F. H. RICHARDS.

MACHINE FOR MAKING TYPE BARS.

APPLICATION FILED APR. 18, 1901.

946,866. Patented Jan. 18, 1910

4 SHEETS—SHEET 1.

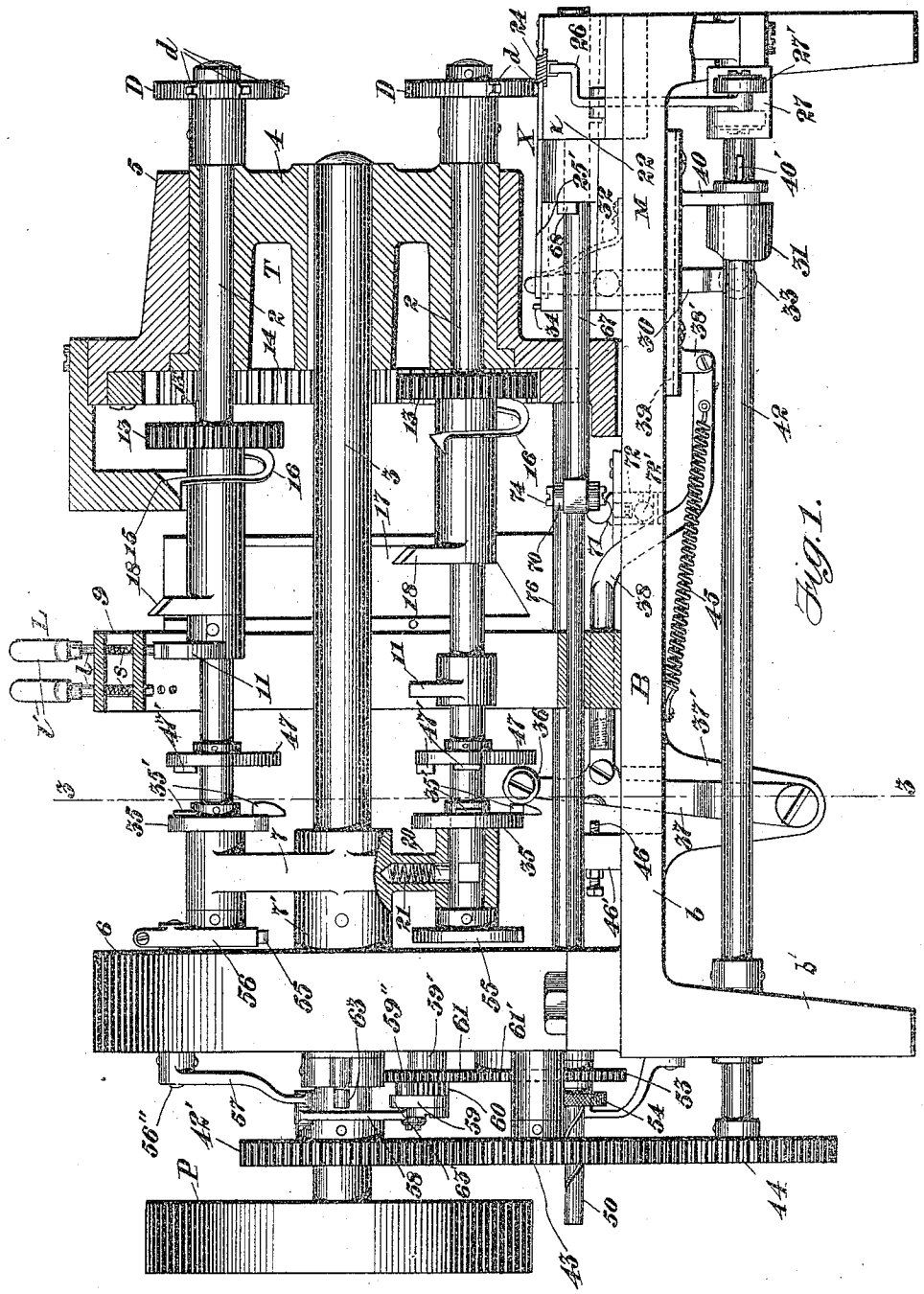

FIG. 1.

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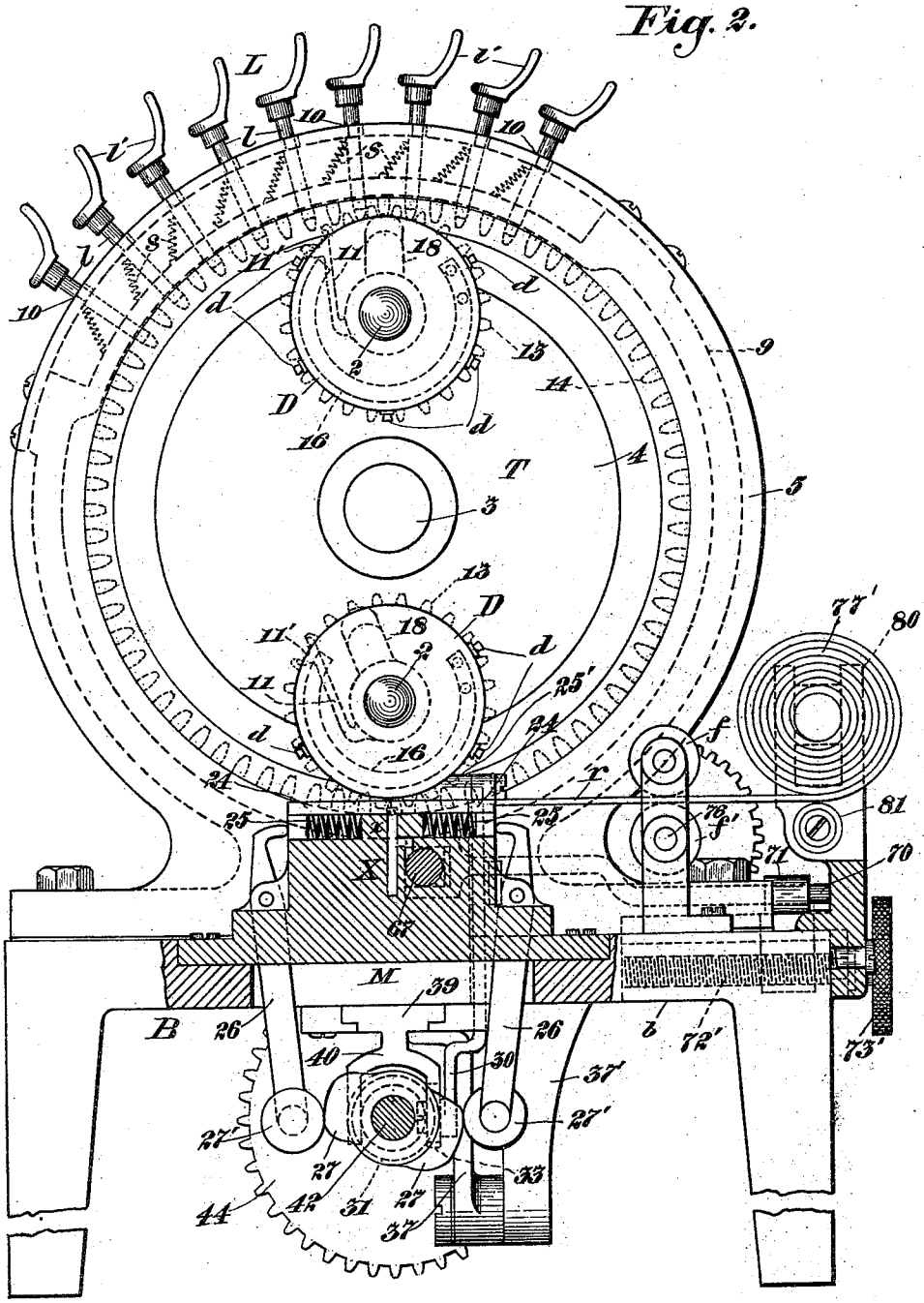
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.

