Sept. 9, 1941. J. H. HILPMAN 2,255,254

SLUG CASTING MACHINE

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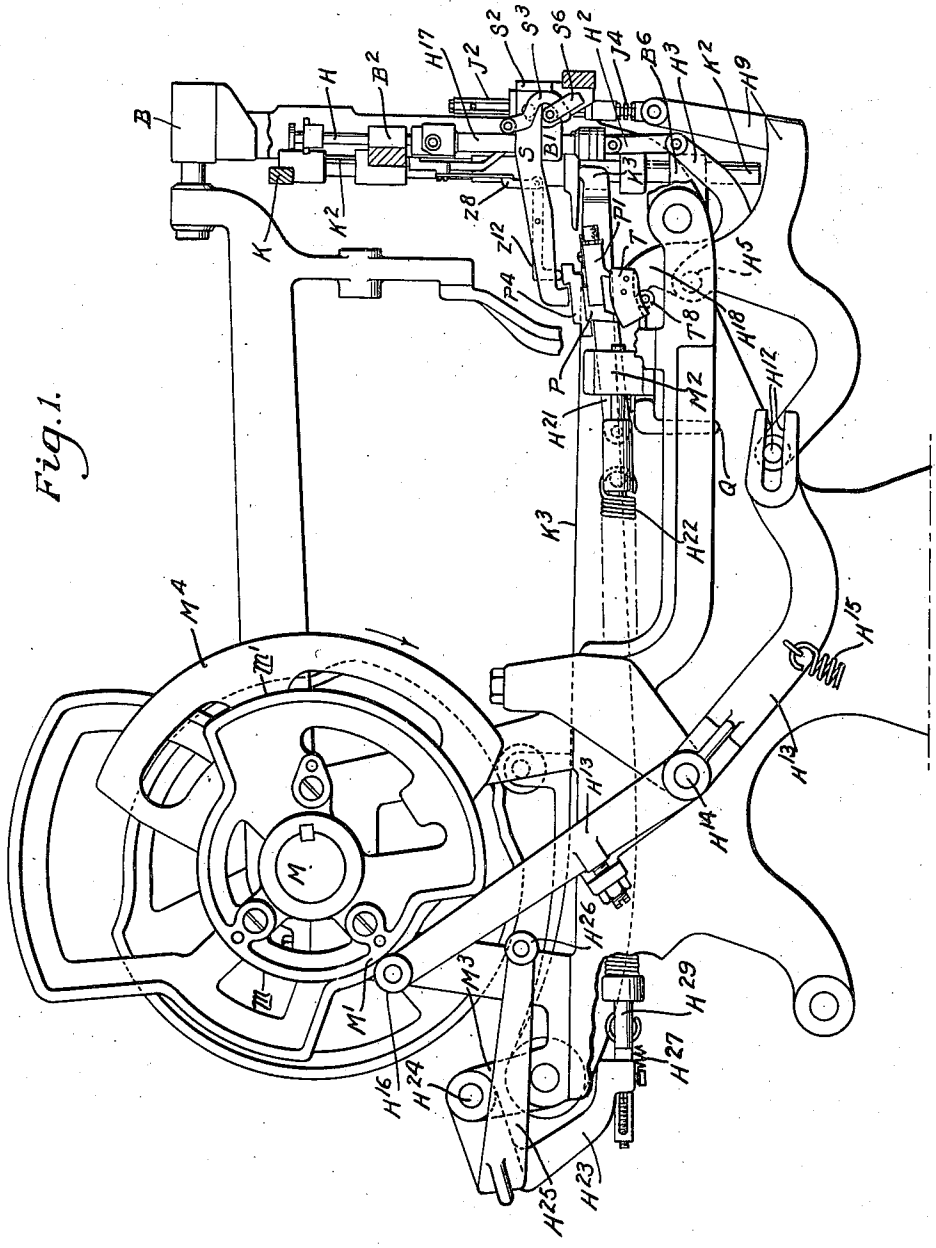
Fig. 1.



INVENTOR
John H. Hilpman
BY
Morrison, Kennedy & Campbell
ATTORNEYS.

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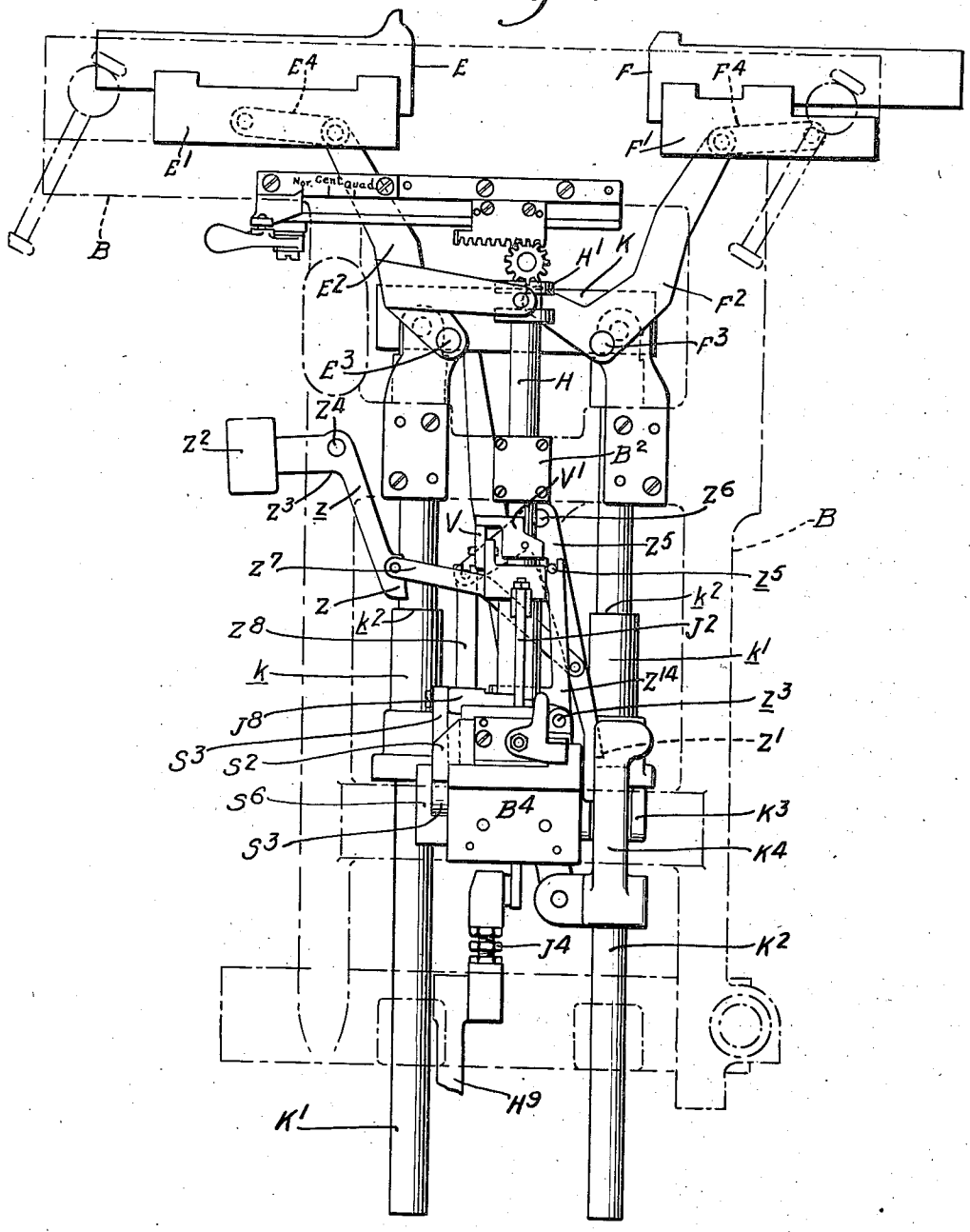
Fig. 2.



INVENTOR
John H. Hilpman

BY
Morrison, Kennedy & Campbell
ATTORNEYS.

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SLUG CASTING MACHINE

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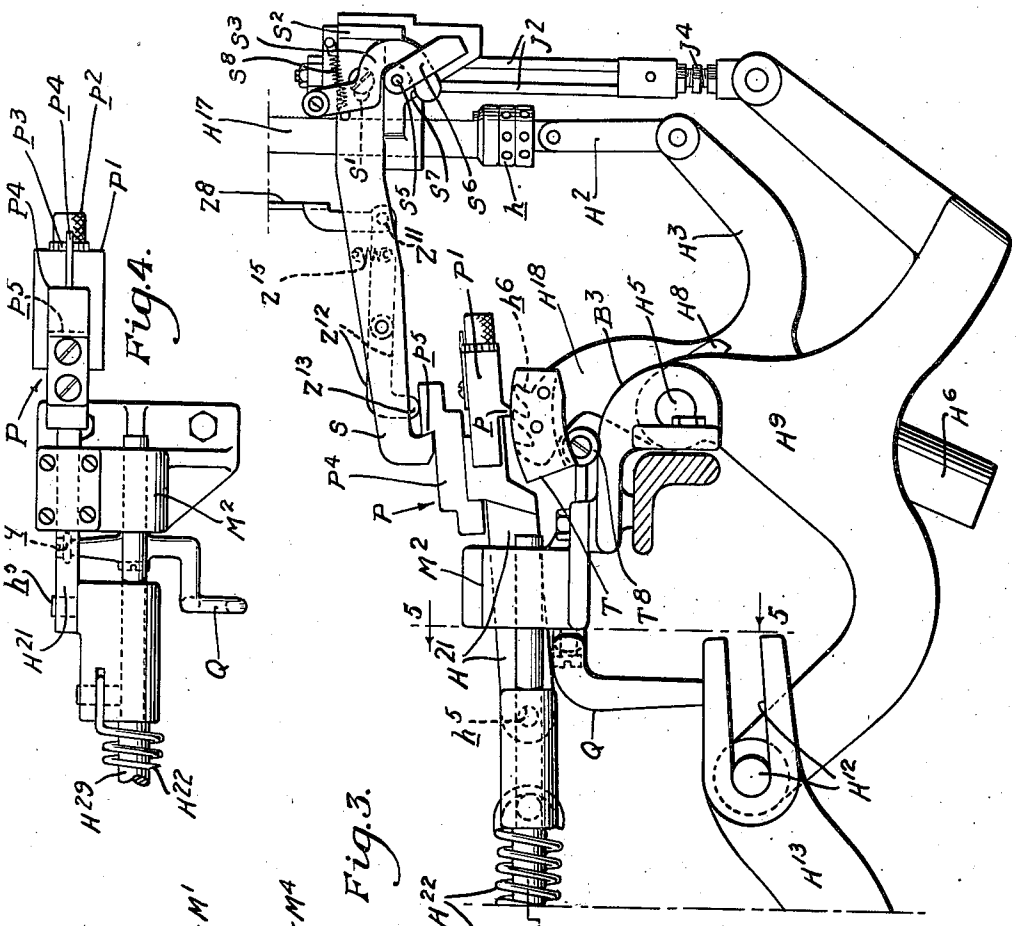

Fig. 4.

