J. E. ERICKSON.

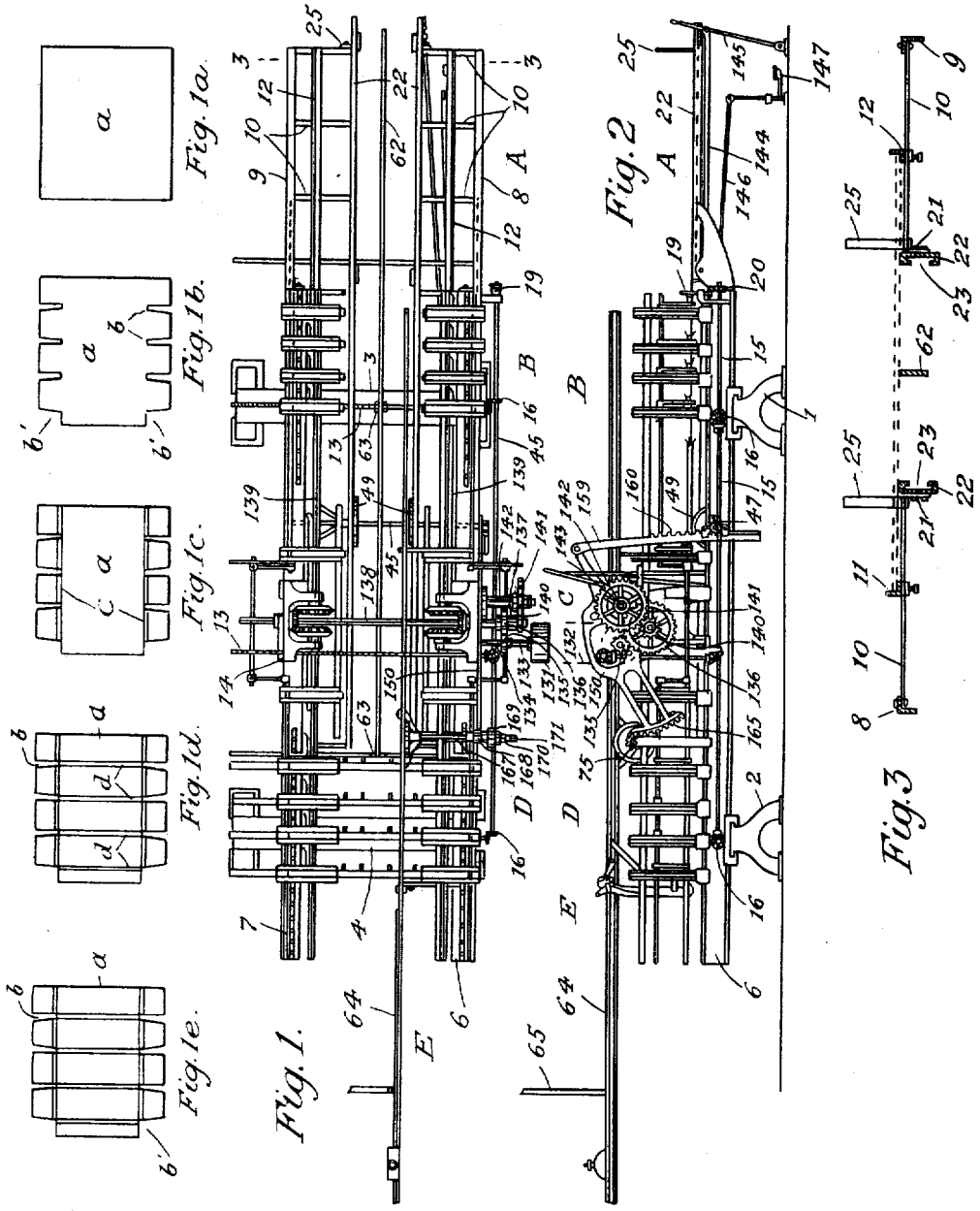
FEEDING MECHANISM FOR MACHINES FOR CUTTING AND CREASING BLANKS.

APPLICATION FILED MAY 4, 1911.

1,023,558.

Patented Apr. 16, 1912.

5 SHEETS—SHEET 1.



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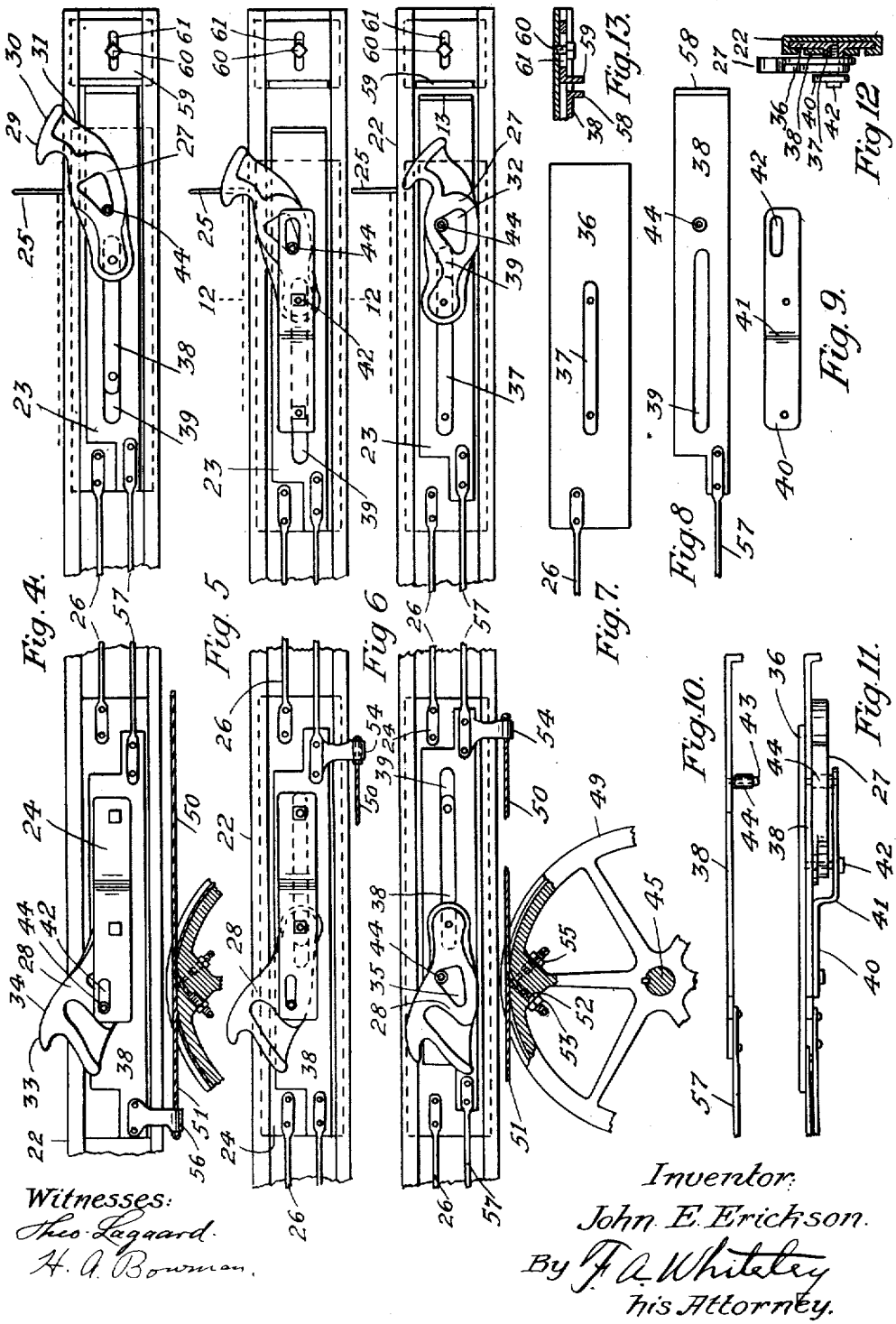

