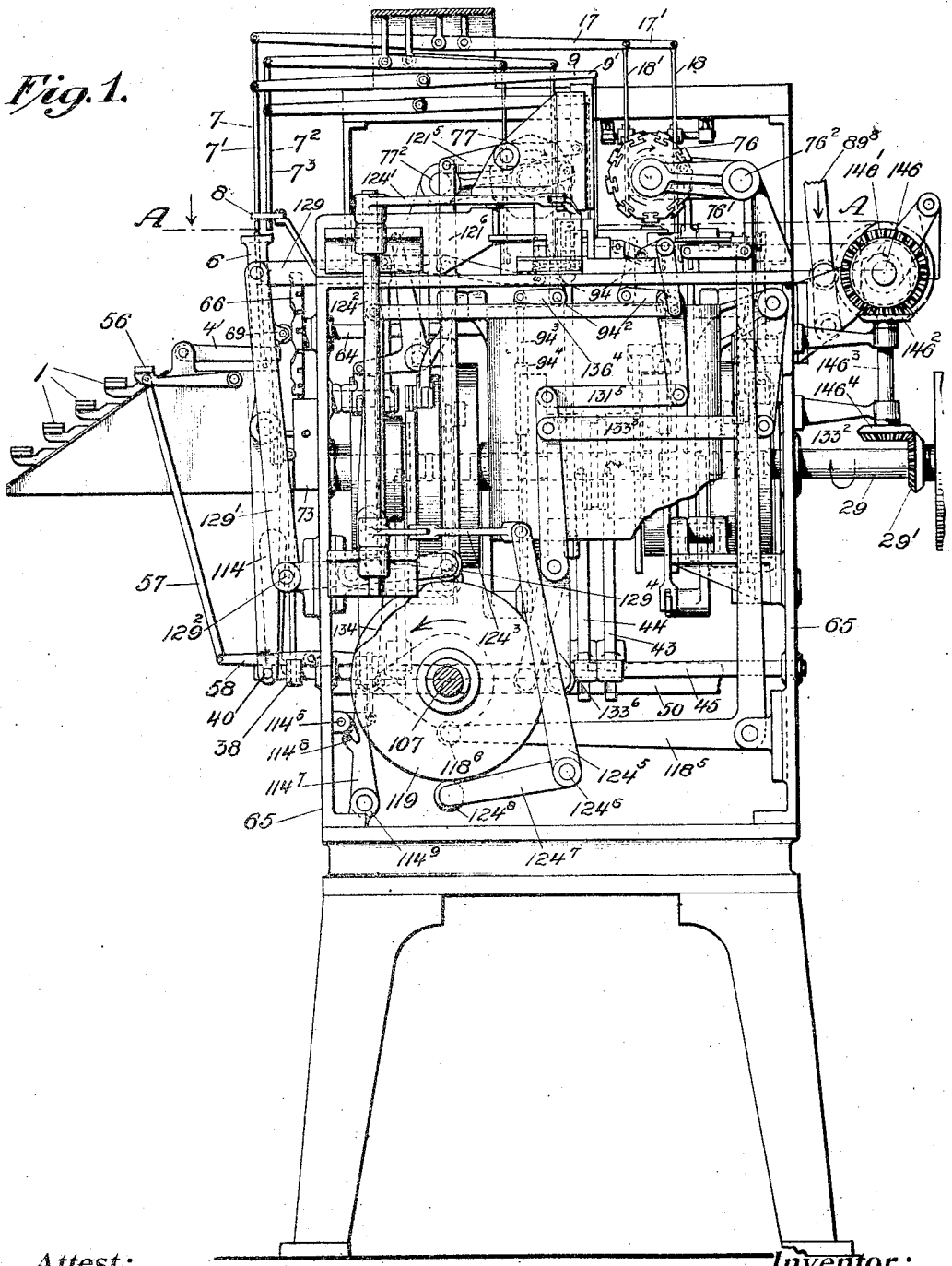
TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846. Patented Dec. 7, 1909.

17 SHEETS—SHEET 1.

Fig. 1.



Attest:

L. L. Browning

by

Inventor:

Oddur V. Sigurdsson

Edward C. Davidson

Atty

O. V. SIGURDSSON.

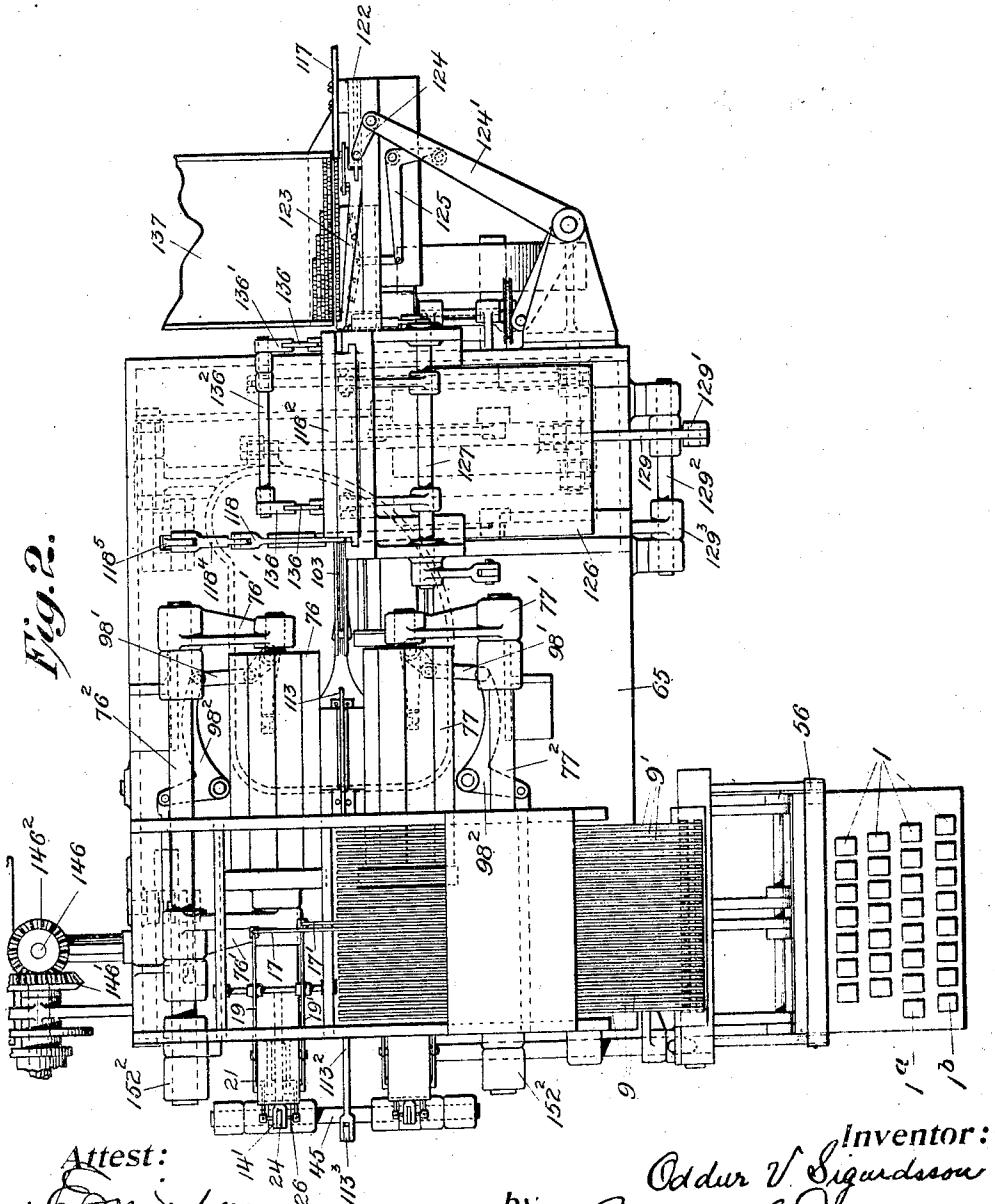
TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846. Patented Dec. 7, 1909.

17 SHEETS—SHEET 2.

Fig. 2.



Attest:

E. Mitchell

L. L. Browning

Inventor:

Oddur V. Sigurdsson

by Edward C. Davidson

Atty

O. V. SIGURDSSON.

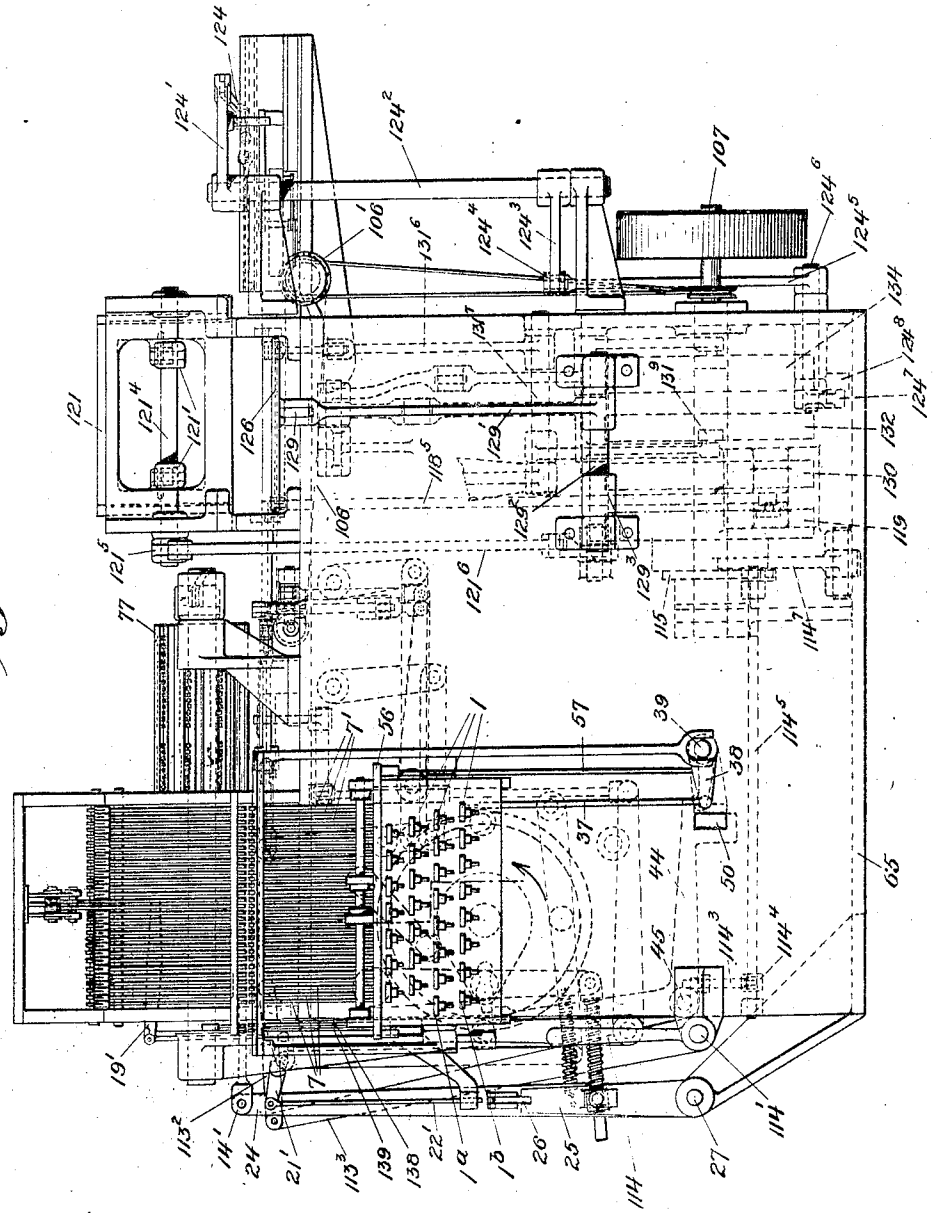
TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846. Patented Dec. 7, 1909.

17 SHEETS—SHEET 3.

Fig. 3.



Attest:

E. F. Mitchell

L. L. Browning

Inventor:

Oddur V. Sigurdsson

by Edward C. Davidson

Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

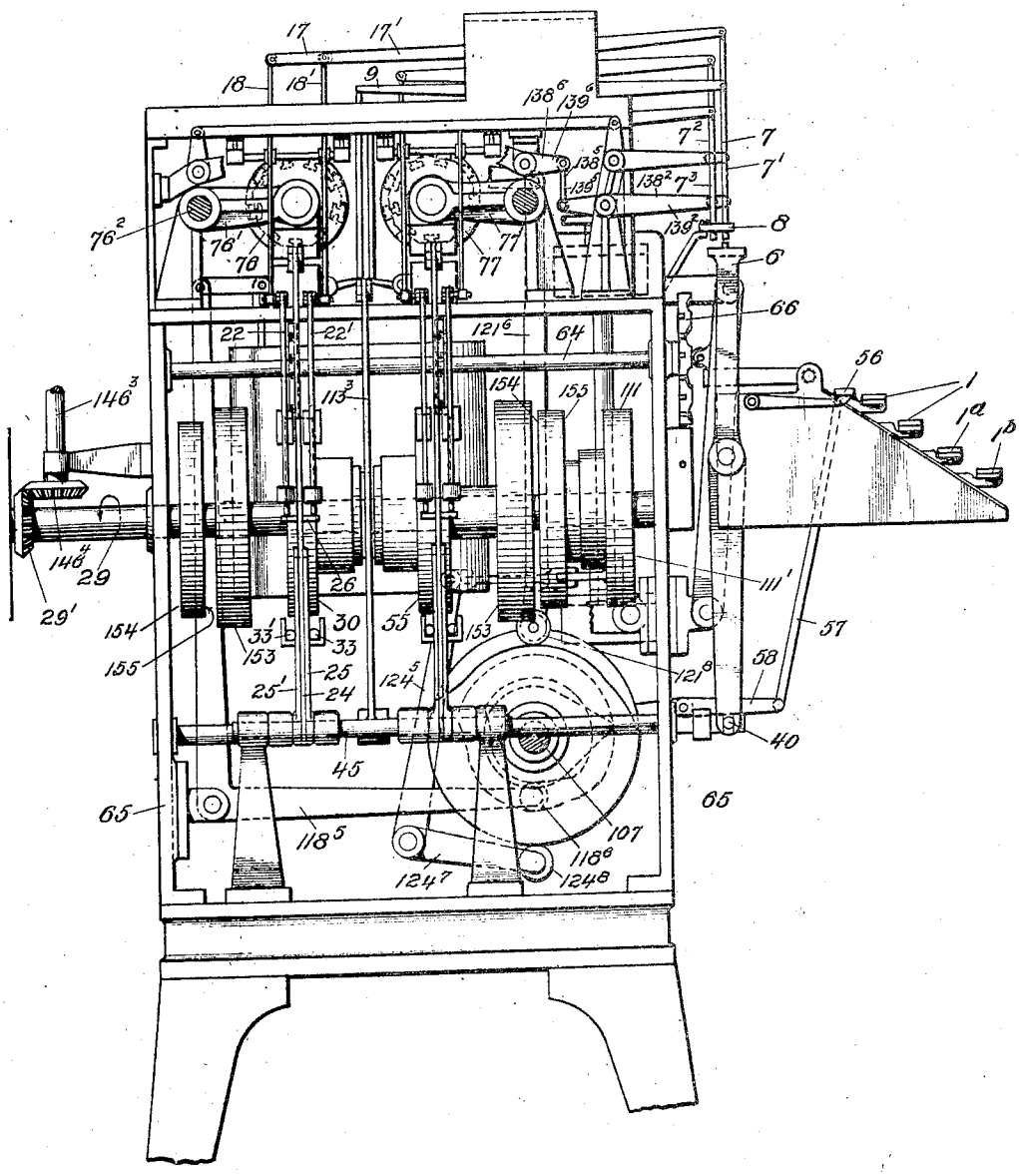
APPLICATION FILED OCT. 31, 1908.