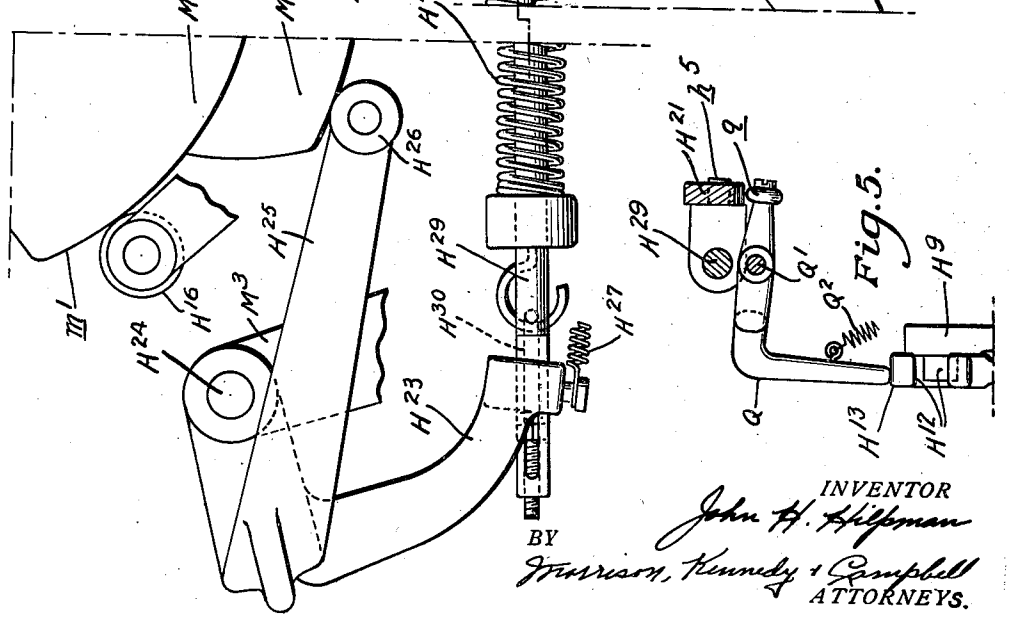

Fig. 3.

Fig. 5.

INVENTOR
John H. Hilpman

BY
Morrison, Kennedy & Campbell
ATTORNEYS.

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SLUG CASTING MACHINE

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Fig. 6.

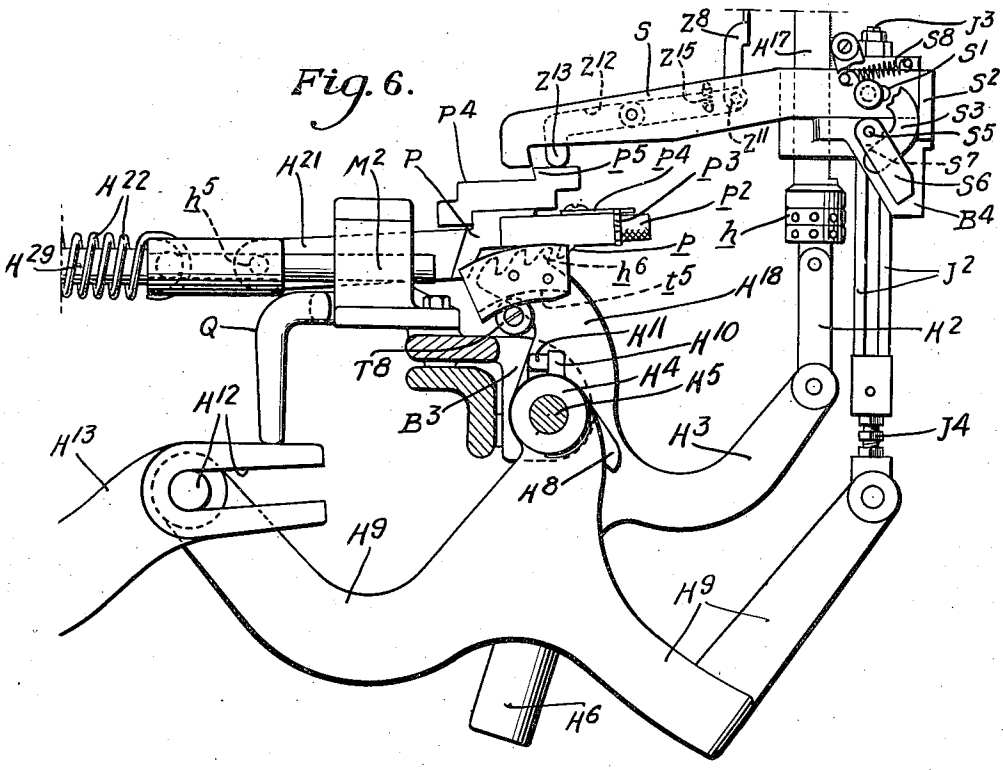


Fig. 7.

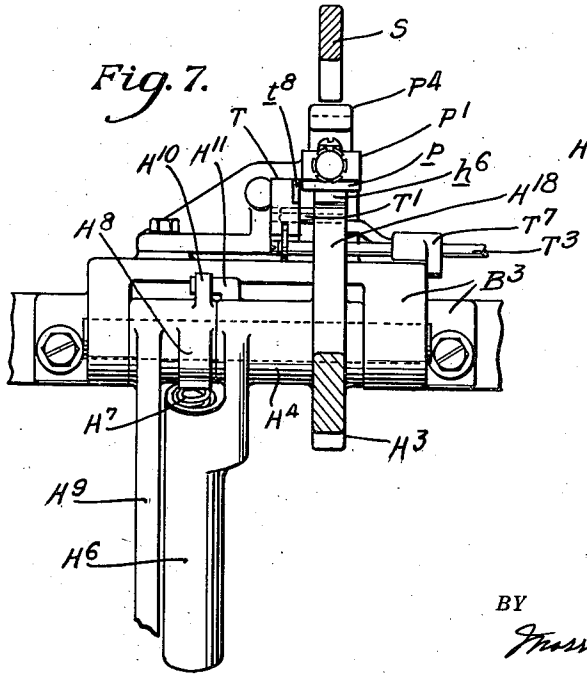
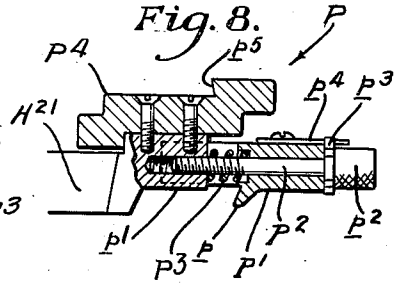


Fig. 8.



INVENTOR
John H. Hilpman

BY
Thomson, Kennedy & Campbell
ATTORNEYS.

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SLUG CASTING MACHINE

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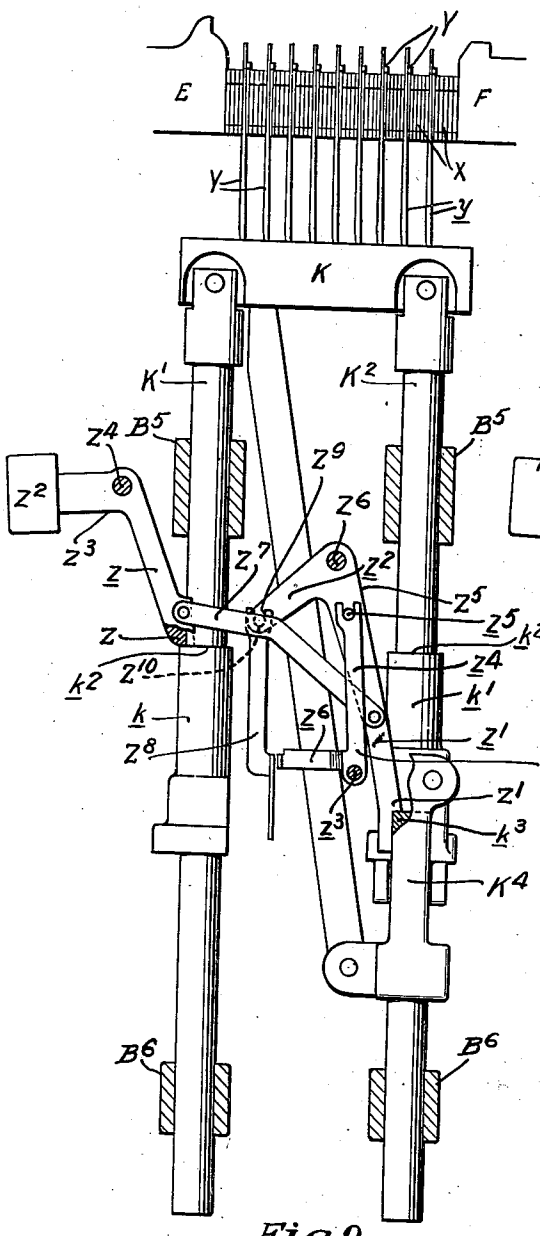

Fig. 9.

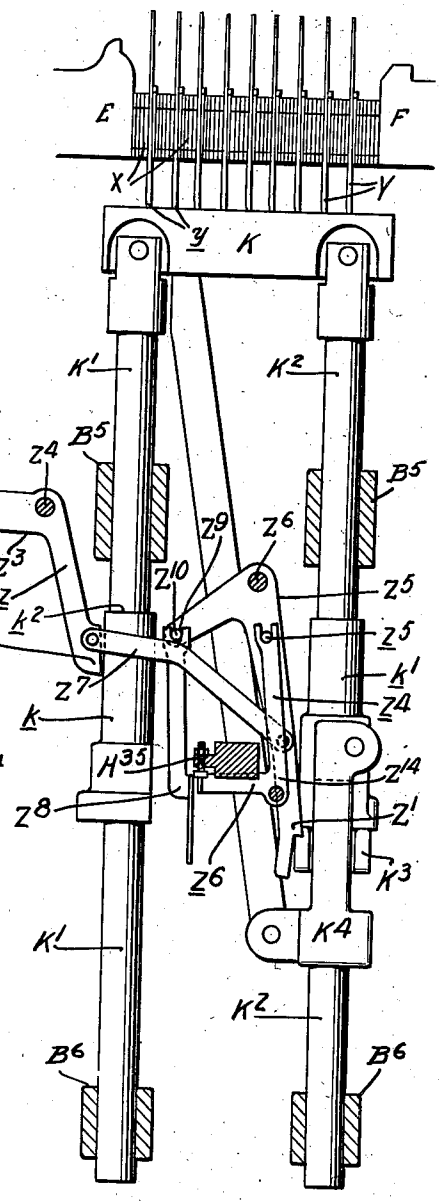

Fig. 10.

INVENTOR
John H. Hilpman

BY
Morrison, Kennedy & Campbell
ATTORNEYS.

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SLUG CASTING MACHINE

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Fig. 11.

