No. 636,911. Patented Nov. 14, 1899.

O. MERGENTHALER.

AUTOMATIC MILLING MACHINE.

(Application filed May 10, 1898.)

(No Model.) 3 Sheets—Sheet 1.

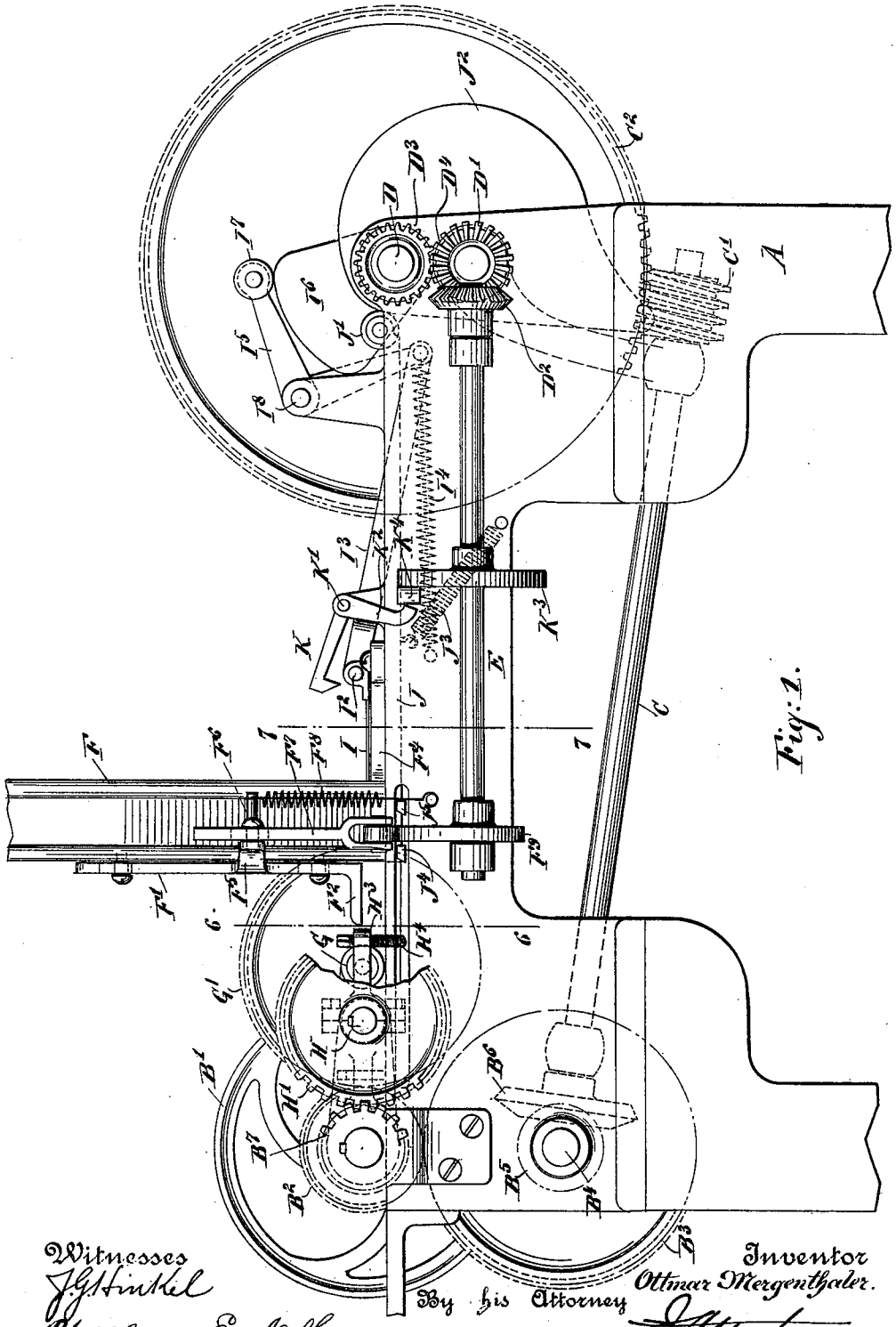


Fig. 1.