942,846.

Patented Dec. 7, 1909.

17 SHEETS—SHEET 4.

Fig. 4.



Attest:

L. F. Browning

by

Inventor:

Oddur V. Sigurdsson

Edward C. Davidson

Atty

O. V. SIGURDSSON.

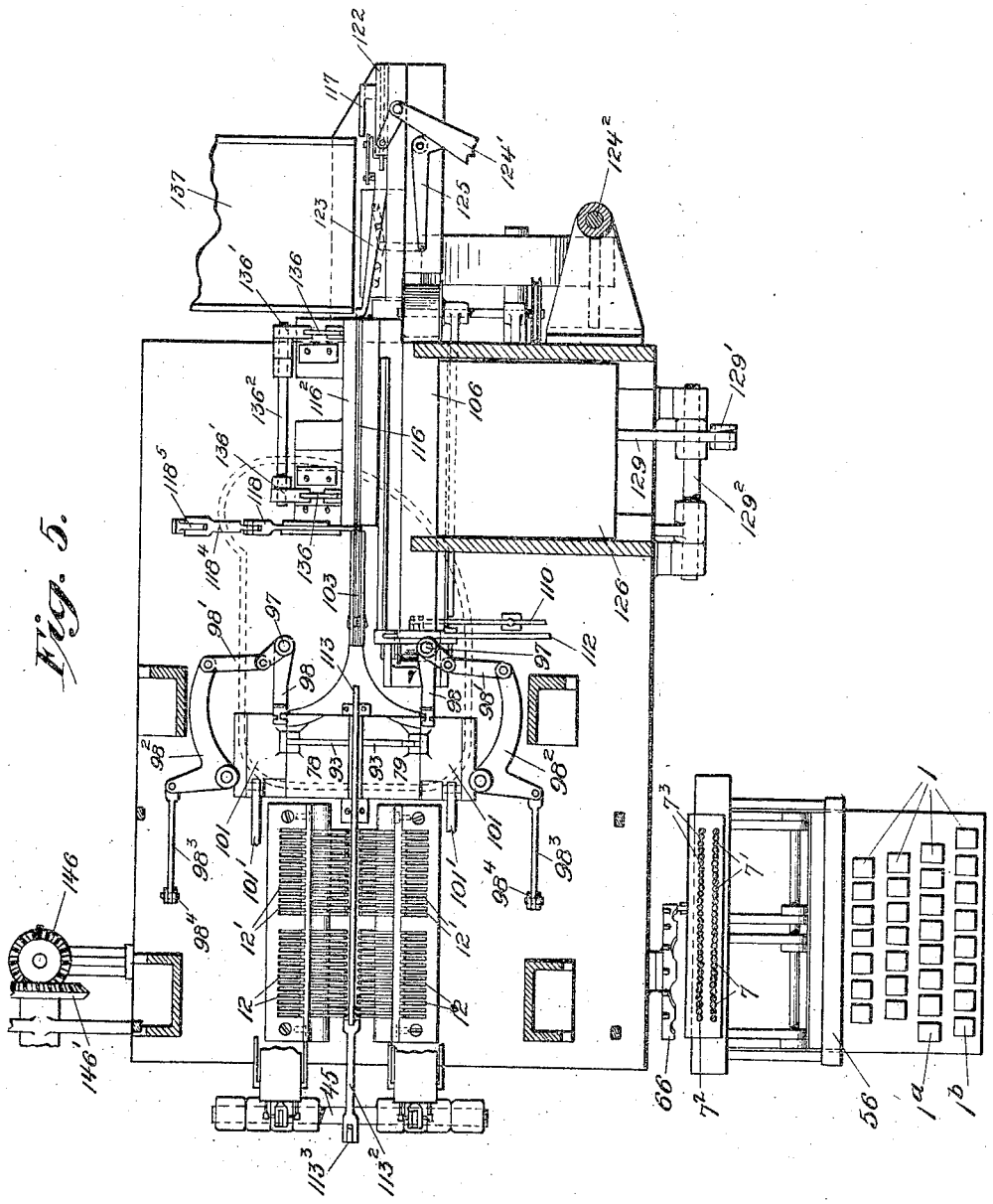
TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846. Patented Dec. 7, 1909.

17 SHEETS—SHEET 5.

Fig. 5.



Attest:

L. L. Browning

by

Inventor:
Oddur V. Sigurdsson
Edward C. Davidson
Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846.

Patented Dec. 7, 1909.

17 SHEETS—SHEET 6.

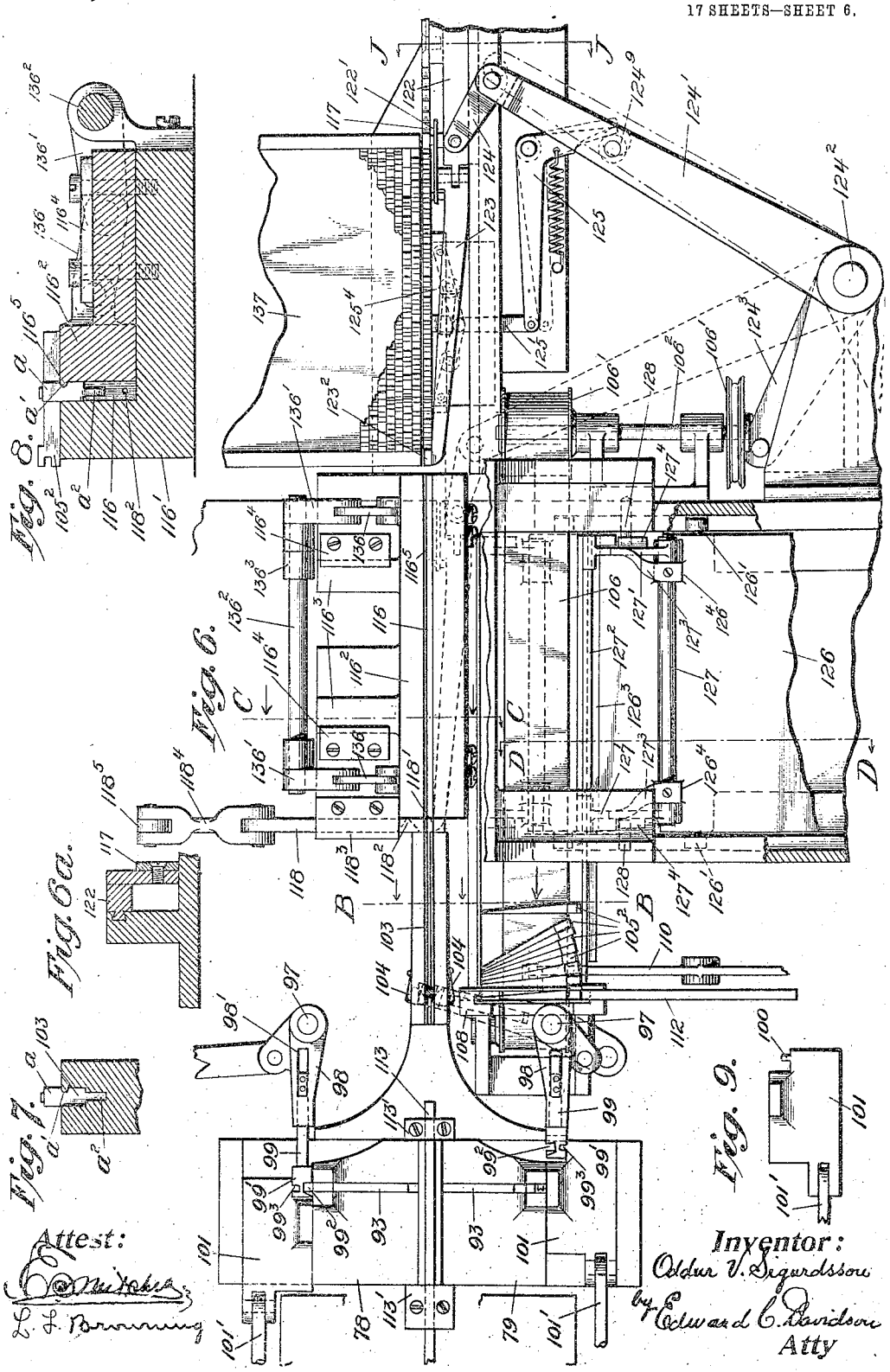


Fig. 8.

Fig. 6.

Fig. 6a.

Fig. 7.

Fig. 9.

Attest:

L. L. Browning

Inventor:

Oddur V. Sigurdsson

by Edward C. Davidson

Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846.

Patented Dec. 7, 1909.

17 SHEETS—SHEET 7.

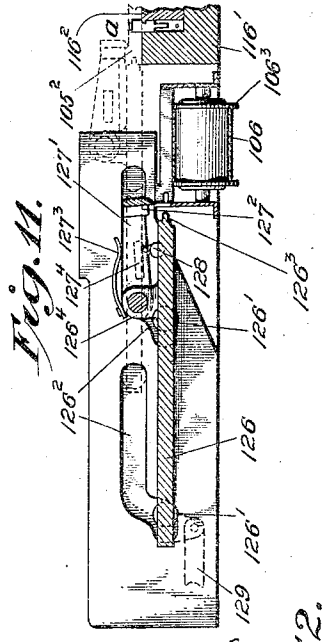


Fig. 11.

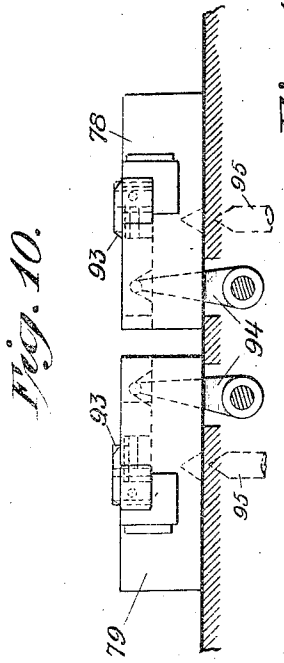


Fig. 10.

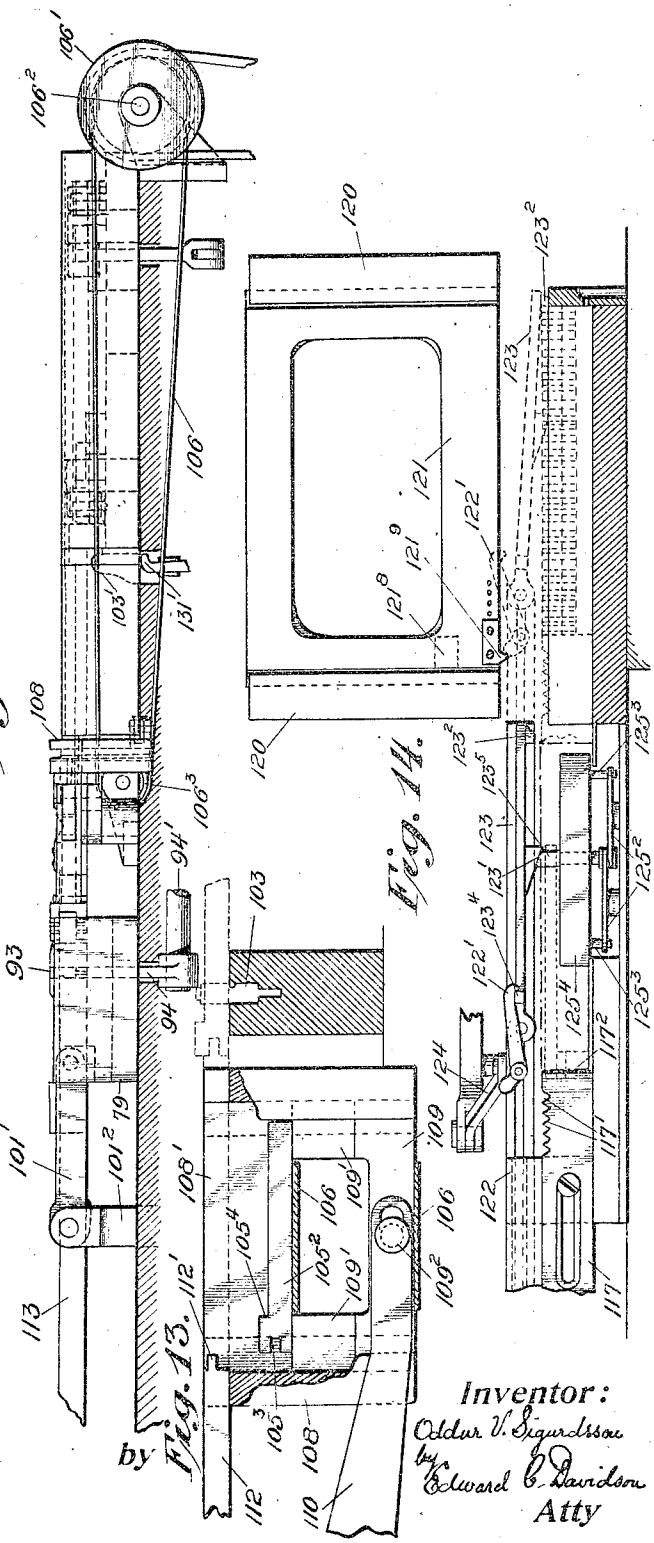


Fig. 12.

Fig. 13.

Fig. 14.

Attest:

L. L. Browning

Inventor:

Oddur V. Sigurdsson

by Edward C. Davidson

Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846. Patented Dec. 7, 1909.

17 SHEETS—SHEET 8.

Fig. 16.

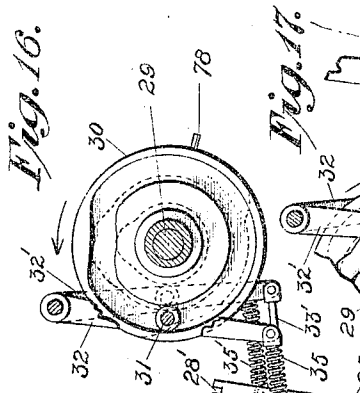


Fig. 17.