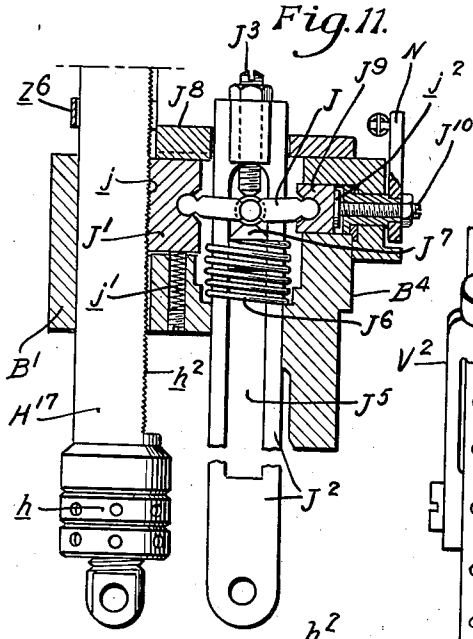


Fig. 12.

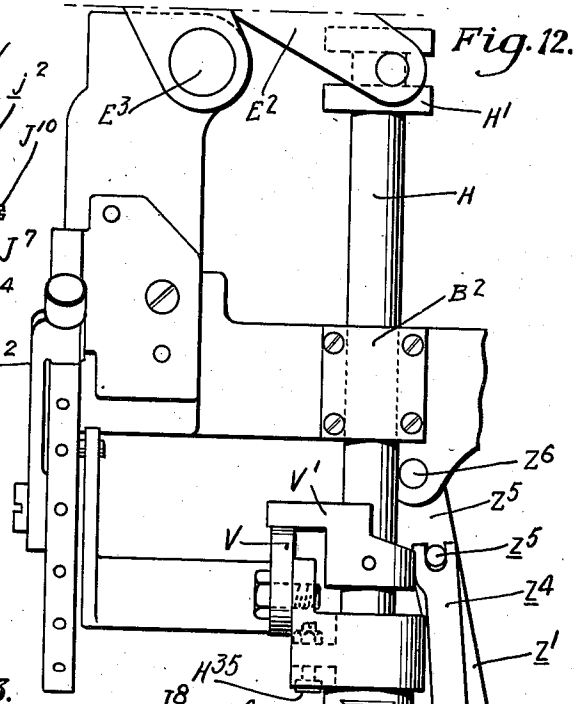
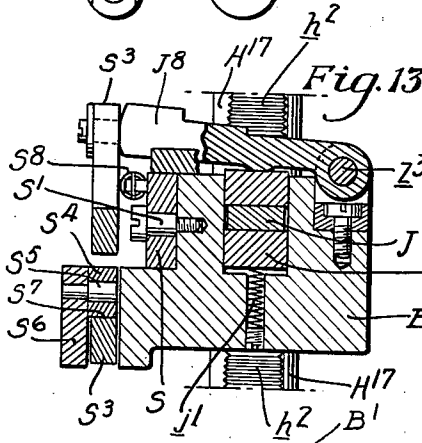


Fig. 13.



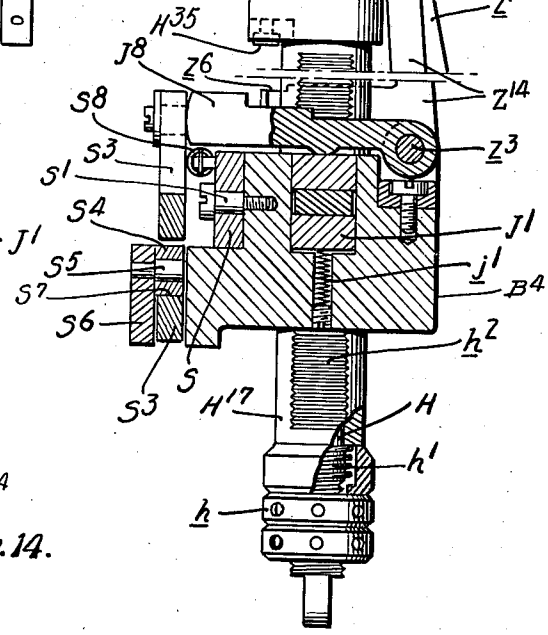
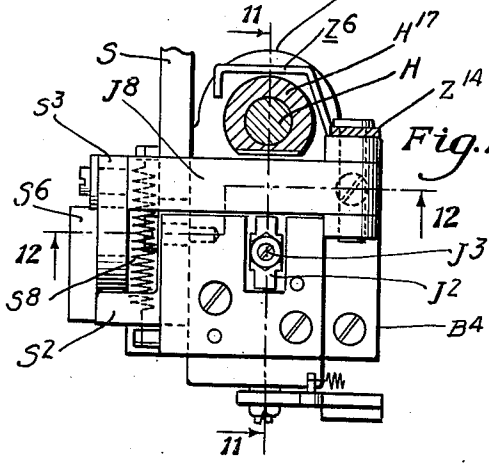


Fig. 14.



INVENTOR
John H. Hilpman

BY
Morrison, Kennedy & Campbell
ATTORNEYS.

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SLUG CASTING MACHINE

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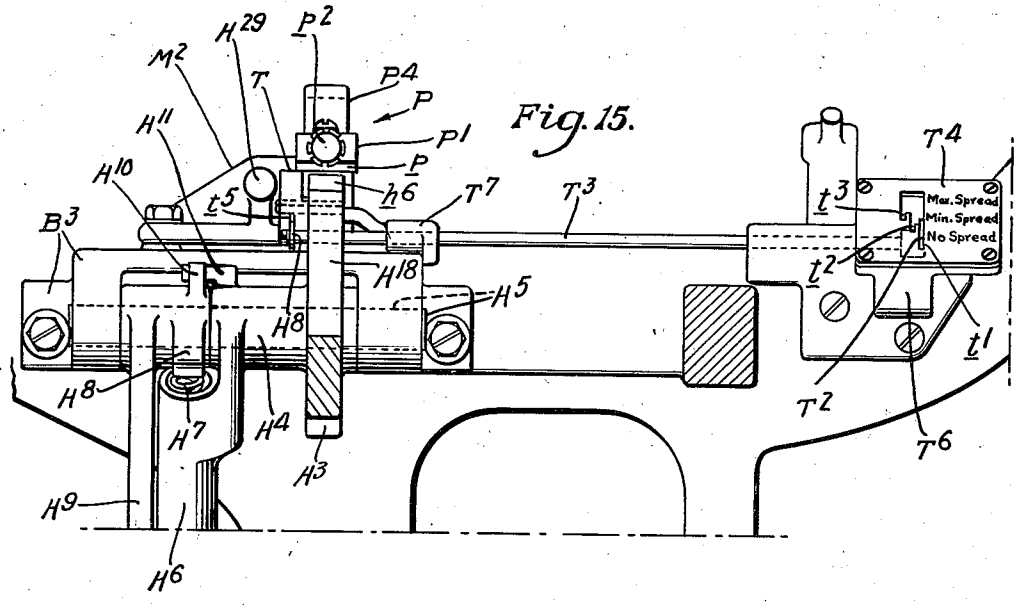

Fig. 15.

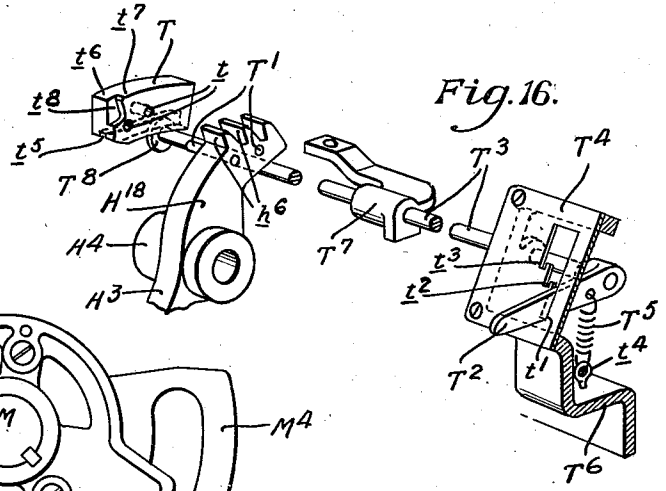

Fig. 16.

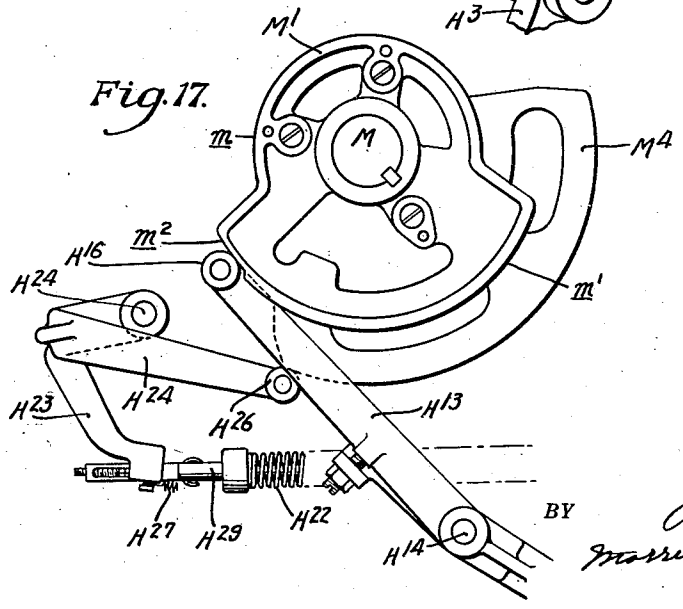

Fig. 17.

INVENTOR
John H. Hilpman
BY
Morrison, Kennedy & Campbell
ATTORNEYS.

Patented Sept. 9, 1941

2,255,254

UNITED STATES PATENT OFFICE

2,255,254

SLUG CASTING MACHINE

John H. Hilpman, Springfield Gardens, N. Y., assignor to Mergenthaler Linotype Company, a corporation of New York

Application August 3, 1940, Serial No. 350,682

43 Claims. (Cl. 199—51)

This invention relates to slug casting machines, such as Linotype machines of the general organization represented in United States Letters Patent to O. Mergenthaler No. 436,532, wherein circulating matrices and expansible spacebands are composed in line by the manipulation of a keyboard, the composed line transferred to a slotted mold for the casting of a type bar or slug, and the matrices and spacebands thereafter separated and returned by a distributing mechanism to the magazines from which they started. More particularly, the invention relates to machines of this character equipped with quadding and centering devices, in order that the machine may handle not only lines of full length as ordinarily, but in addition lines of less than full length (regardless of their actual length), lines of the latter kind in machines of this character being composed merely with the matrices necessary for the printed matter and indented at the left or at the right end of the line or centered as desired.

