No. 861,431. PATENTED JULY 30, 1907.

F. H. BROWN, J. E. HANRAHAN & G. A. BOYDEN.

SORTS MACHINE FOR MAKING TYPE.

APPLICATION FILED APR. 6, 1905.

5 SHEETS—SHEET 1.

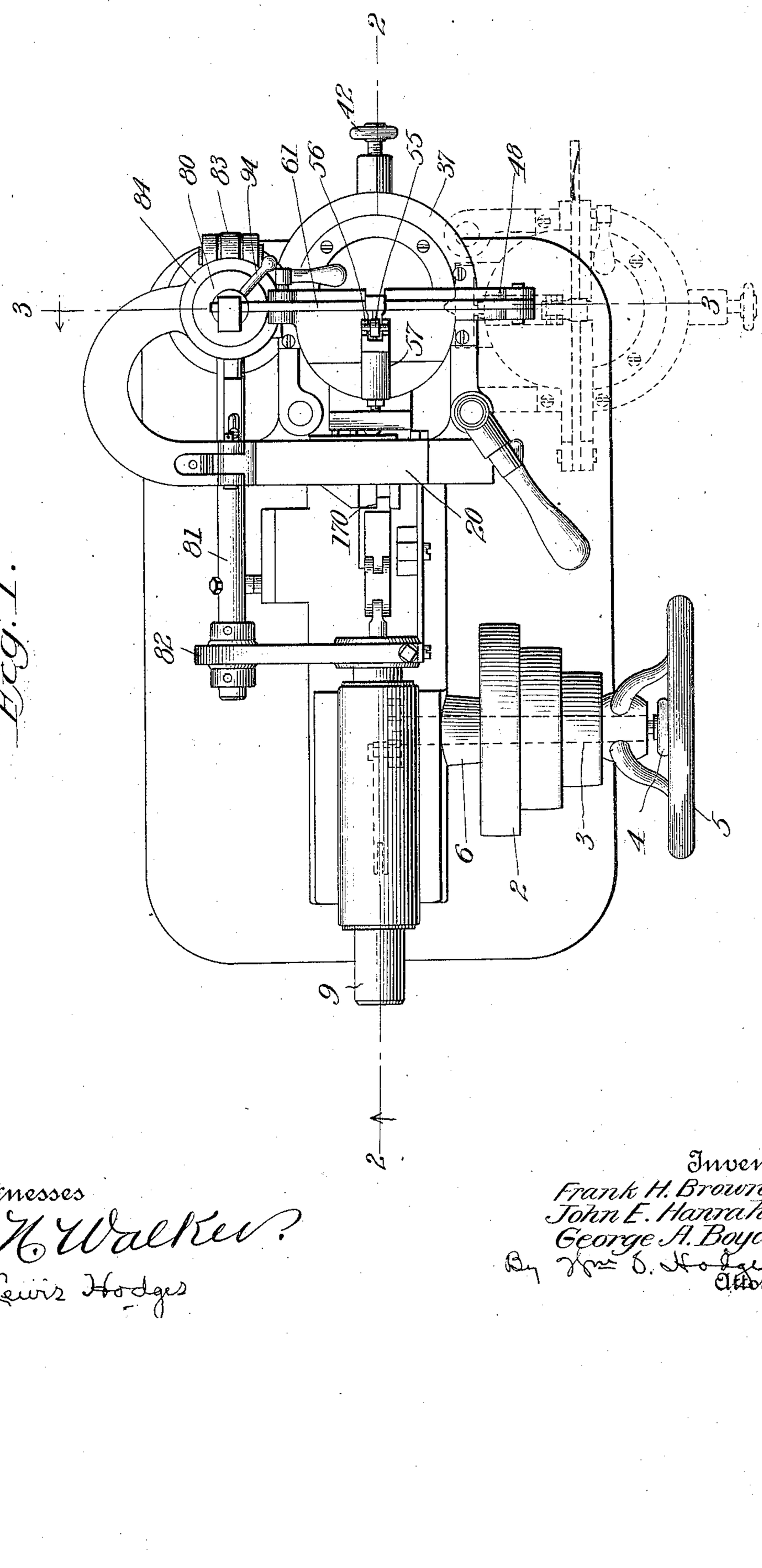

Fig. 1.

Witnesses
C. H. Walker
Lewis Hodges

Inventors,
Frank H. Brown
John E. Hanrahan
George A. Boyden
By Wm. S. Hodges
Attorney

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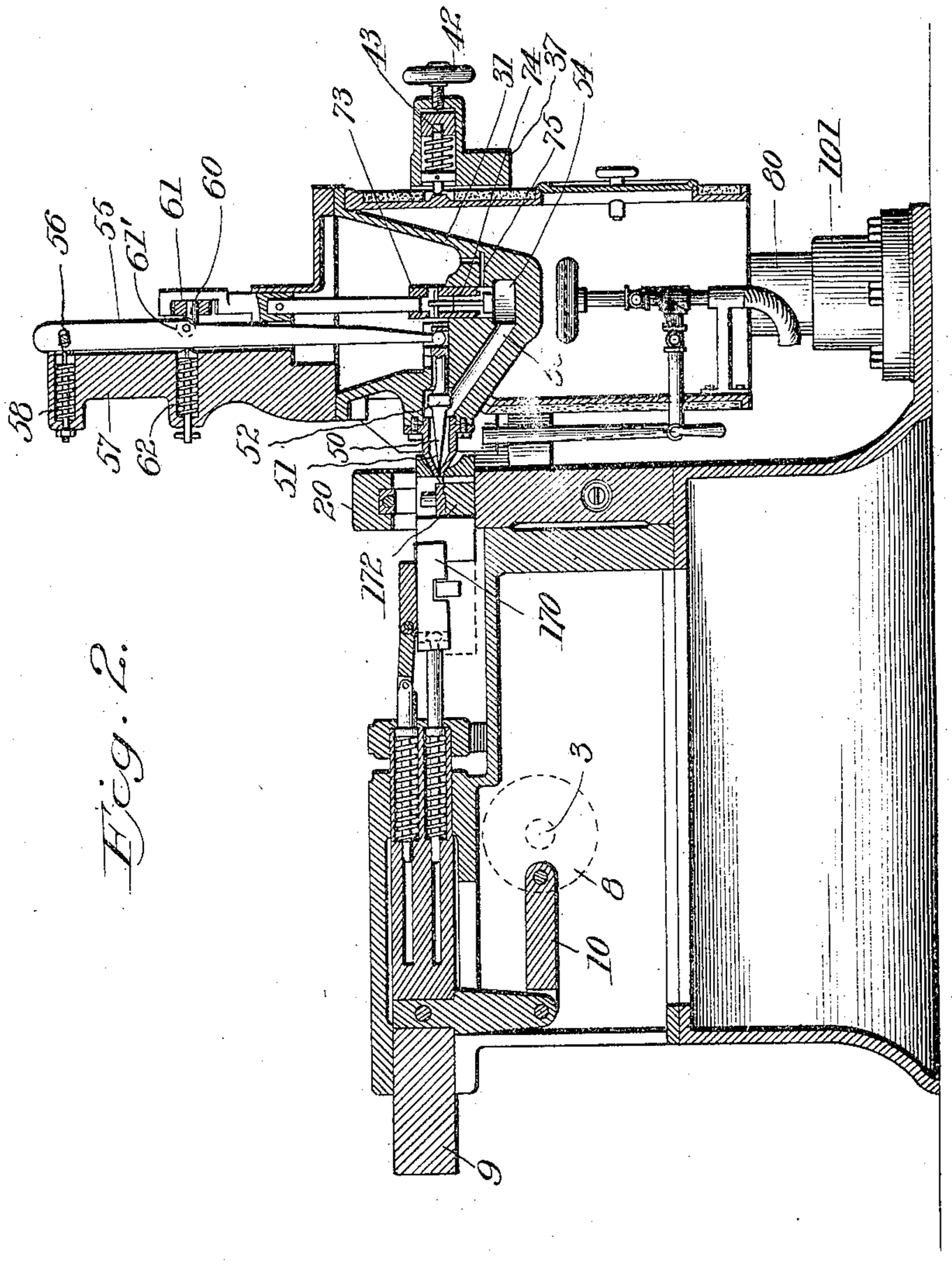