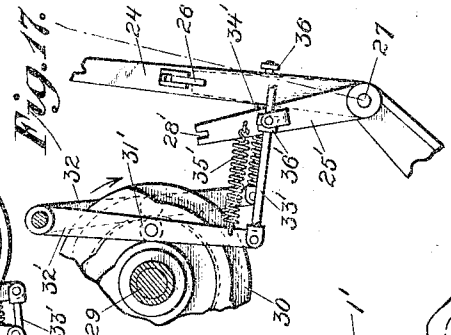
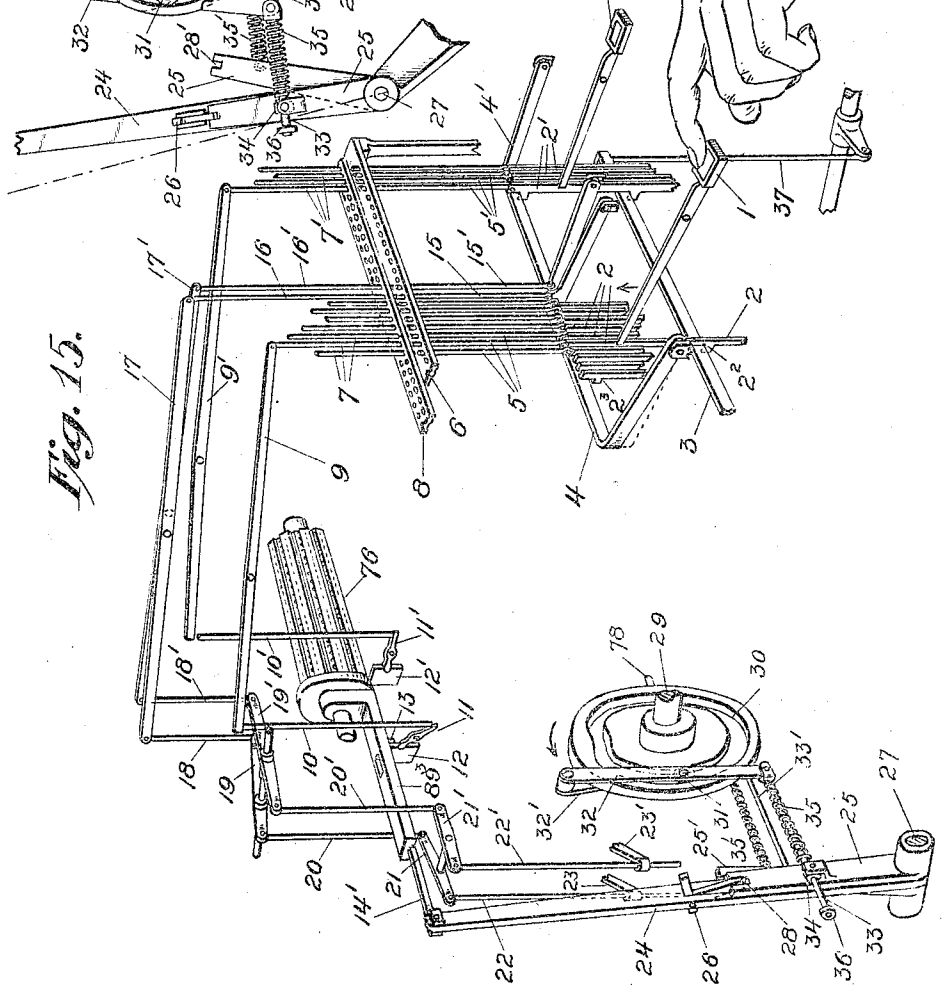


Fig. 15.



Attest:

D. S. Mitchell

D. F. Browning

Inventor:

Oddur V. Sigurdsson

by Edward C. Davidson

Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846.

Patented Dec. 7, 1909.

17 SHEETS—SHEET 9.

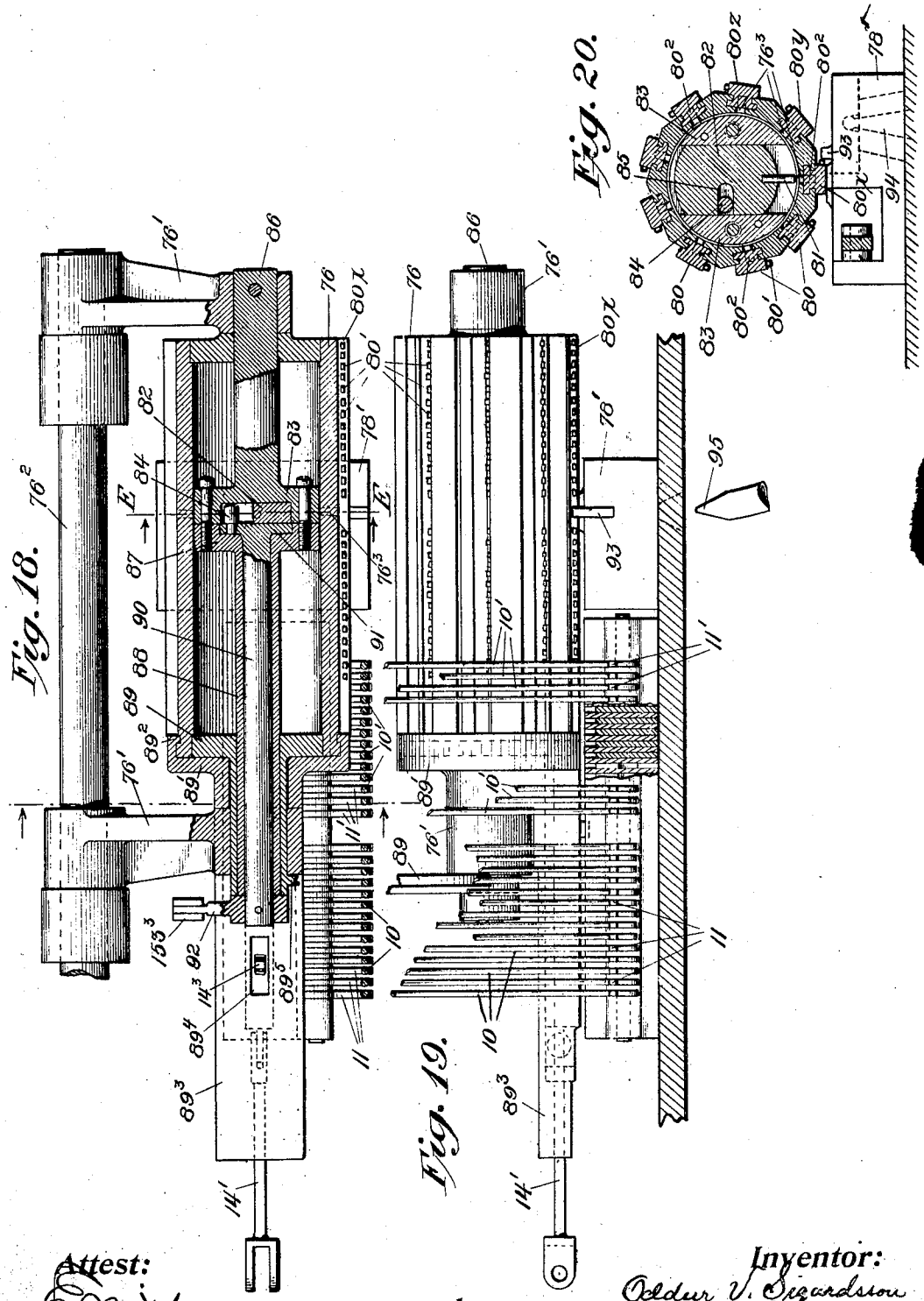


Fig. 18.

Fig. 19.

Fig. 20.

Attest:

C. D. Mitchell

R. F. Browning

by

Inventor:

Oldur V. Sigurdsson

Edward C. Davidson

Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846.

Patented Dec. 7, 1909.

17 SHEETS—SHEET 10.

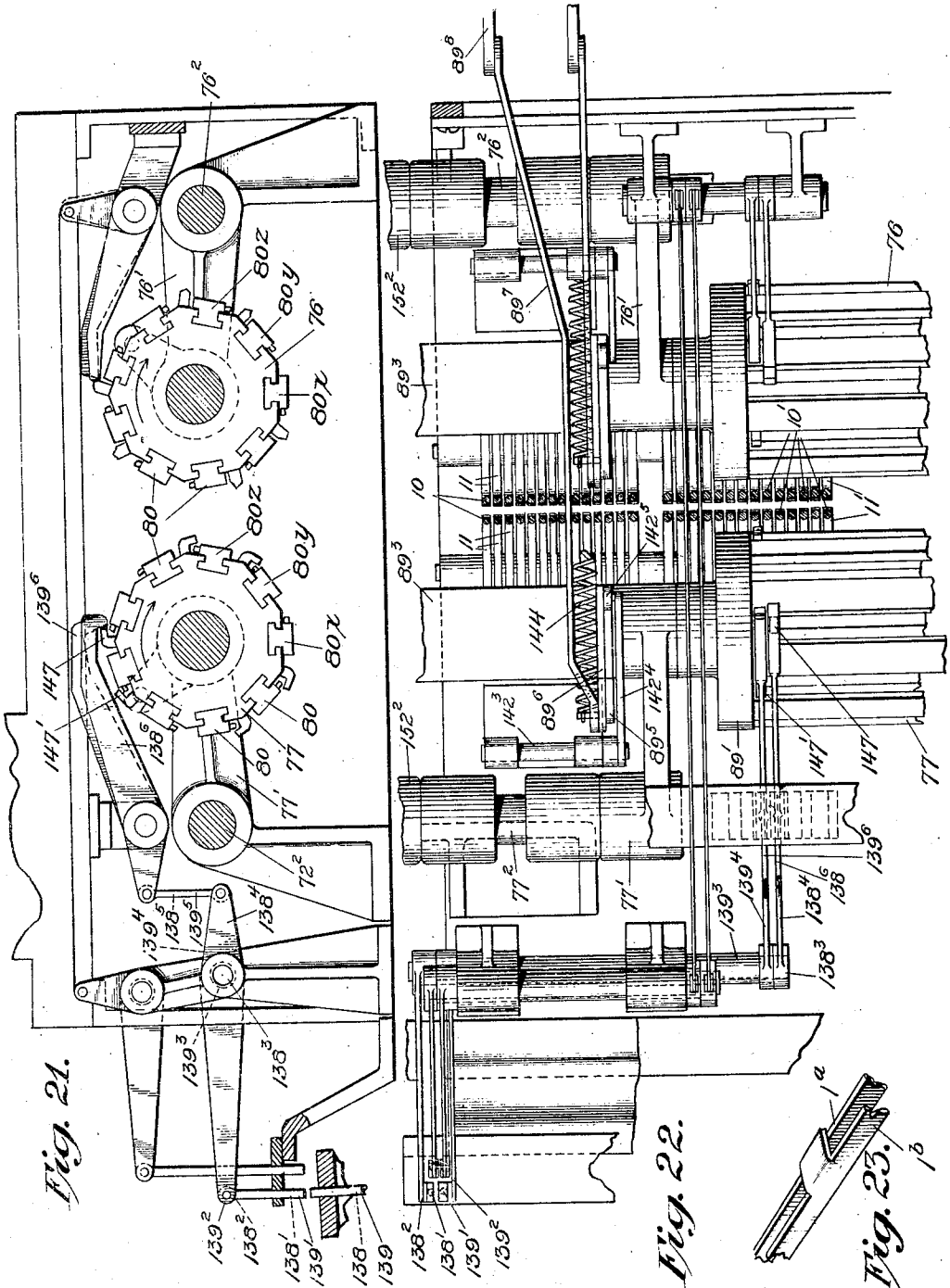


Fig. 21.

Fig. 22.

Fig. 23.

Attest:

L. L. Browning

by

Inventor:

Oddur V. Sigurdsson

Edward C. Davidson

Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846.

Patented Dec. 7, 1909.

17 SHEETS—SHEET 11.

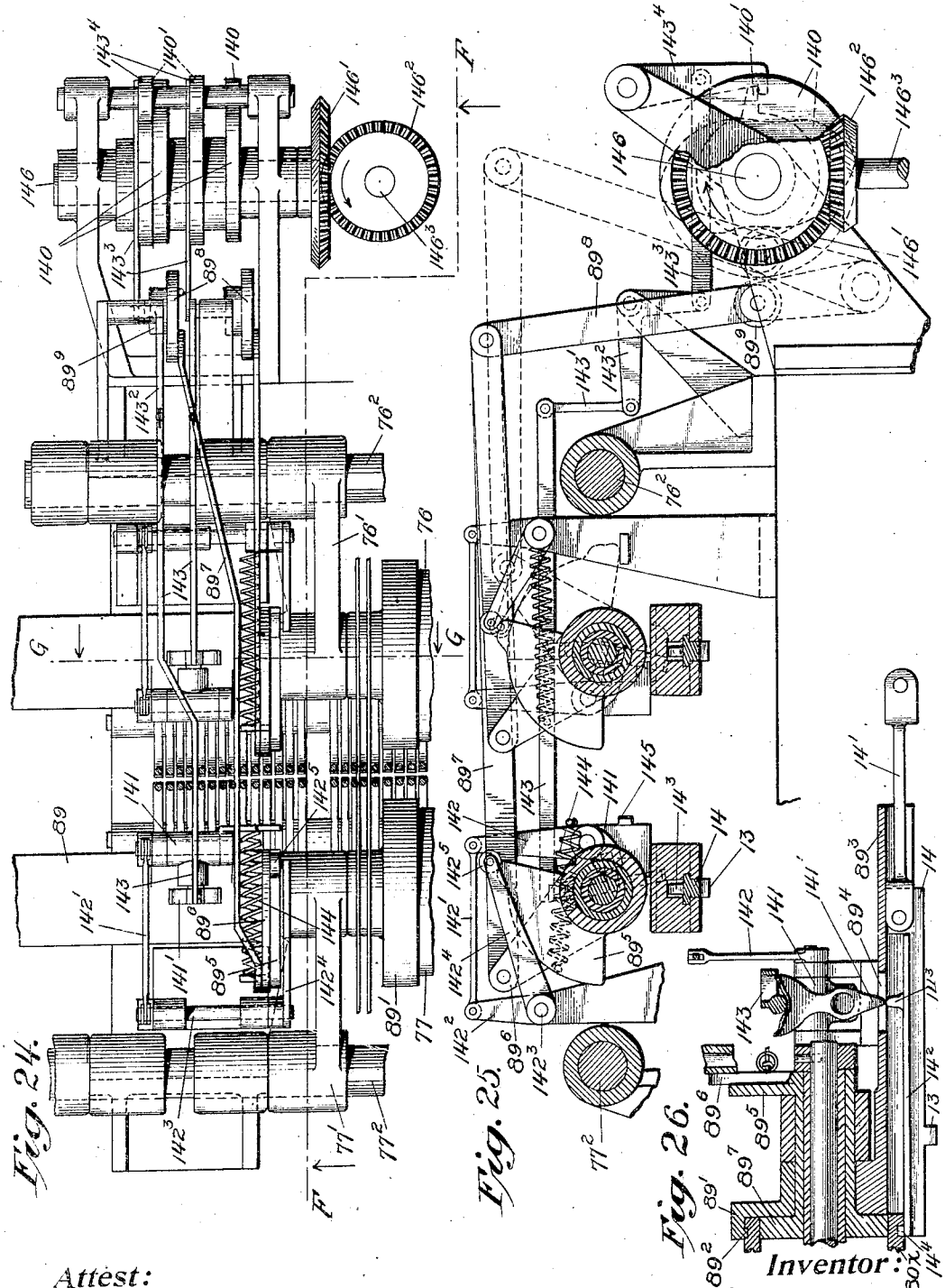


Fig. 24.

Fig. 25.

Fig. 26.

Attest:

L. F. Browning

by Oddur V. Sigurdsson
Edward C. Davidson Atty

Inventor:

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846. Patented Dec. 7, 1909.

17 SHEETS—SHEET 12.

Fig. 27.

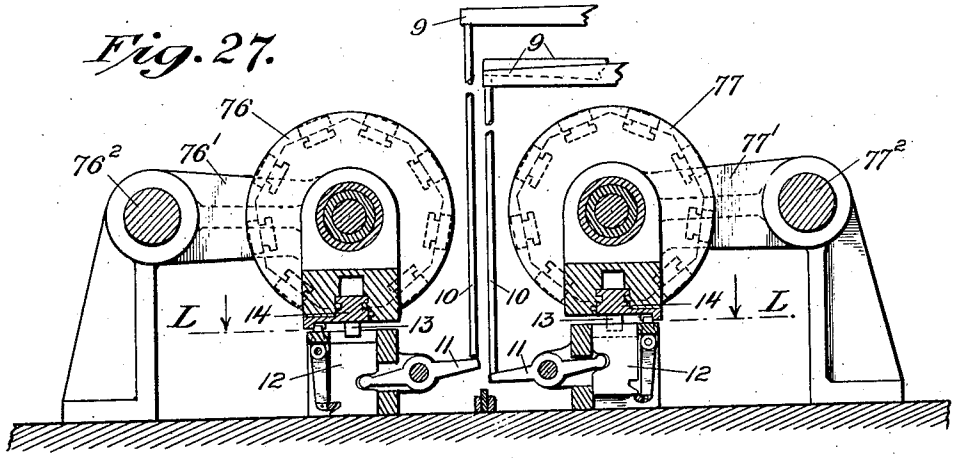


Fig. 28.

