

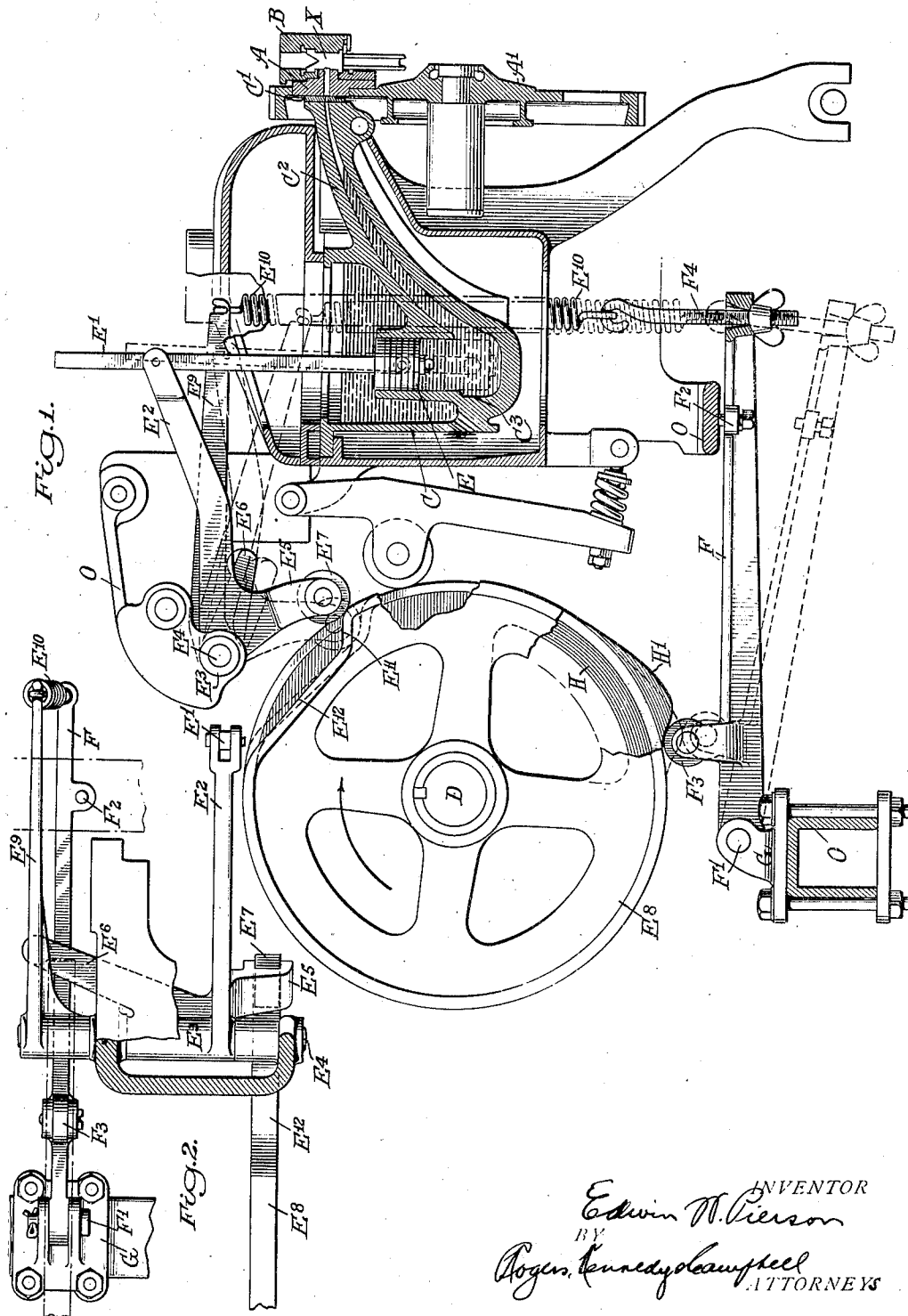
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TYPOGRAPHICAL CASTING MACHINE

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## UNITED STATES PATENT OFFICE.

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## TYPOGRAPHICAL CASTING MACHINE.