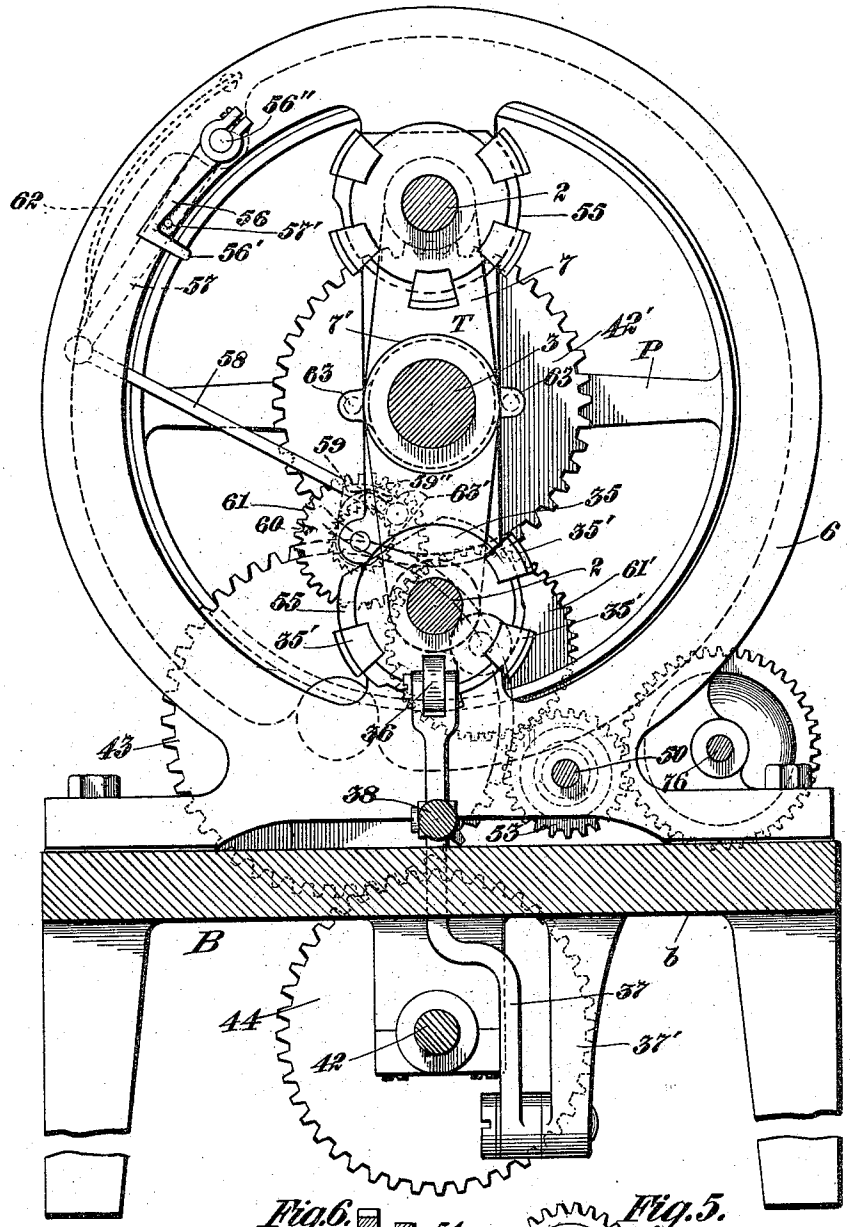


Fig. 6.

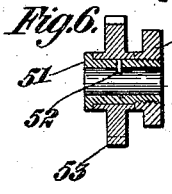
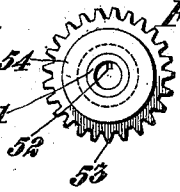


Fig. 5.



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4 SHEETS—SHEET 4.

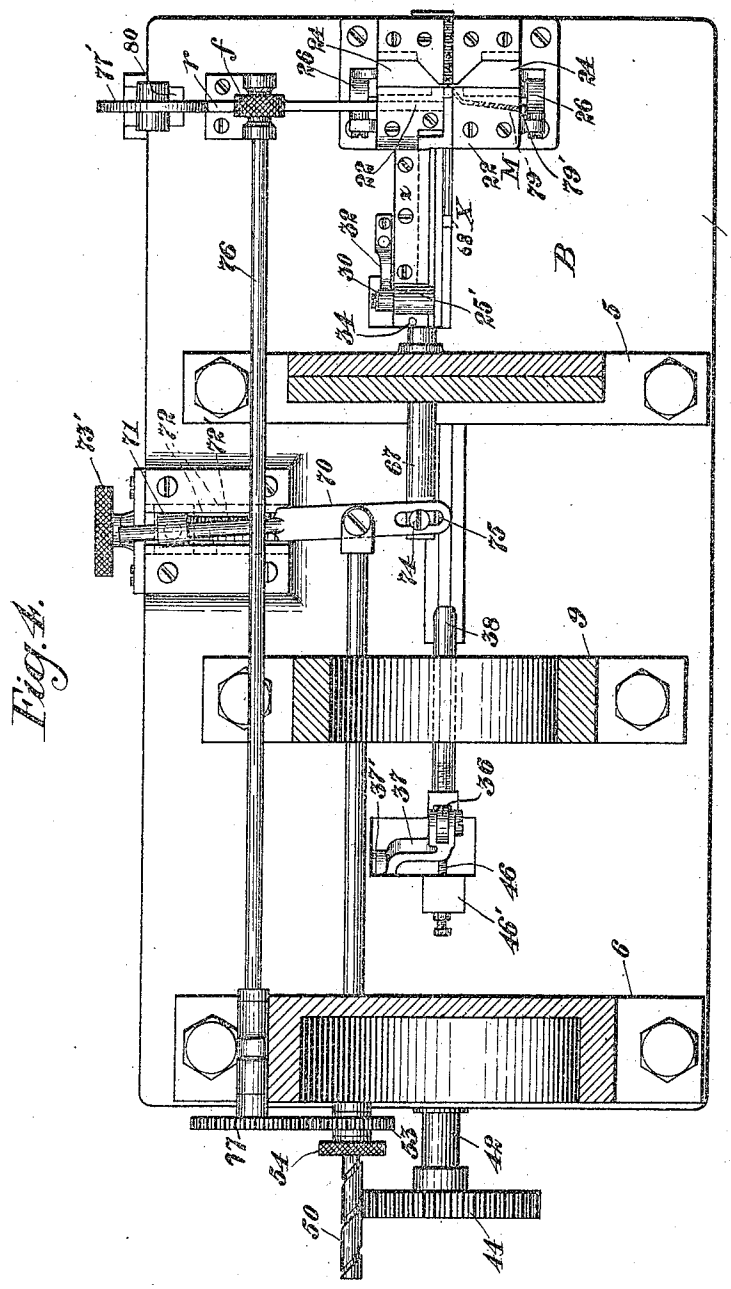

Fig. 4.