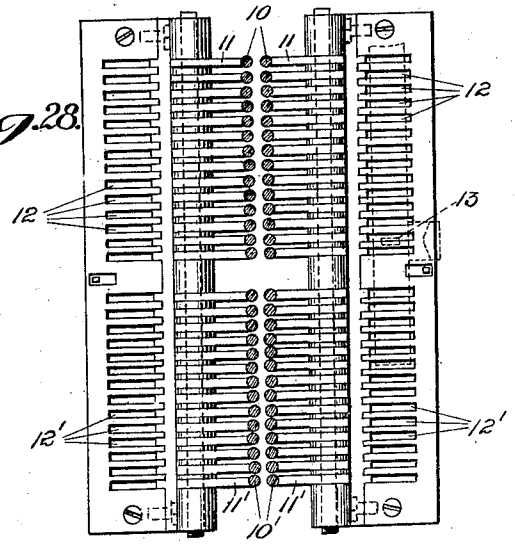
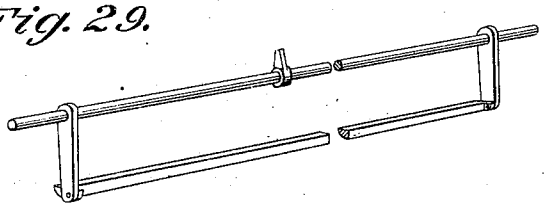


Fig. 29.



Attest:

L. F. Browning

Inventor:

Oddur V. Sigurdsson

by Edward C. Davidson

Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846. Patented Dec. 7, 1909.

17 SHEETS—SHEET 13.

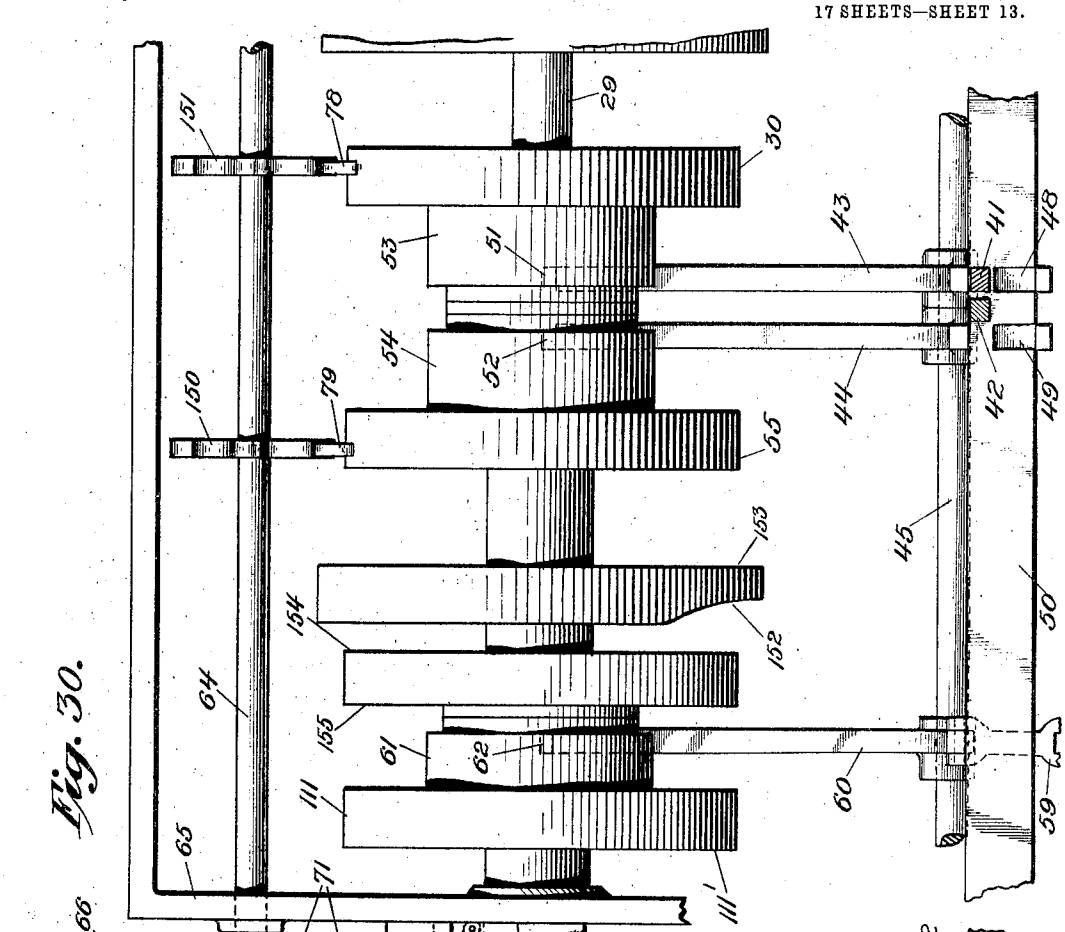


Fig. 30.

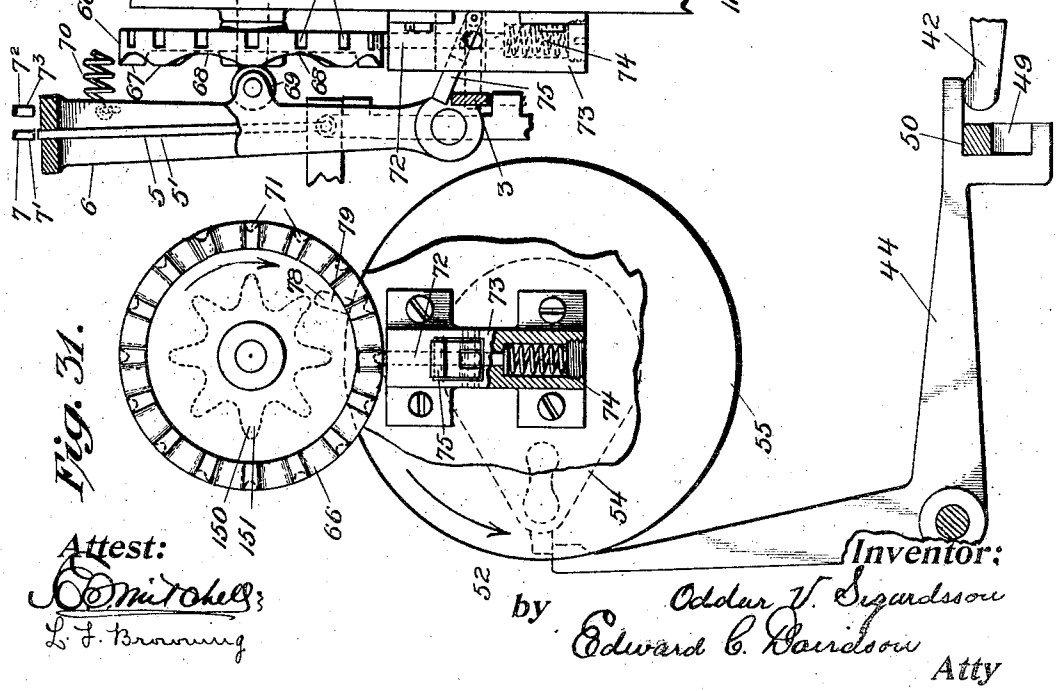


Fig. 31.

Attest:

E. Mitchell

L. F. Browning

Inventor:

Oddur V. Sigurdsson

by Edward C. Davidson

Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846. Patented Dec. 7, 1909.

17 SHEETS—SHEET 14.

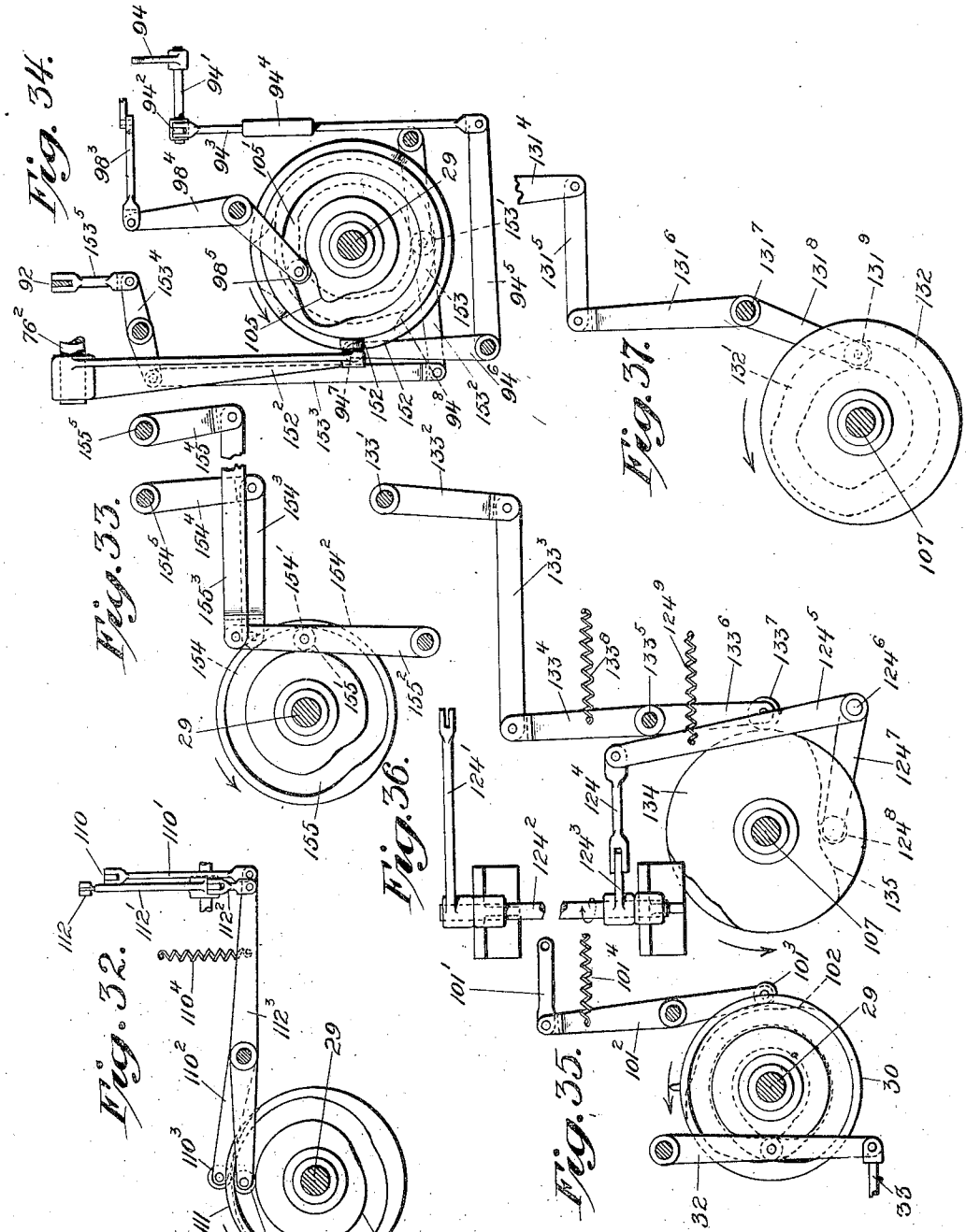


Fig. 34.

Fig. 37.

Fig. 33.

Fig. 36.

Fig. 32.

Fig. 35.

Attest:

L. F. Browning

Inventor:

Oddur V. Sigurdsson

by Edward C. Davidson Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846.

Patented Dec. 7, 1909.

17 SHEETS—SHEET 15.

Fig. 39.

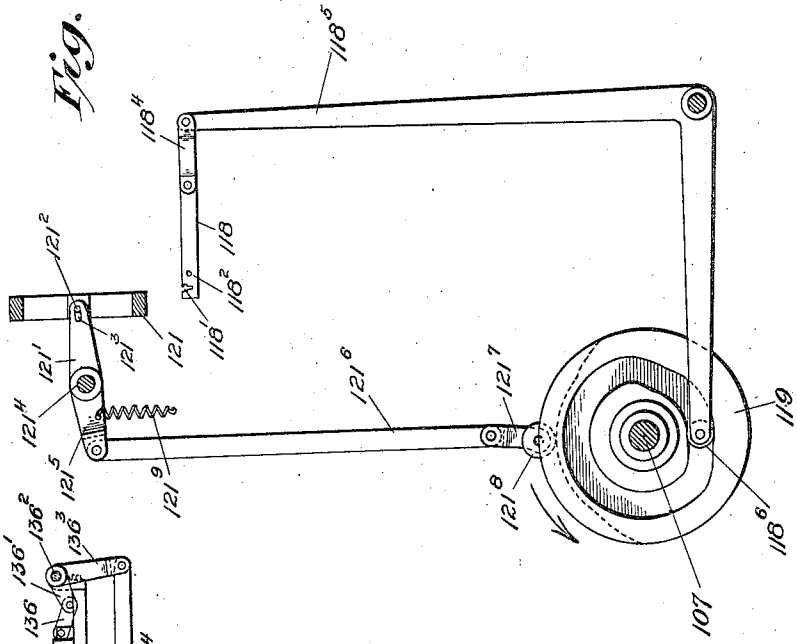
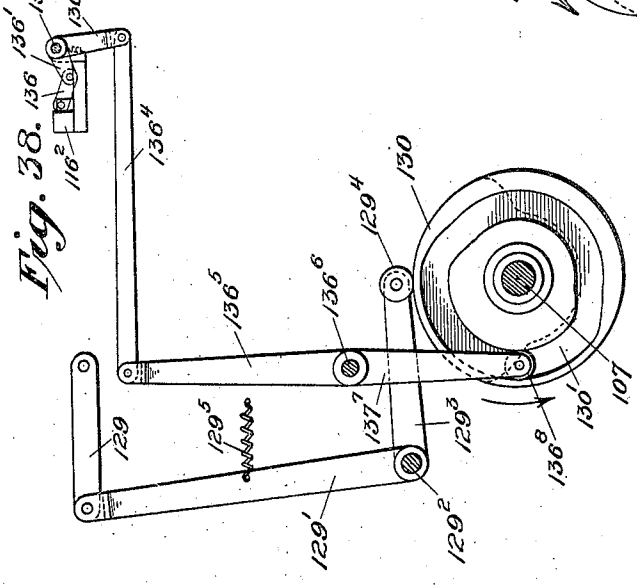


Fig. 38.



Attest:

E. O. Mitchell

L. L. Browning

Inventor:

Oddur V. Sigurdsson

by Edward C. Davidson

Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846.

Patented Dec. 7, 1909.

17 SHEETS—SHEET 16.

Fig. 41.