Fig. 2.

Witnesses
C. H. Walker.
Leurs Hodges

Inventors,
Frank H. Brown,
John E. Hanrahan
George A. Boyden,
By Wm. D. Hodges
Attorney

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Fig. 6.

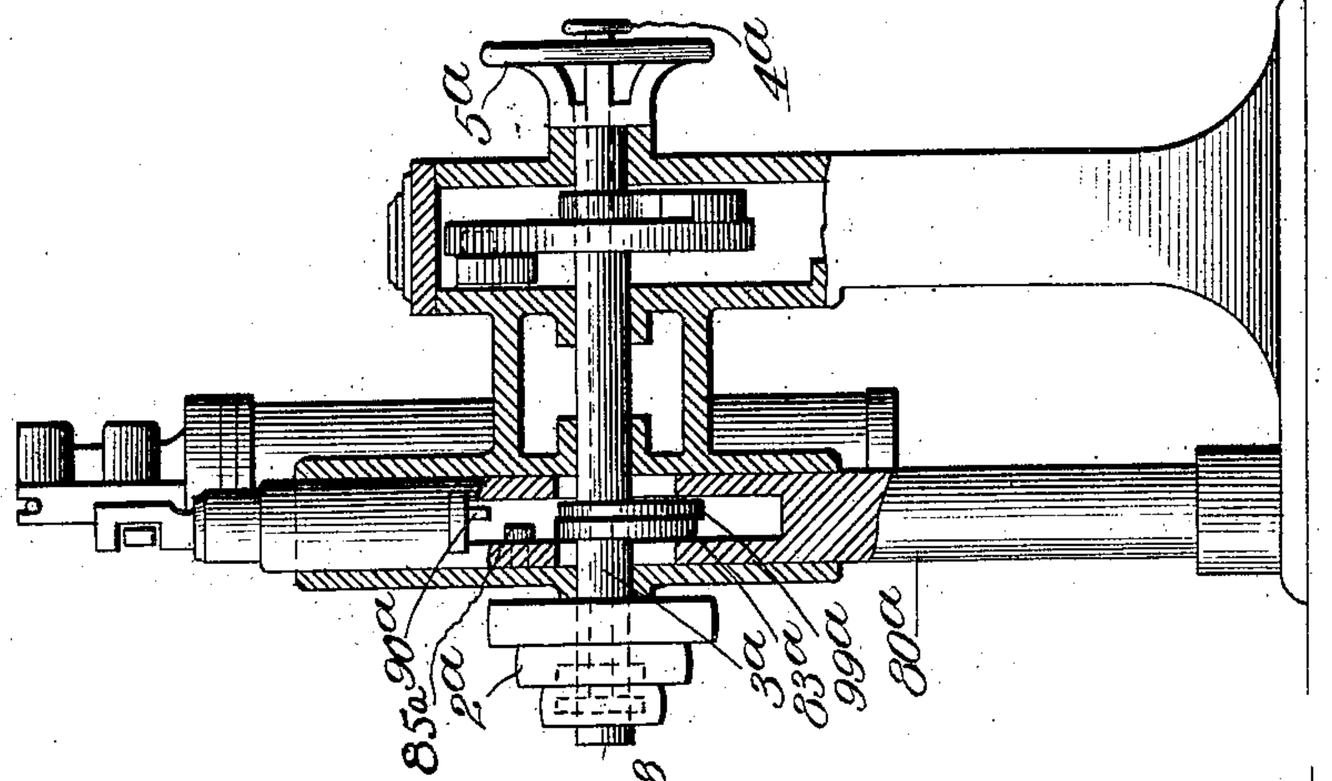
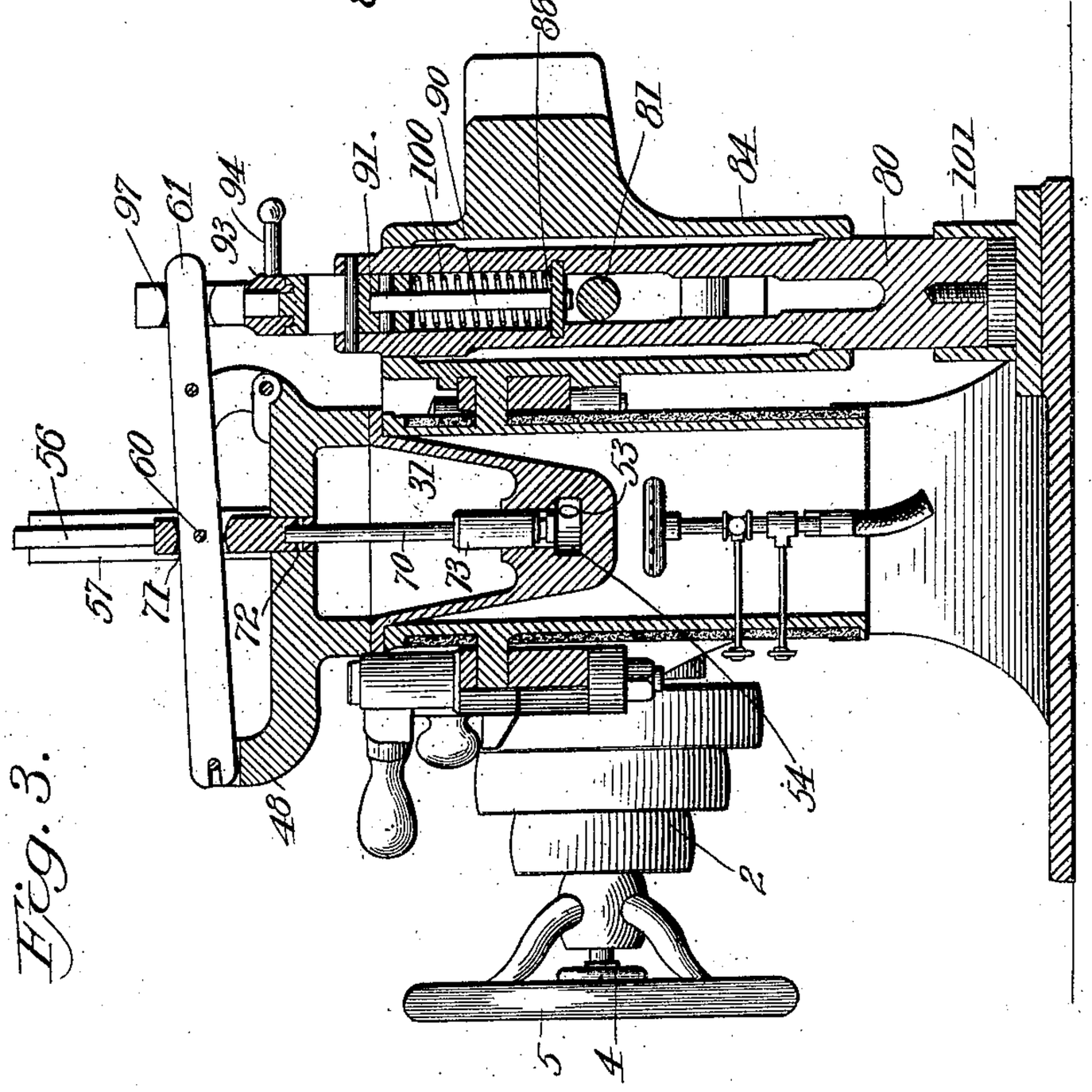