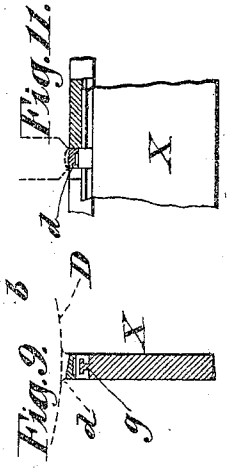

Fig. 11.

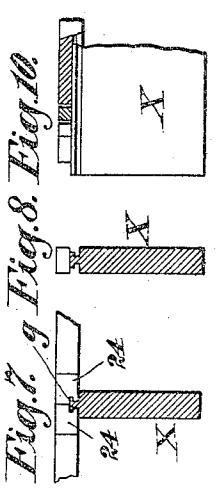

Fig. 2.

Fig. 10.

Fig. 8.

Fig. 7.

Fig. 12.

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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AMERICAN TYPOGRAPHIC CORPORATION, A CORPORATION OF ARIZONA TERRITORY.

MACHINE FOR MAKING TYPE-BARS.

946,866. Specification of Letters Patent. **Patented Jan. 18, 1910.**

Application filed April 18, 1901. Serial No. 56,482.

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Machines for Making Type-Bars, of which the following is a specification.

This invention relates to a machine adapted to make type-bars by forming types in succession along the edge of a type-bar body from stock which is preferably so acted upon during the operation of the type-making instrumentalities as to form types engaged or interlocked with the edge of the typebar body or type-support.

In this machine the typebar body will usually be fed along step by step relatively to appropriate type-forming instrumentalities by means of which the type material, preferably supplied to the machine in the form of a wire of proper cross-section will be shaped into regular type and at the same time each type thus formed may be interlocked with the edge of the typebar body to form a completed typebar. In some cases this interlocking will be effected by placing the type in engagement with the outside of a T-shaped or other suitable form of type-guide on the edge of the typebar body, and in other cases the head will be forced into a suitable retaining groove formed in the edge of the typebar body.

The present invention has for an object to furnish combinations of mechanisms and an organization thereof adapted to impart a varying, step-by-step feed movement to the typebar body upon which the separate types are to be formed and with which they are to be engaged, proportionate at each step to the widths of the types to be produced, and to provide a machine, furthermore, possessing a variability in the size of the mold-space in which the types are to be successively formed, as well as a corresponding variability in the movement of the type-blank stock fed to such space.

In the drawings which accompany the present specification, Figure 1 is partly a side elevation and partly a longitudinal, vertical section of a machine embodying my present improvements. Fig. 2 is an end elevation thereof looking from the right in Fig. 1, certain portions, however, in this figure adjacent to the mold mechanism being shown in section. Fig. 3 is a cross-sectional view on the plane of the line 3—3 in Fig. 1 looking toward the left. Fig. 4 is a horizontal section and plan view. Fig. 5 is a view of a gear-wheel embodied in the mechanism for imparting a sliding movement to a certain feed-screw. Fig. 6 is an axial section of the gear-wheel shown in Fig. 5. Fig. 7 is a transverse section of the typebar body illustrating two oppositely-disposed slides in position to form one end wall of the mold. Fig. 8 is a transverse section of the typebar body with a type-blank in position thereon before compression. Fig. 9 is a similar view illustrating the type-blank compressed by a type-die. Fig. 10 is a detailed side elevation partly in section corresponding to Fig. 8 and showing the type-blank in place between the end walls of the mold. Fig. 11 is a sectional side elevation corresponding to Fig. 9 and illustrates the formation of the finished type by the compressing action of the type-die; and Fig. 12 is a perspective view of a portion of a typebar body or support adapted for use in making the present typebar, showing the same provided with a number of types engaged or interlocked with the type-carrying edge of the body.

The several operative parts of the machine may be mounted on any proper framework—such, for instance, as that indicated in a general way in the present drawings and designated by B, and comprising a suitable bed-plate *b* having supporting legs. This bed-plate *b* offers a convenient means for the attachment of the various subordinate frame elements and fixed portions of the machine.

Each type, it may be stated in a general way, is formed in the present machine by bringing a proper type-making instrumentality or die into engagement with a blank located contiguous to the edge of a type-support or typebar body whose construction is such as to enable the type to be interlocked therewith. These operations may be effected conveniently by the compression of the blank or stock by a die to form in the stock, a type engaged with the support and having a configuration that is a counterpart of a type-forming die. For the making of successive types along the edge of the typebar body I provide a number of selective type-forming dies, together with mechanism of such character as to enable a selected die

to be brought into proper position to coöperate with the various other type-making elements. Provision thus exists for the forming of consecutive composed types along the edge of the support, and for carrying out the invention according to this manner the dies may be supported in any suitable way, an instance of which is illustrated in the present drawings and will now be described.

The dies, designated in a general way by *d*, are supported in this case on the periphery of appropriate die-carriers D, a desired number of which may be embodied in the machine, two being shown in this instance, although, of course, this number may be altered. These die-carriers D are shown in the form of disks secured to supporting shafts 2 to facilitate the selection and positioning of any particular die. The present mechanism embodies a movable element in which the shafts and the die-carriers are mounted and by which the latter are adapted to be conveyed periodically past the point where a selected die operates to form a type. That is to say, the several shafts 2 are mounted in a suitable carrier, which in this case is a rotary carrier or turret designated in a general way by T whose shaft 3 is mounted to rotate about a fixed axis. The supporting construction herein shown embodies a disk 4 secured to the turret-shaft 3, which disk is journaled in a bearing formed in an upright 5 erected upon the bed-plate *b* while adjacent to the opposite end of the turret the shaft thereof is journaled in a bearing formed in or supported by an upright 6 also erected upon the bed-plate *b*.