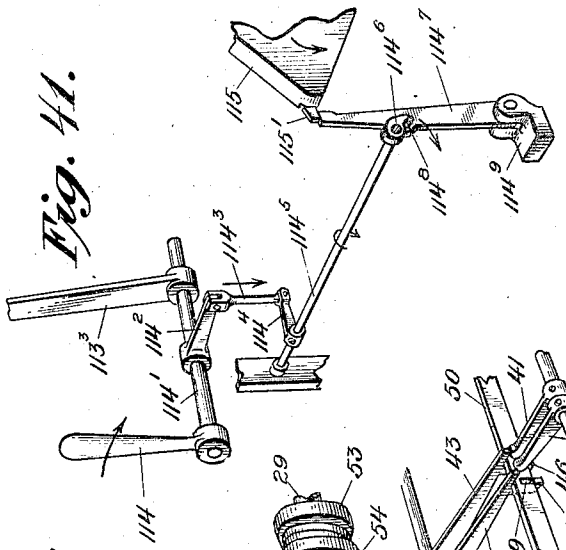
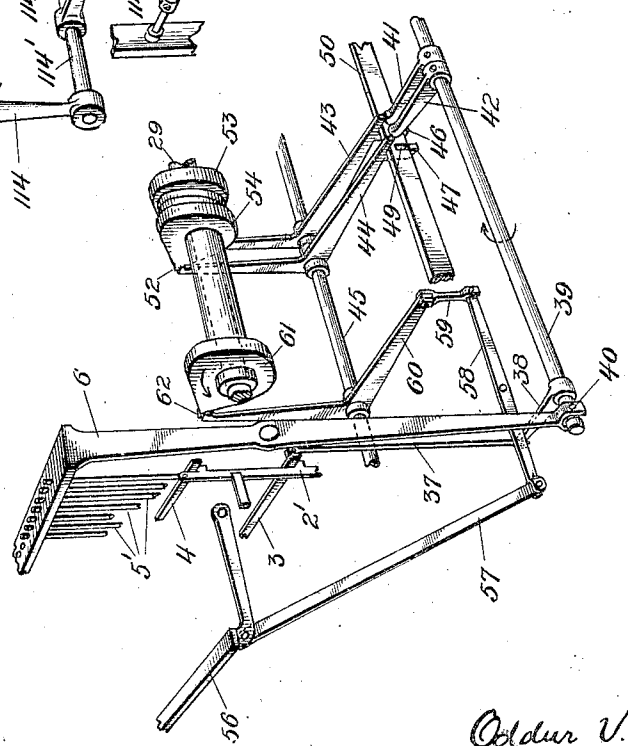


Fig. 40.



Attest:

L. L. Browning

by

Inventor:

Oldur V. Sigurdsson

Edward C. Davidson

Atty

O. V. SIGURDSSON.

TYPE CASTING AND COMPOSING MACHINE.

APPLICATION FILED OCT. 31, 1908.

942,846.

Patented Dec. 7, 1909.

17 SHEETS—SHEET 17.

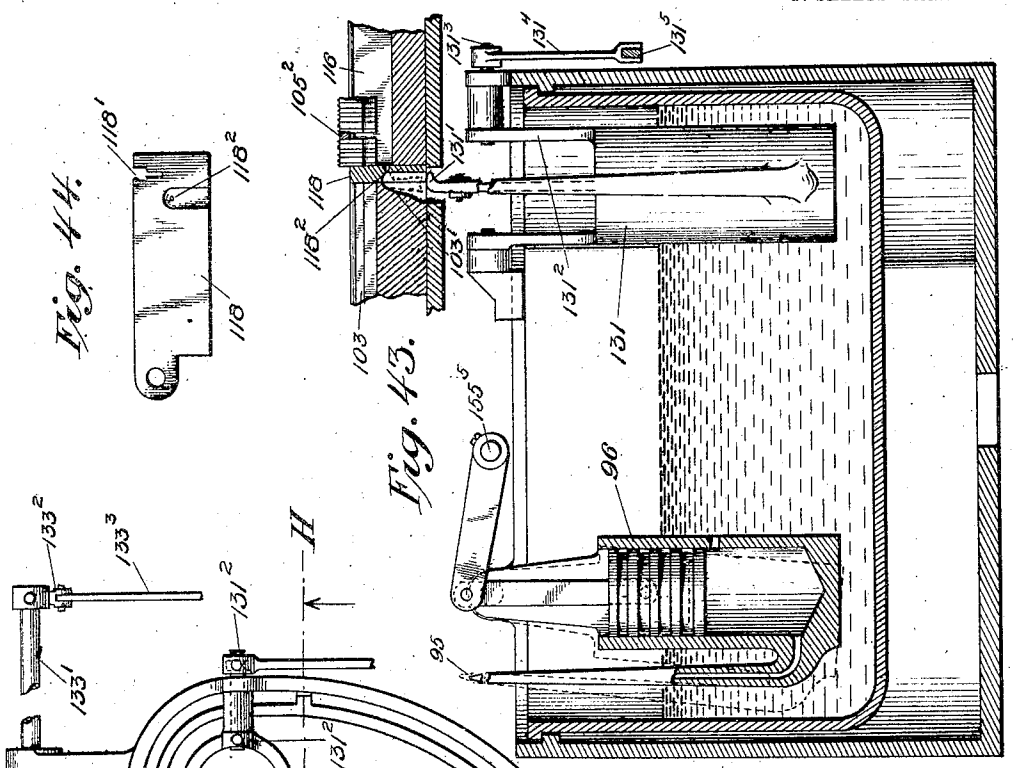


Fig. 44.

Fig. 43.

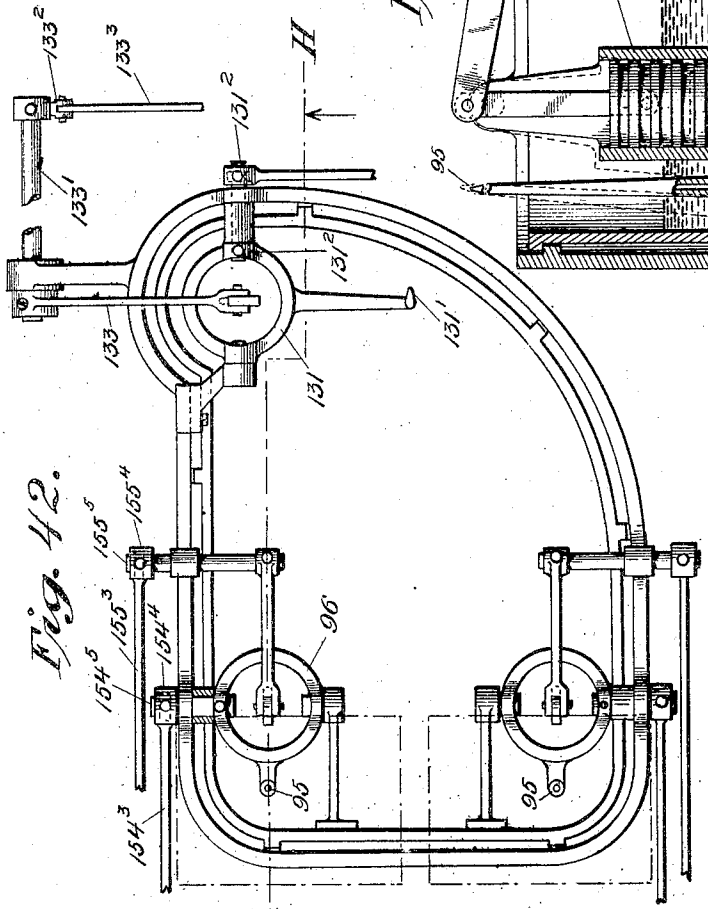


Fig. 42.

Attest:

L. F. Browning

by

Inventor:
Oddur V. Sigurdsson
Edward C. Davidson
Atty

UNITED STATES PATENT OFFICE.

ODDUR V. SIGURDSSON, OF NEW YORK, N. Y., ASSIGNOR TO ODDUR MANUFACTURING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF WEST VIRGINIA.

TYPE CASTING AND COMPOSING MACHINE.

942,846. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed October 31, 1908. Serial No. 460,397.

To all whom it may concern:

Be it known that I, ODDUR VIGFUS SIGURDSSON, a subject of the King of Denmark, residing in the borough of Brooklyn, city and State of New York, have invented certain new and useful Improvements in Type Casting and Composing Machines, of which the following is a specification.

This invention relates to a machine in which, upon the manipulation of character keys in a keyboard, single type are successively cast, assembled in lines, the respective lines solidified or rendered integral and the solidified lines successively delivered to a composing galley.

It comprises a new organization wherein the operation of casting and assembling in lines, solidifying and delivering to the galley are all conducted in one plane; also an organization wherein the matrices are carried in bars mounted to move endwise in a rocking drum or support, the matrices of a font being distributed upon the several bars and the required bar being brought into molding position by rocking the support, and the respective bars moved endwise in either direction from normal mid position to bring a selected matrix opposite a mold located intermediate the ends of the bar in its normal position. This latter organization is one that may be employed in type casting machines differing in general construction from that herein disclosed. The construction is such that on operation of keys in the left hand portion of the keyboard, the selected operative matrix bar is moved in one direction and on operation of keys in the right hand portion of the board the bar is moved in an opposite direction.

This invention constitutes an improvement upon the structure disclosed in my Letters Patent of the United States No. 889,820 granted June 2, 1908.

A further feature of the present invention comprises the employment of a plurality of casting units in connection with a single key-board according to the general plan disclosed in my Patent No. 903,331 dated November 10, 1908.

The invention further comprises various features of construction hereinafter set forth some of which may be employed in machines other than that of the special character herein disclosed.

The accompanying drawings disclose a machine embodying this invention in the form now best known to me but the details of construction thereof may obviously be varied by those skilled in such matters without departing from the spirit of this invention.

It is not intended that the invention in its broader aspects shall be confined to mechanical structural details which may of course be modified in a variety of ways by skilled mechanicians.

Figure 1 is a right hand elevation of a type casting machine with one driving pulley and the galley removed. Fig. 2, a plan view of same: Fig. 3, a front elevation: Fig. 4, a left hand end elevation: Fig. 5, a cross sectional plan on line A, A, of Fig. 1: Fig. 6, an enlarged detailed plan showing type molds, type channel, solidifying mold, spacing mechanism, line extracting mechanism and galley: Fig. 6ª, a section through the sliding block on line J, J, of Fig. 6. Fig. 7, a cross section of type channel on line B, B, of Fig. 6: Fig. 8, a cross section through the solidifying mold on line C, C, of Fig. 6: Fig. 9, an enlarged detail plan of the movable mold face: Fig. 10, a front elevation of the type mold: Fig. 11, a cross section of the justifying mechanism on line D, D, of Fig. 6: Fig. 12, a side view of Fig. 6 from the front of the machine: Fig. 13, an enlarged sectional elevation on line B, B, of Fig. 6 through the belt conveyer, showing lifting mechanism for the justifying wedges and the type channel in cross-section: Fig. 14, a part elevation of Fig. 6 from the galley side, showing the line facing plate, mechanism for extracting the line from the solidifying mold, and mechanism for pushing the solidified line into the galley: Fig. 15, a perspective view showing one of the matrix drums, the lever system by which it is operated from the key-board, and cam actuating devices determining the movement to right or left of the active matrix bar: Figs. 16 and 17, enlarged detail views of cam and levers for operating the matrix bar: Fig. 18, an enlarged longitudinal section through one of the matrix drums showing a matrix bar locking device: Fig. 19, an enlarged elevation showing the matrix drum, rods for actuating the matrix shifting bar stop pawls, an end view of type mold, and nozzle of the

pump for injecting type metal into the mold: Fig. 20, a cross section of matrix drum on line E, E, of Fig. 18 showing matrix bar locking device and type mold in elevation: Fig. 21, an enlarged elevation, partly in section, showing the lever system for locking the matrix drum: Fig. 22, a plan of Fig. 21: Fig. 23, a perspective view of cap and figure key levers: Fig. 24, a plan view of mechanism for revolving the matrix drums: Fig. 25, a cross section on line F, F, of Fig. 24, some parts being omitted: Fig. 26, a cross section on line G, G, of Fig. 24 showing dog cam for starting the mechanism for revolving the matrix drum: Fig. 27, a cross section on line F, F, of Fig. 24 looking toward the matrix drum and showing the method of throwing the pawl, some parts being omitted: Fig. 28, a plan view of Fig. 27 from line L, L, with matrix drums removed: Fig. 29, a detail of matrix bar stop pawl locking device: Fig. 30, a side elevation of automatic mechanism for actuating the matrix drums and devices for locking the key board while an operation is being performed: Fig. 31, an end elevation of Fig. 30: Figs. 32 to 39, detail views of the various cam and lever systems for general operation of the machine: Fig. 40, a perspective view showing connections from the key-board universal bar for starting the cams controlling the type casting operation: Fig. 41, a perspective view showing mechanism for starting the type solidifying cams and line ejector: Fig. 42, a plan of the type metal pot showing the type casting and line solidifying pumps: Fig. 43, a part sectional view on line H, H, of Fig. 42 showing one type casting pump in section, a line solidifying pump in elevation, and in partial section the solidifying mold sprue-plate and the type channel: Fig. 44, an elevation from the pump nozzle side showing the sprue-plate of the solidifying mold.

The drawings illustrate two similar type-making units assembled in a suitable frame and a single key board or set of keys by the manipulation of which the type-making units may be set in motion and controlled and the two units be in action at the same time, having been set in operation by the depression of separate keys or, when any type character is to be repeated, by successive manipulation of the same key. The matrix carrying drum of each unit is capable of containing one or more fonts of type, each font being distributed on several matrix bars, three being shown in this instance and respectively carrying the lower case, upper case, numerals, etc. In this description but one font of type on each matrix drum will be considered. Belt driven shafts operating continuously are suitably mounted in the frame of the machine and are provided with ordinary clutches to set in motion the various cams for proper operation of the machine.

Means are provided for automatically alternating from one matrix drum to the other as successive keys are depressed, each matrix drum having a type casting mold and mechanism for transferring the type as-cast to the line to be solidified. The cycle of operation for effecting casting of type from one matrix drum will be described, the description being applicable to both drums.

To attain increased speed in the operation of the machine, the matrix drums are so mounted above the type casting molds that the matrix bars have an equal maximum travel to right or left of normal position. The keys (other than upper case and numeral) in the right hand half of the key-board operate to throw a selected matrix carrier to the right, and those in the left hand half of the key-board operate to move it to the left.

In the perspective view, Fig. 15, the machine is shown in proper position for operation of the rear matrix drum 76 (Figs. 1, 2, 4, 15, etc.) and the movement of the operative lower case matrix bar to the left. The inner end of each of the pivoted key levers actuates a vertical member 2 by engaging a notch therein. These members, with the exception of those actuated by cap and figure keys, have lugs 2^2 and 2^3 adapted respectively to engage the cross rod 3 and yoke 4. The vertical members 2 are pivotally connected at their upper ends to vertical push pins 5 whose upper ends are free to move through the perforated plate of the oscillating yoke 6. In line with, and vertically above, each push pin 5 is a corresponding pin 7, the lower end of which is held in position by the perforated stationary plate 8 through which it is free to move. The upper end of pins 7 are pivotally connected to lever 9 which is adapted to operate lever 11 through rod 10 at its inner end. Levers 9 and 11 (one only of each of which appears in Fig. 15) are fulcrumed in any suitable manner. Levers 11 engage notches in matrix bar stop pawls 12 adapted to be thrown upward into the path of lug 13 on the lower face of matrix sliding bar 14, Fig. 26. Pawls 12 are provided with means for locking them in their upper and lower positions. The latch bar 156 is actuated by cam projection 14^5, of matrix sliding bar 14, that contacts with finger 157 carried by shaft 158 from which said latch bar is fixedly carried by arms 159, Figs. 27, 28 and 29.

Pivotally connected to yoke 4 is a vertical push pin 15 supported at its upper end by yoke plate 6 and adapted to engage pin 16 pivotally connected at its upper end to lever 17 whose outer end is connected by link 18 to lever 19 which is connected by link 20 to lever 21. Pivotally connected to the outer

end of lever 21 is a downwardly projecting push rod 22 guided near its lower end by a suitable bearing 23. The above description covers the train of levers, rods, links, etc. from the left hand half of the keyboard for determining the left hand movement of the matrix bar from its middle position by any key on that side of the key-board. A similar train of pins, levers and links 2′, 5′, 7′, 9′, 10′ and 11′ serves to throw stop pawl 12′ into the path of lug 13 of matrix sliding bar 14, and the pins, links and levers 15′, 16′, 17′, 18′, 19′, 20′, 21′, and 22′ actuated by keys of the right hand half of the key-board control the movement of the matrix bar to the right of its middle position.