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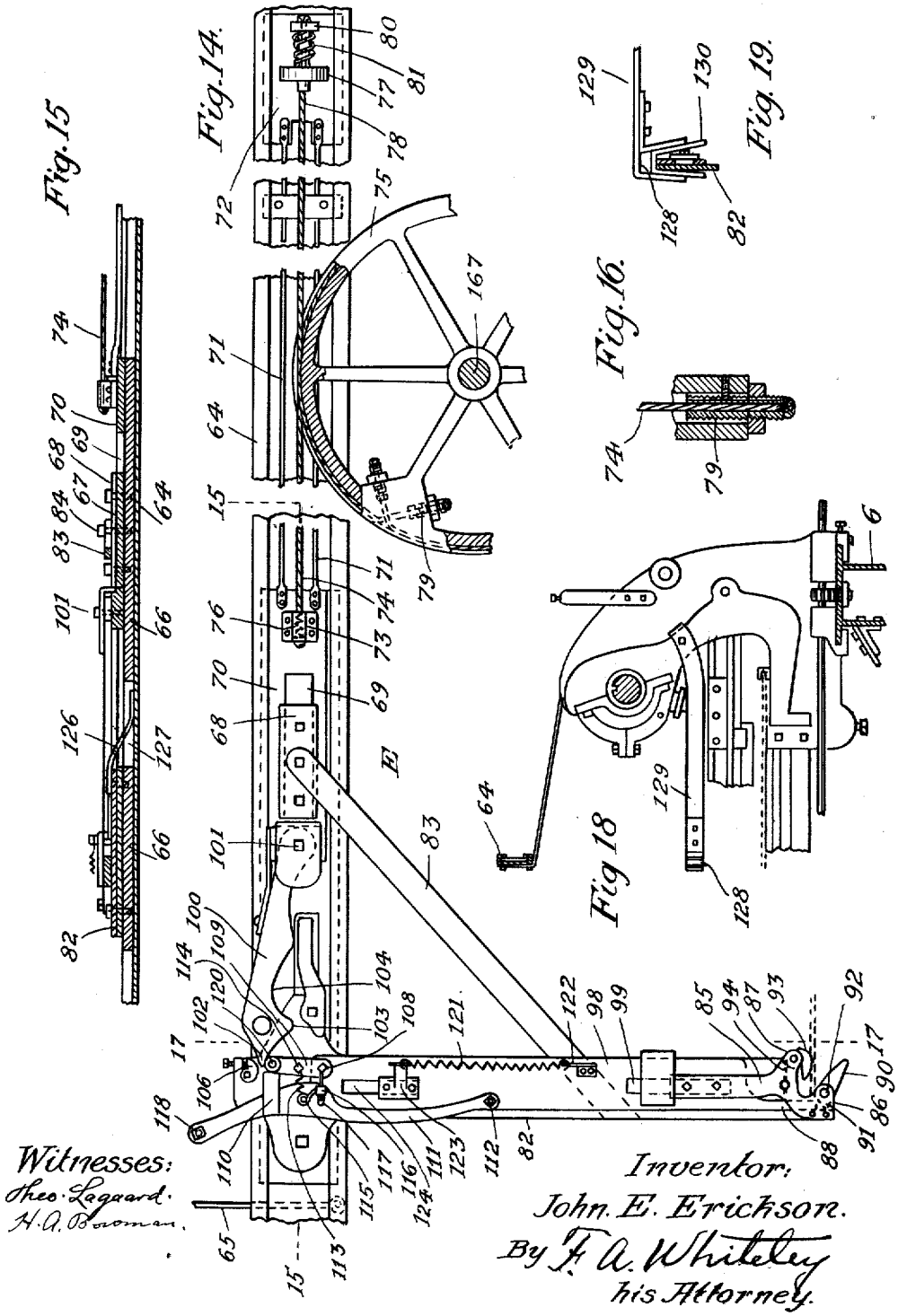

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6 SHEETS—SHEET 4.

Fig. 20.

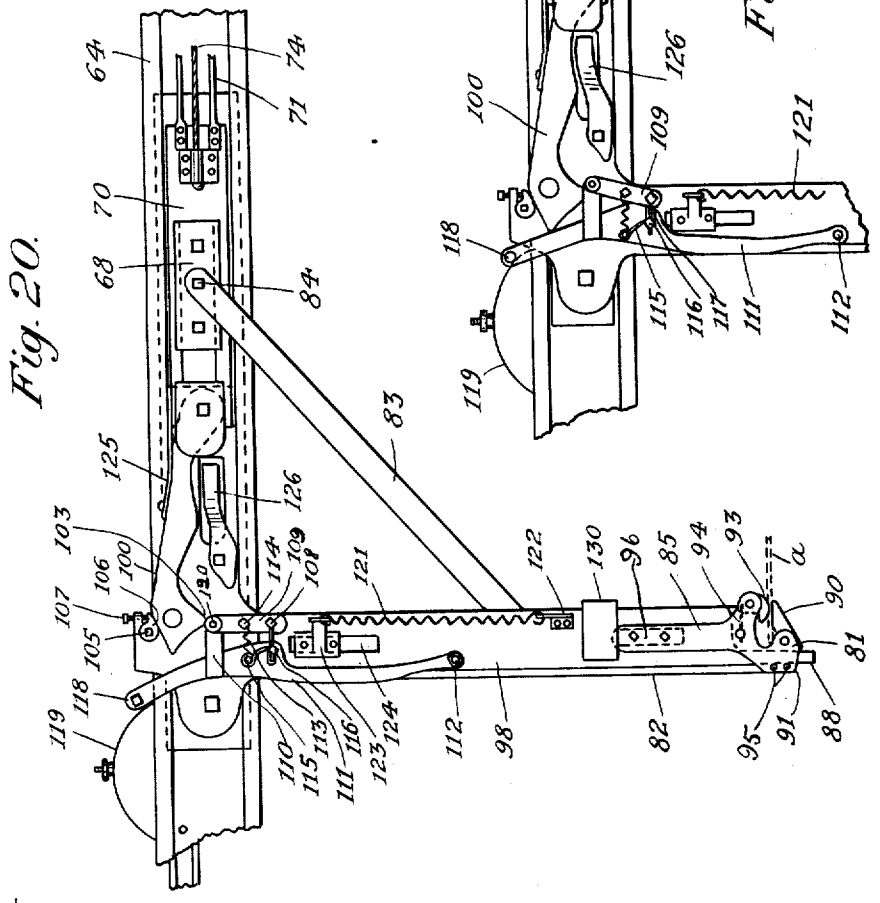

Fig 21.

