Feb. 18, 1947. E. BRAUN 2,415,866

PUNCHING DEVICE

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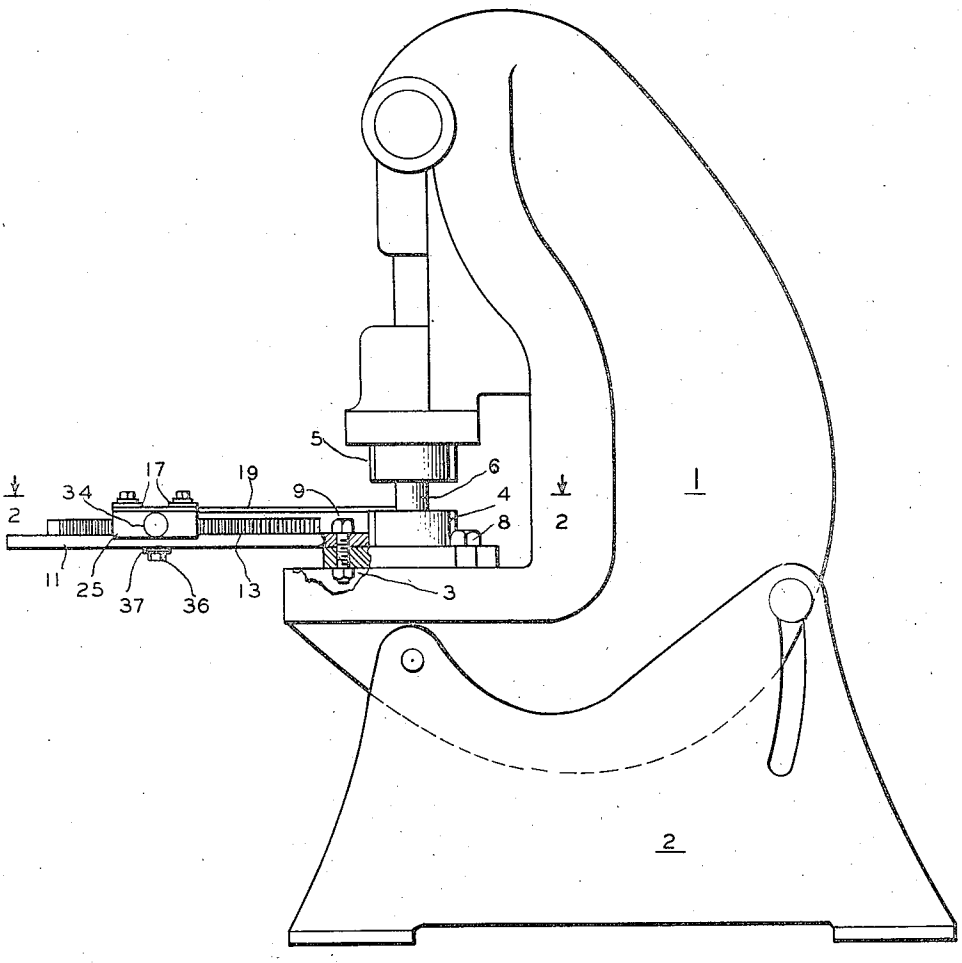
FIG. 1