Fig. 3.



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C. H. Walker.
Lewis Hodges

Inventors
Frank H. Brown,
John E. Hanrahan,
George A. Boyden,
By Wm. S. Hodges
Attorney

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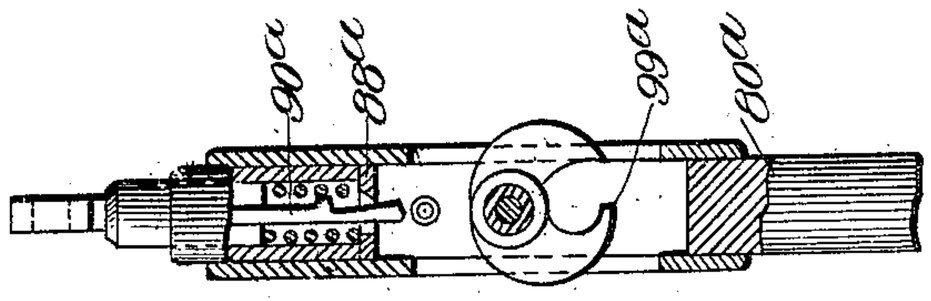

Fig. 7.

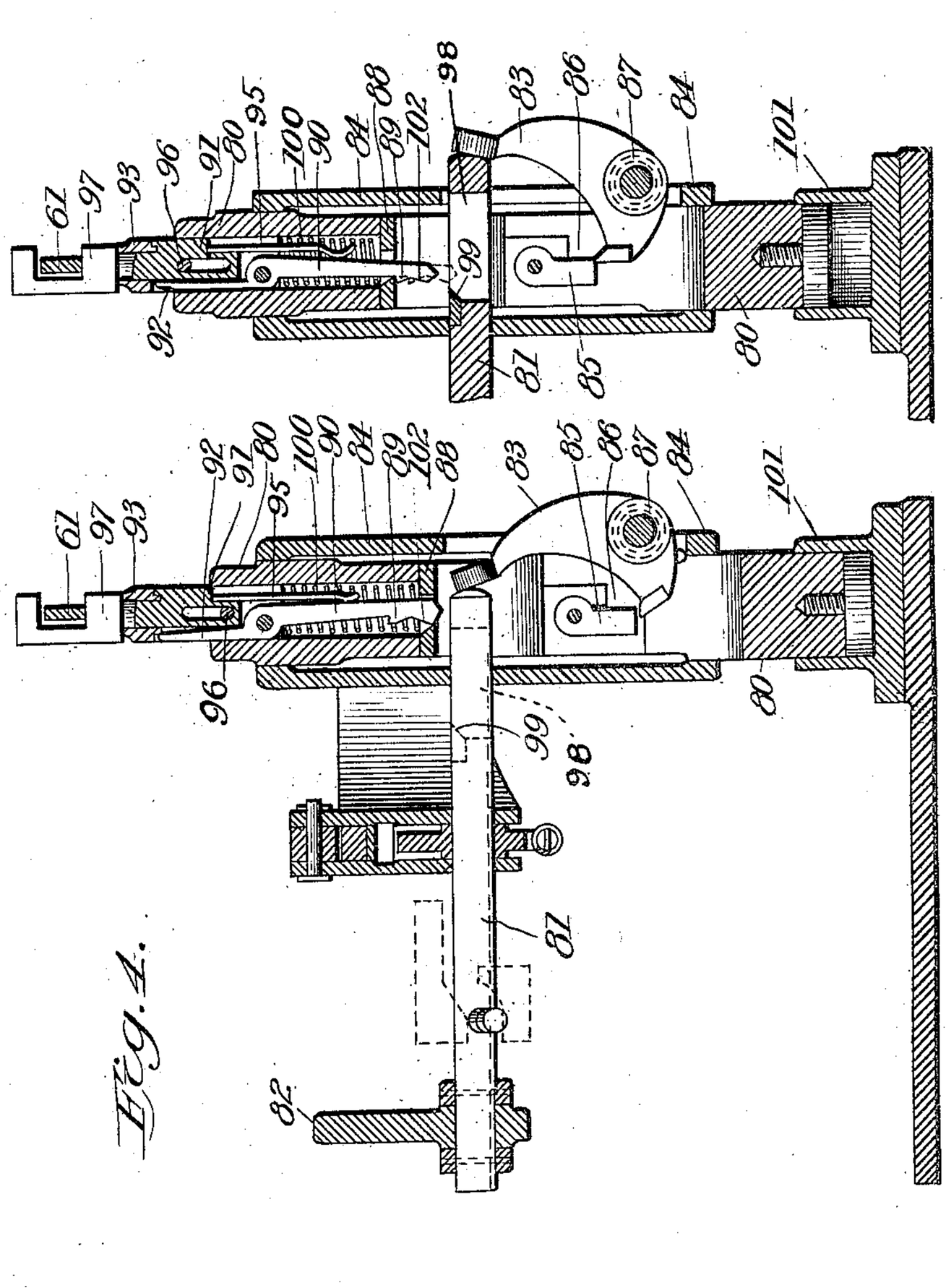

Fig. 5.