Fig 17.

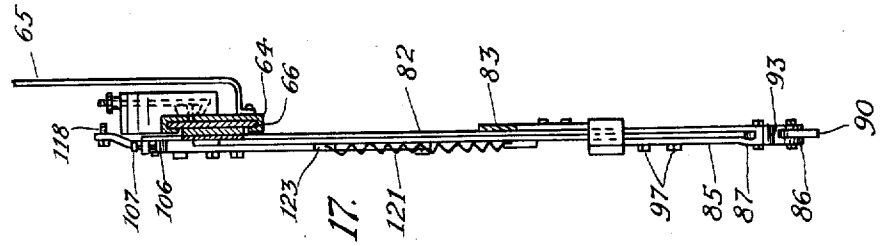

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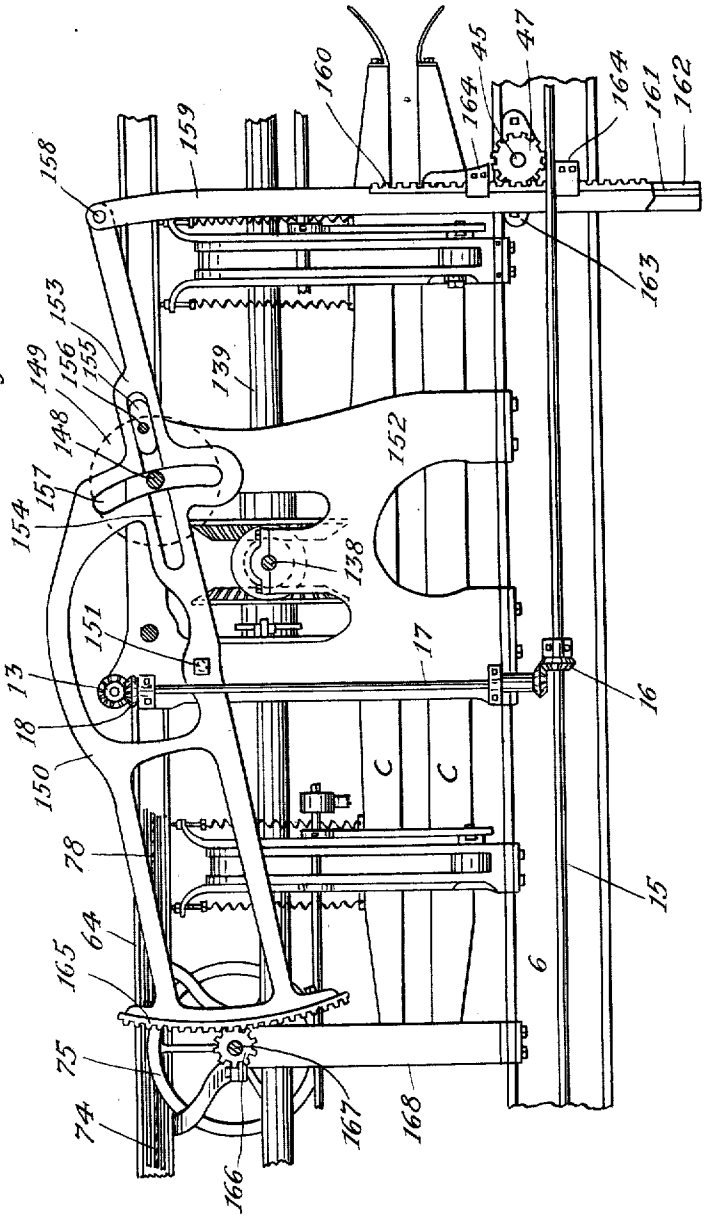
Fig. 22.



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UNITED STATES PATENT OFFICE.

JOHN E. ERICKSON, OF ST. PAUL, MINNESOTA.

FEEDING MECHANISM FOR MACHINES FOR CUTTING AND CREASING BLANKS.

1,023,558. Specification of Letters Patent. Patented Apr. 16, 1912.

Original application filed January 10, 1911, Serial No. 601,772. Divided and this application filed May 4, 1911. Serial No. 625,074.

To all whom it may concern:

Be it known that I, JOHN E. ERICKSON, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Feeding Mechanism for Machines for Cutting and Creasing Blanks, of which the following is a specification.

My invention relates to improvements in feeding mechanism for machines for operating upon blanks of fiber board to be used for making boxes, and more especially upon such blanks of a peculiarly thick and heavy nature where it is desired to make unusually strong and heavy boxes.

My object is to provide a machine of improved and particularly simple construction for making the desired cuts in the edges and from the corners of the blanks, which will crease the same both longitudinally and transversely in proper relation to the cuts, which will automatically feed the blanks to the different positions for the successive operations thereupon with absolute accuracy, thereafter delivering the blanks from the machine, which is rapid in operation and easy and certain of control.

Further objects and advantages of my improvements will appear in connection with the detailed description thereof and are particularly pointed out in the claims.

In the drawings, illustrating one form of my invention—Figure 1 is a plan of the entire machine. Figs. 1^a, 1^b, 1^c, 1^d, 1^e are views of the blank, showing the conditions thereof at different stages of its progress through the machine. Fig. 2 is a side elevation of the entire machine. Fig. 3 is a section on line 3—3 of Fig. 1. Figs. 4, 5 and 6 are detail elevation views of the conveying mechanism, part of the operating drum being shown in broken sections. Figs. 7, 8, 9, 10 and 11 are views of details of the conveying mechanism. Fig. 12 is a section on line 12—12 of Fig. 5. Fig. 13 is a section on line 13—13 of Fig. 6. Fig. 14 is a side view of the blank removing mechanism in position for receiving the sheet. Fig. 15 is a section on line 15—15 of Fig. 14. Fig. 16 is a sectional detail of the connections to the driving drum. Fig. 17 is a section on line 17—17 of Fig. 14, showing an end elevation of the blank removing finger. Fig. 18 is an end view of the blank removing mechanism and coöperating stop. Fig. 19 is a detail view of the stop. Fig. 20 is a side view of the blank. Fig. 21 is a view of the tripping device on the blank removing mechanism when about to release the blank. Fig. 22 is a sectional elevation of part of the machine showing the means for operating the blank feeding and withdrawing means.