Directly beneath the downwardly projecting push rods 22 and 22′ are mounted on a suitable shaft 27 three levers 24, 25 and 25′, the middle one 24 being longer and connected at its upper end by link 14′ to matrix sliding bar 14. Lever 24 carries a T-shaped dog 26 suspended in a slot and adapted to be thrown either to the right or left by rods 22 and 22′ to engage the slots 28 or 28′ in the upper ends of levers 25 or 25′ which are clearly shown in perspective and in elevation in Figs. 15, 16 and 17.

Mounted on the type casting cam shaft 29 is a double bridle cam 30 operating against rollers 31, 31′ carried by levers 32, 32′ suitably pivoted above the cam. Cam levers 32, 32′ are flexibly connected to levers 25, 25′, by means of rods 33, 33′, yoked at the lower ends of said levers and sliding through pivotally mounted collars 34, 34′ mounted on levers 25, 25′. On the rod 33, interposed between its connection with lever 32 and collar 34, is a compression spring 35 tending at all times to force lever 35 outwardly or away from cam 30. Integral with the outer end of rod 33 is a stop or collar 36 limiting the outward movement of lever 25, which movement is sufficient for the maximum throw of the matrix bar 14 to the left. Stop 36 also serves to bring the lever 25 to a vertical position when cam 30 is at rest. Rod 33′ that connects cam lever 32′ to lever 25′ has its stop or collar 36′ interposed between the two levers and limits the movement of lever 25′ inwardly toward cam 30, thereby controlling the maximum throw of matrix shifting bar 14 to the right and also serving to force outwardly lever 25′ to a vertical position when cam 30 is in its rest position. Tension spring 35′ connecting levers 25′, 32′, tends at all times to draw lever 25′ toward cam 30. In the two cam faces of cam 30 there is a neutral point where, when the cam is at rest, both levers 32 and 32′ are in alinement; and levers 25, 25′ and 24 are in vertical position. The slots 28, 28′, of levers 25, 25′, are ready to be engaged by the lower projection of the swinging dog 26 as it is forced either to the right or left by rods 22 or 22′.

It will be obvious that upon depression of any of the key-levers the corresponding vertical member 2 raises cross rod 3, yoke 4 and rod 5. The upper end of rod 5 engages the lower end of rod 7 pivoted to lever 9, raises its outer end, depresses the inner end and, through rod 10 and lever 11, raises the matrix bar stop pawl 12 into the path of lug 13 on matrix shifting bar 14 (Figs. 25, 26 and 27). Through link 37 attached to cross rod 3 and other mechanism to be described hereafter, the type casting cam shaft 29, which rotates continuously, starts cam 30 into motion by means of a suitable clutch. Yoke 4 in its upward movement lifts the outer end of lever 17 by means of the pivoted rods 15 and 16. The inner end of lever 17 by means of the train of links and levers 18, 19, 20 and 21 forces down rod 22 and its lower end coming into contact with the left hand part of the cross-head of rocking dog 26 throws the lower projection of said dog to the right into slot 28 of lever 25, thus locking levers 24 and 25 together. Cam 30 is so timed as to permit of the locking of the levers before motion takes place. Levers 24 and 25 being locked together, an outward motion is imparted to them by cam 30 through lever 32, rod 33 and compression spring 35. The outward movement of lever 24 draws matrix shifting bar 14 to the left until lug 13 thereon comes in contact with stop pawl 12 and the character on the matrix corresponding to the key-lever depressed is brought over the type mold that is mounted under the matrix drum centrally of the path of right and left hand travel of the matrix bar. The outward movement of lever 24 is arrested by abutment of lug 13 against pawl 12, and rod 33 now slides through collar 34 and spring 35 is compressed until the maximum throw of cam 30 is reached. At this point there is a dwell or period of inaction of the cam of sufficient duration to admit of the typecasting operation which is described later. After the completion of typecasting, cam 30 reverses the motions just described and all parts are brought to their positions of rest. Stop pawl 12 has been locked in its upper position by latch bar 156, Figs. 27 and 29, and remains so locked in its upper position until released by the return action of cam projection 14^5 carried by matrix sliding bar 14. Latch bar 156 is suspended by two arms 159, Fig. 29, carried by shaft 158 mounted in suitable bearings on the housing of stop pawls 12 and 12′. Shaft 158 carries an upwardly projecting finger 157, the upper end of which lies in the path of cam projection 14^5 of matrix sliding bar 14, Fig. 28. When the matrix sliding bar is in its normal or resting position, cam 14^5 deflects the finger 157 inwardly, thereby moving outwardly the latch bar 156 from engagement with stop pawls

12 and 12′, and leaving said pawls free to be thrown upwardly by any of their actuating levers 11 or 11′. After any pawl 11 or 11′ has been thrown upward, the matrix sliding bar 14 by its movement to either the right or left of its mid position releases cam 14^5 from contact with finger 157 allowing latch bar 156 to move inwardly and engage the notches of the inactive stop pawls and the bottom edge of the active stop pawl holding the latter in its upper or operative position. The cam lever 32′ and lever 25′ are free to move without interference with the locked levers 24 and 25.

When a key lever in the right hand portion of the key-board is depressed, an action similar to that just described takes place through the rod and lever systems 2′, 4′, 5′, 7′, 9′, etc., forcing stop pawl 12′ to its upward position in the path of lug 13 on matrix shifting bar 14 and limiting the movement of said matrix bar to the right thereby bringing into register with the mold the character in the matrix bar corresponding to the key depressed. Rod 22′ through its train of rods and levers 15′, 16′, 17′, etc. is depressed, throwing the swinging pawl 26 to the left, locking levers 24 and 25′ together and permitting cam 30 to impart an inward or right hand movement to levers 24, 25′ through the tension spring 35′ and lever 32′. By this movement of lever 24, matrix shifting bar 14 is forced to the right until lug 13 engages with pawl 12′ when further motion is arrested and the increased throw of cam lever 32′ produces merely additional tension in spring 31′. After the casting operation all parts return to their normal positions of rest.

The mechanism for starting cam 30 in motion with shaft 29 is shown in Figs. 1, 3, 4, 30, 31 and 40, particular reference being made at this time to the latter. Cross rod 3 of the key-board is connected to shaft 39 by link 37 and lever arm 38. Shaft 39 (Fig. 40) is mounted in suitable bearings, not shown, and is capable of having a rotative movement transmitted to it by lever arm 38; and also a reciprocating motion along its axis by the downwardly extending arm of yoke 6 that engages by means of pins 40 an annular recess turned in the shaft. Pinned to shaft 39 are two cam arms 41 and 42 adapted when in proper alinement to engage respectively the under faces of the bell crank levers 43 and 44 that are free to rock on shaft 45 and are limited in their upward movement by lugs 46 and 47 on their under sides coming in contact with the upper ends of slots 48 and 49 in stop bar 50. The upwardly projecting arms of the bell cranks engage projecting stops or pins 51, 52 on clutch members 53, 54. These clutches are integral with cams 30 and 55 (not shown in Fig. 40) that operate the respective mechanisms for imparting movement to the matrix bars of the rear and front matrix drums 76, 77 as previously described.

In Fig. 40 the swinging yoke 6 is shown in its outward position and its projecting lever arm has moved shaft 39 backward along its axis thereby bringing the end of cam arm 41 into alinement with the under face of the horizontally projecting arm of bell crank lever 43 and throwing lever arm 42 out of alinement with the horizontal arm of bell crank lever 44. When cross rod 3 is lifted by any key lever, rotation in the direction of the arrow is imparted to shaft 39 through link 37 and lever arm 38; and cam arm 41, being in alinement with bell crank lever 43, lifts the horizontal arm and throws the upwardly projecting arm out of engagement with stop 51 of clutch member 53, thus allowing it to engage with shaft 29 and make one revolution, after which stop 51 again comes in contact with the upper end of lever 43.

The space bar 56 of the key-board is connected by link 57 with lever 58 whose other extremity is attached by link 59 to bell crank lever 60 mounted on shaft 45. The upwardly extending arm of bell crank lever 60 engages a pin or lug 62 on clutch member 61 integral with type spacing cam 111 (omitted in Fig. 40 but shown in elevation in Fig. 32). By depression of space bar 56, the horizontal arm of bell crank lever 60 will be raised and the upper end of the vertical arm disengaged from pin 62 of clutch member 61 permitting shaft 29 to rotate clutch 61 and its cam 111 in the direction indicated by the arrow. The method of spacing the type from cam 111 is hereinafter described.

In order to cast type alternately from the two drums (Figs. 1, 4, 15 and 30) there are provided two sets of vertical pins 7, 7′, comprising the first or front row, that operate the cross levers 9, 9′ to actuate stop pawls 12, 12′ that control the rear matrix drum; and pins 7^2, 7^3, comprising the second or rear row, that operate through a similar set of cross levers (not shown) the matrix bar stop pawls for the front matrix drum. The vertical pins comprising the two rows are held in alinement with each other by the perforated plate 8 through which they are free to move and are adapted to have brought into alinement with them, by the oscillating yoke 6, the vertical pins 5 and 5′ that are actuated from the key-board as previously described. Yoke 6, as shown, is in the correct position to control the operation of the rear matrix drum and should be oscillated rearwardly to start in motion the front matrix drum.

Mounted in suitable bearings in the frame of the machine, vertically above shaft 29 (Fig. 30), is a shaft 64 having fixed to its

outer end, beyond the frame 65, a face cam 66 that has a series of high and low points 67, 68, adapted to engage roller 69 mounted on one of the vertical arms of yoke 6. Roller 69 is forced to follow the face of cam 66 by tension spring 70 attached to yoke 6. By rotation of cam 66 the swinging yoke 6 is caused to oscillate and the rows of lifting pins 5, 5′ are brought alternately beneath the vertical rods 7, 7′ and 7^2, 7^3, that control respectively the rear and front matrix drums 76, 77.

In the periphery of cam 66 corresponding to the high and low points of its face are a series of notches 71 adapted to be brought into alinement with and engaged, as the cam revolves, by pawl 72 (Fig. 31) which is slidably mounted in block 73 and normally pressed upward by spring 74. Pivoted in block 73 is a lever 75 yoked around pawl 72 and adapted to be raised and lowered by a pin in the pawl acting in slots of the yoke arms of lever 75. Two star wheels 150, 151, each having an equal number of teeth that correspond to the high points of cam 66, are so mounted on shaft 64 as to bring their teeth in alinement with each other and with the high points of the cam.

In the peripheries of cams 30 and 55 are fixed pins 78, 79, in line with and adapted to engage the teeth of star wheels 150, 151. These pins are so placed (Fig. 31) that in their normal position their star wheels are free to pass, there being a certain amount of lost motion before either cam engages its star wheel. On depression of a key lever, cross arm 3 (shown in section Fig. 30) is raised and immediately drops again. In rising the cross arm lifts vertical pin 7 or 7′ and starts in motion its train of devices that control the movement (to left or right) of the matrix bar of matrix drum 76; clutch 53 is released and starts cam 30 in rotation bringing pin 78 in contact with a tooth of star wheel 151 thereby rotating the wheel one tooth and the cam 66 one notch; pawl 72 is forced out of engagement and held in its downward position by the periphery of the cam wheel until allowed to engage its next succeeding notch.

In the downward position of pawl 72, lever 75 is held in its lower position indicated by dotted lines in Fig. 30, preventing any upward movement of cross bar 3 and consequently any movement of its actuating key-levers, thus locking the whole key-board until pawl 72 engages with a notch in cam 66 and lifts arm 75 thereby permitting an upward movement of cross arm 3 that unlocks the key-board. By rotation of cam 66 the distance of one notch, roller 69 is moved from a high to a lower point and yoke 6 is oscillated to its rearward position, bringing the upper ends of the row of vertical pins 5, 5′ beneath the ends of the rear row of vertical pins 7^2, 7^3, that control the matrix bar of the forward matrix drum 77. In operating any key controlling the casting of type from a matrix bar or carrier of either the front or rear matrix drum, the oscillating yoke 6 will be automatically shifted to the required position to start the casting of type from the other matrix drum.

The matrix drums 76, 77 (Figs. 1, 2, 3, 4, 18, 19, etc.) are respectively carried by pairs of arms 76′, 76′, 77′, 77′, fast to shafts 76^2, 77^2 mounted in suitable bearings and are adapted to be raised from, or lowered to, the faces of the type molds 78′, 79 by cam 152 (Fig. 34) acting against roller 152′ carried by lever arm 152^2 attached to shaft 76^2. In normal position the matrix drums, shown in detail in Figs. 18, 19, 20, are raised so that the matrix bars are free to pass over the mold. The matrix bars are slidably mounted in the matrix drums by means of tongues bearing in grooves as in Fig. 20 and are adapted to be engaged and moved by the upwardly projecting rib 14^4 formed at the inner end of matrix sliding bar 14 which, as shown in Fig. 26, completes the annular rib 89^2 of head 89′ in that portion of said head cut out for the passage of the matrix bar. The matrix bars 80 each carry on one of their longitudinal edges beyond the periphery of the matrix drum and respectively opposite characters in the bar, a series of lugs 80′ of varying heights serving as stops for the closing slide 93 of the type mold and determining the width of mold to the thickness of the particular character to be cast. The inner faces of the matrix bars 80 have a series of holes 80^2, one opposite each character on the outer face of the bar, that register with corresponding holes 76^3 in the body of the matrix drum as the successive characters are brought into their type casting positions over the mold, in which position the matrix bars are locked during the type casting operation by pin 81 passing through holes 76^3 and into the hole in the bar. Pin 81 is mounted in a slide 82 guided in the sides of a recess cut in the stationary piston 83, and is capable of having a vertical upward and downward motion imparted to it by pin 84 working in slot 85. The piston 83 is formed on the inner end of shaft 86 that is pinned at its outer end in arm 76′ and forms a bearing for the outer end of matrix drum 76. Face to face with and secured to piston 83 by any suitable means is a second stationary piston 87 whose hollow shaft 88 extends through a sleeve or head 89 carried by the inner end of matrix drum 76. Revolubly mounted in the hollow shaft 88 is a secondary shaft 90 having an enlarged disk end 91 working in a counterbore of piston 87 and carrying a pin 84.

On the outer end of shaft 90 is fixed a crank arm 92 through which a motion of ro-

tation is imparted to the shaft by a cam 153 (Fig. 34) mounted on shaft 29. This cam acts on roller 153′ carried by lever 153² attached by link 153³ to lever 153⁴ that is connected by link 153⁵ to crank arm 92. On rotation of shaft 90 a downward movement is imparted to plate 82 and pin 81 is forced through hole 76³ in matrix drum 76 and into a registering hole 80² of the matrix bar 80, thereby locking the matrix bar to the drum and preventing further movement of the bar until released. As previously described, upon depressing any key lever the matrix bar is thrown either to the right or left until stopped by the corresponding matrix shifting bar stop pawl, thus bringing the desired character over the mold; the matrix bar is then locked by pin 81, the matrix drum lowered to bring the under face of the matrix bar in contact with the upper face of the mold, and mold closing slide 93 moves inward until stopped by projection 80′ on the matrix bar. The slide 93 is moved by means of lever 94 engaging a recess in its under side. The lever is actuated by shaft 94′ carrying an arm 94² connected by link 94³ to lever 94⁵. Link 94³ carries a sleeve 94⁴ containing a compression spring, that admits of continued upward action of the lower portion of link 94³ after the mold slide has come in contact with the stop 80′. This spring also serves to force forward slide 93 to eject cast type from the mold. Lever 94⁵ is mounted on a shaft that carries a second lever 94⁶ having a roller 94⁷ bearing against periphery of cam 94⁸, Fig. 34.