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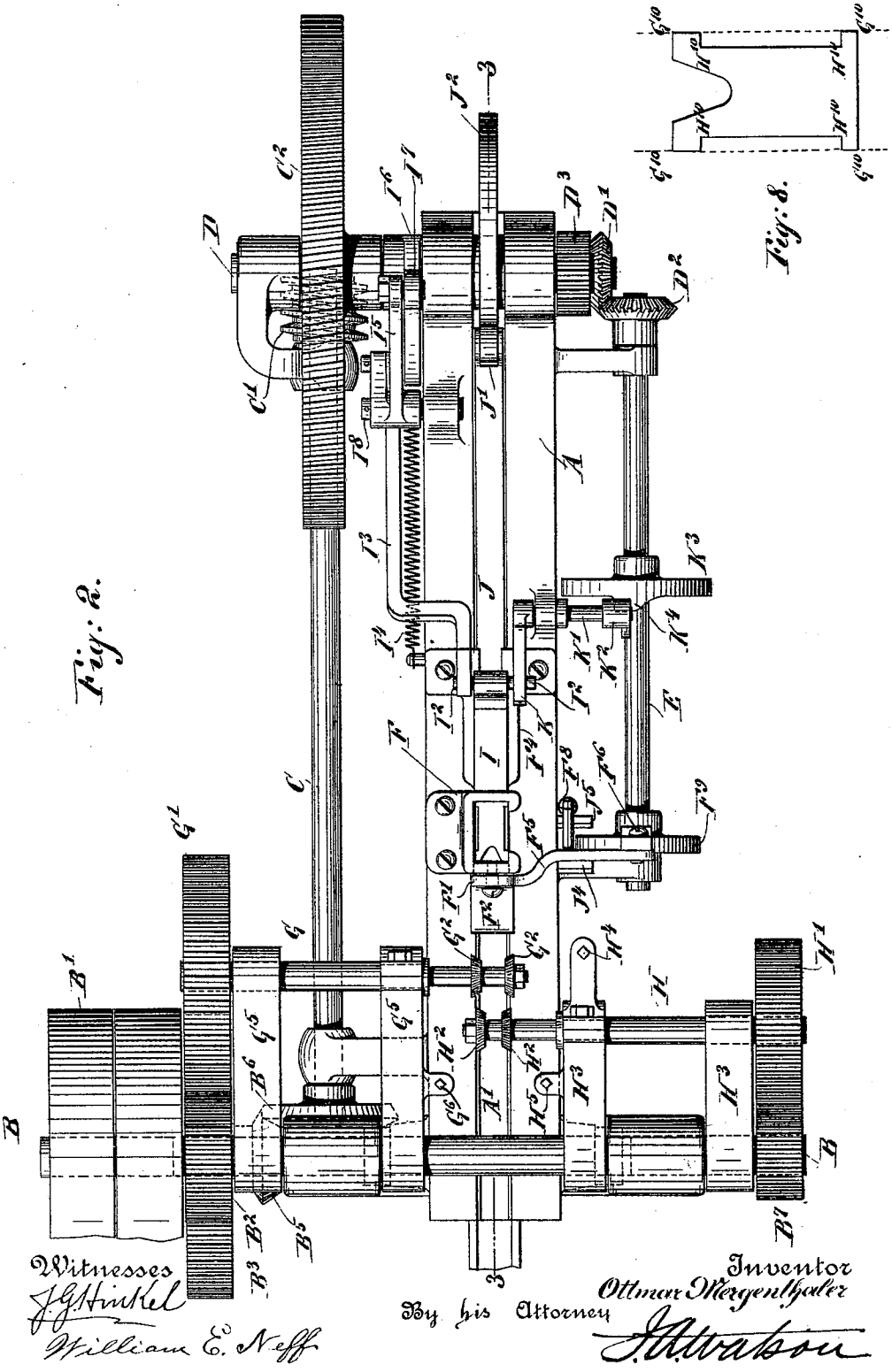


Fig. 2.

Fig. 8.

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Fig: 3.