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PUNCHING DEVICE

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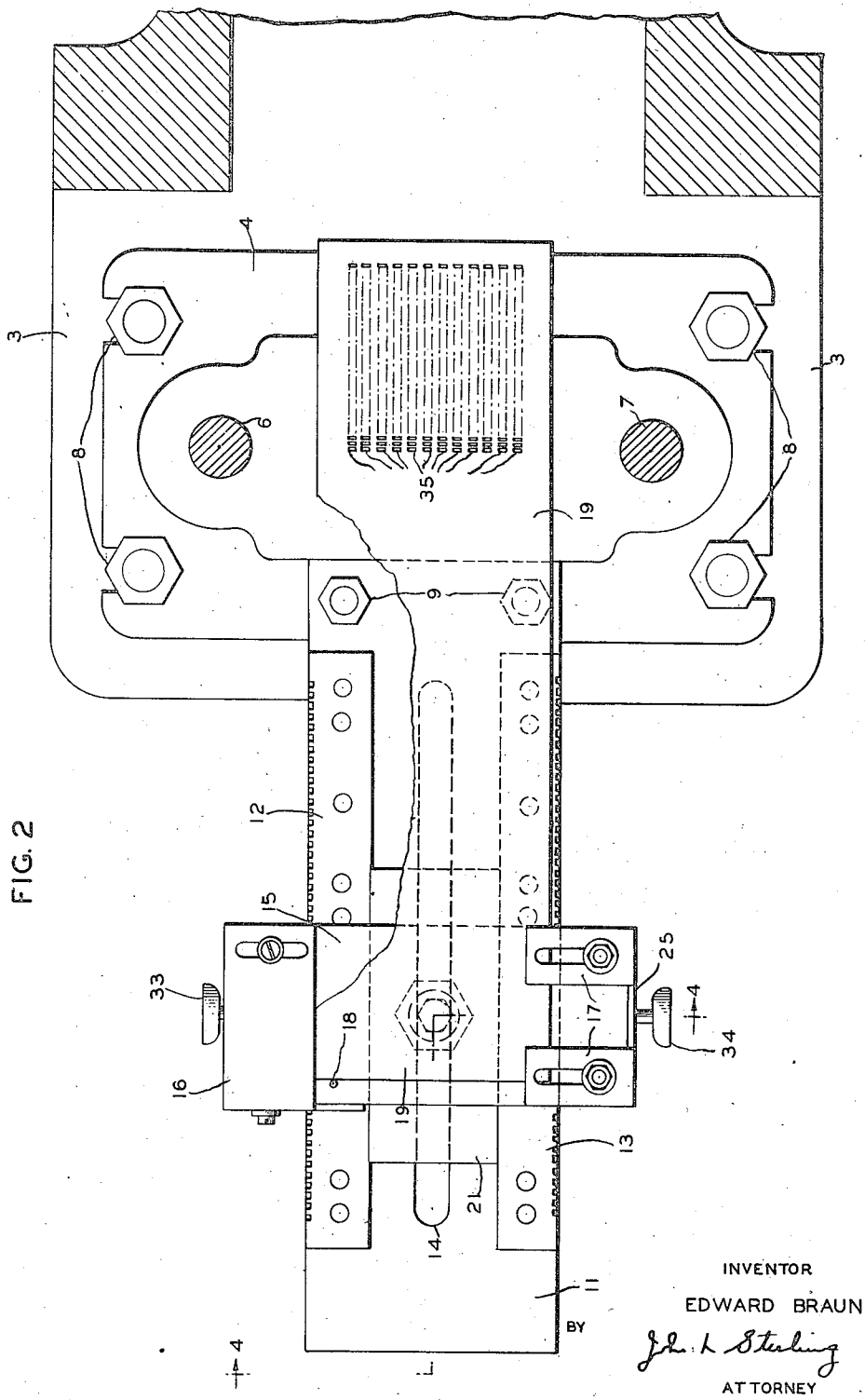