Fig. 4.

Witnesses
C. H. Walker.
Louis Hodges

Inventors,
Frank H. Brown
John E. Hanrahan
George A. Boyden.
By Wm. L. Hodges
Attorney

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5 SHEETS—SHEET 5.

Fig. 10.

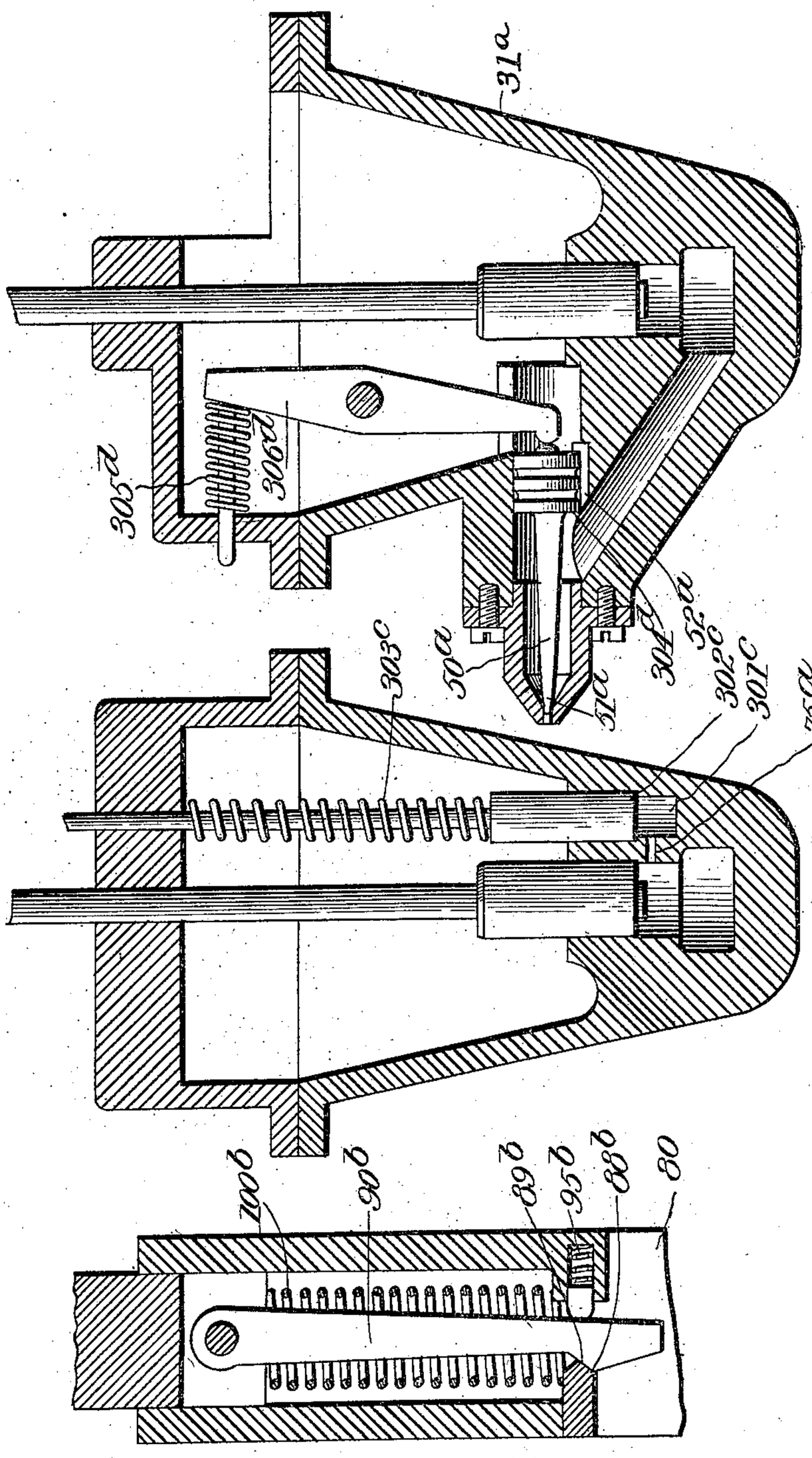

Fig. 9.

Fig. 8.

Witnesses
C. H. Walker,
Louis Hodges

Inventors,
Frank H. Brown,
John E. Hanrahan,
George A. Boyden,
By Wm. D. Hodges
Attorney

UNITED STATES PATENT OFFICE.

FRANK HOWARTH BROWN AND JOHN EDWARD HANRAHAN, OF BALTIMORE, AND GEORGE ALBERT BOYDEN, OF MOUNT WASHINGTON, MARYLAND, ASSIGNORS TO NATIONAL COMPOSITYPE COMPANY, OF BALTIMORE, MARYLAND, A CORPORATION OF DELAWARE.

SORTS-MACHINE FOR MAKING TYPE.

No. 861,431. Specification of Letters Patent. Patented July 30, 1907.

Application filed April 6, 1905. Serial No. 254,199.

To all whom it may concern:

Be it known that we, FRANK HOWARTH BROWN and JOHN EDWARD HANRAHAN, of Baltimore city, State of Maryland, and GEORGE ALBERT BOYDEN, of Mount Washington, in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Sorts-Machines for Making Type; and we 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.

This invention relates to the art of type making in which are produced individual type characters, such as body and display letters, borders, ornaments, spaces and quads, that are used in ordinary type composition, the same being designed particularly for use in conjunction with the sorts machine for casting type covered in our pending application for patent filed January 22nd, 1903, Serial No. 140,152.

The invention has for its object the production of simple and efficient means for feeding molten metal to the molds of a type casting machine.

A further object is to provide means for varying the feed of the molten metal to conform to the size of the cast.

A further object is to provide means for applying a fixed, uniform, and unvarying pressure to the molten metal in filling molds of various sizes, whereby the type will be of uniform density.

A further object is to provide means for relieving the mechanism of abnormal strains and jars in casting type bodies of the smaller sizes.

A further object is to provide means for automatically cutting off the supply of molten metal just as soon as the mold is filled irrespective of the size of the cast.

A further object is to provide valve operating mechanism, and means for automatically varying the time in which the valves are opened and closed to conform to different sizes of casts.

A further object is to provide means for actuating the metal supply mechanism, said actuating mechanism being arranged to automatically adjust itself to conform to the various sizes of the type cast, and to compensate for any changes due to expansion, contraction, or wear.