It is evident from the foregoing description that each die-carrier D, and consequently its supporting shaft is adapted to have not only a motion of revolution about the axis of the turret but at times also one of rotation about its own axis during the movement of a selected die to the type-forming point. Each die-carrier shaft is therefore mounted to rotate in its bearings in the turret T which bearings, as shown, are formed in the disk 4, and a corresponding arm 7 extending from a hub 7′ attached to the turret-shaft 3. It may here be premised that the type-forming point, that is, the point at which a die operates to produce a type from appropriately located stock is adjacent to the lower portion of the circular path which the extreme outer portion of the periphery of each die-carrier traces when idle. To enable any particular die to be brought to the type-forming point as the turret rotates, I have provided mechanism whereby the rotation of the revolving die-carrier, may be initiated at fixed points in the path of the die-carrier, which points are so located with reference to the type-forming point that the amount of rotation given to the die-carrier upon which the particular die is located is just sufficient to bring the selected die in proper relation to the stock at the type-forming point to form a type. To enable the various dies to be operated in this manner it is sufficient to so locate the mechanism for initiating and continuing the rotation of the die-carrier upon which they are located as that either a greater or lesser amount of rotation is imparted to the die-carrier dependent upon the location of the die when in its idle position.

In a general way the mechanism provided herein for thus operating the die-carriers on the rotating turret embodies devices for initiating the rotation of the carriers, for continuing the rotation of a rotating carrier until it passes the type-forming point and devices for suppressing its rotation and finally locating the die-carrier in its idle or inoperative position with respect to the turret. The rotation of each die-carrier shaft may be conveniently initiated through the coöperation of an appropriately located and projected latch with a member whose actuation by the latch serves to turn the corresponding die-carrier shaft in its bearings. These latches though normally inoperative to effect any movement of the carrier-shaft, thus become, when actuated and caused to project into the path of said member, effective to turn the shaft. These latch mechanisms, designated in a general way herein by L, may be of any suitable form and construction. The particular style I have shown herein are for illustrative purposes only, and not definitive of a particular type of latch necessary to the use of the present invention. As shown, the latch mechanisms comprise a series of spring-actuated pins or latches *l*, located in suitable bearings in a latch-frame 9 erected upon the bed-plate *b*. These latches when in their retracted positions are inoperative to effect any movement of a die-carrier shaft but when located in their working positions project into the path of and serve to operate an actuating member for a die-carrier shaft. They are provided with suitable springs for projecting them when released to their working position, and as shown particularly in Fig. 2 each latch-setting spring *s* is attached at one end to its latch while it leads angularly thereto to its point of attachment to the latch-frame thus serving not only as a means for projecting the latch inward but also for engaging a shoulder 10 on the latch with the edge of the opening in the latch-frame, thus normally holding the latch in its inoperative or non-working position. A finger-piece indicative in a general way of a device for facilitating the manipulation of the latch is designated by *l′*. Of course other means of tripping the latches may be employed, such, for instance, as key mechanism. The shaft 3 of the turret

T constitutes the main driving-shaft of the machine in the present construction, being rotated from some suitable source of power. A pulley P is shown attached thereto which may be power driven, as usual.

The member previously stated as serving to effect by its coöperation with a projected latch the initial rotation of a die-carrier shaft, is herein shown in the form of a starting-arm 11 formed with a socket 11′ at its outer end whose purpose is not only to insure the engagement of the starting-arm with the end of the projecting latch, but also the thrusting outward or resetting of the latch as a result of the continued rotation of the turret and the coincident swinging of the starting-arm. After engagement of the starting-arm with the projected latch the arm acts as a toggle to push the latch outward until the shoulder 10 thereon reaches a position to engage with the edge of the opening in the latch-frame, an action resulting from the tension of the inclined spring *s*, as previously described.

For continuing the rotation of each die-carrier shaft it is provided with a driver, one for each shaft, which, normally, is inoperative to effect any rotary movement of the shaft but is rendered operative to accomplish such movement by the initial rotation of the shaft effected through the projection of a latch, as already adverted to. As an instance of an appropriate device of this character, there is shown in the present case a driver in the form of a gear-wheel 13 which is movable axially with respect to a fixed point on the frame for the purpose of shifting it into and out of an engaging position with an actuator. As the present construction embodies dies which are carried through their circuit of movements in a fixed plane, that is, which are not shifted axially to effect a movement from a normal or idle to a working position, or vice versa, each gear-wheel 13 is movable axially upon its die-carrier shaft but compels the latter to rotate with it by some appropriate construction—such, for instance, as that shown and consisting of a feather or key 13′ extending from the shaft and engaging with a corresponding keyway in the bore of the gear-wheel.

The actuator for the several gear-wheels 13 is herein shown as consisting of an internal gear-wheel 14 secured to the upright 5. For the convenient axial shifting of each gear-wheel 13 to effect its engagement with and its disengagement from the gear-wheel 14 I have shown actuators consisting of appropriate coöperative cam devices, and, more specifically, for shifting a gear-wheel 13 in one direction to engage it with the internal gear-wheel 14 there is arranged a cam member 15 secured to the upright 5 with the cam surface of which is adapted to engage a corresponding surface upon a cam-arm 16 secured to and extending from the radial face of the gear-wheel. The operative surface of this arm 16 may be located on a resilient strip constituting the cam-arm in order to reduce the shock of the parts when they are brought into engagement.

Normally, each arm 16 is located in such a position that it is free of the cam member 15 during the rotation of the turret. When, however, the starting-arm upon the corresponding shaft is swung about the axis of the shaft the arm 16 is swung into a position such that it engages with the operative surface of the cam member 15. Upon further swinging of the starting-arm and its shaft the coöperative cam-surfaces operate to shift the gear-wheel 13 axially and into engagement with the internal gear-wheel 14. The rotation of the die-carrier shaft thus continues during the rotation of the turret until the selected die has been brought to the type-forming point and rolled over and impressed the blank thereat. Some time after this operation a retracting device is brought into operation as the result of the continued rotation and revolution of the die-carrier shaft. This retracting device may be of similar construction to that already described for effecting the engagement of the gear-wheel 14 but is oppositely-facing. For instance, there may be provided a cam member 17 secured to the bed-plate *b* with the cam-surface of which is adapted to engage an actuator consisting of a cam-arm 18 projecting from the elongated hub of the gear-wheel 13. It is evident from what has been described that after the type-forming operation has been completed by the selected die the cam-arm 18 comes into engagement with the cam-surface of the member 17 and the continued rotation and revolution of the die-carrier shaft operates to slide the gear-wheel 13 and parts moving with it in such a direction as to disengage the gear-wheel from the internal gear-wheel 14. It may be here stated that prior to the engagement of the cam members 18 and 17, the cam members 15 and 16 have separated from each other to permit the rearward sliding of the gear-wheel 13 and attached parts.