The blanks to be operated by my machine may be of any type of pasteboard composition and of any degree of thickness or weight, it being a special feature of my machine that it will perform upon such thick and heavy blanks the operations necessary to prepare said heavy blanks for ready folding into the necessary form for producing the heavy boxes which it is desired to make from said blanks. The mechanism required to perform these operations, therefore, must be of particularly substantial type and the feeding devices for the blanks of such a nature as positively to grip and feed the blanks into the successive positions in which the different operations upon said blanks are to be performed, and said feeding means must be adjusted to coöperate with each of said operating devices so as to position the blanks with absolute accuracy for each successive operation. My feeding device is, however, adapted to feed to and withdraw from successive operative positions any sheet-like members upon which a series of operations is to be performed.

The relative position of the blanks as they are fed through the machine, together with the operations performed upon said blanks, is shown in relation to Fig. 1 by the Figs. 1^a to 1^e, inclusive, of the blanks *a*. In the position shown in Fig. 1^a, the blank is laid upon the receiving platform of the machine, designated generally by reference character "A." From this position, the blank is positively fed to its second position, shown in Fig. 1^b, where the devices for making the narrow V-shaped cuts *b* and the corner cuts *b'*, as shown in Fig. 1^b, operate upon the blanks, and which devices are represented in their entirety by the reference character "B." The blank is then fed to its third position in the machine where it is operated upon by the mechanism for longitudinally scoring or creasing the blanks, as shown at *c* in Fig. 1^c, which longitudinal creasing mechanism is designated in its entirety by the reference character "C." From this po-

sition, the blank is positively fed to its fourth position in the machine where it is operated upon by mechanism for making the transverse creases *d*, shown in Fig. 1[d], and which transverse creasing mechanism is represented generally by the reference character "D." This completes the operation of the machine upon the blanks, but additional means for removing the blanks from their fourth position in the machine and depositing them outside of the machine in the relative position shown in Fig. 1[e] are required and provided, and this blank-withdrawing means is designated in its entirety by reference character "E." Each of the means "B," "C" and "D" successively operates upon the blanks in coöperation with the means for feeding the blanks to their successive operative positions.

Transverse I-beams 3 and 4 secured to standards 1 and 2 have positioned thereon longitudinal I-beams 6 and 7 forming a supporting framework for the operating and feeding devices of my machine. Forwardly extending bars 8 and 9 are secured to the front ends of the longitudinal members 6 and 7, each of these bars 8 and 9 carrying a series of short crossbars 10. To the crossbars 10 are adjustably secured guides 11 and 12. To the crossbars 10 and to the inner sides of the longitudinal members 6 and 7 are bolted a series of brackets 21. To each set of bracket arms 21, on either side of the machine, are bolted longitudinal guide-ways 22 provided with interior longitudinal channels, a view of which, showing the cross-sectional form of the guide-ways 22, is given in Fig. 12. These guide-ways 22 provide a support for the blanks upon which they are moved to successive operative positions, and also are for the purpose of housing and supporting within the aforesaid channels reciprocating feeding devices, of which the forward feeding member thereof is designated 23, and each of the two rear members thereof, being identical in form and function, is designated by the reference character 24. The guide-ways 22 extend back underneath the feeding-platform A, as shown in Fig. 1, and the feeding members 23 coöperate to feed the blanks from their position on said platform to the second position to be operated upon by the devices B, as shown in Figs. 1 and 2, stops 25, as shown in Figs. 1 and 3, being provided against which the operator places the blanks to position them for engagement with the feeding means. The feeding devices 23 and 24 are connected to move in unison by links 26, movement of one member thereby causing movement of each of the other feeding members. Each of the feeding members 23 comprises a hook member 27 of peculiar shape, the member 24 having hook members 28 of different shape and differently disposed in the feeding means 24 from the disposition of the hook members 27 in the feeding means 23, and this difference in form and disposition of the respective hook members of the different parts is all that distinguishes the front feeding means 23 from the rear sets of feeding means 24. The hook members 27 are disposed in the forward portion of the feeding device and have a hook 29, a top cam-face 30, a rear cam-face 31 and a central cam-opening 32, all designed to coöperate in a manner and for a purpose to be described. The hook members 28 each have a hook 33, pointing in the same direction as the hook 29 but oppositely with respect to the body of the hook member 28. The hook members 28 are also provided with a top cam-portion 34 and a central cam-opening 35. Each of the feeding devices consists primarily of a plate 36, having thereon a longitudinal raised member 37, as clearly shown in Figs 7 and 11, and these plates 36 are connected together by the links 26, before mentioned, and slide directly in the guide-ways 22. In conjunction with the plates 36, and adapted to have a limited movement therealong, are members 38, having thereon longitudinal slots 39, in which the members 37 register when the plates are assembled, and since the members 37 are shorter than the slots 39 the members 38 may slide along the members 36 to a limited extent. Bolted to each of the raised portions 37 of the plates 36 are bracket pieces 40, as shown in detail in Fig. 9, the said bracket portion 40 being off-set at 41, as shown in Fig. 11, a front bolt 42 thereof operating as a pivot upon which the hook members 27 or 28 are adapted to rock. In the forward portion of the member 40 is a slot 42 equal in length to the difference in length of the raised members 37 on the plates 36 and the slots 39 in the plates 38. Through these slots 42, extend studs 43 having thereon anti-friction rollers 44, as shown in detail in Fig. 10, and these rollers 44 are adapted to coöperate with the cam-faces in the openings 32 or 35 of the front and rear hook members, respectively, for the purpose of raising and lowering the hook members 27—28 in the manner hereinafter described.

To a transverse shaft 45, held in a bearing 46 and having thereon a gear 47 in operative connection with driving mechanism at the left hand side of the machine, said shaft 45 passing through and beyond a bearing in the longitudinal members 6 and 7, as shown in Fig. 1, are secured drums 49, about which is coiled a pair of driving ropes 50—51. The driving rope 50 passes through an opening 52 in a spiral casting on one of the spokes of the drum, being removably secured therein by the nut 53, the other end of said driving rope 50 being attached to a member 54 bolted to plate 38 of the middle