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*To all whom it may concern:*

Be it known that I, EDWIN W. PIERSON, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Typographical Casting Machines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to typographical casting machines, such as linotype machines of the general organization represented in U. S. Letters Patent to O. Mergenthaler, No. 436,532, wherein a type bar or slug is cast in a slotted mold up against a composed line of matrices and thereafter removed from the mold by an ejector blade which advances from the rear and drives the slug before it into a receiving galley at the front. In these machines, the molten metal is introduced into the mold by means of a pump piston or plunger arranged within a melting pot and controlled in its action by a rotary cam which, as is well known, makes one complete rotation for each cycle of operation of the machine. The cam is so shaped as normally to maintain the pump plunger in a raised position out of action, but at one point in its circumference, it is formed with a depression which, at the proper time, permits the plunger to descend under the action of a strong spring to carry out the slug casting operation. Under this old arrangement, it frequently happens that the cast slugs are imperfect, the imperfections being present not only in the type characters but also in the body portions of the slugs. A rather common defect is that the bottom edges of the slugs are hollow or spongy, this being particularly true of slugs of the larger sizes. As a result, the ejector blade, in removing such a defective slug from the mold, often embeds itself in the base of the slug and wedges the latter tightly in the mold, giving rise to considerable annoyance and delays and sometimes causing serious damage to the parts. The objections referred to are due primarily to the fact that the pump plunger fails to exert sufficient pressure upon the molten metal throughout the casting operation, it being noted that the spring, which effects the working stroke of the plunger, is anchored to a fixed part of the machine and hence grows weaker and weaker as the casting operation progresses.

In other words, near the completion of the casting operation, the load applied to the plunger (which should be at its maximum) is actually at its minimum, due to the lost tension or relaxation of the spring at the time.

The present invention is intended to obviate the foregoing objections, and to this end, it consists specifically in the provision of an automatic tensioning device which will not only keep up the initial tension of the spring during the working stroke of the pump plunger but which will actually increase said tension at or near the completion of such working stroke. In this way, the molten metal is maintained under an undiminishing pressure throughout the casting operation and thus caused to fill the mold completely. Actual practice has shown that a slug cast according to this invention is substantially free from the defects before noted, being practically solid throughout and presenting in particular a base or bottom edge well adapted to withstand the impact of the ejector blade in removing the slug from the mold. In the preferred embodiment herein illustrated, the invention is disclosed in the nature of an attachment capable of ready application to the regular linotype machine now on the market, a feature which is advantageous for obvious reasons. The exact construction and operation of the parts will best be understood from the detailed description to follow.

Referring to the drawings:

Fig. 1 is a vertical section taken through the casting mechanism of a linotype machine equipped with the present improvements; and

Fig. 2 is a top plan view, partly in section, of the pump plunger actuating devices.

In Fig. 1, the parts are shown in the relative positions they occupy just prior to the commencement of the casting operation. In this condition of the parts, the slotted mold A, carried by a rotary disk A', is closed at the front by the composed line of matrices X presented momentarily thereto by a carrier or "first elevator" B, and it is closed at the rear by the mouthpiece C' of a melting pot C having a throat or passage C<sup>2</sup> leading from a pump well or cylinder C<sup>3</sup> located within the pot. The well or cylinder C<sup>3</sup> contains a reciprocatory pump piston or plunger E adapted to be actuated at each casting operation to inject the molten

metal into the mold A up against the composed matrix line X for the production of the type bar or slug. The pump plunger E is connected by means of a rod or link E' to the free end of a vertically movable lever E<sup>2</sup> formed at its opposite end with a bearing sleeve E<sup>3</sup> mounted loosely on a fixed transverse rod E<sup>4</sup> of the machine frame, designated generally by the letter O. The sleeve E<sup>3</sup> is provided with two arms E<sup>5</sup> and E<sup>6</sup>, the former carrying a roller E<sup>7</sup> which is arranged to track upon the periphery of a rotary cam wheel E<sup>8</sup> fast to the main shaft D of the machine, and the latter being extended laterally beneath a further lever E<sup>9</sup> which is also mounted loosely on the fixed rod E<sup>4</sup> and has its free end connected to a long helical spring E<sup>10</sup> pulling downwardly thereon under a heavy tension. As well understood in the art, the peripheral edge of the cam wheel E<sup>8</sup> is concentric throughout except at one portion of its circumference, where it is cut away or formed with a depression to provide sloping surfaces E<sup>11</sup> and E<sup>12</sup>. When the machine is at rest, the roller E<sup>7</sup> is in contact with the concentric portion of the cam wheel E<sup>8</sup>, so that the plunger E is maintained in its raised or inoperative position against the opposition of the spring E<sup>10</sup>, as indicated in Fig. 1. This condition obtains until the casting period arrives, when the cam wheel (rotating in the direction of the arrow) brings its sloping surface E<sup>11</sup> into engagement with the roller E<sup>7</sup>, which thereupon descends along such surface to the bottom of the depression and permits the spring E<sup>10</sup>, through the connections described, to depress the plunger E and force a charge of molten metal into the mold. As the cam wheel continues to rotate, the roller E<sup>7</sup> is engaged sooner or later by the sloping surface E<sup>12</sup> and the parts thereby restored to and maintained in their original condition to await the next casting operation.