All mold parts being in position for type casting as shown by Fig. 6, type metal nozzle 95 is raised to the sprue plate in the under side of the type mold by the action of cam 154 (Fig. 33) on roller 154′ carried by a lever 154² connected by a link 154³ to arm 154⁴ carried by pump rock shaft 154⁵, Fig. 42. The cam slot that actuates roller 154′ is on the face opposite that shown in Fig. 33 and lever 154² lies behind lever 155². The plunger of type casting pump 96 (Fig. 42) is moved down by cam 155 (Fig. 33) acting on roller 155′ carried by a lever 155² connected by link 155³ to arm 155⁴ on the pump plunger shaft 155⁵, and metal is injected into the type mold. Upon the completion of this operation the matrix drum rises, withdrawing the matrix bar from the face of the mold. The matrix bar is unlocked and returns to normal position and the cast type is ready to be ejected from the mold and delivered to the line channel.

Rotatively mounted on vertical bearing pins 97 (Figs. 5, 6, etc.) are type delivering arms 98 in slots or grooves in which are movably mounted arms 99 having at their outer ends heads 99′. On the mold sides of these arms are recesses 99² for receiving the type as ejected from the molds, and on their rear faces notches 99³ adapted to be engaged by lugs 100 (Fig. 9) on the sliding faces 101 of the molds. These sliding faces are operated by cams mounted on shaft 29 (Fig. 35) through links 101′, levers 101², and rollers 101³ normally held against cams 102 by tension springs 101⁴. The type having been cast, the sliding face 101 of the mold is drawn back, bringing forward, to the position shown in the upper mold plan Fig. 6, the movable head 99′ of arm 99 and causing the recess 99² in head 99′ to register with the type mold. The type ejector 93 under stress of its spring moves forward and ejects the cast type into recess 99² and then it and slide 101 return to normal position. The head 99′ of arm 99 comes to a stop against type delivering arm 98 and is there held by a tension spring (not shown). The delivering arm 98 carrying the cast type rotates on its axis to the position indicated in dotted lines in Fig. 6 and delivers the type to the type channel 103, the mouth of which is provided on either side with spring pressed latches 104 projecting slightly into the channel and between which the type is forced and by which it is retained when arm 98 returns to normal position. The type delivering arms are moved by links 98′, levers 98², links 98³, (Fig. 5) and levers 98⁴ that carry rollers 98⁵ occupying slots 105′ of bridal cam 105 (Fig. 34) mounted on shaft 29. As the types are assembled in the type channel, the word spacing is accomplished by the insertion of spacing wedges 105² (Fig. 6) carried on and supported by the continuously traveling conveyer belt 106 (Figs. 6, 12 and 13) driven by pulley 106× suitably mounted on a shaft 106² at its outer end and passing over idler pulley 106³ at its inner end. Shaft 106² is driven by pulleys and belt from the cam shaft 107, Figs. 1, 3, etc. Placed near the idler end of the conveying belt is a hollow frame 108 (Figs. 6 and 13) through which the belt passes and against the inner face of which the type spacing wedges 105 are arrested.

Mounted in guides in the frame 108 is a movable head 109 having upwardly projecting arms 109′ straddling belt 106. The upper faces of arms 109′ when in normal position are slightly below the upper face of the belt. The head 109 is capable of having an upward motion imparted to it by the slotted lever 110 which bears on pin 109² and is pivoted in the frame of the machine and connected by link 110′ to lever 110² that carries at its other extremity roller 110³ bearing upon a cam 111 on shaft 29 (Fig. 32) and adapted to be engaged by clutch member 61, Fig. 40. Upon delivery to the type channel of type forming a completed word the operator depresses the space key 56 releasing, through the medium of link 57,

or table 126 is supported by four rollers 126′ bearing in cam slots 126² formed in the frame of the machine. The forward or mold edge of plate 126 has a projecting rib 126³ extending along its entire length and adapted to fit into the notches 105′ in the head ends of spacing wedges 105. Carried by bearings 126⁴ on the upper face of plate 126 is a cross shaft 127 provided at either end with arms 127′ extending beyond the inner edge of plate 126. Attached to the outer ends of arms 127′ is a cross arm or latch bar 127² adapted to pass over the heads of the spacing wedges 105 and drop behind their shoulders 105⁴. The lower edge on the mold side of latch bar 127² is rounded to enable it to nose over the heads of the spacing wedges in its forward movement. Leaf-springs 127³ bear on the upper edges of arms 127′ tending at all times to keep the latch 127² in its locked position. To counter-act this spring pressure and provide for unlocking latch 127², there are provided projecting lugs 127⁴ on arms 127′ that are cammed upward by pins 128 in the frame of the machine. Plate 126 in its normal or resting position has its lower face approximately in the same plane with the upper side of the conveyer belt 106. By reason of the cam slots 126² the plate 126 in its forward movement is raised and assumes the position shown by dotted lines Fig. 11, lugs 127⁴ are lifted from camming pins 128, rib 126³ engages the notches 105³ in the heads of the space wedges 105² and cross bar latch 127² noses over the heads of the spacing wedges and engages their faces 105⁴. Plate 126 is actuated by a link 129 that connects it with the upper end of a lever arm 129′ carried by shaft 129² which also carries arm 129³ having a roller 129⁴ bearing on periphery of cam 130′. Roller 129⁴ is held against the cam by tension of spring 129⁵ and allows for the cushioning of the type wedges when the line has been spread to fill the solidifying mold, Fig. 38.

Fig. 44 shows in detail the outer face elevation of sprue plate 118, type passage 118′ and sprue hole 118².

Fig. 43 is a section through the type metal pot and shows in elevation the swinging plunger pump 131 for ejecting type metal into the solidifying mold; a partial longitudinal section through the type channel 103 and solidifying mold 116; a cross section of sprue plate 118 through the sprue hole 118²; a partial line of type in the solidifying mold; and a type spacing wedge 105² in cross section.

All cams on the cam shaft 107 are set in motion by hand lever 114 (Fig. 41). The cams being properly timed the following movements governing the solidification and ejection of a line take place in proper relation to each other.

By the action of cam faced recess 103′ in the under side of type channel 103, the nozzle 131′ of solidifying pump 131 will, when raised, be forced against the sprue hole 118² making close contact with it. One of the upwardly projecting arms 131² of pump 131 is fastened to the short rocking shaft 131³ the outer end of which carries the downwardly projecting arm 131⁴ attached by link 131⁵ (Fig. 37) to lever 131⁶ on shaft 131⁷ that carries a second or downwardly projecting arm 131⁸ having in its end a roller 131⁹ bearing in bridle cam slot 132′ of cam 132 on shaft 107. The plunger of solidifying pump 131 (Figs. 42 and 36) is operated through lever 133, shaft 133′, lever 133², link 133³, lever 133⁴, shaft 133⁵, and lever 133⁶ that has in its end a roller 133⁷ bearing on periphery of cam 134. Roller 133⁷ is held in contact with cam 134 by the action of tension spring 133⁸. The completed line having been forced into the solidifying mold, and plunger 113 having returned to its rest position, the sprue plate 118 moves forward closing the end of the mold and bringing the sprue hole 118² into the position shown in Figs. 8 and 43 ready to receive pump nozzle 131′. Simultaneously with this action the line ejector 123 moves forward to the position shown in dotted lines in Figs. 6 and 41, type facing head 121 descends on the face of the type, trips latch 122′ allows the line ejecting arm 123 to fall and its lip 123² to engage the inner end of the type line. Projection 121⁷ on head 121 engages its registering groove in adjustable plate 117 locking it in the mold. Table 126 is moved to its forward position (Fig. 11) and engages the ends of spacing wedges 105² forcing them forward between the words of the line, thus justifying the line and completely filling the mold. Any excess movement imparted by the cam 130 (Fig. 38) is compensated by spring 129⁵. Cross latch 127² grips the wedges for withdrawal upon the return of table 126; movable mold face 116² (Figs. 6 and 8) closes tightly against the face of the type; the space above the mold between words of the line is filled by the type space wedges; and the mold is completely closed ready for the solidifying metal. Pump nozzle 131′ rises to the sprue hole 118² and the pump plunger descending injects molten type metal into the mold, completely filling all the spaces between the type and the mold and the spaces between the words up to the under face of type spacing wedges. The line having been solidified, the movable mold face 116² recedes, type facing plate 121 rises thereby unlocking the adjustable end mold plate 117, table 126 returns to its normal full line position (Fig. 11) carrying with it the wedges 105², and lugs 127⁴ on arms 127′ that engage cam pins 128 lift cross latch 127² thus releasing

the type spacing wedges 105^2 and depositing them on the top surface of the upper run of conveyer belt 106. The nozzle of solidifying pump has dropped, and the sprue plate returned to its rest position bringing the type passage 118′ again in alinement with the type channel and solidifying mold. The line extracting arm 123 moves to its outward position (Figs. 6 and 14) withdrawing the solidified line to a position opposite the end of galley 137. The cam face 123 engages pin 123^5, lifts latch 123^2 and leaves the solidified line free to be delivered to the galley. The continued backward action of lever arm 124′ forces forward pusher plate 125^4 driving the solidified line into the galley 137.

The foregoing description of the machine has dealt only with the casting of type from the lower case or the lower matrix bars 80^x, Figs. 18, 19, 20, 21. In this explanation the particular matrix bars under discussion are designated by 80^x, 80^y and 80^z being respectively lower case, caps, figures, etc. of matrix drum 77. It is evident that in order to cast type from the cap or figure matrix bars, the matrix drums must be partially rotated to bring either of these bars to the lower or casting position occupied by lower case bar 80^x. The matrix drums are rotatively mounted, the outer end head bearing on the fixed shaft 86 (Fig. 18), and the inner end head 89 having an outwardly extending sleeve carried by a bearing in arm 76′.

Surrounding the inner end of the matrix drum is a fixed head 89′ having an annular rib 89^2 that engages a corresponding recess in the matrix drum and in the outer faces of the matrix bars, and locks the matrix bars in the matrix drum as it revolves. The head 89′ is cut out on its lower side as shown in Fig. 26 to permit the passage of the active matrix bar and the matrix shifting bar 14. From the lower outer face of head 89′ projects a guide frame 89^3 recessed on the under side and provided in its downwardly projecting edges with longitudinal slots or guides that serve as slideways for the longitudinal projecting flanges 14^2 on matrix shifting bar 14. An opening 89^4 is provided in the upper portion of the guide frame for the working of pawl cam 141′. The matrix shifting bar 14 carries an upwardly projecting dog 14^3 designed to engage an oscillating pawl cam 141′ when the latter is thrown in its path; and also an upwardly projecting lip 14^4 to engage the transverse groove in the outer faces of the matrix bars, the lip 14^4 always being in engagement with the lowest matrix bar when the matrix drum is at rest. The cap and figure keys 1^a and 1^b (Figs. 2 and 15) have no action on cross rod 3 and yoke 4. Their inner ends respectively operate vertical push pins 138 and 139 (Figs. 3, 21 and 22) whose upper ends engage alternately the lower ends of the downwardly projecting lever pins 138′ and 139′ pivoted to lever arms 138^2 and 139^2, carried by the outer ends of rock shafts 138^3 and 139^3. Shaft 139^3 is hollow and is carried by a frame bearing. Shaft 138^3 is solid and passes through shaft 139^3 which serves as its bearing. On the inner ends of these shafts are lever arms 138^4, 139^4, whose outer ends are connected by upwardly extending links to the short ends of pawl levers 138^6 and 139^6 the long ends of which have downwardly projecting noses adapted to engage stops on the periphery of matrix drum 77.

Mounted on the outer end of the matrix drum sleeve head 89 is the segment cam 89^5 carrying lever arm 89^6 pivoted at its outer end to link 89^7 which connects it to roller lever arm 89^8, carrying roller 89^9 adapted to be engaged by cam 140.

Mounted in a block supported by frame guide 89^3 is an oscillating block 141 that pivotally supports the pawl cam 141′ whose lower or pawl end is adapted to be thrown by the rocking of lever arm 142 into and out of the path of travel of lug 14^3 on matrix shifting bar 14 (Fig. 26). The upper or cam end of pawl 141′ is symmetrically shaped on either side of its vertical center line and is engaged by the rounded end of lever arm 143. This lever extends rearwardly of the machine, is suitably fulcrumed and connected at its outer end by link 143′ to bell crank lever 143^2 whose downwardly projecting arm is connected to clutch stop lever 143^4 by link 143^3.

Carried by a rock shaft 142^3 mounted in bearings on the frame of the machine is lever arm 142^4 supporting roller 142^5 that bears on segment cam 89^5, and also on rock shaft 142^3 is an arm 142^2 connected by link 142′ to lever 142 that rocks the pawl cam carrying block 141. A tension spring 144 attached to cam 89^5 tends always to throw the 80^z matrix bar to the lower or casting position, and to press the edge of the cam against stop 145, Fig. 25. Mounted in bearings at the rear of the machine is cam shaft 146 (Figs. 1, 24 and 25) constantly driven by bevel gears 146′, 146^2. Shaft 146^3 carries at its lower end gear 146^4 meshing with gear 29′ on the type casting cam shaft 29. Loosely carried by shaft 146 are duplicate clutch members 140′ that are adapted to engage the shaft and are respectively integral with duplicate cams 140 which impart backward rotation to the matrix drums 77 and 76 against their spring tensions.

When it is necessary to cast from a cap matrix bar, key 1^a is depressed (Figs. 2, 3, 21, 22, 23, 24, 25, 26) and the upward movement of push pin 138 raises the engaging pin 138′ which lifts lever 138^2 and depresses lever 138^4 thereby causing link 138^5 to draw down the short arm of lever 138^6 raising its

long end and releasing the stop 147 on the matrix drum. The drum then rotates under tension of spring 144 until the staggered stop 147′ engages the downwardly projecting lip of lever 139^6 thereby bringing the matrix drum to rest with the cap matrix bar 80^y in the lower or molding position. The figure key lever 1^b (Fig. 23) has projecting from its upper edge an outwardly turned lip that overlaps and is adapted to engage the cap key lever 1^a when key lever 1^b is depressed. If it is desired to cast from the figure matrix bar 80^z, key lever 1^b is depressed and both sets of lever arms 138^6 and 139^6 are raised thereby releasing both stops 147 and 147′ and allowing the matrix drum to rotate until the segment cam (Fig. 25) engages stop 145 at which point bar 80^z will be in casting position. When either 80^y or 80^z is in casting position the roller 142^5 (Fig. 26) will have dropped from the high point of cam 89^5 to the concentric face and through its system of levers and links will have rocked block 141 (Figs. 25 and 26) to bring the pawl 141′ into the path of lug 14^3 on matrix shifting bar 14. Lug 14^3 in its normal position stands in a vertical plane bisecting pawl cam 141′ through its oscillating axis. The pawl now being in the path of lug 14^3 is engaged by it upon its return from either the right or left to its normal position of rest. The upper or cam face of pawl 141′ when rocked to either side raises lever 143 and through its train of links and levers disengages stop lever 143^4 from clutch member 140′ and starts cam 140. The roller 89^9 in its extreme position (shown by dotted lines Fig. 25) corresponding to 80^z mold position and in mid position corresponding to 80^y mold position, is engaged by cam 140 in its rotation, so that lever arm 89^8 is forced forward and causes rotation of matrix drum 77 against the action of its spring 144, thereby bringing the lower case matrix bar 80^x to mold position at which time lever 138^6 engages stop 147 and locks the matrix drum. A similar train of mechanism operates matrix drum 76 when the oscillating yoke 6 is in its backward position. Each matrix drum, as previously stated, is capable of carrying a plurality of matrix bars having different type fonts. The adjustment of the matrix drums for the use of any particular font is made manually while the machine is at rest. A duplicate set of cams and clutch members is provided on shaft 29, one set each for the operation of the respective matrix drums 76 and 77.