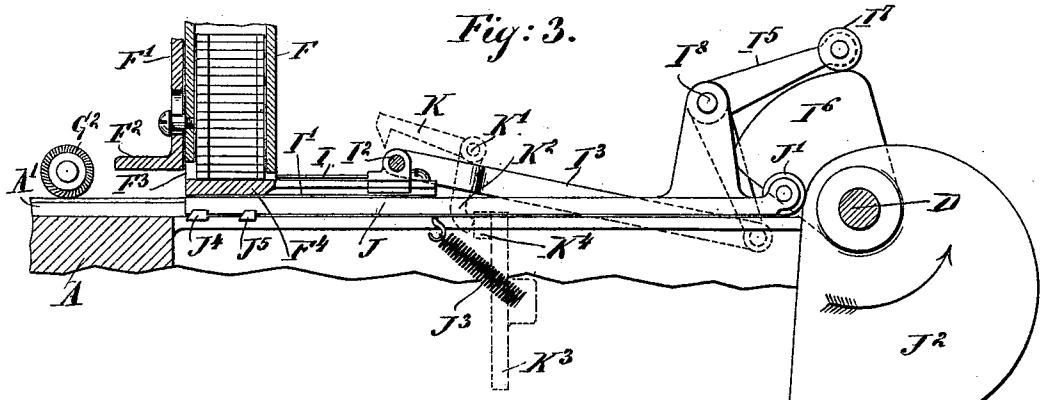
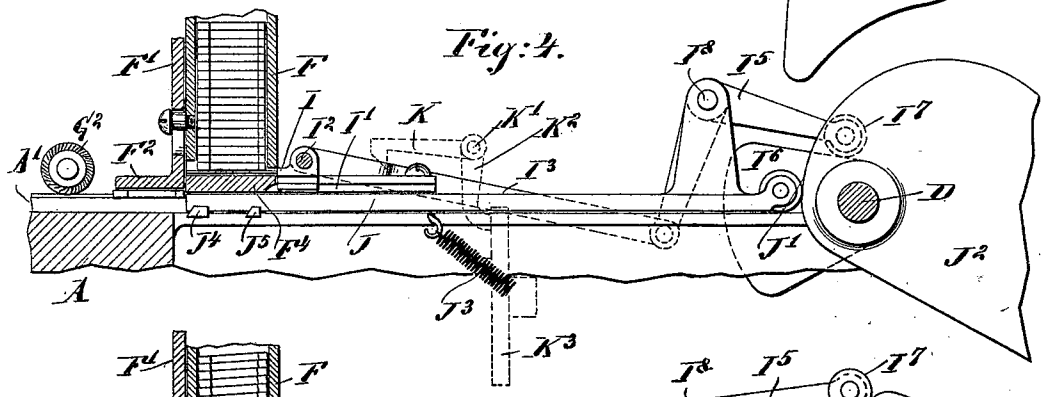


Fig: 4.



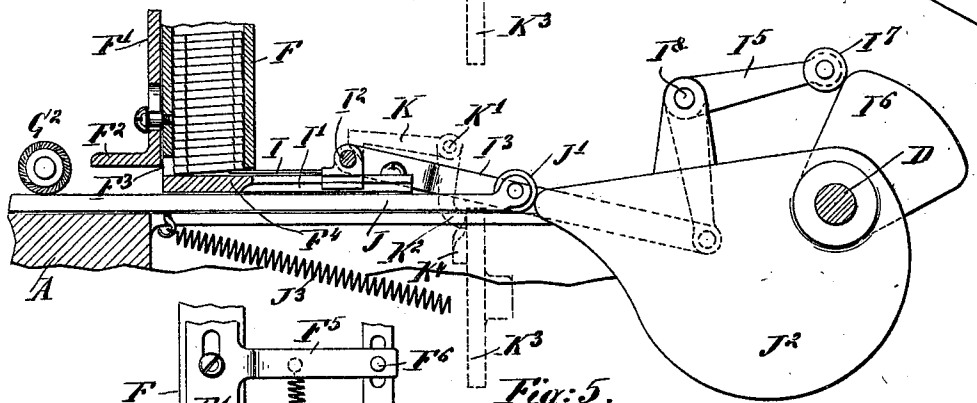


Fig: 5.

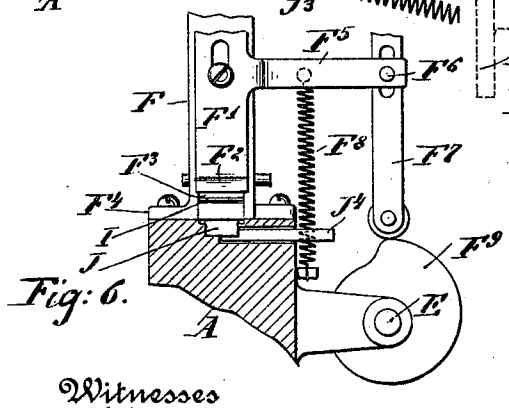


Fig: 6.