Certainty of action and the precise location of a selected die at the type-forming point is evidently in the present organization dependent upon the assuming by each die-carrier of a fixed and definite idle position. To bring each die-carrier shaft to a definite position and stop its rotation a suitable device may be provided—such, for instance, as that shown herein and comprising a plunger 20 conveniently located in a recess provided in the corresponding arm 7 and pressed outward against the die-carrier shaft by a spring 21, a flattened portion on the shaft cooperating with the plunger to suppress the

rotation of the shaft with the plunger in contact with the flattened portion. It will be noticed that the latches *l* are disposed in different planes transverse to the axis of rotation of the turret. By locating a starting-arm in each plane, all the latches in any one plane will be effective when tripped to actuate that shaft whose starting-arm is located in that plane.

The mold in which the types are to be formed may be of any suitable construction so long as it is capable of coöperating with each die and the typebar body to form type material into a finished type engaged with such support. A mold suitable for this purpose is indicated in a general way by M and it may be made up of a number of parts and will preferably be a separable mold two sides of which will be formed by fixed walls 22, 22 in juxtaposition with the type-support or typebar body indicated in a general way by X. In the preferred construction, at least one end of the mold will be formed of a movable wall which will be shiftable for permitting the movement of the finished type out of the mold. These shiftable mold members may be in the form of slides, 24, 24 suitably guided and shiftable toward and from their mold-closing position, their movements in this case being transverse to the typebar body and they being so constructed as to fit snugly over the type-guide on the typebar body and completely close one end of the mold. These two slides which form said end wall of the mold are complementary to and in alinement with each other in the preferred construction. Said slides may be normally spring-pressed away from the typebar body, to clear the latter, suitable springs such as 25, 25 being employed for this purpose, and said slides may be power-operated as by means of actuators consisting of fulcrumed levers 26, 26 whose upper ends contact with the slides and are swung inward by means of cams 27, 27, to shift the slides toward each other and close the forward end of the mold. The cams 27, 27 bear against corresponding cam-rollers 27′, 27′ carried by the lower ends of the levers and may be attached to a shaft 42, driven from the main shaft of the machine. The inner ends of the mold-slides 24, 24 where they coöperate with the adjacent face of the typebar body X are so shaped as to completely close the forward end of the mold (see Fig. 7) and when the typebar body has thereon a type-guide in the form of a projecting rib or member such as the T-shaped rib *g*, of course the under sides or edges of the mold-slides will be so shaped as to form when in contact with each other a similar key-shaped recess into which the rib *g* will fit.

The plunger or slide 25′ whose end, in the present construction forms the mold wall at the rear is of some suitable construction and operated by appropriate mechanism adapted to permit the position of the slide to be varied dependent upon the particular type to be formed in the mold. The construction here provided for enabling the position of this slide to be changed comprises a lever 30 pivoted at its upper end to the slide and intermediate its ends fulcrumed to a fixed portion of the machine. The swinging of this lever upon its fulcrum results evidently in the shifting of the slide and the changing of the size of the mold-space endwise of the typebar body. In the present organization the position of the lever 30 and consequently the slide to which it is pivoted is controlled by a cam 31 which operates to swing the lever against the tension of a spring 32. This cam 31 bears against a cam-roller 33 on the end of the lever and is shiftable in the plane of the vibratory movement of the lever to diminish or increase the angle through which the lever is swung during the operation of the machine. The movement of this lever in one direction is limited by a stop 34 while in the opposite direction the extent of its movement is dependent upon the position of the extreme end or working face of the cam. For shifting this cam and thus altering the position of such working face there is provided in the present construction mechanism for controlling the movement of the cam. Which mechanism is actuated from and controlled in its operation by devices mounted upon each die-carrier shaft and referrable to the dies on the respective carriers. As constructed a disk 35 secured to each shaft is provided upon its radial face with a number of blocks designated generally by 35′ of different depths measured axially of the shaft to which the disk is attached. Adapted to bear against these blocks and contacting with a particular block when a shaft is revolving and rotating to bring a die to its working position, is an antifriction-roller 36 carried at the end of a lever 37 pivoted to a bracket 37′ extending from the base-plate *b*. In other words, there is provided for each die a surface which serves to control the position of the lever 37 and through mechanism to be described, the position of the cam 31 already adverted to. It is evident that the movement of each block 35′ as the shaft to which its supporting-disk is attached revolves and rotates is along a cycloidal path whose cusp is traced adjacent in space to the antifriction-roller 36; hence the outer end of each block may be tapered as shown to enable the parts to come together and leave each other freely.

Movement from the lever 37 to the cam 31 is transmitted in this construction by means of a link 38 passing through an opening in the base-plate and pivoted at one end to the lever and at the other end to a bracket 38′ extending from a slide 39 guided in a suit-

able slideway formed below the base-plate b. From this slide 39 projects an arm 40 whose bifurcated end lies in an annular channel formed in the body of the cam 31. While the cam 31 is shiftable axially upon its shaft, yet it is constructed to be rotated thereby, a feather 40′ being here provided upon the shaft which engages with a slot or keyway (not shown) formed in the bore of the cam. The shaft 42 serving to drive the cam is journaled in suitable bearings in the machine and is driven by a gear-wheel 42′ upon the main shaft of the machine which meshes through an intermediate gear-wheel 43 with a gear-wheel 44 attached to the shaft 42. A spring 45 is shown attached at one end to the link 38 and at the other end to a fixed point for insuring the contact of the antifriction-roller 36 with the surface of the blocks. There is also shown an adjustment pin 46 passing through a threaded opening in a standard 46′ on the base-plate and serving as a stop for limiting the movement of the lever 37 under the action of the spring. To preclude the separation of the antifriction-roller 36 from the surfaces with which it should properly contact, in the event of the resistance to the movement of the slide being sufficiently great to lengthen the spring 45, there is provided in the present construction a disk 47 on each shaft provided with projections 47′ extending axially of the shaft and of such character as to confine the roller between stops on each side.

The organization embraced in the present machine is adapted, as before stated, for forming type-heads upon a suitable type-bar support or body in succession engaged therewith and spaced according to the usual requirements obtaining in the typographic art, and as types are usually of varying width, an organization is included in the present machine for shifting the typebar body varying amounts with respect to the type-mold—that is to say, when a die has been selected and brought by reason of the operation of the mechanism, as previously described, into proper relation with the stock in the mold (referred to more at length hereinafter) and the die has operated to form a type the mold will open and the typebar body with the formed and interlocked type will be shifted to move the type out of the mold a distance determined by the width of the type and the next consecutive portion of the edge of the typebar body will be brought into coöperative relation with the mold. Any appropriate mechanism for this purpose may be utilized, that herein shown embodying a feed-screw 50 mounted in the upright 6 and the latch-frame to slide lengthwise therethrough. Such sliding motion is effected herein by the rotation of a sleeve 51 surrounding the feed-screw, from which sleeve projects a pin 52 (see Fig. 6) extending into the thread of the feed-screw and serving in the present organization to traverse the feed-screw rod and cause the shifting of the typebar body. The sleeve is conveniently rotated by means of a gear-wheel 53 whose hub is mounted on the sleeve, and to enable the feed-screw to be disconnected from the gear-wheel 53 I have shown a clamping-nut 54, which engages with a thread upon the sleeve and serves when tightened to clamp the gear-wheel between opposite shoulders and thereby secure it to the sleeve.