A machine so constructed is disclosed in the Frolander Patent No. 1,971,400, dated August 28, 1934. In the machine therein disclosed the movable supports for the two line clamping jaws (the latter being made long enough to perform their required functions of closing the mold slot at the front) are actuated through two distinct trains of connections from a vertically movable member controlled from the main shaft of the machine. When both jaw supports are connected to the member, they are, prior to casting, moved equidistantly toward each other until arrested by the contact of their respective jaws with the opposite ends of the composed line (for centering) and later, after casting, restored to their original positions of maximum separation. Due provision is made for disconnecting either the right-hand jaw or the left-hand jaw from the vertically movable member, so that one or the other may be operated independently for quadding at the right or at the left as may be desired. When both jaws are disconnected, as they may be, the machine is free to function in the usual way, the right-hand jaw being left normally stationary and the left-hand jaw being adjustable by the customary devices. When the clamping jaws are moved into contact with the composed line, the vertically movable member is locked in its downwardly moved position by means of a toggle clamp actuated by a lost motion device included in the operating connections and, after a casting operation, the toggle clamp is released, allowing the vertically movable member to ascend and restore the clamping jaws to their positions of maximum separation.

An improvement upon the aforementioned toggle clamp is disclosed in the Mead Patent No. 2,092,220, dated September 7, 1937, wherein the grip element is allowed a limited degree of movement while still in engagement with the vertically movable member to allow the latter to be actuated upwardly for a small distance to permit the slight backing off of the line clamping jaws before the line has been lifted clear of the jaws, the grip element later (after the line has cleared the jaws) being disengaged from the vertically movable member to permit it to ascend to its uppermost position and return the jaws to their positions of maximum separation.

The disclosures of the Frolander and Mead patents referred to, contemplate the closing of the jaws against the composed line under pressure and thereafter effecting a positive separation of the jaws for a limited distance for the free expansion of the spacebands in justifying the line, the justification pressure being sufficient (as in regular machine operation) to spread out the line tightly between the jaws. It is not the practice, however, to justify quadded lines, whether or not they contain spacebands, except in certain instances such as for so-called straight-line indention, when the jaws are backed off from line contacting position to abut against fixed stops. In the absence of justification, the line closing pressure of the jaws is not always great enough to compress the matrices in the line sufficiently to prevent metal squirts or the production of hair lines on the cast slug. For example, the line clamping jaws are supported loosely enough so that under normal line closing pressure they may contact the end matrices of the line in a tilted position and thus fail to engage the matrices throughout their full height. This leaves a space at one or both ends of the line between the end matrices and the matrix engaging faces of the jaws through which metal can squirt when injected into the mold for casting. The other difficulty, the production of hair lines on the slugs, may be due to several causes, chief among which is that arising from the fact that as a result of continued use the matrices warp or otherwise become bent, or in the case of the thinner matrices they may not be straight even when new, and, hence, they do not stand in sidewise contact throughout their full extent when composed in line and must be compressed into tight engagement. If this were true of one or two matrices only, the line closing pressure might squeeze the

line sufficiently to straighten the matrices, but when one-half or more of the total number of matrices in the line must be straightened to obtain a tight lock-up, as is frequently the case, the line closing pressure may be far from adequate.

To obviate this condition, it is proposed in accordance with the present invention to move the jaw (assuming one jaw only to be connected for movement) into line contacting position for quadding as usual, and then apply a supplemental pressure through the jaw moving means to urge the jaw inwardly from its line contacting position to squeeze the line tight enough to insure the straightening and complete sidewise contact of all matrices composed therein. Such line squeezing pressure also serves to straighten the jaws so that their matrix engaging faces make complete contact with the side faces of the end matrices.

In carrying out the invention, the power means for backing off the jaws from their line contacting position is utilized to produce the requisite supplemental pressure, there being employed an adjustable interponent which, under one setting, connects the power means to the vertically movable member to back off the jaws for justified lines and which, under another setting, connects the power means to the toggle clamp for urging the jaws inwardly from line contacting position to squeeze unjustified lines. The interponent is adjusted manually to adapt the power means selectively to perform either of its functions. A locking device is provided which normally is operative to lock the line justifying mechanism against operation, and this locking device also is controlled by the interponent and rendered inoperative when the jaws are to be backed off for a line spread. For regular machine operation, provision is made for rendering the locking device inoperative during each cycle of the machine.

In the accompanying drawings, the invention has been shown merely by way of example and in preferred form, but obviously many variations and modifications may be made therein and in its mode of application which will still be comprised within its spirit. It is to be understood, therefore, that the invention is not limited to any specific form or embodiment, except inso-far as such limitations are specified in the appended claims.

Referring to the drawings:

Fig. 1 is a side elevation of a portion of a slug casting machine equipped with the present improvements, looking from the left hand side of the machine;

Fig. 2 is a front elevation of a portion of the machine, showing certain of the parts included in Fig. 1;

Fig. 3 is a view of some of the parts shown in Fig. 1, illustrating the operating connections for the vertically movable member and its locking device;

Fig. 4 is a plan view of certain of the parts shown in Fig. 3;

Fig. 5 is a vertical section, taken substantially on the line 5—5 of Fig. 3 and looking in the direction of the arrows;

Fig. 6 is a view similar to Fig. 3, with some of the parts omitted, however, and with the parts shown in different relative positions;

Fig. 7 is a front elevation of some of the parts of the mechanism for actuating the vertically movable member;

Fig. 8 is a sectional view of the interponent for connecting the jaw spreading power means to the lever for actuating the vertically movable member;

Figs. 9 and 10 are comparative views of a portion of the justifying mechanism and the means for disabling it;

Fig. 11 is a sectional view of the locking device for the vertically movable member, taken on the line 11—11 of Fig. 14 and looking in the direction of the arrows;

Fig. 12 is a view, partly in elevation and partly in section and taken substantially on the line 12—12 of Fig. 14, of the vertically movable member and its locking device;

Fig. 13 is a sectional view of the locking device similar to that shown in Fig. 12 but showing the parts in different relative positions;

Fig. 14 is a top plan view of the locking device;

Fig. 15 is a front elevation of the means for conditioning the interponent;

Fig. 16 is a perspective view of some of the parts of the conditioning means, showing them in separated relationship; and

Fig. 17 is a side elevation of a modified form of jaw closing cam.

The matrices X and the expansible spacebands Y are composed in line in the assembler in the usual way, and transferred to a vertically movable transporter or first elevator, which thereupon descends to position the line between the left hand jaw E and the right hand jaw F (Figs. 2, 9 and 10) and in front of a slotted mold (not shown). The mold then advances from the rear and into contact with the line and with the two clamping jaws for the slug casting operation, the line, prior to casting, being aligned and justified in the same manner as when the machine is being operated under the usual conditions. After the slug has been cast, the mold is carried from its horizontal casting position to a vertical ejecting position by a three-quarter rotation of the mold disc, the first elevator in the meantime being raised to deliver the composed line to the matrix and spaceband distributing devices and finally coming to rest in its original or line receiving position.

As described in the Frolander patent previously referred to, the two jaws E and F are mounted for movement in the vise frame in the customary manner, being carried by supporting blocks E^1 and F^1 slidable in suitable guideways in the vise frame, and are movable toward and from each other by a periodically operated part in the form of a vertically movable rod H which may be connected at its upper end to the respective jaws through the medium of two similar but oppositely disposed bell crank levers E^2 and F^2 pivoted at E^3 and F^3 to the fixed vise frame B, the longer arms of said levers being connected by short links E^4 and F^4 to the jaw supports E^1 and F^1, respectively, and the shorter arms of said levers being arranged for connection to the rod H. According to this arrangement, when the rod H is moved downwardly from its uppermost position (which is its normal position of rest), it will move the two jaws equidistantly toward each other (assuming both to be connected to the rod) until they contact with the opposite ends of a composed line which has previously been positioned between them and, when the rod is moved upwardly for restoration to its position of rest, it will in like manner move the jaws equidistantly away from each other to return them to their original positions of maximum separation. Since the composed line positioned

between the jaws may vary in length, the actual extent of movement of the rod H will, of course, vary accordingly, and hence provision is made for such varied movement of the rod in its actuating connections, as will presently appear.

A suitable device, in the nature of a segmental grooved member H^1, is provided at the upper end of the vertically movable rod H for connecting the jaws thereto, this grooved member being adjustable so as selectively to connect either or both jaws to the rod, as desired, for quadding at either end of the line or for centering. The manner in which the member is adjusted has no concern with the present invention and nothing further will be said about it here.

The rod H is slidable in suitable bearings B^1 and B^2 in the fixed frame. At its lower end, the rod H is connected by a link H^2 to the forward end of a lever H^3 having a hub portion H^4 journalled on a pivot rod H^5 carried by a bracket B^3 secured to the vise frame (Figs. 1, 3, 6 and 7). Fixed to and depending from the hub portion H^4 is a barrel or cylinder H^6 containing an expansion spring H^7 pressing upwardly against a lug H^8 projecting forwardly from the hub portion of a second lever H^9 also journalled on the pivot rod H^5. The lifting tendency of the spring H^7 is resisted and overcome by the engagement of a stop lug H^{10} on the hub portion of the second lever H^9 with a stop lug H^{11} formed on the hub portion of the first lever H^3, the effect of this arrangement being to cause the two levers to move in unison until the first lever is arrested by the rod H as the jaw or jaws, whichever is connected thereto, banks against the composed line.

The second lever H^9 is connected at its rear end by the roller and groove connection H^{12} to the forward end of a bent lever H^{13} journalled on a pivoted rod H^{14} fixed in the main frame, a tension spring H^{15} being connected to the lever in advance of its pivot and serving constantly to move it downwardly at its forward end. The lever at its rear end is provided with a roller H^{16} tracking upon the periphery of an edge cam M^1 fast to the main shaft M of the machine.

From the foregoing construction, it will be seen that the rotation of the cam M^1 (which is always in a clockwise direction and which makes one complete rotation at each cycle of operation of the machine) is imparted to the rod H, through the train of connections just described, to move the rod first downwardly to effect the inward or closing movement of the jaws E and F, and then upwardly to effect the outward or separating movement of the jaws. Since, as already stated, the downward movement of the rod H will vary according to the length of the composed line positioned between the jaws, its actuating connections must be arranged to yield as the rotation of the cam continues, and this yielding is provided for by the lost motion which takes place between the two levers H^3 and H^9, the latter acting on the former through the expansion spring H^7 which, of course, will be compressed to absorb the lost motion. The lever H^9, being thus permitted to partake of a full rocking movement, may be (as it is) positively connected to the cam operated lever H^{13}.

In order to lock the rod H in its downwardly moved position, there is provided a toggle member J (see Fig. 11) enclosed within a box or housing B^4 which carries the bearing B^1 before alluded to. This toggle member operates a clamp or grip element J^1 arranged to contact with a sleeve H^{17} carried by the rod H and which, for purposes of the present description, may be assumed to be integral with the rod H. Associated with the toggle is an actuating link J^2 provided at its upper end with an adjusting screw J^3 arranged to bear upon the toggle joint. At its lower end, the link J^2 is connected by a turn buckle link J^4 (Figs. 1, 2, 3 and 6) to the forward upwardly bent arm of the lever H^9 before referred to. As will be noted, the link is slotted as at J^5, so as to straddle the toggle joint, being encircled within the box by a compression spring J^6 which normally presses upwardly through a pin or stud J^7 on the toggle joint to maintain the grip element J^1 in inactive position.