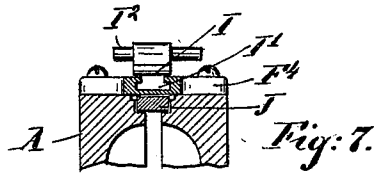


Fig: 7.

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UNITED STATES PATENT OFFICE.

OTTMAR MERGENTHALER, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE OTT. MERGENTHALER COMPANY, OF SAME PLACE.

AUTOMATIC MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 636,911, dated November 14, 1899.

Application filed May 10, 1898. Serial No. 680,301. (No model.)

To all whom it may concern:

Be it known that I, OTTMAR MERGENTHALER, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Automatic Milling-Machines, of which the following is a specification.

My invention relates to automatic milling-machines, and especially to that class of milling-machines wherein blanks are stored in a magazine from which they are discharged one by one and brought under the action of one or more milling tools or cutters.

Although it will be understood that my improved machine is capable of general application wherever it may be desired to operate upon a series of blanks, it is shown and described herein as employed in connection with the manufacture of matrices for use in linotype-machines—such, for example, as those shown and described in Letters Patent of the United States Nos. 436,531 and 436,532, granted to me on the 16th day of September, 1890.

My invention consists, first, in the employment of millers or cutters, one or more of which are adapted to be automatically lifted out of operative position at intervals, so that during the passage of the blank under the cutters it may be acted upon only at certain points by the several cutters; second, in the construction of the magazine provided with a plunger or presser-foot which is intermittingly operated to serve the double function of holding the blank in proper position with relation to the cutters and of acting as a stop for the mouth of the magazine; third, in the provision of a slide arranged to carry the blank under and past the cutters, the said slide or feed-piece being positively actuated, and, further, the employment of a second or auxiliary blade or slide whose function it is simply to remove a single blank from the magazine and to place it in proper position before the first-named slide or feed-piece, this second slide being actuated by a spring under control of a cam, and, fourth, in the provision of a safety-catch which is actuated at the proper intervals to permit the operation of the spring-actuated discharging-slide, but which prevents its forward movement in the event of a jam or improper action of the parts.

Referring to the drawings, Figure 1 is a side view of a portion of my improved milling-machine, certain parts of it being broken away. Fig. 2 is a partial top plan view of the same. Figs. 3, 4, and 5 are longitudinal vertical sectional views taken substantially on the line 3 3 in Fig. 2 and showing different positions of the two slides, the safety-catch, and the respective actuating devices therefor at different points in the operation of the machine. Fig. 6 is a transverse vertical section taken substantially on the line 6 6 in Fig. 1, showing the presser-foot or slide and its actuating devices. Fig. 7 is a transverse vertical section taken substantially on the line 7 7 in Fig. 1, showing particularly the manner of guiding the two slides. Fig. 8 is a diagrammatic view showing a blank or matrix and indicating the lines of operation of the respective cutters.

The frame A of the machine may be of any suitable construction, provided it is of sufficient strength and rigidity to properly sustain the working parts. It is provided along its top surface with a guideway A′, through which the matrices are forced under and past the cutters. Power is transmitted to the machine from any suitable source to the customary fast and loose pulleys B′ upon the shaft B, which is journaled in the frame of the machine. Fast upon the shaft B is the pinion B^2, which gears into the gear-wheels G′ and B^3 and imparts motion thereto. The gear-wheel G′ is fast on the shaft or spindle G, which is journaled in the frame G^5, mounted upon the shaft B in such manner as to be capable of a pivotal motion thereon. Fast upon the other end of the shaft or spindle G are the cutters G^3, located over the guideway A′ in such position as to act upon the blanks therein contained. The adjusting-screw G^6 in the frame G^5, resting upon the frame A, permits the frame G^5 to be adjusted in any desired position, so that the cutters G^3 may be raised or lowered, as desired, to correspond with the different thicknesses of blanks which may be fed from the magazine. Also fast upon the other end of the shaft B is the pinion B^7, which gears into the gear-wheel H′ and imparts motion thereto. The gear-wheel H′ is fast upon the end of the shaft or arbor

H, which is suitably journaled in the frame H^3, supported upon the shaft B in such manner as to permit a pivotal motion thereon. Fast upon the opposite end of the shaft H are the milling tools or cutters H^2, also arranged above the guideway A' in such manner as to act upon the blanks therein. The frame H^3 also is provided with an adjusting-screw H^5 to permit of the proper vertical adjustment of the cutters H^2. The frame H^3 is further provided with an adjusting-screw H^4, which is adapted to be acted upon and lifted by the cam-pieces J^4 J^5 on the slide J, in the manner hereinafter to be described, in order that the cutters H^2 may be lifted out of operative position at the desired intervals.