I claim:

1. A typecasting machine comprising a keyboard, a plurality of type casting units controlled by the keys each unit being adapted to produce types of different widths runningwise, means whereby on successive depression of any keys of the board the type casting units are successively set in operation in regular rotation each going into operation irrespective of whether the one put into operation ahead of it has completed the casting of a type, a line composing receptacle located in the plane in which the type are cast and to which the types are successively delivered in the order in which the keys in the board are manipulated, means for solidifying the composed line of types by casting metal thereupon, a composing galley located in the same plane in which the types are cast and means for delivering the solidified line to the galley.

2. A type casting machine comprising a keyboard, a plurality of type casting units controlled by the keys each unit being adapted to produce types of different widths runningwise, means whereby on successive depression of any keys of the board the type casting units are successively set in operation in regular rotation each going into operation irrespective of whether the one put into operation ahead of it has completed the casting of a type, a line composing receptacle located in the plane in which the type are cast and to which the types are successively delivered in the order in which the keys in the board are manipulated, means for inserting space pieces between the words of the line formed in the composing receptacle, means for solidifying the composed line of types by casting metal thereupon, means for then withdrawing the spacing pieces, a composing galley located in the same plane in which the types are cast and means for delivering the solidified line to the galley.

3. A type casting unit controlled by the key board and comprising a plurality of matrix bars in which are distributed the matrices of a single font and a mold having a single molding cavity with which all the matrices of several matrix bars coöperate and which is automatically adjustable to the different widths required by the several type of the same font, combined with a line composing receptacle located in the same plane in which the types are cast, means for automatically delivering the types as cast to the assembling receptacle, a line solidifying mold located in the same plane as that in which the types are cast, means for delivering to the solidifying mold a line of type assembled in the composing chamber, means for admitting molten metal to the solidifying mold to integrally unite the line of types therein, a composing galley and means for transferring the solidified line to the composing galley.

4. A type casting unit controlled by the key board and comprising a plurality of matrix bars in which are distributed the matrices of a single font and a mold having a single molding cavity with which all the

matrices of several matrix bars coöperate and which is automatically adjustable to the different widths required by the several types of the same font, combined with a line composing receptacle located in the same plane in which the types are cast, means for automatically delivering the types as cast to the assembling receptacle, means for inserting space pieces between the words of the line formed in the composing receptacle, a line solidifying mold located in the same plane as that in which the types are cast, means for delivering to the solidifying mold a line of type assembled in the composing chamber, means for admitting molten metal to the solidifying mold to integrally unite the line of types therein, means for then withdrawing the spacing pieces, a composing galley and means for transferring the solidified line to the composing galley.

5. A type casting and composing machine comprising a keyboard, a plurality of type casting units controlled by the key board, means whereby on successive depression of any keys of the board the type casting units are successively set in operation in regular rotation each going into operation irrespective of whether the one put into operation ahead of it has completed the casting of a type, each unit comprising a mold and a plurality of matrix bars upon which the matrices of a font are distributed, combined with a line composing receptacle, means for automatically, successively delivering the types to the line composing receptacle in the order in which the keys of the board are manipulated, a line solidifying mold, means for transferring the composed line from the line composing receptacle to the solidifying mold, means for admitting molten metal to the mold to integrally unite the types of the line, a composing galley and means for transferring the solidified line to the galley.

6. A type casting and composing machine comprising a keyboard, a plurality of type casting units controlled by the key board, means whereby on successive depression of any keys of the board the type casting units are successively set in operation in regular rotation each going into operation irrespective of whether the one put into operation ahead of it has completed the casting of a type, each unit comprising a mold and a plurality of matrix bars upon which the matrices of a font are distributed, combined with a line composing receptacle, means for automatically, successively delivering the types to the line composing receptacle in the order in which the keys of the board are manipulated, means for inserting space pieces between the words of the line formed in the composing receptacle, a line solidifying mold, means for transferring the composed line from the line composing receptacle to the solidifying mold, means for admitting molten metal to the mold to integrally unite the types of the line, means for then withdrawing the spacing pieces, a composing galley and means for transferring the solidified line to the galley.

7. A type casting and composing machine comprising a keyboard, a plurality of type casting units controlled by the key board, means whereby on successive depression of any keys of the board the type casting units are successively set in operation in regular rotation each going into operation irrespective of whether the one put into operation ahead of it has completed the casting of a type, each unit comprising an automatically adjustable mold adapted to mold type of different widths runningwise, and a plurality of matrix bars upon which the matrices of a font are distributed, combined with a line composing receptacle, means for automatically, successively delivering the types to the line composing receptacle in the order in which the keys of the board are manipulated, a line solidifying mold, means for transferring the composed line from the line composing receptacle to the solidifying mold, means for admitting molten metal to the mold to integrally unite the types of the line, a composing galley and means for transferring the solidified line to the galley.

8. A type casting machine comprising a keyboard, a plurality of type casting units controlled by the keys, means whereby on successive depression of any keys of the board the type casting units are successively set in operation in regular rotation each going into operation irrespective of whether the one put into operation ahead of it has completed the casting of a type, each unit being adapted to produce types of different widths runningwise, combined with a line composing receptacle located in the plane in which the type are cast and to which the types are successively delivered in the order in which the keys in the board are manipulated, means for solidifying the composed line of types by casting metal thereupon, and a composing galley adapted to receive the solidified line.

9. A type casting machine comprising a keyboard, a plurality of type casting units controlled by the keys, means whereby on successive depression of any keys of the board the type casting units are successively set in operation in regular rotation each going into operation irrespective of whether the one put into operation ahead of it has completed the casting of a type, each unit being adapted to produce types of different widths runningwise, combined with a line composing receptacle located in the plane in which the types are cast and to which the types are successively delivered in the order in which the keys in the board are manipulated, means for inserting space pieces be-

tween the words of the line formed in the composing receptacle, means for solidifying the composed line of types by casting metal thereupon, means for then withdrawing the spacing pieces, and a composing galley adapted to receive the solidified line.

10. A type casting unit controlled by the key board and comprising a plurality of matrix bars in which are distributed the matrices of a single font and a mold having a single molding cavity with which all the matrices of several matrix bars coöperate and which is automatically adjustable to the different widths required by the several type of the same font, combined with a line composing receptacle located in the same plane in which the types are cast, means for automatically delivering the types as cast to the assembling receptacle, a line solidifying mold located in the same plane as that in which the types are cast, means for delivering to the solidifying mold a line of type assembled in the composing chamber, means for admitting molten metal to the solidifying mold to integrally unite the line of types therein, and a composing galley adapted to receive the solidified line.

11. A type casting unit controlled by the key board and comprising a plurality of matrix bars in which are distributed the matrices of a single font and a mold having a single molding cavity with which all the matrices of several matrix bars coöperate and which is automatically adjustable to the different widths required by the several type of the same font, combined with a line composing receptacle located in the same plane in which the types are cast, means for automatically delivering the types cast to the assembling receptacle, means for inserting space pieces between the words of the line formed in the composing receptacle, a line solidifying mold located in the same plane as that in which the types are cast, means for delivering to the solidifying mold a line of type assembled in the composing chamber, means for admitting molten metal to the solidifying mold to integrally unite the line of types therein, means for then withdrawing the spacing pieces, and a composing galley adapted to receive the solidified line.

12. A type casting and composing machine comprising a keyboard, a plurality of type casting units controlled by the key board, means whereby on successive depression of any keys of the board the type casting units are successively set in operation in regular rotation each going into operation irrespective of whether the one put into operation ahead of it has completed the casting of a type, each unit comprising a mold and a plurality of matrix bars upon which the matrices of font are distributed, combined with a line composing receptacle, means for automatically, successively delivering the types to the line composing receptacle in the order in which the keys of the board are manipulated, a line solidifying mold, means for transferring the composed line from the line composing receptacle to the solidifying mold, means for admitting molten metal to the mold to integrally unite the types of the line, and a composing galley adapted to receive the solidified line.

13. A type casting and composing machine comprising a keyboard, a plurality of type casting units controlled by the key board, means whereby on successive depression of any keys of the board the type casting units are successively set in operation in regular rotation each going into operation irrespective of whether the one put into operation ahead of it has completed the casting of a type, each unit comprising a mold and a plurality of matrix bars upon which the matrices of a font are distributed, a line composing receptacle, means for automatically, successively delivering the types to the line composing receptacle in the order in which the keys of the board are manipulated, means for inserting space pieces between the words of the line formed in the composing receptacle, a line solidifying mold, means for transferring the composed line from the line composing receptacle to the solidifying mold, means for admitting molten metal to the mold to integrally unite the types of the line, means for then withdrawing the spacing pieces, and a composing galley adapted to receive the solidified line.

14. A type casting and composing machine comprising a keyboard, a plurality of type casting units controlled by the key board, means whereby on successive depression of any keys of the board the type casting units are successively set in operation in regulation rotation each going into operation irrespective of whether the one put into operation ahead of it has completed the casting of a type, each unit comprising an automatically adjustable mold adapted to mold types of different widths runningwise, and a plurality of matrix bars upon which the matrices of a font are distributed, combined with a line composing receptacle, means for automatically, successively delivering the types to the line composing receptacle in the order in which the keys of the board are manipulated, a line solidifying mold, means for transferring the composed line from the line composing receptacle to the solidifying mold, means for admitting molten metal to the mold to integrally unite the types of the line, and a composing galley adapted to receive the solidified line.

15. The combination of a matrix carrier support mounted to rock about an axis and a plurality of matrix bars mounted to move endwise thereon in either direction from

normal position and in a direction parallel with the axis of the carrier to bring a selected matrix on a bar opposite a molding point and means for moving the several bars in either direction from normal, or mid, position.

16. The combination of a matrix carrier support mounted to rock about an axis and a plurality of matrix bars mounted to independently move endwise thereon in either direction from normal position and in a direction parallel with the axis of the carrier to bring a selected matrix opposite the molding point, and means fo. moving the several bars in either direction from normal, or mid, position.

17. The combinati ı of a matrix carrier support mounted to rock about an axis, a plurality of matrix bars each having matrices of the same font and movable endwise on the s ıport in either direction from normal position and in a direction parallel with the axis of the carrier to bring a selected matrix to the molding point, and means for moving the several bars in either direction from normal, or mid, position.

18. The combination of a matrix carrier support mounted to rock about an axis and a plurality of matrix bars mounted to independently slide endwise thereon in either direction from normal position and in a direction parallel with the axis of the carrier, combined with a key board and means controlled by the key and acting when a key is operated, to move the corresponding matrix bar upon the said support to bring that one of its matrices, corresponding with the depressed key, opposite the molding point.

19. An adjustable matrix carrier support and a plurality of matrix carriers movable thereon in either direction from normal position and each having a plurality of matrices forming part of the same font and all matrices being adapted to coöperate with a single mold, combined with an operating keyboard, means whereby on operation of a key corresponding with a matrix of that carrier which is in operative relation to the mold, said carrier is moved to bring said matrix to molding location and means whereby, when a key corresponding with a matrix of another carrier, is operated, the support is first adjusted and the last named carrier is moved to bring the last named matrix to molding location.

20. An adjustable matrix carrier support and a plurality of endwise movable matrix bars movable thereon in either direction from normal position in a direction parallel with the axis of the carrier and each having a plurality of matrices forming part of the same font and all matrices being adapted to coöperate with a single mold, combined with an operating keyboard, means whereby on operation of a key corresponding with a matrix of that bar which is in operative relation to the mold, said bar is moved to bring said matrix to molding location and means whereby, when a key corresponding with a matrix of another bar is operated, the support is first adjusted and the last named bar is moved to bring the last named matrix to molding location.

21. A matrix carrier support mounted to rock for adjustment about an axis and a plurality of matrix bars mounted to slide endwise thereon in either direction from normal position and in a direction parallel with the axis of the carrier each bar having a plurality of matrices of the same font and all matrices being adapted to coöperate with a single mold, combined with a board of keys, means controlled by the keys for operating all the matrix bars and a special key for adjusting the carrier to bring into molding position such bar as is not normally in molding position.

22. The combination of a plurality of matrix bars each formed with matrices disposed on one of its faces on both sides of a point intermediate its ends, a movable carrier in which the several bars are mounted to move endwise independently, a mold located opposite said intermediate point, means for moving the carrier to bring any one of the bars opposite the mold, character keys, and means controlled by the keys and automatically acting on their depression to move that matrix bar then opposite the mold endwise in either direction from normal position to bring the matrix corresponding with a depressed key into operative relation to the mold.

23. The combination of a matrix bar carrier adapted to rock about an axis, a plurality of matrix bars mounted to slide endwise upon the exterior face of said carrier and all having matrices of the same font and each having matrices in one of its faces on both sides of a point intermediate its ends, a mold located opposite said intermediate point of the bar in normal holding position, means for rocking the carrier to bring any other one of the matrix bars into molding position, a board of character keys and means whereby on the depression of any one of said keys, a matrix bar in molding position is moved in either direction from its normal position to bring the corresponding matrix into operative relation to the mold.

24. The combination of a matrix bar carrier, a matrix bar slidably mounted to move endwise in the face thereof and having in one of its faces matrices on both sides of a point intermediate its length and in its face opposite that containing the matrices a series of recesses, one for each matrix, a mold located opposite said intermediate point,

means for moving the bar in either direction from its normal position to bring a selected matrix into operative relation to the mold, an aperture in the carrier with which a recess corresponding to the selected matrix registers and a locking device automatically acting to enter said recess through said aperture and lock the matrix during molding operation.

25. The combination of a matrix carrier adapted to rock about an axis, a plurality of matrix bars slidably mounted to move endwise in the face thereof and upon which the matrices of a font are distributed each bar having in one of its faces matrices on both sides of a point intermediate its length and in its face opposite that containing the matrices, a series of recesses one for each matrix, a mold located opposite said intermediate point of that matrix bar normally in molding position, means for rocking the matrix carrier to bring another matrix bar into said normal molding position, means for moving any matrix bar in normal molding position endwise in either direction to bring a selected matrix therein into operative relation to the mold, an aperture in the carrier opposite said intermediate points on each of the bars, means for moving the matrix bar in normal molding position in either direction from its normal position to bring a selected matrix into molding relation to the mold and the corresponding recess of said matrix opposite the aperture in the carrier and a locking device automatically working through said aperture and engaging said recess to lock the matrix bar in position during the molding operation.

26. Matrix selecting devices comprising a matrix bar movable in either direction from a normal central position levers 24, 25, and 25′, a rocking locking pawl 26 mounted on lever 24 and adapted to interlock either with lever 25 or lever 25′, cam 30, cam arms 32, 32′ connecting links and springs, means whereby lever 24 may move the matrix bar in one direction when pawl 26 is interlocked with lever 25 and in the opposite direction when the pawl is interlocked with lever 25′ combined with a board of operating character keys, rocking yokes 4 and 4′ adapted to be operated on depression of the finger keys in the board and means operated by said yokes for rocking the locking pawl 26.

27. Matrix selecting means comprising matrix bars rocking yokes 4, 4′, lifting members, vertically moving pins 5, an oscillating yoke through which pins 5 move, plate 8 having two rows of perforations through which work two sets of pins either of which is engaged by the pins 5 according to the position of said oscillating yoke one row of pins acting to select a matrix from a given group of matrix bars and the other row operating to select a matrix from another group of matrix bars.

28. In a type casting machine having a plurality of casting units adapted to be successively set in operation and to be in operation at the same time, type casting unit selecting devices comprising star wheels 150 and 151, cams 30 and 55, projections 78, 79 turning with the cams and selectively operating the star wheels.

29. The combination of a plurality of matrix carriers, a movable support upon which they are mounted to each move in either direction from a normal mid position, means for moving the support to bring a desired matrix carrier into operative relation to a molding point, and means for moving the latter matrix carrier in either direction from normal mid position to bring a desired matrix to the molding point.

In testimony whereof, I have hereunto subscribed my name.

ODDUR V. SIGURDSSON.

Witnesses:
L. F. Browning,
E. F. Wicks.