FIG. 2

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FIG. 3

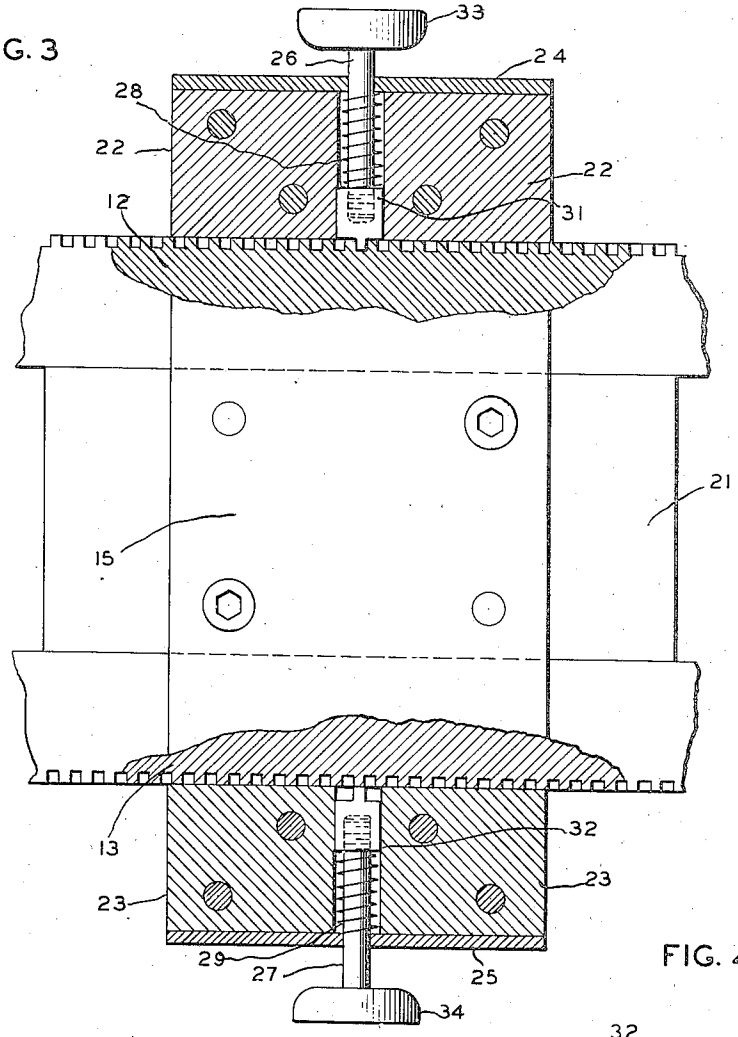
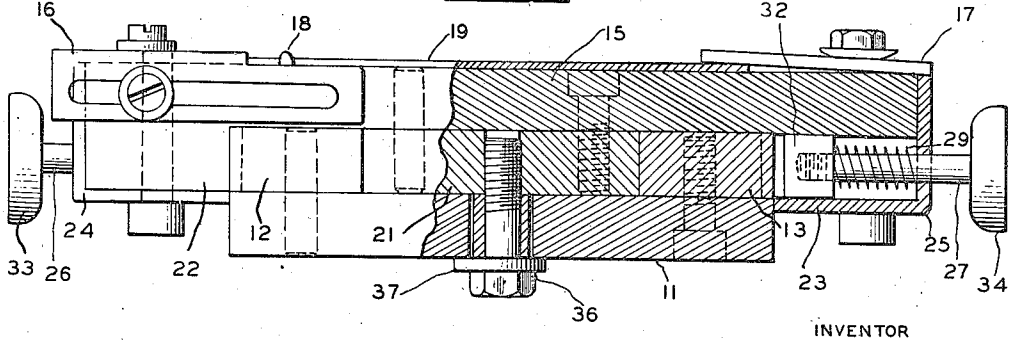


FIG. 4



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UNITED STATES PATENT OFFICE

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PUNCHING DEVICE

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5 Claims. (Cl. 164—116)

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This invention relates to feeding mechanisms, and more particularly to fixtures for feeding, in successive stages, material to a machine having relatively movable members such as a punch press or the like.

The within disclosure reveals the invention in an embodiment thereof especially adapted for feeding a metal strip between the punch and die members of a standard power punch press for making perforations therein in precisely predetermined positions. The invention is regarded as being particularly useful in meeting the problem encountered in the production of multi-perforated plates, wherein the provision of means for a complete stamping out of the several perforations in one punching operation would be impracticable. An example of this problem is presented in the production of guide or stripper plates for use in mechanically controlled punch card business machines. Several of such plates of varying size and design are required in the manufacture of various types of such machines, and it is essential, for the machines' proper operation, that such plates be produced with an extremely high degree of accuracy. Among other types there are known feeds adapted for operations wherein the blanks stamped out from the stock are the desired product of the operation and, accordingly, the relative position of such perforations to the stock from which they are cut and which is to be discarded is not of utmost importance. Positive feeds by devices wherein the intent is to obtain an accurately punched sheet are also known to the art. In this type of feeding operation, the relative position of the several perforations to each other and to the stock becomes of paramount importance, and the accuracy thereof in the product becomes entirely dependent on the accuracy with which the stock is fed to the punches. So far as known to the applicant, a feed of sufficient accuracy for the purposes hereinbefore described could be achieved only with mechanisms utilizing pilot pins manually positionable in guide holes or with devices of relatively complex and correspondingly expensive construction, the expense of which becomes a material factor in work requiring a large variety of spacings. The pilot pin mechanisms, in addition to being time consuming, also often necessitates the discard of a considerable amount of the stock. The object of this invention is to improve feeding mechanisms by providing a device of simplified structure and operation adaptable for close spacing work requiring a degree

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of precision heretofore attainable by less expeditious and economical means.