It is evident from the fact that types vary in width that the motion necessary to be imparted step by step to the typebar body will vary with the types to be formed thereon, and to enable a varying amount of feed movement to be imparted to the feed-screw rod to effect the necessary shifting of the typebar body there is provided in the present machine a feed member whose position with relation to a coöperative member is determined by the particular die upon a die-carrier which is next to operate and form a type. The former member comprises, in the present construction, a feed-disk 55, one for each die-carrier and fixedly secured to its shaft. The periphery of each feed-disk is made up of portions of different radial depths corresponding to the various widths of the dies upon the die-carrier to whose shaft the disk is affixed. A rock-arm 56 constitutes the coöperative element of the feed device, being provided with a toe 56′ oscillatory with the rock-arm in the plane of the feed-disks and actuated when a disk is rotated, by reason of the selection of a die and the movement thereof to the type-forming point. When by virtue of the rotation of the turret a feed-disk is brought in contact with the toe 56′ of the rock-arm, this arm is swung outward by the rotating and revolving feed-disk and serves in the present construction to similarly actuate an arm 57 secured to a rock-shaft 56″ mounted in the upright 6 and to which both the arm 57 and the arm 56 are secured. A stop 57′ limits the inward movement of the rock-arm 56.

The rock-arm 57 is connected by a link 58 with a pawl-carrier 59 journaled on a stud 59′ extending from the upright 6 and supporting a pivoted spring-pressed pawl 59″ engaging with a ratchet-wheel 60 loosely mounted upon the stud. To this ratchet-wheel is attached a gear-wheel 61 which, through an intermediate gear-wheel 61′, engaging with the mentioned gear-wheel 53 for actuating the screw, serves to impart motion to the latter. Upon the actuation of the rock-arm 56 and the swinging outward of the same, the pawl-carrier 59 is swung upon its pivot and the pawl slides idly over the teeth of the ratchet-

wheel. Upon the release of the toe 56′ of the rock-arm 56 from the feed-disk, this arm and the various connected parts are free to reverse their motions and to assume their original normal positions, excess movement being prevented, by virtue of the tension of a spring 62, which bears against the arm 57. During the reverse motion the pawl 59″ engaging with the teeth of the ratchet-wheel causes in a manner readily understood from the foregoing description a partial rotation of the gear-wheel 52 and consequently the sliding of the feed-screw in its bearings. To cause this reverse or feeding movement of the parts there is shown attached to and rotating with the turret a wiper 63 (one for each shaft 2) adapted to engage with a lug 63′ extending from the pawl-carrier.

The typebar body X is located in and adapted to move lengthwise of a suitable slot provided in a fixture *x* of the bed-plate and for the purpose of transmitting the sliding motion of the feed-screw rod to the typebar body in the slide, I have shown a plunger 67 adapted to slide through a bearing in the upright 5, and as organized in the present instance, this plunger is provided with an offset portion 68 whose end contacts with the end of the typebar body occupying the slot.

There is thus a feature embraced in the present machine whereby a variability in the lengths or extent of the several intermittent movements imparted to the typebar body is rendered possible as among themselves. In addition to this, however, provision exists whereby the magnitude of these several intermittent lengthwise movements, considered as a whole, may be varied; thus, while the proportionality between the least and the greatest and all intermediate movements of the typebar body necessitated by the varying widths of the types to be produced may be the same whatever the absolute width of a given type or the number of units of length along the typebar body to be devoted to it, yet, it may be desirable, as, for instance, in changing from one font to another, to vary the absolute or over-all width of that type or character whose width is taken as a base. Provision exists in the present machine whereby any desired ratio of absolute widths within the limits of the device may be brought about. To this end the feed-screw is not connected directly with the plunger 67 but motion is imparted from one to the other through the medium of a lever 70, so mounted as to vibrate about a fulcrum which may be shifted in relation to the points of connection of the feed-screw and the plunger with the lever. This shiftable fulcrum, designated in a general way by 71, is conveniently mounted upon a slide which may be shifted lengthwise of suitable guideways 72 either automatically or by hand, or in any other desired manner. The device for altering the position of the slide is here shown in the form of a screw 72′ which is mounted in an appurtenance of the bed-plate and engages with a tapped extension of the slide and manipulated by means of a finger-piece 73′. The end of the lever 70 which engages with this slide is adapted to slide in the shiftable fulcrum which is pivoted to the slide and thus not only enables the fulcrum member to be shifted along the lever but also permits the latter to swing about an axis.

To render constant the ratio of the movement transmitted from the feed-screw to the plunger I have shown the pivot-screw 74 on the latter as engaging with a slot 75 formed in the lever.

It is evident from the preceding description that by setting the slide in any given position the movements of the typebar body will be varied so as to accommodate types of varying sizes, and that furthermore by setting the slide in different predetermined positions a given part of the typographic composition may be made to fill a given space, or length of bar.

The material from which the types are to be made may be any suitable for the purpose and may be delivered to the mold in any proper manner, but I prefer to feed thereto intermittently a type-blank rod, such as *r*, which rod may be fed toward the mold by some suitable means, as, for instance, by a pair of feed-rolls *f*, *f*′, the former of which positively drives the type-blank rod definite amounts forwardly into the mold dependent upon the size of and hence the quantity of stock necessary to form, a given type-head. The amount of feed-movement imparted to the type-blank rod thus varies proportionately and directly with the size of the type to be produced, and I may therefore impart a varying feed movement to the feed-roll by providing its shaft 76 with a gear-wheel 77 which serves, by engagement with a gear-wheel driven from the typebar body feed-actuating mechanism, for instance, the gear-wheel 53, to rotate the feed-roll and thereby feed the type-blank rod toward and into the mold. The type-blank rod may be fed from a coil thereof, designated by 77′, which may be supported upon a supply-roll mounted in bearings loosely supported in housings 80 and resting by its own weight upon an idle roller 81 rotating below the coil.

If the amount of material fed to the mold exceeds that necessary for the formation of each type formed in succession the surplus material may be disposed of in any suitable manner; thus it may be permitted to escape through an outlet-opening 79 in the mold wall, this opening being controlled by a

spring-pressed resistance device or plug 79′ which will be pushed back when a type-die is brought down upon the type-blank or material in the mold. This surplus will be sheared off when the type is moved forward out of the mold-box and by the edge of the outlet-opening which is located adjacent to the finished type.

It will be noticed from an examination of Fig. 4 that the point at which the type-blank rod is fed toward the space immediately above the typebar body is somewhat to the rear of the location of the normal mold-space, that is, somewhat to the rear of the forward edge of the slide 25′, which serves to form thereat the wall of the mold-space. When the slide is shifted to assume its final position determining the size of the mold the forward edge will act as a cutting or shearing instrument to sever from the type-blank rod a length constituting a blank for a type, which is, during the further movement of the slide, shifted forward into the mold-box.