As thus far described, the parts and their mode of operation are or may be the same as embodied in the commercial linotype machine. In prior constructions, however, the spring E<sup>10</sup> has been anchored at its lower end to a fixed part of the machine, and hence loses much of its tension as the pump plunger descends, becoming weakest when the plunger is at the end of its working stroke. As a result, the pressure exerted upon the molten metal during the casting operation correspondingly varies, being at its maximum at the beginning of the operation and at its minimum at the close of the operation. According to the present invention, the initial tension of the spring (i. e., the tension the spring is under at the beginning of the pump stroke) is kept up throughout the casting operation, so that the pressure upon the molten metal will not

lag or drop off at any stage thereof. It would probably answer the purpose if the tension of the spring were kept uniform throughout the casting operation so as to cause the pump plunger to exert a constant pressure upon the molten metal, but, in view of the difficulties involved, it is proposed to increase the tension of the spring at or near the end of the operation so as to build up the pressure at that time.

In carrying out the invention, there is provided a second lever F pivoted at one end, as at F', to a bracket G secured to the machine frame, and having at its free end a suitable anchor F<sup>4</sup> for the spring E<sup>10</sup>. Near its free end, the lever F is provided with a set screw or stop F<sup>2</sup> adapted to engage a fixed part of the machine frame O and limit the upward movement of the lever. Near its pivoted end, the lever is provided with a roller F<sup>3</sup> which is adapted to co-operate with a riser or projection H' of a second cam wheel H secured to the main shaft D of the machine. In the drawings, the riser H' is shown as being integral with the cam wheel H (as it might be), but in actual practice it is in the form of a separate piece applied thereto.

In the condition of the parts just prior to the casting operation, as shown in Fig. 1, the lever F is in engagement with the fixed machine frame and holds the spring E<sup>10</sup> under the desired initial tension, but when the pump plunger E begins its working stroke, as permitted by the travel of the roller E<sup>7</sup> down the inclined surface E<sup>11</sup>, the roller F<sup>3</sup> is at or about such time engaged by the cam riser or projection H', which then depresses the lever F so as to lower the spring anchor F<sup>4</sup> at a rate of speed sufficient substantially to keep up the initial tension of the spring throughout the pump stroke. In the present instance, the parts are so proportioned that the spring anchor will be moved at a rate of speed and for a distance such as to increase the initial tension of the spring as the pump plunger nears the end of its working stroke. The dotted lines in Fig. 1 show the parts in their fully operated condition. When the pump plunger E is restored to its original position in the manner before described, the lever F is lifted back into engagement with the machine frame through the medium of the spring E<sup>10</sup>, which at the same time is placed under its original or initial tension ready for the next pump stroke. In this connection, it may be remarked that the use of the stop F<sup>2</sup> is herein resorted to merely because of the fact that the cam wheel H, which forms a part of the standard linotype equipment, is not such as to permit the roller F<sup>3</sup> to track thereon. It is obvious that it would be entirely feasible to employ a continuous cam upon which the roller F<sup>3</sup> might track,

in which event there would of course be no necessity for the stop F<sup>2</sup>.

The invention has been shown herein only in preferred form and by way of example and as applied to a regular linotype machine, and it is obvious that many changes and variations may be made therein and in its mode of application without departing from its spirit. It should be understood, therefore, that the invention is not limited to any particular form or embodiment except in so far as such limitations are specified in the claims.