The gear-wheel B^3, previously referred to, is fast upon the shaft B^4, suitably journaled in the main frame A, which carries the bevel-pinion B^5, which gears into the bevel-pinion B^6, fast upon the shaft C, imparting a continuous motion thereto. The shaft C is suitably journaled in the main frame A and carries at its further end a worm C', which gears into and turns the worm-gear C^2. The worm-gear C^2 is fast upon the cam-shaft D, which carries the cam I^6, the cam J^2, and at its further end the pinion D^3. The pinion D^3 gears into and turns the pinion D^4, which is attached to and actuates the bevel-pinion D', which in turn engages and actuates the bevel-pinion D^2, fast upon the counter-shaft E. These various shafts and pinions are suitably journaled in the main frame A, and as the result of the connections described it will be seen that the various shafts and cams are continuously actuated. The counter-shaft E carries the face-cam K^3 for actuating the safety-catch and the edge-cam F^9 for actuating the plunger or presser-foot F' of the magazine.

The magazine F is provided with the foot F^4, which is attached to the main frame A, and in the magazine F the blanks are stored in series, as clearly shown in Fig. 1. At the front of the magazine F, as clearly shown in Fig. 3, an opening or mouth F^3 is formed, through which the blanks may be fed one by one. At the front of the magazine F is provided the plunger or slide F', capable of a limited movement thereon, the lower end of the plunger F' being formed with the presser-foot F^2. This slide and presser-foot are automatically and intermittingly actuated and serve a double function. In its uppermost position (see Fig. 3) the presser-foot F^2 serves as a stop for the second blank in the series, permitting only one to be fed from the magazine at one operation of the ejector-blade or slide I, and in its lowermost position (see Fig. 4) the presser-foot F^2 rests upon the ejected blank and holds it in proper position to be fed under the cutters. Attached to the slide F' is the arm F^5, which in turn is connected to the piece F^7, which rests upon the cam F^9. The slotted connection F^6 between the arm F^5 and piece F^7 permits of the vertical adjustment of the slide F' with relation to the pieces F^7 in such manner as to vary the position of the presser-foot F^2 and to adapt it to different thicknesses of blanks. The spring F^8, attached to the arm F^5 and to the frame A, normally tends to depress the slide F' and presser-foot F^2 and to maintain them in the position shown in Fig. 4. This tendency of the spring F^8, however, is controlled by the cam F^9, which actuates the slide F' and presser-foot F^2 in the manner hereinafter to be described.

Suitably guided by a way I', formed in the foot F^4, (see particularly Fig. 7,) is the ejector-blade or slide I, which enters the magazine through a recess at its rear and acting upon the lower blank of the series ejects it through the mouth or aperture F^3 and under the presser-foot F^2. This ejector-blade I carries at its rear end a stud I^2, which is connected to the link I^3, which in turn is pivoted to the elbow-lever I^5, pivoted at I^8 to the frame of the machine. The spring I^4, attached to the elbow-lever I^5 and to the frame of the machine, tends, through the link I^3, to advance the ejector-blade or slide I in such manner as to effect the feed of the blanks from the magazine F. This tendency of the spring I^4 is, however, resisted and controlled by the cam I^6, fast on the shaft D, which acts upon the roller I^7, carried by the elbow-lever I^5. It will be seen that the forward or ejecting movement of the slide I is not positive, but is caused by the action of the spring I^4, and that it is retracted by the cam I^6. The operation of the ejector-blade will be hereinafter described.

The slide or feed-bar proper, J, is suitably guided in the frame of the machine and under the magazine-foot F^4, as best shown in Fig. 7. The slide J is moved in such manner as to feed the blank from under the presser-foot F^2 under and past the cutters G^2 and H^2 and is actuated positively by the cam J^2, fast upon the shaft D, which acts upon the roller J', carried by the slide or feed-bar J. The spring J^3, attached to the slide J and to the frame of the machine, is so arranged as to restore the slide J to its rearward or inoperative position. It will be seen that in contradistinction to the actuation of the ejector-blade I the slide J is positively actuated in its forward direction and retracted by spring action.