feed member 24. One end of the driving rope 51 is similarly fastened to the drum 49 by a nut 55, as shown in Fig. 6, the other end of said driving rope 51 being secured to a member 56, attached to the plate 38 of the rear feeding device 24. All of the adjacent plates 38 in the feeding members 23—24 are connected together by links 57 so that movement imparted to any one of said plates through either of the driving cords 50—51 will be uniformly transmitted to each of the plates 38, and movement to the feeding members as a whole, and more especially the hook members 27—28 thereof, must be effected through the plates 38. Since, therefore, the plates 38 are connected with the plates 36 by means of the projections 37 in the slots 39 and the covering plates 40, and since said projections 37 are shorter than the slots 39, each of the plates 38, and the friction rollers 44 carried thereby, during the first period of its movement in a longitudinal direction, will have a movement independent of the plates 36, the effect of which will be to cause the stud 44 to operate through the slot 42 in the member 40, on the cam-faces of the opening 32 in the hook members 27—28, to cause said hook members to rise above the top of the longitudinal guide members, as the plates 36 start to move in the direction of feeding through the machine, and cause the hooks to fall or recede below the top or feeding plate of the guide-ways 22 when the motion begins in the reverse direction, as will be clearly understood from an inspection of the Figs. 4 to 13, inclusive. Since the drums 49 are oscillated on the shaft 45, it follows that the feeding members 23—24 will be reciprocated and the hook members 27—28 raised or lowered at the beginning of each reciprocation according to whether the same is in a forward or a backward direction. To insure bringing the hooks into a raised position before the feeding operation begins, the plate 38 of the forward feeding member 23 has at the front end thereof a depending projection 58 adapted to coöperate with a stop 59 adjustably attached by the bolt 60 through the slot 61 therein to the end of the guideway 22. When, therefore, the plates 38 are brought to the end of their movement by the cords 51, they come sharply in contact through the members 58 with the stop 59 bringing them quickly stationary, and the plates 36 connected by the link 26 and bearing the hook members 27—28 continue, by reason of the momentum acquired from the stroke of the return reciprocation, for some distance, which may be as far as the slot 39 will permit, thus causing the rollers 44 to engage the upper cam-face of the openings 32—35 and thereby bring the hooks into practically their raised position. On the forward reciprocation of the feeding means, each of the three pairs of hooks will grip a blank and feed the same forward to the next successive position for operation thereupon, the first set of hooks feeding to position 2, where the cutting mechanism B operates thereupon the second set of hooks feeding the blank to position 3 where the longitudinal creasing devices C operate thereupon, and the third set of hooks feeding to position 4, where the final operation of transversely creasing the blank is performed by mechanism D. From this fourth position the blanks are removed from the machine by mechanism subsequently to be described. For steadying the center of the blanks as they are fed through the machine, a bar 62 is loosely mounted on supports 63 provided for that purpose.

It is to be understood that the two guideways 22 attached to the longitudinal frame members 6 and 7, respectively, although exactly alike and housing identical feeding devices operated simultaneously by the means above described, are wholly independent of one another and are relatively adjustable to vary the distance between the same for feeding blanks of different widths. This adjustment is provided for by making the frame piece 7 and the parts carried thereby bodily adjustable on the cross pieces 3 and 4, being effected by shafts 13 transversely threaded in said frame piece 7 and a bracket 14 thereon, said screw-threaded shafts being operated by means of a shaft 15 secured to the frame member 6 and connected by bevel gearing 16 with said transverse shafts, and with a vertical shaft 17 which through bevel gearing 18 operates the upper of said screw-threaded shafts 13, as shown in Fig. 22. The shaft 15 is adapted to be operated by a movable hand crank to be applied to a short vertical shaft 19, connected by bevel gearing 20 to the shaft 15.

The means for withdrawing the blanks after the last operation thereon, generally designated by "E", comprises a guide-way 64 of substantially the same form as the guideway 22 for the blank feeding means, the guideway 64 being held in a position above the other mechanism of the machine by means of brackets attached to the frame member 6 on the operating side of the machine, which brackets may extend rearwardly above the rear end of said guideway 64 and connect thereto by means of hangers 65, as shown in Figs. 14 and 17, or said hangers may extend directly from the frame of the building in which the machine is positioned. Mounted within the guideway 64, so as to have a movement therealong is a plate 66. Bolted to said plate 66 is an extension 67 having a cap 68, said extension 67 extending through a slot 69 in a second plate 70. The slot 69 is longer than the extension 67 so the second

plate 70 will have a limited movement on the plate 66. The plate 70 is connected by links 71 to a front operating member 72 mounted to slide in the guideway 64. Upon the front end of the plate 70 is bolted a hasp 73 through which passes a connection 74 to an operating drum 75, said connection being provided with a spring 76 for taking up shock. On the member 72 is a projection 77 through which a cord or flexible connection 78 passes, said flexible connection being fastened at one end, as indicated at 79, to the drum 75, the other end of said flexible member 78 passing through the member 77 and being fastened to a headed device 80, a spring 81 between said head and the member 77 operating to take up shock in the movements of the parts. It will thus be seen that any movement communicated to the plate 66 from the drum 75 must be transmitted through the plate 70 mounted thereupon. Bolted to the plate 66, is a depending hanger 82 which hanger is connected by a brace 83 to the plate 66 by a bolt 84, which passes through the brace 83, the holding member 68, the raised extension 67 and into the plate 66, as clearly shown in Fig. 15. Upon the lower end of the plate 82 is bolted a member 85 having two forwardly projecting portions 86—87, the bottom portion of the plate 82 being provided with similar forwardly projecting portions. Pivoted between the members 86 is a dog 90 having a cam-extension 91 extending rearwardly from the pivot 92. Between the members 87 is another dog 93 having a lower curved surface adapted to coöperate with the upwardly curved surface of the dog 90 to form a gripping means for the blanks, the dog 93 being held in its outward position by a spring 94. Between the members 85 and 82, at the lower end thereof, is bolted a guide-piece as indicated at 95, another guide-piece 96 of elongated shape being bolted between said members 85 and 82 at 97. Upon the plate 82 is mounted another plate 98 having therein a slot 99 longer than member 96 which embraces said member 96 so that the plate 98 will have a limited sliding movement up and down on the plate 82, a downward extension 88 of said plate 98 being adapted to coöperate with the guiding-piece 95 and the cam-member 91 on the dog 90 to swing such dog on its pivot 92 when the plate 98 is lowered and cause the dog to rise into operative position for gripping a blank, as shown in Fig. 20.

To operate the cam plate 98 in the depending member 82 a cam finger 100 is provided, said cam finger being pivoted at 101 to the plate 70. As shown, the cam finger 100 has a pointed end 102 and a depending portion 103, back of which is a hollowed out portion 104, these characteristics of the cam finger being for purposes to be hereinafter described. Upon the upper end of the depending member 82 is pivoted by means of a set screw 105 a cam lug 106, which may be adjusted by means of an adjusting screw 107, this cam lug being immediately above the longitudinal line of movement of the point 102 of the cam finger 100. Pivoted to the cam plate 98 at 108, said pivot 108 being directly below the cam lug 106, in an operating and locking member 109, which is normally held in a substantially vertical position against a lug 110 on an arm 111 pivoted at 112 to the cam plate 98, by means of a spring 113 attached to the locking member 109 at 114 and connected with the plate 98 by means of a spring holding device 115, as clearly shown in Figs. 20 and 21, said member 111 being further secured to the cam plate 98, to have a limited movement thereon about the pivot 112, by means of a bolt 116 passing through a slot 117 in said member 111, to which bolt the spring holding member 115 is directly attached, the arm 111 being provided with a short offset arm 118 to coöperate with a fixed cam 119 and throw the member 109 into non-locking position and positively move the cam plate 98 on the depending member 82, as will now be explained.