It will now be seen that the toggle member J is operated by reason of the lost motion which takes place between the two levers H^3 and H^9, it being remembered that the former lever is the one connected to the rod H. In other words, after the lever H^3 is arrested in its movement by the cessation in downward movement of the rod H (due, of course, to the contact of the jaws E and F with the opposite ends of a composed line), the lever H^9 continues to move to its full extent under the influence of the rotary cam M^1 which acts in the meantime to continue its drawing down of the link J^2. The length of the link (or what amounts to the same thing, the position of the screw J^3 thereon) is such that, during the last portion of the movement of the lever H^9, the screw is moved within the box and caused to actuate the toggle member J so as thereby to press the grip element J^1 under heavy pressure against the sleeve H^{17} and lock the rod H securely in its downwardly moved position.

Actually, the rod H and its sleeve H^{17} are not connected together as one, provision being made for a slight relative movement between the rod and the sleeve after the latter has been locked by the toggle member in the downwardly moved or line clamping position of the rod, in order to allow for a limited line spread during justification. Referring particularly to Fig. 12, it will be noted that at its lower end, the rod H is provided with a fixed collar h threaded on the rod and which contains an expansion spring h^1 encircling the rod H and pressing upwardly on the lower end of the sleeve H^{17}. This lifting tendency of the spring, however, in the downwardly moved position of the rod, will be resisted and overcome by a rotary cam V rotatably mounted on the sleeve H^{17} at its upper end and arranged in position to engage a collar V^1 fixed to the rod H. When the cam V is set with its high point in contact with the collar V^1, it will, by reacting against the collar and over the opposition of the spring h^1, hold the sleeve H^{17} in contact with the second collar h at the lower end of the rod. Under such a setting of the cam, as will now be evident, there can be no relative movement between the rod and the sleeve, and the two parts function as if they were rigidly united, which is the condition that should exist when casting from lines without spacebands. On the other hand, when the cam V is set, say to bring its lowest point into contact with the collar V^1, then the sleeve H^{17} in the downwardly moved position of the rod H will be raised by the spring h^1 out of engagement with the collar h, and the clearance thus provided will determine the amount of the relative movement which can take place between the rod and sleeve after the locking of the latter by the toggle member J in the manner before described. This is a condition which should exist

when it is desired to permit the maximum spread of a composed line during justification. When it is desired to provide for a less spread of a composed line, the cam V is set in an intermediate position, that is to say, in a position intermediate its lowest and highest points.

The cam V may be set either manually by adjustment of the arm V^2 to different set positions or automatically by the movement of the rod H to allow for different degrees of line spread depending upon the length of the composed line. The means for setting the cam V are described fully in the Frolander patent heretofore referred to and the details thereof will not be repeated here.

The outward limited movement of the jaws E and F to allow for the line spread prior to justification is effected by positively raising the vertically movable rod H to the limited degree allowed by the setting of the cam V, it being recalled that the sleeve at this time is positively locked by the toggle member J. The mechanism for effecting the upward limited or line spread movement of the rod H is illustrated in Figs. 1, 3, 6 and 17. By reference to these figures, it will be seen that the lever H^3, which actuates the rod H, is provided with an upwardly extending arm H^{18} adapted to be connected to the forward end of a fore-and-aft actuating link H^{21}. As will presently appear, when the machine is in operation, the link H^{21} is moved rearwardly after the sleeve H^{17} has been locked by the toggle member J in its downwardly moved position with the clamping jaws in contact with the composed line, and, in its rearward movement, the link rocks the lever H^3 in a counter-clockwise direction against the opposition of the spring H^7. This counter-clockwise rocking movement of the lever is, of course, communicated to the rod H which, as a result, is moved upwardly with reference to the sleeve H^{17} until the rod collar h banks against the lower end of the sleeve, the extent of such relative movement of the rod being, as previously stated, determined by the setting of the cam V. It is this upward limited movement of the rod H which moves the line clamping jaws outwardly from their line contacting position and thus determines the final quadding or centering position of the jaws when a composed line is to be spread or justified by the expansion of the contained spacebands.

Going back to the actuating connections, the link H^{21} is connected by a long tension spring H^{22} (which is more powerful than the spring H^7 above referred to) to the lower end of a lever H^{23} secured to and depending from a shaft H^{24} journalled in a supporting bracket M^3 attached to the fixed machine frame at the rear. Likewise secured to the shaft, in offset relation to the lever, is a second lever H^{25} having a forwardly extending arm which carries at its extremity a roller H^{26} arranged to cooperate with a cam M^4. While this cam might be mounted directly on the shaft, it is, as a matter of convenience, attached to the side face of the cam M^1 which controls the jaw closing and jaw opening movements of the rod H.

As will be noted (Figs. 1 and 17), the relation of the two cams M^1 and M^4 is such that, shortly after the former has operated the lever H^{13} to effect the downward or jaw closing movement of the rod H and to lock the sleeve in its downwardly moved position, the cam M^4 will be caused to engage with the roller H^{26} and rock the connecting levers H^{23} and H^{25} clockwise to draw the link H^{21} rearwardly in effecting the limited upward movement of the rod H relatively to the locked sleeve H^{17} in the manner before described. When the cam M^4 travels clear of the roller, the levers H^{23} and H^{25} are restored to their original or normal position of rest by a spring H^{27} connected to the lower end of the lever and pulling forwardly thereon from an anchorage point in the machine frame, a stop (not shown) engaged by the lever H^{25} serving to locate the parts in their proper positions. In order to move the link H^{21} forwardly to its original or normal position of rest, the link is provided with a long rod H^{29} extending through the spring H^{22} and connected at its rear end by a pin and slot connection H^{30} to the lever H^{23}. The play of the pin and slot connection H^{30} is such that the actuating movement of the lever H^{23} will always be transmitted to the link H^{21} through the spring H^{22}, the rod H^{29} therefore acting merely as a return connection for the link from the spring. While unnecessary perhaps, the rod H^{29} is slidably supported at its forward end in a bearing formed in a bracket M^2 attached to the fixed machine frame.

As already stated, the disclosure of the Mead patent referred to is directed to a modification of the toggle device for holding the vertically movable rod H in its downward position to adapt it for a slight relaxing movement in order to allow the line clamping jaw to be backed off for the removal of the line. Accordingly, the grip element J^1 is formed with teeth j adapted to engage with teeth h^2 formed on the sleeve H^{17} to provide a positive grip instead of the friction engagement disclosed in the Frolander patent. The grip element J^1 is allowed to float to provide for a slight vertical movement relatively to its housing B^4, being normally held in an upper position by a spring j^1. When the lever H^9 is rocked to operate the toggle J, it also rocks the lever J^8 (by means of connections which have been omitted from the modified structure shown herein) to cam the grip element J^1 downwardly, in which position the block thereafter is forced laterally into engagement with the sleeve H^{17} by the downward movement of the toggle member J beyond dead center. At such time, a block J^9 supporting one end of the toggle member J occupies an inner position in which it is held by a stud J^{10} adapted to be rocked by a lever N. The head j^2 of the stud J^{10} is formed with high and low portions (not shown) and adapted by its rocking movement to force the block J^9 inwardly or allow it to be moved outwardly. When the block J^9 occupies its inner position, it offers strong resistance to the movement of the toggle member J upwardly beyond dead center, but in the outer position of the block J^9, the pin J^7 can move the toggle member J upwardly beyond dead center with ease.

With this arrangement, according to the Mead disclosure, after the casting operation and before the grip element J^1 is disengaged from the sleeve H^{17}, the lever J^8 is raised to allow the grip element J^1 and the sleeve H^{17} to be moved upwardly (compare Figs. 12 and 13), this slight upward movement of the sleeve backing off the line clamping jaws E and F a slight distance to relieve the pressure of the jaws on the composed line. Thereafter, the lever N is rocked by the ascent of the first elevator to permit the outward movement of the block J^9 and the withdrawal of the grip element J^1 from engagement with the teeth h^2 on the sleeve H^{17} to allow the

latter to rise and return the line clamping jaws to their positions of maximum separation.

The justification of the composed line is effected in the usual way by a two-stage upward thrust of the bar K (Figs. 9 and 10) against the lower ends of the long or pendant wedge sections *y* of the spacebands Y to force the sections upwardly between the matrices and expand the line tightly between the jaws E and F. The bar K is carried at the upper ends of two spaced vertical rods K^1 and K^2 sliding in upper and lower bearings B^5 and B^6, respectively, of the fixed frame B. Below the upper bearings B^5, the rods K^1 and K^2 are formed with collars *k* and k^1, respectively, and the ends of two justification levers (one lever K^3 only being shown) engage beneath the collars *k* and k^1 in raising the rods K^1 and K^2 successively during justification. When spacebands Y are present in the composed line, they limit the extent to which the justification bar K can rise, but if the line is composed without spacebands, the bar K is free to partake of a full stroke, the upper limit of which is determined by the banking of the upper ends k^2 of the collars *k* and k^1 against the bearings B^5.

As thus far described, the parts and their operation, except as hereinafter noted, are or may be the same as set forth in the Mergenthaler Patent No. 436,532, the Frolander Patent No. 1,971,400, and the Mead Patent No. 2,092,220, all before referred to.

Coming now to the present improvements: The link H^{21} is not permanently secured to the jaw moving mechanism but is adapted to be selectively connected thereto during the machine operation. To this end, an interponent P (Figs. 1, 3, 4, 6, 7, 8 and 15) is provided at the forward end of the link H^{21} and the latter is pivotally mounted for vertical rocking movement on a pin h^5 projecting from the sliding rod H^{29}. The interponent P presents a lower portion P^1 provided with a tooth *p* projecting from its bottom edge and adapted to engage with one or another of three teeth h^6 formed at the free end of the upstanding arm H^{18} of the lever H^3 when the link H^{21} occupies its lower position. As best shown in Fig. 8, the interponent section P^1 is carried by an adjusting screw P^2 threaded into a boss p^1, the adjusting screw passing through a compression spring P^3 between the inner end of the section P^1 and the boss. The adjusting screw P^2 is formed with a knurled head p^2, by which it may be turned manually, and is provided with a circular flange p^3 notched at spaced intervals in its periphery to receive a leaf spring p^4 which holds the screw in different set positions. The purpose of the adjustable mounting of the section P^1 will be set forth hereinafter.

Normally, the link H^{21} and interponent P occupy a raised position as shown in Fig. 3 with the tooth *p* disengaged from the teeth h^6 on the arm H^{18}, being held up in that position by a lever Q (see particularly Figs. 1, 3, 4 and 5) mounted to rock on a pivot Q^1. When the jaw closing lever H^{13} is moved to the position shown in Fig. 1, its idle position, a spring Q^2 (Fig. 5) rocks the lever Q counter-clockwise (looking from the front of the machine) and a roller *q* carried by the lever engages the link H^{21} and rocks it upwardly about its pivot h^5 to carry the tooth *p* clear of the teeth h^6.