Suitably journaled in the frame of the machine is the short rock-shaft K', attached to one end of which is the safety catch or pawl K, which in its downward and operative position is adapted to engage and hold the outer end of the stud I^2 of the ejector-blade I. At the outer end of the rock-shaft K' is the arm K^2, so located as to be intermittingly actuated by the cam projection K^4 of the cam K^3, fast upon the shaft E. It will be seen that through the force of gravity the safety-catch K will normally be in its lowermost position, as shown best in Figs. 4 and 5, but that it will be raised from its lowermost position by the cam-piece K^4 at regular intervals, as best shown in Figs. 1 and 3. The outer portion of the pawl K is formed with a bevel to permit of its being

acted upon and lifted and passed by the stud I^2 when the ejector-blade I is retracted. The cam-piece K^4 is so located on the cam K^3 that it will act to raise the safety-pawl K for a brief period just before the forward and operative action of the ejector-blade I and then permit it to drop to its normal position. In the event of a jam or improper action, which prevents the forward movement of the ejector-blade I, the pawl K will engage the stud I^2, holding the ejector-blade I in its inoperative position, thereby preventing unnecessary strain and avoiding the breakage or bending of the parts or the improper delivery of the blanks. This arrangement of the safety-pawl K permits the employment of a very thin slide or ejector-blade I—such, for instance, as may be necessitated to deal with blanks of extremely small thickness—and it will be seen that the sole function of the ejector-blade I is to feed a single blank at one time from the magazine F in front of the slide or feed-bar J, which is positively actuated and which in effect is the operative slide which carries the blanks under and past the cutters. The provision of the slide or feed-bar J, which is of sufficient strength to firmly advance the blanks under the cutters in connection with the thin ejector-blade I, permits of the adaptation of the machine to blanks of extremely small thickness.

Having now described the construction of the various parts of the machine, their operation will be understood to proceed in the following manner: The blanks are stored in series in the magazine F, from which they are fed one by one by the ejector-blade I. The initial position of the parts is practically that shown in Fig. 3, in which the shaft D and cam I^6 thereon have turned to such position as to permit by the further turning of the shaft D and cam I^6 of the actuation of the slide I by the spring I^4 and the ejection of the lowermost blank through the aperture F^3 and under the presser-foot F^2. When the lowermost blank has been ejected, the rotation of the cam F^9 has permitted the downward movement of the plunger or slide F′ and presser-foot F^2 until the ejected blank is firmly held under the presser-foot F^2 directly in front of the slide or feed-bar J in such position that the actuation of the feed-bar J will carry the blank through the guideway A′ and under and past the cutters. The parts are now substantially as shown in Fig. 4, wherein it will be seen that the further rotation of the shaft D and cam J^2 will effect the forward and positive actuation of the slide J, thereby carrying the blank from under the presser-foot F^2 through the guideway A′ and under and into contact with the cutters. In Fig. 5 the slide or feed-bar J is shown in its extreme forward position and with the cam J^2 in such position that a further rotation of the shaft D will permit of the retraction of the slide J through the action of the spring J^3. In this figure the slide F′ and presser-foot F^2 have been raised by the action of the cam F^9, and the ejector-blade I is shown as partially retracted from the magazine. A further rotation of the cam D will restore all the parts to the positions shown in Fig. 3, when the operations may be repeated, as described. During this cycle of operation the cam K^3, by its cam-piece K^4, has raised the safety catch or pawl K in such manner as to permit of the forward movement of the ejector-blade I, as shown in Fig. 3, the safety-pawl K descending just after the ejector-blade I has begun its forward movement to the position shown in dotted lines in Fig. 4. The rearward movement of the ejector-blade I, as shown in Fig. 5, raises the safety-pawl K by reason of the contact of the stud I^2 with the bevel on the pawl. In the event of the forward movement of the ejector-blade I being resisted by a jam of the blanks or in some other manner the safety-pawl K descends from the position shown in Fig. 3 to the position shown in Fig. 4, thereby engaging the stud I^2 and relieving the forward pressure on the thin blade I and preventing its breakage or bending or the improper delivery of the blanks.