Referring again to that feature of the present machine which renders the latter capable of forming and engaging with a given length of typebar body, those types necessary to produce a given amount of composition, the amount of composition to which the typebar body is susceptible of being devoted may be determined preliminarily in any well-known manner. Thus the composition may first be written out on the ordinary typewriter and the number of ems or other units therein counted and the determination made, if necessary, of how many the typebar body used can support, whereupon the fulcrum of the lever 70 may be located to properly modify the extent of the motion imparted from the feed-disks.

The operation of a machine such as described hereinbefore is as follows: It being assumed that the turret T is rotating and the stock has been fed into the mold and that it is desired to make upon the typebar body X a particular type, the proper latch *l* is tripped and permitted to be thrown inward by its operative spring. The first starting-arm 11 to come into contact with the projecting latch will engage therewith and will be swung thereby, thus initiating the rotation of the die-carrier shaft 2 to which it is attached. The rotation of this shaft and the die-carrier attached thereto will be continued as the result of the engagement of the gear-wheel 13 mounted on the shaft with the internal gear-wheel 14 in a manner readily understood from the description of the operation of the cam members 15 and 16. This rotation will continue until the orbitally moving and rotating die-carrier brings the particular selected die into contact with the type material or blank in the mold and compresses the same, thus simultaneously forming a type corresponding to such type-die and engaging and interlocking the type with the type-guide on the typebar body. Before the compressing action, which is illustrated clearly in Figs. 9 and 11, takes place, however, the cams 27, 27, by reason of the continued rotation of the shaft 42, operate to move the slides 24, 24 inward and thus close the forward wall of the mold-box. Prior to the time in which the selected die reaches the type-forming point, the slide 25′ is actuated by the described mechanism and moved forward, shearing a type-blank from the type stock and pushing the same into the mold-box whose lower surface or bottom is manifestly formed by the upper surface of the typebar body. Before the cam members 17 and 18 operate to suppress the rotation of the rotating and revolving die-carrier, and after the type has been made, the pawl-carrier 59, which with its pawl has been previously set in a manner already described, will by the operation of the designed wiper 63 be actuated and cause the feeding of the typebar body forward and the shifting of the formed type out of the mold-box—the slides 24, 24 opening in time for this shifting movement.

Having described my invention, I claim—

1. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support, a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body, and mechanism for feeding the typebar body embodying a feed member under the control of the die for effecting the operation of said mechanism and feeding the typebar body.

2. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support, a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body, and a feed member embodying a series of operative surfaces for effecting the feeding of the typebar body different amounts.

3. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support, a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body, and a feed disk embodying a series of operative surfaces for effecting the feeding of the typebar body different amounts.

4. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support, a type-die adapted to coöperate with type material

in the mold to form a type engaged with the typebar body, and a feed-disk having surfaces occupying different positions for effecting the feeding of the typebar body different amounts.

5. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; type-dies adapted to coöperate respectively with type material in the mold to form type engaged with the typebar body; a carrier upon which the dies are mounted; and a feed member moving with said carrier when the same is adjusted to bring a die to its working position.

6. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; type-dies adapted to coöperate respectively with type material in the mold to form type engaged with the typebar body; a carrier upon which the dies are mounted; and a rotatable revoluble feed-disk moving with said carrier when the same is adjusted to bring a die to its working position.

7. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body; a feed member; a member adapted to coöperate therewith; and a lever having a shiftable fulcrum for altering the amount of movement imparted from the last-named member to the typebar body.

8. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body; a feed member; a member adapted to coöperate therewith; a slide or plunger for moving the typebar body; and an intermediate mechanism for altering the amount of movement imparted from the cooperative member to the typebar body.

9. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body; a feed member; a member adapted to coöperate therewith; a slide for moving the typebar body; and a lever having a shiftable fulcrum for altering the amount of movement imparted from the cooperative member to the typebar body.

10. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body; a feed member having a series of operative surfaces for feeding the typebar body different amounts; and mechanism for altering the ratio of the movement arising from the operation of said surfaces to the movement imparted to the typebar body.

11. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body; a feed-disk embodying a series of operative surfaces for effecting the feeding of the typebar body different amounts; and mechanism for altering the ratio of the movement arising from the operation of said surfaces to the movement imparted to the typebar body.

12. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body; a feed-disk having surfaces occupying different positions for effecting the feeding of the typebar body different amounts; and mechanism for altering the ratio of the movement arising from the operation of said surfaces to the movement imparted to the typebar body.

13. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; type-dies adapted to coöperate respectively with type material in the mold to form type engaged with the typebar body; a carrier upon which the dies are mounted; and a feed member moving with said carrier when the same is adjusted to bring a die to its working position.

14. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; type-dies adapted to coöperate respectively with type material in the mold to form type engaged with the typebar body; a carrier upon which the dies are mounted; a rotatable revoluble feed-disk moving with said carrier when the same is adjusted to bring a die to its working position; and mechanism for altering the ratio of the movement arising from the operation of such surfaces to the movement imparted to the typebar body.

15. In a typebar-machine, the combination with a support for a typebar body, of a sepa-

rable mold adapted to coöperate with a typebar body in the support; a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body; a feed member having a series of operative surfaces for feeding the typebar body different amounts; mechanism for altering the ratio of the movement arising from the operation of said surfaces to the movement imparted to the typebar body; and means for feeding varying amounts of stock to the mold.

16. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body; a feed-disk embodying a series of operative surfaces for effecting the feeding of the typebar body different amounts; mechanism for altering the ratio of the movement arising from the operation of said surfaces to the movement imparted to the typebar body; and means for feeding varying amounts of stock to the mold.

17. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body; a feed-disk having surfaces occupying different positions for effecting the feeding of the typebar body different amounts; mechanism for altering the ratio of the movement arising from the operation of said surfaces to the movement imparted to the typebar body; and means for feeding varying amounts of stock to the mold.

18. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; type-dies adapted to coöperate respectively with type material in the mold to form type engaged with the typebar body; a carrier upon which the dies are mounted; a feed member moving with said carrier when the same is adjusted to bring a die to its working position; and means for feeding varying amounts of stock to the mold.

19. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support; type-dies adapted to coöperate respectively with type material in the mold to form type engaged with the typebar body; a carrier upon which the dies are mounted; a rotatable revoluble feed-disk moving with said carrier when the same is adjusted to bring a die to its working position; mechanism for altering the ratio of the movement arising from the operation of said surfaces to the movement imparted to the typebar body; and means for feeding varying amounts of stock to the mold.

20. In a typebar-machine, the combination with a support for a typebar body, having a movable wall effective to shear a type-blank from the stock, of a type-die adapted to coöperate with a typebar body in the support; a type-die adapted to coöperate with type material in the mold to form a type engaged with the typebar body; a feed member having a series of operative surfaces for feeding the typebar body different amounts; mechanism for altering the ratio of the movement arising from the operation of said surfaces to the movement imparted to the typebar body; and means for feeding varying amounts of stock to the mold.