When the drum 75 is rotated in a rearwardly direction, through the flexible connection 78, the forward plate 72 and links 71, the plate 70 is moved rearwardly, such motion being upon the plate 66, by reason of the fact that the slot 69 is longer than the extension 67 on the plate 66 registering in said slot. This movement of the plate 70 on the plate 66 will carry the cam finger 100 rearward, the point 102 thereof first entering between the cam lug 106 and the lug 120 on the end of the locking and operating member 109, further movement of the cam finger rearwardly against the fixed cam lug 106 on one side and the cam lug 120 on the member 109 on the other side of said cam finger, will cause the same to force the locking and operating member 109 downward and with it the cam plate 98, until the plate 70 reaches the limit of the movement on the plate 66 permitted by the slot 69, when the depending portion 103 of the cam finger 100 will occupy the position shown in Fig. 20, in which, by means of said cam finger and the locking member 109 the cam plate 98 is locked in its lowered position, downward movement thereof having caused the cam extension 88 thereon to engage the cam extension 91 on the gripping finger 90 thereby causing said gripping finger to swing upwardly into coöperative engagement with the blank *a* between said gripping finger 90 and the gripping finger 93. The blank is thus gripped and held between the fingers 90 and 93, any movement or force tending to withdraw the blank

therefrom operating to cause the gripping fingers to hold yet more tightly by reason of the rolling contact of the gripping surface of the finger 93 permitted by the spring 94. Further movement rearward of the plate 70 will now be transmitted to the plate 66, which will carry the depending member 82 and the blank *a* gripped thereby rearwardly until the blank is removed from the machine. The fixed cam 119 may be placed on the guideway 64 at such a point as will be most convenient for the depositing of the withdrawn blanks. When the short arm or lug 118 on the arm 111 first comes in contact with the cam 119, the arm 111 will be swung forwardly on the pivot 112 and through the block or extension 110 push or trip the lug 120 on the locking member 109 from beneath the extension 103 of the cam finger 100, the said lug 120 riding into the cutaway portion 104 of the cam finger 100, while the lug or arm 118 will ride up on the cam 119 thus positively raising the cam plate 98 and withdrawing the depending portion 100 thereof from coöperation with the gripping finger 90, thus permitting said finger to drop and release the blank. The spring 121, attached to the cam plate 98 at 122 and to a spring holding member 123 fast to the depending member 82 and extending through a slot 124 in said cam plate 98, operates to complete the upward movement of the cam plate and restore the same to inoperative position, in which it is normally held by said spring 121. Upon reverse movement being communicated to the plate 70 from the drum 75, said plate 70 will first be moved on the plate 66, thereby withdrawing the cam finger 100 from contact with the lug 120 on the locking member 109, whereupon the spring 113 will restore said locking member to its normal position, the leaf spring 125 upon the cam finger 100 operating to resiliently hold said cam finger in proper position for the next succeeding operation of the withdrawing devices. A brake 126 consisting of a leaf spring attached to the plate 66 over the depending member 82 and extending through a slot 127 in said plate 66 so as to bear against the wall of the guideway 64, is provided to retard movement of the plate 66 so as certainly to permit the limited movement of the plate 70 upon the plate 66 necessary to effect the proper operation of the gripping fingers through the cam finger 100. Upon the return stroke of the blank removing device the same will be brought in contact with a V-shaped stop 128 carried by an arm 129 bolted to one of the frame castings as clearly shown in Figs. 18 and 19, said stop coöperating with a member 130 of similar shape carried by the depending member 82 in the proper position to register with said stop 128, the purpose of this device being accurately to position and steady the depending members and the jaw or gripping fingers carried thereby for the reception of the edge of the blank as it is fed into its last operative position.

The machine is driven from the main driving pulley 131 by a belt 132 connected with any suitable source of power. The pulley 131 is carried by a sleeve 133 which rotates on a stub shaft 134, said sleeve carrying a pinion 135. The pinion 135 meshes with a gear 136 on a sleeve 137 loose on a shaft 138 extending across the machine and connected by suitable gearing with shafts 139 for actuating the different devices A, B and C for operating on the blanks. The sleeve 137 carries a pinion 140 which meshes with a gear 141 on a sleeve 142 loose on a stub shaft 143. The sleeves 137 and 142 are thus constantly rotated, the sleeve 137 being adapted by clutching mechanism, not shown, operable through link 144 and hand lever 145, to be connected to shaft 138, to drive devices A, B and C, and the sleeve 142 being adapted by clutching mechanism, not shown, operable through link 146 and foot lever 147 to be connected to a short shaft 148 carrying a crank-wheel 149 for operating a rocking member 150 pivoted at 151 to a bracket 152 bolted on the frame of the machine.

The rocking member 150, which is best shown in Fig. 22, is for the purpose of operating the blank feeding and blank withdrawing means in timed relation. One arm 153 of said rocking member is provided with a longitudinal slot 154, and engaging said slot and adapted to slide therein is a piece 155 which is pivoted to a crank pin 156 of the crank wheel 149 before considered. When, therefore, the crank wheel 149 is rotated the piece 155 will ride back and forth in the slot 154 and the rocking member 150 will be rocked backward and forward by said rotating member 149. At right angles to the slot 154 is another slot 157 in the rocking member 150 the said slot 157 being formed in the arc of the circle whose center is at the pivot 151 of the rocking member 150. The shaft 148 passes through the slot 157, so that when the rocking member 150 is rocked on its pivot 151 said slot 157 will be oscillated over the shaft 148. This not only results in a convenient disposition of the shaft 148 but operates to steady the member 150 in its oscillating movements on its pivot 151. Pivoted to the arm 153 at 158 is a depending arm 159 which carries a rack 160. The arm 159 slides on a raised member 161 on a guide member 162 which is pivoted at 163 to the frame, said arm 159 being additionally guided by plates 164 bolted to the frame and overlapping the rack arm 159, as clearly shown in Fig. 22. The rack bar 159 has a slot in which the raised member

161 on the guide arm 162 registers. As the rack 160 is oscillated by the rocking member 150 it is thus constantly held in engagement with the pinion 47 on the shaft 45 upon which are mounted the drums 49 for operating the feeding devices. It will thus be seen that for each rotation of the crank wheel 149 the rocking member will cause the rack 160 to make a complete reciprocation in each direction thereby rotating the drums 49 backward and forward and effecting a complete feeding movement and return of the feeding devices. The other end of the rocking member 150 has formed directly thereon a segment 165 in an arc having a center at the pivot point 151 and said segment 165 meshes with and drives a gear 166 fast on a shaft 167 mounted in an upright member 168 bolted to the longitudinal frame member 6, the member 168, in addition to furnishing bearings for the shaft 167, providing a mounting for the bracket arms 65 which support a portion of the guideway 64 for the blank withdrawing devices. The shaft 167 carries the drum 75 for actuating the flexible connections 74 and 78 by which the blank removing device is operated. The gear 166 is loose on the shaft 167 and is provided with a clutching member 169 adapted to coöperate with a similar clutch member splined on the shaft 167. These clutch members are held in clutching engagement by means of a nut 170 threaded on the shaft 167. The shaft 167 is provided with a squared end 171 for receiving a removable hand crank. Upon loosening the nut 170 the shaft 167 may, by said crank, be rotated independently of the gear 166, the purpose being to adjust the position of the blank removing device on the guideway 67 to adapt the same for removing blanks of different sizes, the stop 119 being correspondingly adjusted on said guideway.