As shown in Fig. 2 of the drawings, the pair of cutters G^2 are more widely separated on their spindle G than the pair of cutters H^2 on their spindle H. These cutters G^2 are designed to cut along the blank, as indicated by the dotted lines G^{10} in Fig. 8, and the cutters H^2 are designed to cut the blank, as indicated by the lines H^{10} in Fig. 8. It will be obvious, however, from the location of the cutters G^2 and H^2 as the blank is fed from the first pair G^2 to the the second pair H^2 that the cutters H^2 would cut into the blank before reaching the points H^{10} unless some means were provided for lifting them out of operative position, and similarly that as the blank was advanced under the cutters H^2 the blank would be cut after leaving the lines H^{10} unless the cutters H^2 were again lifted out of operative position. It is for this reason that I have made the frame H^3 pivotally movable about the shaft B and that I have provided the slide J with the cam-pieces J^4 and J^5, which in the advance of the slide J act upon the adjusting-screw H^4, thereby lifting the frame H^3 and the cutters H^2 out of operative position while the blank is passing thereunder at two points, permitting the descent of the frame H^3 and the operative engagement of the cutters H^2 only along the lines H^{10} in the manner clearly presented in the drawings. It will be obvious that this arrangement of the cutters H^2 might be employed alone without the other cutters G^2 or that one or more cutters H^2 might be employed.

In practice I have found that my improved milling-machine operates efficiently and quickly without the breakage of parts and that I am enabled to handle and efficiently deal with blanks of any thickness.

It will be understood that many of the details of my machine may be varied without departing from the spirit of my invention and

that different cutters may be employed and that their location may be varied, and I do not desire to limit myself to the specific devices herein described.

Having described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a milling-machine, the combination of a magazine for blanks, a movable slide constructed to serve as a stop for the blanks and a presser-foot for the ejected blank, and mechanism for raising said presser-foot to a predetermined position before each blank is ejected from the magazine, for the purpose set forth.

2. In a milling-machine, the combination of a magazine for blanks, a presser-foot adjacent to said magazine, a cam for raising said presser-foot to a predetermined position in which it serves as a stop to limit the number of blanks ejected from the magazine, and a spring connected to said presser-foot and operating to draw it down upon an ejected blank to hold the same in position to be delivered to the cutters.

3. In a milling-machine, the combination with a vertically-arranged magazine, a presser-foot adapted to slide on said magazine, a cam for raising the presser-foot, and an adjustable connection between said cam and presser-foot whereby the extreme elevation of the presser-foot may be predetermined.

4. In a milling-machine, the combination with milling-cutters, a guideway, and a positively-actuated slide for feeding blanks through said guideway to the cutters, of a magazine for blanks, an ejecting-blade arranged to deliver blanks from the magazine to the feed-slide, and suitable cams for operating said ejecting-blade and feed-slide, substantially as described.

5. In a milling-machine, the combination with the milling-cutters, of the movable piece for feeding blanks to the cutters, the blade or slide arranged to deliver a blank in front of the feed-piece, and suitable actuating means therefor, substantially as described.

6. In a milling-machine, the combination with the milling-cutters, of a positively-actuated slide for feeding blanks to the cutters, a magazine, and a second spring-actuated slide or blade adapted to deliver the blanks from the magazine in front of the feed-slide, substantially as described.

7. In a milling-machine, the combination with the milling-cutters, of a magazine provided with a suitably-actuated presser-foot, a positively-driven slide or feed-piece for conveying the blank under and past the cutters, and a second slide or blade adapted to deliver a blank from the magazine under the presser-foot and in front of the slide or feed-piece, substantially as described.

8. In a milling-machine, the combination with the milling-cutters, of a slide or feed-piece positively driven to carry the work to the cutters and retracted by a spring, and a second slide or blade operated by a spring to deliver a blank in front of the slide and then positively retracted, substantially as described.

9. In a milling-machine, the combination with the magazine for holding the blanks in series, of a spring-actuated ejector-blade designed to feed the blanks therefrom, and a safety-catch suitably actuated in such manner as to hold the ejector-blade in the event of accidental stoppage, substantially as described.

10. In a milling-machine, the combination with the magazine for holding the blanks, of a spring-actuated ejector-blade for feeding the blanks therefrom, and a safety-catch, together with means for actuating the safety-catch, said means normally permitting of the free action of the ejector-slide, but in the event of a jam or improper action of the parts catching and holding said ejector-blade, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

OTT. MERGENTHALER.

Witnesses:

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MURRAY HANSON.