Considering only the structure thus far described, when the lever H^3 is rocked downwardly by the lever H^{13} to pull down on the rod H and effect the quadding movement of the jaw (or both jaws when centering), the arm H^{18} rocks idly in a clockwise direction (as viewed in Fig. 3). Thereafter, as the lever H^{13} completes its stroke and effects the locking of the rod H in its downward position, its forward end engages the lever Q, overcoming the action of the spring Q^2 and rocking the lever Q clockwise (Fig. 5) to allow the link H^{21} to drop and thus engege the tooth *p* of the interponent P with one or another of the teeth h^6 on the arm H^{18}, depending upon the extent to which the arm H^{18} has been rocked. Subsequently, when the link H^{21} is drawn rearwardly by the spring H^{22}, the arm H^{18} is rocked counter-clockwise (Fig. 3) to lift the rod H and move the jaw out of line contacting position to permit expansion of the line by the spacebands during justification, all in accordance with the disclosure of the Frolander patent referred to.

Whenever a line of matrices is to be quadded (or centered) and expansion of the line by the spacebands is not desired, the jaw spreading power mechanism just described is utilized to urge the jaw inward from line contacting position to squeeze the line. For this purpose, an upper portion of the interponent P in the form of a detachable block P^4 (Figs. 1, 3, 4, 6, 7, 8 and 15) provided with a shoulder p^5 is adapted to engage the hooked end of an arm S when the link H^{21} is in its raised position. After the quadding movement of the jaw has taken place, if the link H^{21} remains in its raised position (being prevented from dropping by means to be described hereinafter), when it is moved rearwardly by the spring H^{22}, it carries the block P^4 with it and imparts a longitudinal movement to the arm S, which arm is free to partake of such movement by virtue of a pin and slot connection S^1 by which it is supported at one side of the housing B^4. The following end of the arm S is bent to provide a lip S^2 arranged to engage in back of a hooked arm S^3 pivotally suspended from the free end of the aforementioned arm J^8 (see Figs. 12, 13 and 14). The hooked arm S^3 engages a roller S^4 mounted on a fixed pin S^5 between the housing B^4 and a member S^6 which holds the arm S^3 against sidewise displacement. Hence, when the arm S is moved rearwardly in the manner stated, the lip S^2 engages and rocks the hooked arm S^3. However, the roller S^4, riding on the surface S^7 of the hooked arm S^3, cams the later downwardly and rocks the lever J^8 from the position shown in Fig. 13 to that shown in Fig. 12. This movement of the lever J^8 forces the grip element J^1 downwardly and, since the latter is already in engagement with the sleeve H^{17}, the sleeve also moves downwardly, carrying the rod H with it and causing the jaw to squeeze the composed line of matrices under the pressure of the spring H^{22}, which pressure is greatly multiplied by the form and arrangement of the parts described. When the shaft H^{21} is returned to its forward position, a spring S^8 exercises itself to draw the arm S forward and allow the hooked arm S^3 to rock back to its original position as the lever J^8 is raised by the grip element J^1 in response to the expansion of the spring j^1.

When the composed line is squeezed instead of expanded, the justifying mechanism is disabled by locking the justification bar K against upward movement. Referring to Figs. 2, 9 and 10, two locks Z and Z^1 are provided to prevent both first and second justification from taking place, a lock being provided for each of the rods K^1 and K^2 because of the independent actuation

of the rod K^2 for first justification. In their active positions, the lock Z is adapted to be located above the upper end of the collar k of the justification rod K^1 and the lock Z^1 located above a surface k^3 of the block K^4 carried by the justification rod K^2, the two locks being hold in their active positions by a weight Z^2 acting through a series of levers and connecting links. As shown, the lock Z is formed at the end of a long arm z of a bell-crank Z^3 pivoted to the fixed frame as at Z^4, while the lock Z^1 is formed at the end of a long arm z^1 of a second bell-crank Z^5 pivoted to the frame as at Z^6. The bell-cranks Z^3 and Z^5 are connected by a link Z^7 to move in unison into and out of their active positions. A link Z^8 has its upper forked end Z^9 in engagement with a pin Z^{10} projecting from a short arm z^2 of the bell-crank Z^5 and its lower end pivotally connected as at Z^{11} (Fig. 3) to one end of a pivoted lever Z^{12}, the opposite end of which lever is formed with a nose portion Z^{13} adapted to contact the top edge of the upper interponent block P^4.

When the block P^4 is held in its raised position (which is its normal position) by the link H^{21}, the lever Z^{12} occupies the position shown in Fig. 3. In this position of the lever Z^{12}, a spring Z^{15}, fixed to said lever and to the arm S, is placed under tension and the link Z^8 is lowered to allow the weight Z^2 to hold the locks Z and Z^1 in their active positions. Hence, whenever the link H^{21} is in its raised position to effect the squeezing of the line, the locks Z and Z^1 are active to prevent justification. However, when the link H^{21} is allowed to drop to engage the tooth p of the lower interponent portion P^1 with a tooth h^6 of the lever arm H^{18} to effect the jaw spreading movement, the downward movement of the block P^4 allows the spring Z^{15} to contract and rock the lever Z^{12} counter-clockwise (Fig. 3) to raise the link Z^8 and through the levers Z^5 and Z^3 withdraw the locks Z and Z^1 to their inactive positions, so that justification can take place.

It may be pointed out now that while there is a slight upward movement of the justification bar K before the locks Z and Z^1 become effective, this is desirable if any spacebands Y happen to be present in the line because it raises the long wedge sections y thereof a slight amount sufficient to insure that their upper ends extend above the routing notches of the matrices and cut off any possible leakage of molten metal at this point during casting. Such leakage might take place if a matrix bearing one of the larger size characters happened to be next to a section y of a spaceband, for in some instances the upper routing notch of a large character matrix may extend above the top edge of a section y of a spaceband if the section is not raised at all.

Of course, during regular machine operation, that is, when the jaws are not connected for quadding or centering, the justifying mechanism must be freed for operation, and the idle downward movement of the rod H is employed to move the locks Z and Z^1 to their inactive positions. This is accomplished by providing a bell-crank Z^{14} which is pivotally mounted on a pin z^3 in the fixed frame and arranged so that the forked end of its long arm z^4 engages a pin z^5 projecting from the long arm z^1 of the bell-crank Z^5 and its short arm z^6 lies in the path of an adjustable screw H^{35} carried by the rod H. In operation, when the rod H approaches the end of its downward stroke (in its idle movement the rod H partakes of a full stroke), the screw H^{35} strikes the arm z^6 of the bell-crank Z^{14} and rocks it in a counter-clockwise direction (Fig. 10). This rocking of the bell-crank Z^{14} acts through the pin z^5 to rock the bell-cranks Z^5 and Z^3 in a clockwise direction and carry the locks Z and Z^1 to their inactive positions. After the casting operation, when the rod H is raised again, the weight Z^2 swings the locks back to their normal active positions.

Turning now to the mechanism for conditioning the quadding device either to spread the jaw (or both jaws when centering) for justification of the line by the spacebands or to utilize the same power means for squeezing the line, such mechanism comprises a block T (Figs. 1, 3, 6, 7, 15 and 16) having a left hand portion t^6 (see particularly Fig. 16) continuous throughout the length of the block, and a right hand portion t^7 stopping short of the forward end of the block due to a cut out portion thereof which provides a recess t^8. The block T is formed with two openings t adapted to receive pins T^1 extending laterally from the arm H^{18}, the block T fitting loosely on the pins for sliding movement sidewise toward and away from the arm H^{18} and being supported so that its top surface is located slightly above the teeth h^6 formed at the upper end of the arm H^{18}. The lateral sliding movement of the block T is effected by a control lever T^2 fixed to an axially movable rock shaft T^3 which is shiftable manually to any one of three different positions as determined by notches t^1, t^2 and t^3 formed in a plate T^4 through which the control lever T^2 extends. A spring T^5 normally holds the control lever T^2 in one or another of the notches, one end of the spring being connected to the lever T^2 and the opposite end to an eyelet t^4 fixed to a fixed bracket T^6. The shaft T^3 is supported adjacent the arm H^{18} by another fixed bracket T^7 and at its end opposite the control lever T^2, the shaft is equipped with a circular flange T^8 adapted to engage in a groove t^5 formed in the bottom face of the block T and which permits fore-and-aft movement of the block relatively to the flange. In two of its lateral set positions, the block T underlies and gives support to the tooth p of the lower interponent portion P^1 to maintain the link H^{21} in its raised position when the link is released by the actuation of the lever Q as the lever H^{13} completes its upward stroke, thus preventing the engagement of the tooth p with a tooth h^6 on the arm H^{18}. In its third lateral set position, the block T is located beyond the side edge of the tooth p and leaves the latter free to engage with a tooth h^6 when the link H^{21} is released by the lever Q and drops to its lower position. More specifically, when the control lever T^2 is in the position shown in Figs. 15 and 16, i. e., engaged in the lowermost notch t^1, the position indicated as "No spread," the block T occupies its innermost position adjacent the side of the arm H^{18} and the left hand portion t^6 underlies and gives support to the tooth p of the interponent P. When the parts occupy this position, the block T acts to hold the link H^{21} in its raised position at all times after its release by the lever Q, regardless of the extent to which the arm H^{18} may rock during the quadding movement of the jaw. Hence, after the jaw has been moved into line contacting position and the link H^{21} drawn rearwardly, the arm S is engaged by the block P^4 and carried rearwardly with it to rock the hooked arm S^3 and depress the grip element J^1, thereby moving the rod H downward and urging the jaw inward from its line contacting position to squeeze the line un-

der the multiplied pressure of the spring H^{22}. Because the link H^{21} and and block P^4 remain in their raised positions, the lever Z^{12} is undisturbed (the block P^4 merely moving fore-and-aft relatively thereto) and the justification bar locks Z and Z^1 remain in their active positions to prevent justification.

When the control lever T^2 is adjusted to the intermediate notch t^2, indicated as the setting for "Min. spread" (minimum spread), the block T occupies its intermediate lateral position with the right hand portion t^7 only thereof in position to underlie the tooth p of the interponent P. With this setting of the block T, if the arm H^{18} is rocked clockwise (in Fig. 3) during the jaw closing movement sufficiently to carry the recess t^8 forwardly beyond the tooth p, the top surface of the block T becomes effective to maintain the link H^{21} in its raised position after its release by the lever Q and bring about a line squeezing operation through the spring H^{22}. On the other hand, if the rocking of the arm H^{18} is not sufficient to render the top surface of the block effective, the recess t^8 allows the tooth p to clear the block T and permit the link H^{21} to drop, thereby (1) engaging the tooth p with a tooth h^6 on the arm H^{18}, (2) allowing the spring Z^{15} to rock the lever Z^{12} counterclockwise (in Fig. 3) to raise the link Z^8 and move the locks Z and Z^1 to their inactive positions so that justification can take place, and (3), when the spring H^{22} comes into operation, drawing the link H^{21} rearwardly and this time rocking the lever arm H^{18} counterclockwise to raise the rod H and back off the jaw or jaws from its or their line contacting position or positions to permit the line to be expanded by the spacebands. This action of the parts takes place only in the case of lines that are composed to within a predetermined extent short of full line length such that the spacebands can expand the line to its full justified length. If it is intended to cast from a full length line, but for one reason or another the line has not been composed to within the predetermined range mentioned, then the jaw moves inwardly sufficiently before it contacts the line to bring the top surface of the block T into position below the tooth p of the interponent P and thus acts to maintain the link H^{21} in its raised position with the result that the subsequent operation of the link through the spring H^{22} effects a line squeeze rather than the backing off of the jaw to its full line position.