The invention will be hereinafter fully set forth and particularly pointed out in the claims, and the inventive ideas involved are illustrated in the accompanying drawings, which include modifications of the machine and also of certain parts, but it is to be distinctly understood that the said drawings are intended for illustration only and not as defining the limits or scope of the invention.

In the accompanying drawings:—Figure 1 is a top view of the machine. Fig. 2 is a longitudinal sectional view on the line 2—2, Fig. 1. Fig. 3 is a cross sectional view on the line 3—3, Fig. 1. Fig. 4 is a vertical section through the weight mechanism, and shows the reciprocating shaft. Fig. 5 is a similar view showing the weight raised. Fig. 6 is an end elevation, partly in section of a modified form of the machine. Fig. 7 is a vertical sectional view of the weight parts, cams and trips taken at right angles to Fig. 6. Fig. 8 is a sectional view of a modified latch mechanism. Fig. 9, is a sectional view of a modified overflow for pump mechanism and Fig. 10 is a sectional view of a modified molten metal valve mechanism.

The power applying mechanism (Figs. 1, 2 3) comprises a drive pulley 2 that revolves loosely on the main shaft 3, and is made fast thereto when desired, by suitable clutch mechanism that instantly disengages or engages the two, by moving the clutch wheel 4 in or out, thereby affording a quick and convenient arrangement for this purpose which is essential in order to start the machine at its maximum speed and instantly release the power in case of accident to the parts. The hand wheel 5 is rigidly secured to the shaft 3 and is used to operate the machine by hand, to test the position of the parts before the power is applied. The shaft 3 rotates in the bearing 6 and passes into the hollow body of the machine, where it is provided with a crank wheel 8, from which reciprocating motion is transmitted to the ram 9 by the connecting rod 10 and suitable connections. With this mechanism are combined the several sub combinations which receive their respective movements therefrom.

The mold yoke 20, the yoke 37 supporting the molten-metal receptacle, the stationary mold part 172 and the movable mold part 170 are the same as described in our pending application heretofore referred to, the movable mold part and its locking mechanism being operated by the ram 9, and further description thereof is unnecessary.

The actuating mechanism comprises one or more than one of the mechanisms that impart movement or action, to the various elements that perform the required functions, and is characterized by having parts so constructed and combined as to automatically vary or modify their functions to meet the requirements of the changed conditions established in the mold parts in casting various sizes of type. For example, the pump is required to be operated by a fixed force, and eject more or less molten metal in accordance with the size of type cast, and the pressure exerted on the molten metal by the fixed force must be retained for casting large type, but reduced for casting smaller type, other-

wise the different size type will lack uniform density and the sudden stopping of the large flow and force of metal necessary to cast large type would create a destructive force on the parts involved if retained to cast small type. This pressure of the metal and capacity of the pump in this machine is automatically modified according to the different amounts of molten metal required in casting different sizes of type, by having the pump well provided with a molten metal overflow passage which is fully active in discharging back from the pump well to the metal receptacle an excess of metal when small type are cast, but which excess discharge is automatically modified by diminution as more and more molten metal is required for type of increased size, until said excess discharge wholly ceases when the larger sizes of type are cast. This explains what is meant by the expression "automatically modified", which expression is more or less applicable to the other sub-combinations of the actuating mechanism, all of which are fully described under their respective captions in this specification, and which will now be described in their proper order.

The molten metal receptacle 31 is mounted in the yoke 37 and the same is provided with a pump well 54. The eduction valve 51 is formed on the stem 50 and controls the port through which the metal is ejected from the well 54 to the mold cavity, and on said stem is also formed the induction valve 52 which controls the port through which part of the molten metal passes, by way of the duct 53, from the metal receptacle to said pump well. The pump plunger 73 is provided with a second induction valve 74 that permits the metal to also flow to the well 54 in addition to the valve 52, and thereby affords a second admission of the metal to insure the rapid and complete filling of the same, after every stroke of the pump. The valve 74 remains open until the pump plunger 73 drops, when it is instantly closed, and any back flow to the metal receptacle 31 is prevented. The vertical valve lever 55 is supported at its upper end by a pin 56 that rests in horizontal slots formed in each wing of the arm 57. The compression spring 58 forces the top end of the lever 55 outward toward the lug 60 on the pump lever 61, said lug serving to move the vertical valve lever 55 to close the eduction valve 51, and is located in relation to said lever 55 so as to multiply the movement of the end of said lever connected to the valve stem 50, by which a greater movement is imparted to the lower end of said lever from the lesser movement of the lug 60, thereby quickening the action of the valve stem in order to close the valve 51 to coact with the variable release actions of pump and metal valve operating mechanisms to cut off the metal at the jet, at the proper heat unit. By the action of the spring 58 the valve stem 50 is forced towards the nipple and the valve 51 held against its seat. At the same time the spring 58 maintains a yielding condition which automatically compensates for the variations in sizes of the parts they are continually undergoing due to expansion, contraction and wear. The compression spring 62 forces the lower end of lever 55 outward, when the lug 60 and lever 61 drops, and with it the valve stem 50, which opens the eduction valve 51 to permit the ejection of the metal from the receptacle 31 into the mold cavity, and at the same time close the induction valve 52, to prevent the return of any metal therethrough, from the well 54 to the receptacle 31. The valve lever 55 is provided with a roller 61′ to reduce the friction between said lever and the lug 60, when the latter forces the former back, to seat the valve 51 by the upward motion of the pump lever 61.

The pump mechanism comprises the pump lever 61 pivoted to the arm 48 and attached by the clevis 71 to the rod 70 and extends down through the bearing 72 to the metal well 54, where it is secured to the pump plunger 73. The pump plunger 73 fits the bore of the well very accurately to insure a comparatively tight joint between the two, to prevent the metal in the well from escaping through the joint when the pump acts. Located a little below pump plunger 73 in the wall that forms the well 54, is a small passage 75, that leads from the well into the metal receptacle 31 and which forms a metal escape from the well, that modifies the flow and force of the metal injected into the mold by which a uniform density is maintained in large and small type, and prevents the sudden stopping of the flow of the molten metal and the movement of the pump plunger 73 in casting small type to relieve the different parts of the metal mechanism from the severe strain they would be subject to if there was no outlet for the metal when casting small type with the high force required for large type. Without the overflow in casting small type the mold is filled by a slight movement of the pump plunger and the movement of the molten metal instantly stops, producing small type of a great density and causing a shock or jar to all the parts involved, similar in principle to that of the hydraulic ram. When casting large type a comparatively larger amount of metal and greater force is required than in casting small type, hence the need of such an overflow is not necessary, in fact, detrimental, and the passage 75 is then cut off by the pump plunger 73 passing over it in discharging the larger amount of metal, thereby preventing the overflow; consequently the conditions arising in the pump actions, varying from minimum to the maximum, in casting large and small type, where a fixed pressure is used for both, are herein compensated for by automatically modifying the functions of the pump mechanism.