The present embodiment of the invention herein disclosed comprises a base member which is firmly secured in fixed relation to the punch and die members of the press, and a carriage member for holding the stock and movable to a plurality of definite fixed positions in relation to said base member. For this purpose the base member is provided with two carriage racks, each having square cut teeth of the same pitch, said pitch being double that between resultant successive rows of perforations. Said carriage racks serve the dual function of guiding the movement of the carriage member within a path coincident with that defined by said racks, and of positioning the carriage member in a plurality of close spaced positions within said path through cooperative engagement with the teeth thereof by a pair of spring urged toothed plungers provided therefor in said carriage member. The construction is such that only one of said toothed plungers is in engagement with its cooperating rack in any one fixed carriage position, in which position the other toothed plunger abuts the top land of a tooth of its cooperating rack. The manual release of the engaging toothed plunger permits movement of the carriage only to a point where said other toothed plunger can slide off the top land of its abutting rack tooth to be spring urged into the indenture between two successive teeth, and to thereby position the carriage in its next successive fixed position. The manual release of this other toothed plunger again permits movement of the carriage to a point where said first mentioned engaging toothed plunger can again mesh with its cooperating rack to retain the carriage in another fixed position, and as the feeding operation continues the carriage is thus successively positioned during its course of movement by the alternate engagement of said toothed plungers with their cooperating carriage racks.

The provision of said two carriage racks with teeth spaced for alternate engagement with the two toothed plungers, is one feature of the invention which has the advantage of permitting the rack teeth to be of a pitch twice that of the desired pitch between the cuttings in the stock, the larger meshing teeth providing a correspondingly greater length of aligning contacting surfaces.

A further advantage inherent in the invention arises from the manner of operation which is semi-automatic, thereby eliminating much of the

possibility of human error of skipping or otherwise causing a misplaced perforation to be cut in the stock, while at the same time permitting a wide flexibility of uses to which it may be put, more specifically described hereinafter, not possible with a completely automatic device.

A clearer concept of the invention, together with further features and advantages therein apparent, may be had from a description of the drawings, in which

Fig. 1 is a side elevation view of the device and a power press to which it is attached;

Fig. 2 is a plan view along line 2—2 of Fig. 1;

Fig. 3 is a plan view of the stock carriage with portions of top surface cut away, and

Fig. 4 is a front elevation view partly in section along line 4—4 of Fig. 2.

As appears in Fig. 1, the device embodying the present invention is shown affixed to a standard model inclinable open back press, having the usual body 1 pivotally mounted on a base structure 2, and with the usual bed plate 3, to which is firmly secured by bolts 8 a die holder 4 with center guide posts 6 and 7 for aligning a punch holder 5 adapted to reciprocate in relation thereto in the usual manner as is well known to the art. The feeding device is provided with a rectangular base member 11 with suitable means for firmly securing one end thereof to a stationary member of the press, such means, in the present disclosure, being bolts 9 projecting through holes in said base member and corresponding holes in the die holder 4. In this manner the feeding device is held in fixed relationship to the body of the press, and caused to project forward in a plane perpendicular to the path of reciprocation of the punch holder, wherein the manual motions involved in operating the device may be performed by the operator a safe distance from the press and its exposed movable members.

As can be best seen in Figs. 2 and 4, extending along each side of base member 11, and secured to its upper surface, is a pair of racks 12 and 13, each of which has square cut teeth of the same pitch. Said racks are aligned with the side edges of the base member 11, and their exposed upper and inner faces are carefully machined to provide smooth bearing surfaces for engagement with similar cooperating bearing surfaces of the carriage member of the device. The stock carriage includes a carriage table 15 consisting of a flat rigid rectangular member resting upon and its ends projecting laterally beyond the carriage racks 12 and 13. The top surface of the carriage table furnishes supporting means for securing the stock 19 to be fed, and for that purpose is provided with an adjustable squared plate 16 to facilitate positioning of the stock in relation to the table. Clamps 17 are provided to overlap the stock and thus hold it immobile with respect to the carriage table. A guide pin 18 may also be provided to further facilitate the positioning of the stock, preferably in particular modes of operation, as will be hereinafter described.