Reference has been made to the fact that the portion P^1 of the interponent which carries the tooth p is mounted on an adjusting screw. This is for the purpose of locating the tooth p with reference to the forward end of the top surface of the block T to vary the extent to which the block must be moved forward before the surface becomes effective. In other words, if a full length line is thirty ems, the adjustment could be such that unless the jaw moved inward more than, say, three ems, the block T would not be moved forward far enough to render the top surface effective and the recess t^8 would allow the link H^{21} to drop and engage the tooth p with one of the teeth h^6 for rocking the arm H^{18} to back off the jaw to full line position. However, if the full length of the line were, say, fifteen ems, the adjustment could be such that a jaw closing movement of more than one and one-half ems would render the top surface of the block effective to prevent the backing off of the jaw. Such a setting would be required, too, if the machine were conditioned to cast a full thirty em line or else to center the line, for in the latter case a movement of more than one and one-half ems for each jaw would constitute a total movement of more than three ems for both jaws. From the foregoing, it will be clear that different adjustments of the interponent section P^1 can be made to vary the relationship of the tooth p to the forward end of the block T to meet all requirements.

The third position of the control lever T^2, i. e., in the notch t^3 indicated as the position of "Max. spread" (maximum spread), locates the block T in its extreme left-hand position clear of the side edge of the tooth p. This is the setting employed when a line spread is desired for a quadded line and is intended for use primarily in connection with the so-called "straight-line indention" wherein the jaw is moved for quadding and, regardless of the actual length of the composed line, is backed off to abut against a fixed stop and the line then expanded by the spacebands to fill out the space between the jaws. Straight-line indention is a recent development familiar to those versed in the art and suffice it to say that it is employed for casting successive quadded lines of uniform length, but see if desired the Mead Patent No. 2,166,170, dated July 18, 1939.

It will now be clear that, regardless of whether or not spacebands are contained in the composed line, the jaw spreading and justifying means are both disabled and the supplemental line squeezing pressure is applied except for straight-line indentation or when casting from a line composed within a predetermined extent but of full line measure.

Whenever the machine is conditioned for quadding or centering and the control lever T^2 is set in the "No spread" position, the jaw spreading control arm V^2 must be located in its upper position as shown in Fig. 12, its zero setting, so that the high point of the cam V engages the collar V^1 and prevents relative movement between the rod H and sleeve H^{17}; otherwise the line squeezing pressure will be ineffective, since it will be recalled that that pressure is applied through the sleeve H^{17} and, of course, the sleeve and the rod H must be conditioned to move in unison. For straight-line indention, when the control lever T^2 is set for "Max. spread," the control arm V^2 is set in its lowermost position to engage the low point of the cam V with the collar V^1 and separate the lower end of the sleeve H^{17} and the collar h to provide for maximum relative movement between the sleeve and the rod H for backing off the jaw prior to justification. A like setting of the control arm V^2 is made when the control lever T^2 is set in its intermediate position for "Min. spread." It is pointed out, however, that while a single cam V has been shown in the drawings, a different and quick acting cam is employed for minimum spread, because the relative movement (maximum) between the rod H and the sleeve H^{17} provided for by the cam V must be reduced completely in response to a three em inward movement only of the jaw from its full line position. Actually, the commercial equipment embodying the present improvements includes but a single cam V, adapting the machine either for "No spread" and "Maximum spread" or else for "No spread" and "Minimum spread," but not for all three, and for this reason the single cam has been shown. However, the present invention contemplates the provision of quick detachable interchangeable cams, or a shiftable multiple cam

arrangement such as shown in the Morrison and Frolander Patent No. 1,971,424, dated August 28, 1934, in the event that it is desired to adapt the machine to perform all three functions.

The timing of the jaw closing and jaw spreading mechanism has been altered somewhat to meet the requirements of the dual function now performed by the latter mechanism. Thus, the cams M^1 and M^4 for controlling the operations of the jaw closing and jaw spreading mechanism, respectively, are shown in Fig. 1, and it is to be noted first that the active surface of the cam M^4 has been extended. When the cam M^4 was adapted, as heretofore, to control the jaw spreading function only, the time required for it to be operative was limited to the period between the movement of the jaw into line contacting position and the complete justification of the line. In the present instance, however, because the same mechanism is employed to apply the supplemental line squeezing pressure, the operative period of the cam M^4 is from the time that the jaw has been moved into contact with the composed line until after the casting operation is completed. Actually, the roller H^{26} remains in contact with the high portion of the cam M^4 until the mold disc is retracted after the slug has been cast and the grip element J^1 is released for relaxing the jaw closing pressure prior to the withdrawal of the composed line from between the jaws E and F.

While the form of the cam M^1 as shown in Fig. 1 will answer the purpose, it may be modified as shown in Fig. 17 to actuate the jaw closing lever H^{13} in stages. Thus, the cam M^1 as shown in Fig. 17 is formed with a low portion m, a high portion m^1 and an intermediate portion m^2. As the roller H^{16} rides from the low portion m to the intermediate portion m^2, the lever H^{13} is actuated sufficiently to move the jaw into contact with the line and partially engage the grip element J^1 with the sleeve H^{17}. As the roller H^{16} rides along the intermediate portion m^2, the roller H^{26} rides from the low to the high portion of the cam M^4 to effect either the spreading or line squeezing movement of the jaw, as the case may be. Thereafter, the roller H^{16} rides onto the high portion m^1 of the cam M^1 and effects the final locking action of the toggle member J. Hence, the line squeeze, or the spreading of the jaws, as the case may be, is effected before the final locking of the sleeve H^{17} takes place.

As already stated, the present invention has been shown in the accompanying drawings merely by way of example and in preferred form. It is to be remembered that quadding and centering equipment is intended to adapt a slug casting machine to perform special functions in the production of slugs to be used in the composition of printed matter which is of unusual form, such as different forms of advertising lay-outs, handbills, programs, menus, etc. Therefore, the work of different compositors varies, and the type of equipment which they require varies accordingly. This is brought out by the fact that while the present invention has been developed to adapt the machine for no spread, minimum spread and maximum spread of the jaws, in practice it is seldom that all three functions are required in a single quadding and centering unit and, therefore, the preferred form of equipment embodies but a single cam V, whether it be a slow acting or a quick acting cam as previously explained. Also the capacity of the spring H^{22} may differ according to individual requirements, because in the embodiment herein illustrated its power is multiplied approximately forty times by the train of connections leading therefrom to the jaws E and F, and springs of different strength may be desired or required according to the character of the work to be done. Such considerations notwithstanding, the preferred embodiment of the invention provides equipment which selectively adapts the machine either to spread the jaws for justification of the composed line or to urge the jaws toward one another under heavy, supplemental line squeezing pressure. Moreover, both operations are effected by power means controlled in its operation by the main cam shaft of the machine and specifically adapted for the purpose so as not to place an added burden on existing parts primarily intended to carry out some other machine function. These and many other variations and modifications will be obvious to those skilled in the art and come within the spirit of the invention as set forth in the appended claims.

Having thus described my invention, what I claim is:

1. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting such quadding movement of the jaw, and automatic means independent of the line operable, under one condition, to move the jaw outwardly a limited distance from its line contacting position to permit the line to be expanded by spacebands to a corresponding extent and, under another condition, to urge the jaw inwardly to squeeze the line.

2. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting such quadding movement of the jaw, automatic means independent of the line operable, under one condition, to move the jaw outwardly a limited distance from its line contacting position to permit the line to be expanded by spacebands to a corresponding extent and, under another condition, to urge the jaw inwardly to squeeze the line, and a manually controlled device for conditioning said means to effect either of its stated functions.

3. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting such quadding movement of the jaw, and automatic means independent of the line operable, under different conditions, to move the jaw outwardly a limited distance from its line contacting position to permit the line to be expanded by spacebands to a corresponding extent, or to urge the jaw inwardly to squeeze the line, or selectively to effect either of said functions.

4. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting such quadding movement of the jaw, automatic means independent of the line operable, under one condition, to move the jaw outwardly a limited distance from its line contacting position to permit the line to be expanded by spacebands to a corresponding extent and, under another condition, to urge the jaw inwardly to squeeze the line, and a manually controlled device for conditioning said means to effect one or the other or selectively to effect either of its stated functions.

5. A combination according to claim 4, wherein the selective operations of said means is con-

trolled by the movement of the jaw into line contacting position.

6. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism including a vertically movable rod for effecting such quadding movement of the jaw, means for locking the rod to hold the jaw in its line contacting position, and means for applying a line squeezing pressure on the jaw through said rod locking means.

7. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism including a vertically movable rod for effecting such quadding movement of the jaw, a locking device engageable with said rod to hold the jaw in its line contacting position, said locking device being movable when in engagement with the rod, and pressure applying means acting on said locking device and the rod to urge the jaw inwardly from its line contacting position for squeezing the line.

8. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism including a vertically movable rod for effecting such quadding movement of the jaw, a locking device engageable with said rod to hold the jaw in its line contacting position, said locking device being movable when in engagement with the rod, and pressure applying means acting on said locking device and the rod before casting to urge the jaw inwardly from its line contacting position for squeezing the line and after casting to relax the pressure on the jaw before the lock is released.

9. A combination according to claim 6, wherein the pressure applying means comprises a train of connections actuated by a cam on the main shaft of the machine.

10. A combination according to claim 6, wherein the pressure applying means comprises a train of connections actuated by a cam on the main shaft of the machine, and including a movable interponent for disabling said train of connections at will.

11. A combination according to claim 6, wherein the pressure applying means comprises a train of connections actuated by a cam on the main shaft of the machine, and including a movable interponent controlled automatically by the extent of quadding movement of said rod for disabling said train of connections.

12. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, a train of connections between said jaw and the main cam shaft of the machine for effecting the quadding movement of the jaw, and a second train of connections between the jaw and said cam shaft for applying a line squeezing pressure on the jaw when in quadding position.

13. A combination according to claim 12, wherein some of the elements of said trains of connections are common to both trains.

14. A combination according to claim 12, wherein said trains of connections include a vertically movable rod connected to the jaw and common to both of said trains, and including means to prevent actuation of the rod through the last mentioned train of connections when a line squeeze is to be avoided.