The pump and metal valve operating mechanism comprises a weight 80, sufficiently heavy to produce the required pressure on the molten type metal to perfectly cast the maximum size type. The weight 80 is lifted by the movement of the shaft 81 attached to the ram 9 by the arm 82, and reciprocates with the same. The forward motion of the shaft actuates the lever 83 pivoted to the weight sleeve 84, and imparts an upward movement to the short end of the said lever, provided with a hardened steel tip, that engages with the dog 85, pivoted to the weight 80 in such manner that when the short end of the lever 83 travels through its arc, the weight 80 is lifted to the desired height and then, when the lever tip passes from under the dog 85, the weight will be free and instantly drop, exerting its full force on the pump lever 61. The dog 85 rests against a projection 86 on the weight that prevents it from swinging toward the lever 83, but free to swing in the opposite direction, in order that when said lever makes its return movement, which is produced by the twisted spring 87, the dog is moved back thereby to permit the

same, and then by gravity drops back into its place and assumes the position to reëngage the short end of the lever 83 to again lift and drop the weight 80. To the weight 80 is secured a keeper 88 which engages with the lug 89 on the latch 90 when the weight 80 is raised. The latch 90 is pivoted to the shank 91 and forms the link that connects the shank and the weight 80, when the lug 89 engages the keeper, and it is provided with a finger 92 that projects upward and is in contact with a horizontal eccentric on the revolving collar 93 in such manner that when the latter is turned by the handle 94, the finger is forced outward by the eccentric and the lug 89 on the latch 90 prevented from engaging the keeper 88, in order to permit the weight to drop without moving the shank or actuating the pump mechanism, when not desired, while the machine is in motion. The end of the latch below the lug 89 has an incline 102 by which the time of disengagement between the keeper 88 and the latch 90 is varied in accordance to the distance the weight drops before release from the shank 91, and which is governed by the size of the type cast, as hereinafter explained. The flat spring 95 at its upper end is secured to the shank 91 and its free end bears against the latch 90 to cause the lug 89 thereon to engage with the keeper 88 when the weight 80 is raised to permit the same. The shank 91 has a vertical reciprocating movement in the weight 80, with the stroke limited by the slot therein and the pin 96 secured to the weight, and carries a clevis 97 attached rigidly thereto. The clevis 97 is cut away to receive the pump lever 61 when placed in the operating position and to release the pump lever when it and the metal receptacle mechanism is moved to one side. A spiral spring 100 is located between the shank 91 and the keeper 88 and lifts said shank and the adjuncts attached thereto, when the latch 90 is released from the keeper 88 as the weight drops.

When the above described clevis parts are in the opposition shown in Figs. 3 and 4 they occupy their normal or "up" position, (which they maintain when and while the weight is being lifted) and the weight 80 occupies its "down" position. When the shaft 81 moves forward the lever 83 moves therewith and its short end moves upward and having engaged with the under side of the dog 85 lifts the weight 80, and when the latter is lifted to its maximum height the lug 89, on the latch 90, engages with the keeper 88 by the action of the spring 95, which forces it into that position. In the mean time the short end of the lever, in lifting the weight 80, describes an arc and passes from under the dog 85, and thereby drops the weight 80, and the latch 90, shank 91, clevis 97, and pump lever 61, are pulled down with the weight and the full force thereof instantly exerted on the molten metal in the well 54, through the pump lever 61, the rod 72, and the plunger 73. When the weight parts are dropping the lower end of the latch 90 passes into a slot 98 in the shaft 81 provided with a hardened steel dog 99, which latter encounters the incline 95 on the lower end of the latch, as the shaft moves forward which releases the lug 89 from the keeper 88, allows the spring 100 to act and thereby lift the latch, shank, clevis, pump lever and pump parts, and restores them to their normal or "up" position, also instantly actuating the metal valve 51 to cut off the metal at the proper temperature and places all the pump and valve parts in position ready for another cast, while the weight 80 is still moving downward at its full velocity, which is effectually cushioned to relieve the 80 pound blow of the falling weight by suitable dash pot mechanism 101 arranged at the bottom of the weight 80. The time of the weight release is governed by the size of the type cast, as when small type are cast the pump plunger 73 and weight 80, with the intervening connecting parts traverse but a small portion of their stroke as a comparatively small quantity of metal is ejected from the well 54. This partial traverse, however, is very rapid throughout its entire range, whatever it may be, and continues so until the mold is filled, then by means of the overflow through passage 75, the discharge from the well 54 still continues but very slowly, which practically keeps the incline 102 of latch 90 comparatively elevated in reference to the contact point of the dog 99 (dotted lines, Fig. 5) and in this position the greater width of the incline comes in contact with the dog 99 which is moving toward the latch, thereby releasing it from the keeper 88 sooner than would occur if the latch dropped a greater distance, as in casting large type. Consequently, in casting small type the latch 90 drops but a short distance and thereby exposes the wide part of the incline to the dog 99, thus quickening the release; and when casting large type the latch 90 drops its full distance and exposes the narrow part of the incline to the movement of the dog 99, and thus delays the release. Therefore, the smaller the type cast the quicker the pump parts are released from the falling weight and the larger the type the slower these parts are released, and in all intermediate sizes the release is in accordance to the quantity of metal required by the size of the type cast. These changes in the pump actions and pump accessories are automatically modified by the conditions established by the different sized casts, from the minimum to the maximum, and are of the greatest importance in a machine of this kind. Furthermore, in these several movements there resides a unison of action which varies in point of time with the size of the type cast, so as to quickly refill the well 54 with the amount of metal displaced; actuate the several valves to shut and open the molten metal ports at the right instant to conform to the changed conditions of the different sized type; and cut off the type jet from the metal supply at the proper temperature to insure the clearance of the gate in ejecting it from the mold and the nipple port from being clogged with chilled metal. These several actions: the opening of the eduction valve 51; the closing of the induction valves 52 and 74; the drop of the plunger 73; the passage 75, remaining opened or closed the proper time to meet the changing requirements; the trip or release of the latch 90 and the reverse action of all these operations, are effected in the fraction of a second and all automatically varied or modified to fill the changed conditions required in casting various size type, without skilled attention or manipulation.

By the use of a weight to create the pressure to force the metal into the mold parts, a positive and uniform pressure is always retained on the pump plunger, but the pressure in the pump well 54 is varied by the action of the passage 75, consequently the variable actions are automatically made and as the weight is not susceptible

to any change either as to time of use or different temperatures; skilled attention and manipulation is not required.