21. In a typebar-machine, the combination with a support for a typebar body, of a separable mold adapted to coöperate with a typebar body in the support and having a shiftable wall; type-dies adapted to coöperate respectively with type material in the mold to form types engaged with the typebar body; a carrier for supporting the dies; mechanism moving in unison with the die-carrier for adjusting the position of the movable wall of the mold; means for feeding the typebar body varying amounts; and means for feeding varying amounts of stock to the mold.

22. In a typebar-machine the combination of a plurality of orbitally movable type-dies; a plurality of actuators movable with said type-dies and severally having their operative parts dimensionally proportioned to the types formable by said type-dies respectively; and type-blank feeding mechanism operative from the feed actuators.

23. In a typebar-machine, the combination of a plurality of orbitally movable type-dies; a plurality of actuators movable with said type-dies and severally having their operative parts dimensionally proportioned to the types formable by said type-dies respectively; and typebar-body feeding mechanism operative from the feed actuators.

24. In a typebar-machine, the combination of a plurality of movable type-dies; a plurality of actuators movable with said type-dies and severally having their operative parts dimensionally proportioned to the types formable by said type-dies respectively; type-blank feeding mechanism operative from the feed actuators; and typebar-body feeding mechanism operative from the feed actuators.

25. In a typebar-machine, the combination of a plurality of movable type-dies; a plurality of actuators movable with said type-dies and severally having their operative parts dimensionally proportioned to the types formable by said type-dies respectively; a type-mold having an adjust-

able wall; and type-mold wall-adjusting mechanism operative from the feed actuators.

26. In a typebar-machine, the combination of a plurality of movable type-dies; a plurality of actuators movable with said type-dies and severally having their operative parts dimensionally proportioned to the types formable by said type-dies respectively; type-blank feeding mechanism operative from the feed-actuators; a type-mold having an adjustable wall; and type-mold wall-adjusting mechanism operative from the feed actuators.

27. In a typebar-machine, the combination of a plurality of movable type-dies, a plurality of actuators movable with said type-dies and severally having their operative parts dimensionally proportioned to the types formable by said type-dies respectively; typebar-body feeding mechanism operative from the feed actuators; a type-mold having an adjustable wall; and type-mold wall-adjusting mechanism operative from the feed actuators.

28. In a typebar-machine, the combination of a plurality of movable type-dies; a plurality of actuators movable with said type-dies and severally having their operative parts dimensionally proportioned to the types formable by said type-dies respectively; type-blank feeding mechanism operative from the feed-actuators; typebar-body feeding mechanism operative from the feed actuators; a type-mold having an adjustable wall; and type-mold wall-adjusting mechanism operative from the feed actuators.

29. In a typebar-machine, the combination of a type-mold having an adjustable wall; typebar-body feeding mechanism; and a cam member adjustably shiftable by the typebar-body feeding mechanism and effective to adjust the wall of the mold.

30. In a type-bar machine, the combination of a type-mold having an adjustable wall; type-blank feeding mechanism; typebar-body feeding mechanism; and a cam member adjustably shiftable by the typebar-body feeding mechanism and effective to adjust the wall of the mold.

31. In a typebar-machine, the combination of a plurality of movable type-dies; a plurality of actuators movable with said type-dies and severally having their operative parts dimensionally proportioned to the types formable by said type-dies respectively; typebar-body feeding mechanism; a type-mold having an adjustable wall; and a cam member adjustably shiftable by the typebar-body feeding mechanism and effective to adjust the wall of the mold.

32. In a typebar-machine, the combination of a movable type-die; a feed-actuator movable with said type-die; typebar-body feeding mechanism; a type-mold having an adjustable wall; and a cam member adjustably shiftable by the typebar-body feeding mechanism and effective to adjust the wall of the mold.

33. In a typebar-machine, the combination of a typebar-body feed mechanism; a cam member adjustably shiftable by said feed mechanism; and a mold openable and closable by said cam member.

34. The combinatioin of a type-mold; and mechanism under the control of suitable selective mechanism effective to feed type-formable material into said mold in required proportionate quantities.

35. The combination with a support for a typebar body, of a type-die adapted to form a type engaged with the typebar-body; a feed member; a member adapted to coöperate therewith and means for altering the amount of movement imparted from the last named member to the typebar-body.

36. The combination with a support for a typebar-body; of a type-die adapted to form a type engaged with the typebar-body; a feed member, a member adapted to coöperate therewith; and a lever having a shiftable fulcrum for altering the amount of movement imparted from the last-named member to the typebar-body.

37. The combination with a support for a typebar-body; of a type-die adapted to form a type engaged with the typebar-body; a feed member; a slide or plunger for moving the typebar-body; and an intermediate mechanism for altering the amount of movement imparted by the slide or plunger, to the typebar-body.

38. The combination with a support for a typebar-body, of a type-die adapted to form a type engaged with the typebar-body; a feed member; a member adapted to cooperate therewith; a slide for moving the typebar-body; and a lever having a shiftable fulcrum for altering the amount of movement imparted from the coöperative member to the typebar-body.

39. The combination with a support for a typebar-body; of a type-die adapted to form a type engaged with the typebar-body; a feed member having a series of operative surfaces for feeding the typebar-body different amounts; and mechanism for altering the ratio of the movement arising from the operation of said surfaces to the movement imparted to the typebar-body.

40. The combination with a support for a typebar-body; of a type-die adapted to form a type engaged with the typebar-body; a feed disk embodying a series of operative surfaces for effecting the feeding of the typebar body different amounts; and mechanism for altering the ratio of the movement arising from the operation of said surfaces

to the movement imparted to the typebar-body.

41. The combination with a support for a typebar-body, of a type-die adapted to form a type engaged with the typebar-body; a feed member having a series of operative surfaces for feeding the typebar-body different amounts; mechanism for altering the ratio of the movement arising from the operation of said surfaces to the movement imparted to the typebar-body; and means for feeding varying amounts of stock to form types.

42. The combination with a support for a typebar-body, of type-dies adapted to form type engaged with the typebar-body; a carrier upon which the dies are mounted; a feed member moving with said carrier when the same is adjusted to bring a die to its working position; and means for feeding varying amounts of stock to form types.

43. The combination with a support for a typebar-body; of type-dies adapted to form types engaged with the typebar-body; a carrier upon which the dies are mounted; a rotatable revoluble feed disk moving with said carrier when the same is adjusted to bring a die to its working position; mechanism for altering the ratio of the movement arising from the operation of said surfaces to the movement imparted to the typebar-body; and means for feeding varying amounts of stock to form the types.

44. In a typebar machine, the combination with a feed member, of a mold, a lever operatively connected with said mold, means for shifting the fulcrum of the lever, automatically operative selective devices for determining the amount of said shifting, and a feed member for swinging the lever.

FRANCIS H. RICHARDS.

Witnesses:

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