Having thus described my invention, its construction and mode of operation, what I claim is as follows:

1. In a typographical casting machine, the combination of a mold, intermittently operated and automatically controlled means for injecting molten metal into the mold at each casting operation, and means for keeping up a substantially undiminishing pressure on the molten metal throughout each metal injecting action.

2. In a typographical casting machine, the combination of a melting pot, a reciprocatory pump plunger mounted therein, and intermittently operated and automatically controlled mechanism for reciprocating the pump plunger, said mechanism acting to keep up a substantially undiminishing pressure on the molten metal throughout the working stroke of the pump plunger.

3. In a typographical casting machine, the combination of a melting pot, a reciprocatory pump plunger mounted therein, and mechanism for reciprocating the pump plunger, said mechanism acting substantially to keep up the initial pressure of the plunger on the molten metal during its working stroke and to increase said pressure near the end of said stroke.

4. In a typographical casting machine, the combination of a melting pot, a reciprocatory pump plunger mounted therein, and mechanism for reciprocating the pump plunger, said mechanism including a spring under tension to effect the working stroke of the plunger, and automatic means for keeping up substantially the initial tension of the spring throughout such plunger stroke.

5. In a typographical casting machine, the combination of a melting pot, a reciprocatory pump plunger mounted therein, and mechanism for reciprocating the pump plunger, said mechanism including a spring under tension to effect the working stroke of the plunger, and automatic means for keeping up substantially the initial tension of the spring during such plunger stroke and for increasing said tension near the end of said stroke.

6. In a typographical casting machine, the combination of a melting pot, a periodically operated pump plunger mounted

therein, an automatically controlled spring to effect the working stroke of the plunger, and an automatic tensioning device acting on the spring during its operation of the plunger to keep up substantially the initial pressure of said plunger on the molten metal near the end of its working stroke.

7. In a typographical casting machine, the combination of a melting pot, a periodically operated pump plunger mounted therein, an automatically controlled spring to effect the working stroke of the plunger, and an automatically shiftable member to which the spring is anchored, said member acting to keep up substantially the initial tension of the spring during the working stroke of the plunger.

8. In a typographical casting machine, the combination of a melting pot, a vertically movable pump plunger mounted therein, a spring connected to said plunger and acting constantly to depress it, means cooperating with the plunger to control the action of the spring and to raise the plunger after its depression thereby, and an automatic spring tensioning device operated during the depression of the plunger to keep up substantially the initial pressure of said plunger on the molten metal near the end of its working stroke.

9. In a typographical casting machine, the combination of a melting pot, a vertically movable pump plunger mounted therein, an actuating lever for the pump plunger, a spring connected to said actuating lever and acting constantly to depress the plunger, a cam cooperating with the actuating lever to control the action of the spring and to raise the plunger after its depression thereby, a second lever to which the spring is anchored and which serves to keep up substantially the initial tension of said spring during the working stroke of the plunger, and a cam for operating the second lever in proper synchronism with the other parts.

10. In a typographical casting machine, the combination of a melting pot, a vertically movable pump plunger mounted therein, an actuating lever for the pump plunger, a spring connected to said actuating lever and acting constantly to depress the plunger, a cam cooperating with said actuating lever to control the action of the spring and to raise the plunger after its depression thereby, a second vertically movable lever to which the spring is anchored and normally held against upward movement by engagement with a fixed part of the machine frame, and a cam acting to depress said second lever during the depression of the pump plunger by the spring to keep up substantially the initial tension of the latter throughout such period.

11. In a typographical casting machine, the combination of a melting pot, a verti-

cally movable pump plunger mounted therein, an automatically controlled spring to depress the pump plunger at each casting operation, a vertically movable member to  
5 which the spring is anchored and held normally against upward movement, and automatic means for depressing said member during the depression of the pump plunger by the spring to keep up substantially the  
10 initial tension of the latter throughout such period.

12. In a typographical casting machine,

the combination of a melting pot, a reciprocatory pump plunger mounted therein, and mechanism for reciprocating the pump  
15 plunger including a spring under tension to effect its working stroke, said spring being movable bodily during said plunger stroke to keep up the initial load applied to the  
20 plunger throughout such period.

In testimony whereof, I have affixed my signature hereto.

EDWIN W. PIERSON.