In practice the pulley 2 transmits power to the shaft 3, which through the medium of the wheel 8 and connecting rod 10 reciprocates the ram 9. The forward movement of the latter effects a corresponding movement of the shaft 81 through the connecting arm 82, thereby lifting, by means of the lever 83 and dog 85, the weight 80, which is raised to its maximum height about the time the mold parts have been placed and clamped into position, as described in our pending application hereinbefore referred to. At this high position of the weight 80 and point of time in the operation, lug 89 on latch 90 engages the keeper 88 of the weight, and as the shaft 81 continues this movement the short end of the lever 83 is released from the dog 85, allowing the weight to drop, and thus operating the pump parts and the metal valve mechanism, and exerting the full force of the weight on the metal in the well 54.

By the first portion of the weight's downward movement the valve stem 50 is instantly moved back, the eduction valve 51 opened and the induction valve 52 closed, by the lower end of the lever 55 moving back under the action of the spring 62, when the lug 60 drops away from the roller 61′. The pump lever 61, continuing its movement, after the lug 60 leaves the roller 64, engages with the lower jaw of the clevis 71, and by means of the rod 70, forces the pump plunger 73 downward against the metal in the well 54, and the induction valve 74, closing at the first portion of the plunger's movement, the metal confined in the well 54 is driven into the mold through the passage 53 and the jet orifice and the type is cast.

The movement of shaft 81 continuing while weight 80 is dropping, dog 99 engages the incline 102 on the latch 90, (dotted lines Fig. 5) and disengages the lug 89 from keeper 88, which releases latch 90 from weight 80, and the pump lever 61 and the pump parts are instantly forced to their normal or "up" position by the spring 100. In this "up" movement of pump lever 61, pump plunger 73 is drawn up and the induction valve 74 opened, admitting metal to the well through its port; valve 51 seated, metal cut off from the jet at the right temperature and induction valve 52 opened, to permit the molten metal to fully equalize in the receptacle 31 and well 54, ready for the following cast.

In Figs. 6, 7 and 8 I have illustrated a modification of the weight mechanism, and in Figs. 9 and 10 I have also illustrated modifications of the pump and metal valve mechanisms. The principles of invention, or the inventive ideas involved in these modifications, are the same as those involved in the preferred forms, although the applied mechanics are somewhat different.

The various parts of the structure of the modifications are designated by the same numerals as are used for designating the parts performing the same functions in the preferred form of the structure heretofore described, but in the modifications such numerals have an exponent.

The power mechanism consists of a pulley 2^a, shaft 3^a, hand wheel 5^a and power clutch mechanism operated by the wheel 4^a.

The cam 83^a (Figs. 6 and 7) lifts the weight 80^a by coming in contact with roller 85^a, attached to the weight, and drops the same by passing from under the roller when the weight is raised to its maximum height to permit the latch 90^a to engage the keeper 88^a, when the mold parts are in position to receive the cast. The cam 99^a is secured to the shaft 3^a, adjacent to the cam 83^a and in such relation thereto that when the cam 83^a releases the weight 80^a and the latter is dropping, the lower end of the latch 90^a encounters the hook on the cam 99^a as it rotates, and the latch is thereby released from the keeper 88^a and the pump mechanism disengaged from the weight. The latch 90 and adjacent parts thereto, and mode of operation thereof, shown in Fig. 7, are substantially the same in both the first described and the modified structures, the latch in the latter structure being released by the revolving cam 99^a instead of the reciprocating dog 99.

As shown in Fig. 8, latch 90^b is modified to disengage from the weight 80 without depending on a moving cam or dog actuated by the machine. In this additional modification the latch 90^b is provided with an incline 89^b that engages with a counter incline on the plate 88^b secured to the weight 80 and held in frictional contact with the plate 88^b by a spud and spring 95^b. The spring 95^b is of sufficient power to create a frictional resistance between the inclines, equivalent to the pressure to be applied to the molten metal to cast the type, and when the weight 80 is dropped the force thereof is applied to the pump parts up to the frictional resistance of the incline created by the spring 95^b, the inclines then slide one on the other, and release the latch from the weight. The latch and pump parts are moved to their "up" position by the spring 109^b, and the weight drops its full stroke. When the weight is raised the upper side of the plate 88^b engages and forces back the latch 90^b to allow the incline thereon to pass over the incline on the lower side of the plate and reëngage the incline 89^b to again act. By this modification the effect is to release the weight automatically from the pump parts as soon as the resistance of the metal in the mold and well has reached a predetermined pressure, and it requires no care or adjustment in casting different size type.

As shown in Fig. 9, the overflow or discharge passage 75^a is modified by being discharged into an additional well 301^c, provided with a plunger 302^c, held down by a spring 303^c, and which modification serves the same purpose as set forth in the structure before described.

As shown in Fig. 10, the means to actuate metal valve parts are modified by having the valve stem 50^a actuated, to open the eduction valve, 51^a, by the force of the metal, when the pump acts, coming against a piston 304^d attached to the stem 50^a. The metal forces the piston back unseating the valve 51^a and when the pump pressure is relieved from the molten metal the piston is forced forward to reseat the valve 51^a and permit the eduction valve port 52^a to be opened by the spring 305^d acting on the lever 306^d, which latter is pivoted to the receptacle 31^a. By this modification the valve parts are actuated independently of any mechanical movement of the machine and require no changes or manual adjustment to cast the various size type.

It is obvious, as shown by the different modifications herein, that the applied mechanics or construction of this machine can be greatly altered, varied, or other forms may be substituted therefor which contain substantially the same mode of operation by which the results are accomplished, without departing from the scope of the invention. And it will be particularly noted that although we have referred to the present invention as being particularly applicable for use in conjunction with our pending application for patent heretofore referred to, we do not limit ourselves to such use, but claim the invention broadly for all uses to which it can be applied.

By the term "actuating mechanism" employed in the specification is meant any sub-combination, or its equivalent, acting individually to perform a single function, or a combination of several sub-combinations to perform a plurality of functions, and when the phrase "actuating mechanism" occurs it may mean only one sub-combination, if that combination performs its functions in the manner specified, or it may mean two or more sub-combinations if such are coacting to perform functions in the manner specified.

We are aware that various patents have been issued, both foreign and domestic, for type casting and setting machines operated by key-board actions, and also for type casting machines *per se*, for use in type foundries which require skilled labor to adjust and operate; therefore, we do not include within our claims such machines or combinations, but we believe that we are the first to invent a machine for producing type that is adapted, and practical, for use in printing office and which can be operated by unskilled labor. We believe we are the first to invent a machine in which the "actuating mechanisms" will adjust or regulate themselves to the conditions established by any size of mold that may be selected from a wide range of different sizes. Our claims, therefore, include any means that operate by substantially the same mode herein employed, and which produce the same result, whether specified or not.