In the operation of my complete machine, supposing a blank to be in each of the three operative positions of the machine, the operator standing at the front end thereof will place a blank upon the feeding platform A in contact with the positioning stops 25. The operator then presses down on the footlever 147, which clutches the sleeve 142 to the shaft 148, thereby rotating the crank 149. The crank 149 oscillates the rocking member 150, which simultaneously oscillates the drums 49 for actuating the feeding devices and the drum 75 for actuating the blank removing devices, so that simultaneously the blank in the third operative position is removed from the machine, the blank in the second operative position transferred to the third operative position, the blank in the first operative position to the second operative position, and the blank on the feeding platform to the first operative position. When the positioning of the blanks as above indicated has been completed the sleeve 137 will be clutched to the shaft 138 to actuate the series of devices for performing the desired sets of operations upon the blanks, which sequence of operations may be repeated to any extent required.

I claim:

1. In a machine for operating upon blanks, guideways upon which the blanks are moved to successive operative positions, said guideways being formed with interior, longitudinally-extended channels, and means housed and having independent movement in said channels for feeding a blank successively and intermittently to each of said operative positions, said means comprising hooks movable outside of said channels and guideways.

2. In a machine for operating upon blanks, guideways upon which the blanks are moved to successive operative positions, said guideways being formed with interior, longitudinally-extended channels, means housed and having independent movement in said channels for feeding a blank successively and intermittently to each of said operative positions, said means comprising oscillating hooks movable outside of said channels and guideways, and means positively to oscillate said hooks.

3. In a machine for operating upon blanks, guideways upon which the blanks are moved to successive operative positions, said guideways being formed with interior, longitudinally-extended channels, means housed and having independent movement in said channels for feeding a blank successively and intermittently to each of said operative positions, said means comprising hooks pivoted so as to be movable outside of said channels and guideways, and means positively to rock the hooks to bring the same into operative positions above the guideways at the beginning of each feeding movement of the feeding means.

4. In a machine for operating upon blanks, guideways upon which the blanks are moved to successive operative positions, said guideways being formed with interior, longitudinally-extended channels, means housed and having independent movement in said channels for feeding a blank successively and intermittently to each of said operative positions, said means comprising hooks pivoted so as to be movable outside of said channels and guideways, means positively to rock the hooks to bring the same into operative positions above the guideways at the beginning of each feeding movement of the feeding means, and means positively to lower said hooks below the guideways at the beginning of each non-feeding movement of the feeding means.

5. In a machine for operating upon blanks, guideways upon which the blanks

are moved to successive operative positions, said guideways being formed with interior, longitudinally-extended channels, means housed and having independent reciprocating movement in said channels for feeding a blank successively and intermittently to each of said operative positions, means to reciprocate the feeding means, means positively to raise the hooks above the guideways at the beginning of each forward reciprocation, and means positively to lower the hooks below the guideways at the beginning of each backward reciprocation of the feeding means.

6. In a machine for operating upon blanks, guideways upon which the blanks are moved to successive operative positions, means in said guideways for feeding a blank successively and intermittently to each of said operative positions, said means comprising hooks, pivots upon which said hooks are mounted, some of said hooks having bodies extending backward from said pivots and other of said hooks having bodies extending forward from said pivots, all of said hook-bodies comprising forwardly extending projections for feeding engagement with the blanks.

7. In a machine for operating upon blanks, a feeding device comprising guideways, plates mounted for movement in said guideways, an elongated lug on each of said plates, other plates provided with slots through which said lugs project, said slots being longer than the lugs to permit limited movement of the second plates on the first plates, a member secured to each lug to hold the second plate thereon, hooks pivoted between the lugs and holding members, a cam slot in each of said hooks, a slot in each of said holding members, and a pin on each of said second plates projecting through both of said last named slots so that movement of the second plates on the first plates will cause the pins to engage the cam slots on the hooks to raise and lower the same.

8. In a machine for operating upon blanks, a feeding device comprising guideways, plates mounted in said guideways, hooks pivoted to said plates, other plates mounted on said first named plates so as to have a limited movement thereupon, and means on said second plates coacting with the hooks whereby movement of the second plates on the first plates will cause the hooks to rise and fall in timed relation to engage and feed the blanks.

9. In a machine for operating upon blanks, a feeding device comprising guideways, a series of plates mounted in each of said guideways, means connecting the plates of each series, hooks pivoted to said plates, another series of plates mounted on said first named plates so as to have a limited movement thereupon, means connecting the plates of each second series, and means on said second plates coacting with the hooks whereby movement of the second plates on the first plates will cause all the hooks to rise and fall in timed relation to engage and feed the blanks.

10. In a machine for operating upon blanks, a feeding device comprising guideways, plates mounted in said guideways, hooks pivoted to said plates, other plates mounted on said first named plates so as to have a limited movement thereupon, means on said second plates coacting with the hooks whereby movement of the second platse on the first plates will cause the hooks to rise and fall in timed relation to engage and feed the blanks, and means to move the second series of plates and through said second series to move the first series of plates.

11. In a machine for operating upon blanks, a feeding device comprising guideways, a series of plates mounted in each of said guideways, links connecting the plates of each series so they will move in unison, a second series of plates mounted on said first plates so as to have a limited movement thereon, links connecting the plates of said second series so they will move in unison, drums for each guideway, flexible connections from each of said drums to both ends of the second series of plates, and means intermittently to rotate said drums alternately in opposite directions to reciprocate said second series of plates on the first series and through said second series of plates to reciprocate the first series.