15. A combination according to claim 12, wherein said trains of connections include a vertically movable rod connected to the jaw and common to both of said trains, and including automatic means controlled by the extent of movement of the rod to prevent the actuation of said rod through the last mentioned train of connections when a line squeeze is to be avoided.

16. A combination according to claim 12, wherein said trains of connections include a vertically movable rod connected to the jaw and common to both of said trains, and including a movable interponent adapted in one position to establish one connection between the second mentioned train of connections and the rod to move the rod in one direction for spreading the jaws, and in another position to establish a different connection between said train of connections and the rod to move the rod in the opposite direction to urge the jaws inwardly for squeezing the line.

17. A combination according to claim 12, wherein said trains of connections include a vertically movable rod connected to the jaws and common to both of said trains, and including a movable interponent adapted in one position to establish one connection between the second mentioned train of connections and the rod to move the rod in one direction for spreading the jaws, and in another position to establish a different connection between said train of connections and the rod to move the rod in the opposite direction to urge the jaws inwardly for squeezing the line, and an element adjustable to different set positions relatively to said interponent and adapted thereby to control the position of the interponent.

18. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism including a vertically movable rod and a sleeve mounted on and movable with the rod in effecting the quadding movement of the jaw, means for locking the sleeve and rod when the jaw is in its quadding position, means for permitting a relative movement between the rod and sleeve, and pressure applying means selectively connectable to the rod and to the locking means, said pressure applying means when connected to the rod being operative to effect a movement of the rod relatively to the sleeve to back off the jaw from its quadding position to permit the line to be expanded by spacebands to a corresponding extent, and being operative when connected to the locking means to effect a movement of the sleeve and rod in unison to urge the jaw inwardly to squeeze the line.

19. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting such quadding movement of the jaw, automatic means operable, under one condition, to move the jaw outwardly a limited distance from its line contacting position to permit the line to be expanded by spacebands to a corresponding extent and, under another condition, to urge the jaw inwardly to squeeze the line, justifying means for expanding the spacebands, and an automatic locking device for permitting the operation of the justifying means under said first mentioned condition and for preventing its operation under said second condition.

20. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting such quadding movement of the jaw, automatic means operable, under one condition, to

move the jaw outwardly a limited distance from its line contacting position to permit the line to be expanded by spacebands to a corresponding extent and, under another condition, to urge the jaw inwardly to squeeze the line, justifying means for expanding the spacebands, and an automatic locking device controlled by the quadding movement of the jaw for permitting the operation of the justifying means under said first mentioned condition and for preventing its operation under said second condition.

21. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting such quadding movement of the jaw, automatic means operable, under one condition, to move the jaw outwardly a limited distance from its line contacting position to permit the line to be expanded by spacebands to a corresponding extent and, under another condition, to urge the jaw inwardly to squeeze the line, justifying means for expanding the spacebands, a locking device normally operative to prevent the operation of the justifying means, and automatic means for releasing the locking device during the machine operation to permit justification to take place except when said mechanism is conditioned to squeeze the line.

22. A combination according to claim 21, including other means for releasing said locking device during regular machine operation.

23. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism including a vertically movable rod for effecting such quadding movement of the jaw, a locking device engageable with said rod to hold the jaw in its line contacting position, said locking device being movable when in engagement with the rod, a spring controlled in its operation from the main cam shaft of the machine, and a train of connections between the said locking device and said spring actuable by the latter to depress the locking device and the rod to urge the jaw inwardly from its line contacting position for squeezing the line.

24. A combination according to claim 23, wherein said train of connections includes a series of levers for multiplying the pressure exerted by said spring.

25. A combination according to claim 23, wherein said train of connections includes a sliding arm connected to and movable by said spring, a swinging lever actuable by the movement of said arm and pivoted to a second levere engageable with said locking device, and including a camming element arranged to be engaged by said swinging lever and as the latter swings effect a rectilinear movement thereof for rocking said second lever to depress the locking device.

26. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism including a vertically movable rod for effecting such line contacting movement of the jaw, pressure means operative thereafter through said rod either to back off the jaw to permit expansion of the line by spacebands or to urge the jaw inwardly to squeeze the line, a movable interponent for selectively connecting said pressure means to said rod to perform one or the other of said functions, and a manually adjustable block adapted to be moved into and out of the path of said interponent to prevent or permit movement of the latter in controlling the selective functioning of said pressure means.

27. A combination according to claim 26, wherein the interponent is normally held in one position by a swinging lever and is automatically released thereby for control by said block when the quadding movement of the jaw is effected.

28. A combination according to claim 26, wherein said block is adjustable to any one of three positions, the block in one position standing clear of the interponent to permit movement of the latter to connect the pressure means to said vertically movable rod for backing off the jaw, in a second position being located for engagement with the interponent to prevent movement thereof and maintain a connection between the pressure means and the rod for urging the jaw inwardly to squeeze the line, and in a third position being located to permit or prevent movement of the interponent and thus selectively connect the pressure means to the rod either for squeezing the line or for backing off the jaw, according to the extent of the jaw closing movement of said rod.

29. A combination according to claim 26, wherein said block is adjustable to any one of three positions, the block in one position standing clear of the interponent to permit movement of the latter to connect the pressure means to said vertically movable rod for backing off the jaw, in a second position being located for engagement with the interponent to prevent movement thereof and maintain a connection between the pressure means and the rod for urging the jaw inwardly to squeeze the line, and in a third position being located to permit or prevent movement of the interponent and thus selectively connect the pressure means to the rod either for squeezing the line or for backing off the jaw, according to the extent of the jaw closing movement of said rod, and including a manually operable lever for adjusting the block to any one of its three positions.

30. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting quadding movement of the jaws including a vertically movable rod, a short lever connected to the lower end of the rod, and a longer lever extending between said short lever and the main cam shaft of the machine, a locking device for locking the rod when the jaw is in contact with the line, spring pressure means controlled from the main cam shaft of the machine and connectable to said short lever or to said locking device respectively to move the rod for backing off the jaw to permit expansion of the line by spacebands or for urging the jaw inwardly to squeeze the line, and a vertically movable interponent normally maintained in a raised position for connecting the spring pressure means to the locking device, and being automatically releasable by the jaw closing movement of said longer lever for connecting the spring pressure means to said short lever.

31. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting such quadding movement of the jaws including a vertically movable rod, a short lever connected to the lower end of the rod, and a longer lever extending between said short lever and the main cam shaft of the machine, a locking device for locking the rod when the jaw is in contact with the line, spring pressure means

controlled from the main cam shaft of the machine and connectable to said short lever or to said locking device respectively to move the rod for backing off the jaw to permit expansion of the line by spacebands or for urging the jaw inwardly to squeeze the line, a vertically movable interponent normally maintained by a swinging lever in a raised position for connecting the spring pressure means to the locking device, said swinging lever being supported by said longer lever to maintain the interponent in its raised position and being released by the jaw closing movement of said longer lever to permit the interponent to drop to a lower position for connecting the spring pressure means to said short lever.

32. A combination according to claim 31, including a block carried by said short lever, the block being arranged to underlie said interponent and being adjustable to any one of three set positions, said block being formed with a top surface having a recess cut in one corner of its forward edge and the block, in one set position, standing clear of the interponent to permit movement of the latter for connecting the pressure means to said vertically movable rod to back off the jaw and, in a second position, having the unrecessed portion of its surface underlie the interponent to prevent movement thereof and maintain the connection between the pressure means and said rod for urging the jaw inwardly to squeeze the line and, in a third position, being located with the recessed portion of its surface underlying the interponent, whereby the recess allows the interponent to drop to connect the spring pressure means to the short lever to back off the jaw when the jaw closing movement of the short lever is insufficient to move the block so that the unrecessed portion thereof underlies the interponent and maintains it in its raised position.

33. A slug casting machine including, in combination, a pair of line clamping jaws, justifying mechanism for expanding a composed line of matrices between the jaws by spacebands, means for moving said jaws toward one another in quadding, and an automatic locking device independent of the line for locking the justifying mechanism to render it inoperative to expand the line when the latter is quadded.

34. A slug casting machine including, in combination, a pair of line clamping jaws, justifying mechanism for expanding a composed line of matrices between the jaws by spacebands, said mechanism including a bar engageable with the spacebands and mounted on two vertically movable rods, means for moving said rods independently of one another during justification, means for moving said jaws toward one another in quadding, and an automatic locking device for locking both of said vertically movable rods to prevent justification of the line when the latter is quadded.

35. A combination according to claim 33, wherein said locking device is normally operative to prevent justification, and including means for rendering the locking device inoperative during regular machine operation.

36. A combination according to claim 34, wherein said locking device permits a limited movement of said justifying bar for the purpose stated.

37. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting such quadding movement of the jaw, means for urging said jaw inwardly from its line contacting position to squeeze the line, justifying mechanism for expanding the line between the jaws by spacebands, and automatic means to lock the justifying mechanism against operation when the line squeezing means is active.

38. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting such quadding movement of the jaw, automatic means operable, under one condition, to move the jaw outwardly a limited distance from its line contacting position to permit the line to be expanded by spacebands to a corresponding extent and, under another condition, to urge the jaw inwardly to squeeze the line, justifying mechanism for expanding the spacebands, and automatic means to lock the justifying mechanism against operation when a line squeeze is applied and to permit its operation when the jaw is moved outwardly from line contacting position.

39. A combination according to claim 37, wherein the justifying mechanism includes a bar engageable with the spacebands and mounted on two independently actuable vertically movable rods, and wherein two locks are provided, one for each rod, to prevent the independent actuation thereof.

40. A combination according to claim 38, wherein said locking means is normally active to prevent justification, and is automatically rendered inactive for regular machine operation and when the jaw is moved outwardly from its line contacting position in quadding.

41. A combination according to claim 38, wherein said locking means when active permits a limited movement of said justifying bar for the purpose stated.

42. A slug casting machine including, in combination, a pair of line clamping jaws movable one toward the other in quadding, mechanism for effecting such quadding movement of the jaw including a vertically movable rod, automatic means operable through said jaw moving rod, under one condition, to move the jaw outwardly a limited distance from its line contacting position to permit the line to be expanded by spacebands to a corresponding extent and, under another condition, to urge the jaw inwardly to squeeze the line, said means including a spring controlled from the main cam shaft of the machine and a movable interponent for selectively connecting the spring to one or the other of two trains of connections leading to the jaw moving rod, a justification bar engageable with the spacebands and mounted on two independently actuable vertically movable rods, two locks normally engaged one with each of said bar supporting rods to prevent the actuation thereof, the locks being connected to one another to operate in unison, and connections between said interponent and the locks to control their release by the movement of the interponent, whereby the locks are rendered active to prevent justification when a line squeezing connection with the jaw moving rod is established by said interponent and are released to permit justification when the interponent is moved to establish a connection with the jaw moving rod to move the jaw outwardly from its line contacting position.

43. A combination according to claim 42, including means for effecting the release of said locks by the idle movement of said jaw moving rod during regular machine operation.

JOHN H. HILPMAN.