We claim as our invention:—

1. In pump mechanism for type casting machines, the combination of a pump plunger, a well, means for supplying molten metal to said well, and an overflow passage connected to the well independently of said metal supply and directly controlled by said plunger, whereby the flow of molten metal is not entirely stopped, but only diminished after the type cavity has been filled in casting small type.

2. In pump mechanism for type casting machines, the combination of a pump plunger, a well, having an inlet and an outlet, and an overflow passage which is closed by the pump plunger, whereby, when casting large type the discharge of molten metal through the overflow passage is cut off.

3. In pump mechanism for type casting machines, the combination of a pump well, a pump plunger, and means directly controlled by said plunger, to prevent the sudden stopping of the molten metal flow when casting the smaller sizes of type, whereby an abnormal strain and jar on the parts is obviated.

4. In pump mechanism for type casting machines, the combination of a pump well, a pump plunger, mechanism to exert the same pressure on said plunger when casting both large and small type, and means directly controlled by said plunger to prevent an abnormal strain and jar on the parts involved when casting the smaller sizes of type.

5. In a pump and metal valve operating mechanism for type casting machines, the combination of a well, a pump plunger to eject molten metal from the well, a weight which applies force to the said plunger, a latch to engage and disengage the weight, and valve mechanism and a spring to instantly place said valve mechanism in its normal position whereby the flow of the molten metal will be cut off at the proper temperature.

6. In pump and metal valve operating mechanism for type casting machines, the combination of a molten metal receptacle, pump mechanism to eject the molten metal from the receptacle, valve mechanism controlling molten metal ports of the receptacle, weight mechanism attached to the said valve and pump mechanisms, and means to instantly disconnect the weight from the said mechanisms during any part of the movement thereof, whereby the mechanisms will be returned instantly to their normal positions to properly perform the functions involved.

7. In pump operating mechanism for type casting machines, the combination of a well, a pump plunger to eject molten metal from the well, a weight which applies force to the said plunger, and means arranged to disconnect the weight from the plunger at variable periods during the movement of the weight, whereby the pressure is released from the molten metal in accordance with any diminution in the size of the type that may be cast.

8. In pump operating mechanism for type casting machines the combination of a well, a pump plunger to eject molten metal from the well, a weight to apply force to the plunger, and mechanism to engage and disengage the weight and plunger, whereby the force of the weight is exerted on the plunger to cast the type, and released therefrom when the type has been cast.

9. In pump operating mechanism for type casting machines the combination of pump mechanism to eject the molten metal, power mechanism to apply force to said pump mechanism, means connecting the two and means for variably releasing said connection, whereby said two mechanisms may be disconnected sooner or later to suit the conditions arising in casting various sizes of type.

10. In pump operating mechanism for type casting machines, the combination of a pump plunger to eject the molten metal into the type cavity, a weight to apply force to said plunger, and mechanism connecting the two, whereby the force of the weight in dropping is transmitted to the plunger.

11. In a machine for casting type of various sizes, the combination of a pump plunger to eject molten metal from the pump well, and means for periodically operating the pump plunger, said means including a fixed force which does not vary during the stroke of the plunger.

12. In a machine of the character described, the combination of a pump plunger to eject the molten metal into the type cavity, means for applying a predetermined and unchanging force to said plunger, and means controlled by the pump plunger for preventing an abnormal strain and jar on the parts involved when casting the smaller sizes of type.

13. In a machine of the character described, the combination of a pump well having a relief port, a pump plunger adapted to close said port, and means for applying a predetermined and unchanging force to said plunger.

14. In a machine of the character described, the combination of a pump well having a relief port or overflow passage, a pump plunger adapted to close said relief port, a weight, and means for engaging said weight with said plunger and also for disengaging the same therefrom.

15. In a machine for casting type of various sizes, the combination of a receptacle for containing molten metal, valve mechanism for controlling the flow of metal from said receptacle, and an automatic device provided with means for varying the time in which the valves are opened and closed to conform to different sizes of type cast.

16. In a machine of the character described, the combination of metal supplying pump mechanism, means for applying a fixed force for actuating the same, the pressure of said force being unvaried during the stroke of said mechanism and a device for automatically governing the application of said fixed force, whereby the pressure upon the metal is varied in accordance with the size of the type cast and a relatively uniform density of the different sizes of type is maintained.

17. In a machine of the character described, the combination of metal supplying pump mechanism, means for applying a fixed force for actuating the same, said force being unvaried during the stroke of said pump mechanism, and a device for automatically governing the application of said fixed force, whereby the pressure upon the metal is varied in accordance with the size of the type cast and a relatively uniform density of the different sizes of type is maintained.

18. A machine of the character described comprising molten metal valve and pump mechanism, a weight, means for raising said weight, means for engaging said weight with said valve and pump operating mechanisms, means for disengaging said weight from said mechanisms, and means for varying the time of disengagement in accordance with the size of the type being cast.

19. Molten metal valve and pump operating mechanism, comprising a weight, means for raising the same, and means for dropping said weight at times determined by the size of the type to be cast.

20. Molten metal valve and pump operating mechanism, comprising a weight, means for elevating the same, a latch adapted to support said weight in its elevated position, and means for automatically disengaging said latch.

21. Molten metal valve and pump operating mechanism, comprising a weight, means for raising the same, a latch adapted to engage and support said weight in its elevated position, and means for moving said latch, whereby the same will not engage said weight.

22. Molten metal valve and pump operating mechanism, comprising a weight, a shank loosely connected thereto, a latch carried by said shank, means for elevating said weight into engagement with said latch, and means for disengaging said latch at variable periods determined by the size of the type to be cast.

23. Molten metal valve and pump operating mechanism, comprising a weight provided with a keeper, a shank loosely connected to said weight, a latch carried by said shank and adapted to engage said keeper, and means for disengaging said latch at variable periods determined by the size of the type to be cast.

24. Molten metal valve and pump operating mechanism, comprising a weight, a latch, a lifting device for said weight, means for operating said lifting device, whereby said weight is moved into engagement with said latch, and means whereby a continued movement of said operating means will disengage said latch.

25. Molten metal valve and pump operating mechanism, comprising a weight, means for elevating the same, a latch provided with a lower inclined portion, and means for engaging the inclined portion of said latch, whereby the latter is disengaged at variable periods determined by the size of the type being cast.

26. Molten metal valve and pump operating mechanism, comprising a weight, a shank having a loose connection with said weight, a spring for holding said shank normally elevated, a latch carried by said shank and adapted to engage said weight, and means for disengaging said latch at periods determined by the size of the type being cast.

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

FRANK HOWARTH BROWN.
JOHN EDWARD HANRAHAN.
GEORGE ALBERT BOYDEN.

Witnesses:
ELDRIDGE E. HENDERSON,
ARMSTEAD M. WEBB.