12. In a machine for operating upon blanks, a feeding device comprising guideways, a series of plates mounted in each of said guideways, links connecting the plates of each series so they will move in unison, a second series of plates mounted on said first plates so as to have a limited movement thereon, links connecting the plates of said second series so they will move in unison, drums for each guideway, flexible connections from each of said drums to both ends of the second series of plates, and means intermittently to rotate said drums alternately in opposite directions to reciprocate said second series of plates on the first series and through said second series of plates to reciprocate the first series, hooks pivoted on each plate of said first series, and connections between the plates of the second series and the hooks whereby the movement of the second series of plates on the first series in one direction will positively raise all the hooks above the guideways and movement of the second series of plates on the first series in the opposite direction will positively lower all the hooks below the guideways.

13. In a machine for operating upon

blanks, means for intermittently feeding the blanks to successive positions to be operated upon, independent means for gripping and positively removing the blanks from the machine singly and successively after operation in the last position, means for operating the feeding means, means for operating the removing means, and a single rocking member for operating both said operating means.

14. In a machine for operating upon blanks, means for intermittently feeding the blanks to successive positions to be operated upon, means for removing the blanks from the machine after operation in the last position, drums for operating the feeding means, a drum for operating the removing means, and a rocking member for intermittently rotating both sets of drums in opposite directions.

15. In a machine for operating upon blanks, means for intermittently feeding the blanks to successive positions to be operated upon, means for removing the blanks from the machine after operation in the last position, drums for operating the feeding means, a drum for operating the removing means, a gear on each of said sets of drums, a rocking member, a segment fast on said rocking member meshing with one of said gears, a rack bar pivoted to said rocking member and having a rack meshing with the other gear, and means intermittently to rock the rocking member.

16. In a machine for operating upon blanks, feeding means for said blanks comprising guideways, plates in said guideways, other plates mounted on the first plates to have a limited relative movement therewith, means to reciprocate the second plates and through them the first plates, hooks carried by the first plates, means on the second plates to raise and lower the hooks through relative movement of the second plates with respect to the first plates, stops on each of the guideways, stops on the second plates coacting with the stops on the guideways at the end of a complete reciprocation of the second plates so that the same are instantly rendered stationary and the first plates are permitted to move relatively to the second plates by reason of the momentum of said first plates and thereby cause the hooks to be raised.

17. In a machine for operating upon blanks, blank-removing means comprising a guideway, a member movable in said guideway, means carried by said member positively to grip the blanks, and means mounted on said member to have a limited movement thereon and to move the movable member along the guideway, said limited movement of the means on the movable member operating to cause the gripping means to grip the blanks.

18. In a machine for operating upon blanks, blank-removing means comprising a guideway, a plate mounted for movement in said guideway, gripping means carried by said plate, an elongated lug or extension on said plate, a second plate having a slot longer than the lug, said lug registering in the slot so that the second plate is mounted on the first plate to have a limited movement thereon, means to move the second plate and thereby to move the first plate, and means carried by the second plate whereby movement of the same on the first plate will cause the gripping means positively to grip the blank.

19. In a machine for operating upon blanks, blank removing means comprising a guideway, a plate mounted for movement in said guideway, a second plate mounted on said first plate to have a limited movement thereon, a depending member carried by the first plate, fingers or dogs pivoted on said depending members, means movable on the depending member to move one dog relatively to the other to cause the dogs to grip a blank, and means on said second plate whereby movement of the second plate on the first plate will operate the dog-operating member.

20. In a machine for operating upon blanks, blank removing means comprising a guideway, a plate mounted for movement in said guideway, a second plate mounted on said first plate to have a limited movement thereon, a depending member carried by the first plate, fingers or dogs pivoted on said depending member, means movable on the depending member to move one dog relatively to the other to cause the dogs to grip a blank, means on said second plate whereby movement of the second plate on the first plate will operate the dog-operating member, a spring normally to hold the dog-operating means in inoperative position, means carried by said dog-operating means to lock the same in its operative position after movement of said means on the depending member has caused the dogs to grip a blank, until said blank is removed from the machine, and means on the guideway coöperating with said locking means at the end of the movement of the blank withdrawing means to positively return the dog-operating means to inoperative position and release the blank.

21. In a machine for operating upon blanks, a pair of guideways each connected with frame members of the machine and being relatively adjustable therewith upon which the blanks are moved to successive operative positions, and means working in said guideways for feeding a blank successively and intermittently to each of said operative positions.

22. In a machine for operating upon blanks, a pair of guideways each connected

with frame members of the machine and being relatively adjustable therewith upon which the blanks are moved to successive operative positions, means working in said guideway for feeding a blank successively and intermittently to each of said operative positions, and independent means for positively removing each blank from its last operative position on said guideway and carrying the same outside of the machine.

23. In a machine for operating upon blanks, integral guideways upon which a series of blanks are each moved to successive operative positions, said guideways being formed with interior, longitudinally-extended channels, and means housed and working intermittently in said channels for positively moving the blanks of said series independently and simultaneously to each of said operative positions.

24. In a machine for operating upon blanks, a blank withdrawing device comprising a trackway and depending member supported therefrom, means to reciprocate said device, coöperating fingers or dogs on said member, means to cause the fingers to grip a blank at the beginning of the blank-withdrawing movement, means to cause the fingers to release the blank at the end of said movement, and a stop on the machine for positioning the member and the gripping fingers to receive another blank at the end of the return movement of the withdrawing device.

25. In a machine for operating upon blanks, a blank withdrawing device, gripping fingers on said device, a movable member for operating said fingers, a movable cam-finger for operating said member, a catch on said movable member with which the cam-finger coöperates to move the member and lock it in operative position, a trip coöperating with said catch normally to hold it in locking position, and means to operate the trip first to move the catch into non-locking position and then positively to restore the movable member to inoperative position.

26. In a machine for operating upon blanks, a blank withdrawing device comprising an arm, gripping fingers mounted on said arm, a cam-plate movable on the device to operate the fingers and cause them to grip a blank, a locking catch pivoted to said cam-plate, a trip on said cam-plate coöperating with said catch, a spring normally to hold the catch against the trip, a cam-lug adjustably mounted on the arm in spaced relation to the catch, a movable cam-finger, and means to move said finger between the cam-lug and the catch and thereby cause the cam-plate to operate the gripping fingers.

27. In a machine for operating upon blanks, a blank withdrawing device comprising an arm, gripping fingers mounted on said arm, a cam-plate movable on the device to operate the fingers and cause them to grip a blank, a locking catch pivoted to said cam-plate, a trip on said cam-plate coöperating with said catch, a spring normally to hold the catch against the trip, a cam-lug adjustably mounted on the arm in spaced relation to the catch, a movable cam-finger, means to move said finger between the cam-lug and the catch and thereby cause the cam-plate to operate the gripping fingers, an arm on the trip, and a fixed cam with which said arm is adapted to coöperate, whereby movement of the withdrawing device will cause the fixed cam to operate the trip, first to throw the locking catch from beneath the cam finger and then positively to restore the cam-plate to inoperative position and release the blank from the gripping fingers.

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

JOHN E. ERICKSON.

Witnesses:
H. A. BOWMAN,
F. A. WHITELEY.