To the underside of the carriage table 15, as best seen in Figs. 3 and 4, is secured a guide block 21 closely fitted to slide between the inside opposing surfaces of the carriage racks 12 and 13. Also secured to the underside of the carriage table, at one end thereof, is a plunger housing comprising a pair of plunger guide blocks 22 spaced apart to provide two bearing surfaces for a reciprocating plunger head 31. Said plunger head is of rectangular shape and formed with a single square cut tooth for engagement with similarly shaped teeth, as aforementioned, in the carriage rack 12. Enclosure of the plunger housing is completed by an angle plate 24 providing a bottom bearing surface for the plunger head 31, with its bent side portion containing a bearing for the plunger stem 26. A compression spring 28, fitted between the plunger head and the angle plate, normally urges the tooth of the plunger into engagement with rack 12, a knob 33 being provided to permit manual disengagement therefrom. A similar plunger assembly is provided at the opposite end of the carriage table, and is comprised of plunger guide blocks 23, angle plate 25, toothed plunger head 32 with a stem 27, and a knob 34 under tension of compression spring 29.

Plunger head 31 (Fig. 3) is shown as being in a carriage retaining position, plunger head 32 in a carriage non-retaining position. It is apparent that manual release of plunger head 31 will allow carriage movement only to the position where the tooth of plunger head 32 slides off the top land of the abutting rack tooth to thereby engage rack 13 and automatically prevent further carriage movement.

A bolt 36 threaded into the underside of guide block 21, and projected through a slot 14 in the base member 11, carries a washer 37 and is tightened to a degree of tension so as to prevent only vertical displacement of the stock carriage 15 in relation to said base member. From the foregoing it can be seen that the stock carriage is effectively restrained from any motion in relation to the base member in a direction other than that defined by the channel formed by the two carriage racks 12 and 13, in which path of travel it is capable of being retained in a plurality of fixed positions equal to the total number of teeth in both carriage racks.

The operation of the mechanism is semi-automatic, in that the motivating force for moving the carriage is furnished manually by the operator, while the means for positioning the carriage in the course of its movement is automatically performed by the spring action of the toothed plungers. This combination of operating means permits a flexibility of operation without sacrificing the precision possible in a purely manually operated feed or much of the rapidity possible in a more fully automatic feed device. This result is made possible through the cooperative use of the two racks 12 and 13 for positioning the stock carriage. It will be noted that their arrangement permits the teeth of each rack to be of a pitch twice that of the pitch of the resultant perforations and, accordingly, they can be cut, especially when intended for small pitch feed, with much greater accuracy, strength and resistance to wear than if they were of the same pitch as that of the resultant perforations. Likewise, by positioning the carriage by the locking action of only one of said toothed plungers, the other plunger becomes available to serve as an automatic brake for positively arresting the movement of the carriage in its next fixed punching position.

In describing the operation of the device, the following examples are explained on the basis of the normal feed progressing in a forward to rearward direction, and it should be understood that the same types of operations could be performed with the feed progressing in a rearward to forward direction, such being optional in all cases with the will of the operator. With the carriage in its most forward starting position, one end of the stock 19 is firmly secured to the carriage table

15 by clamps 17, the other end extending beyond the carriage and being interposed between the punch and die. It is, of course, apparent that any carriage position could be a starting position, depending upon the length of the stock and the relative location in the stock at which the first stamping is desired. Likewise, it is apparent that punches and dies of any shape or design may be utilized, those disclosed herein for purposes of illustration being designed to stamp out a group of twelve rectangular perforations evenly spaced in a row perpendicularly transverse to the line of feed. If it is desired to cut out the stock in a successively evenly spaced series of such rows of perforations, such as 35 (Fig. 2), the feeding is accomplished by first initiating a punching cycle in the carriage starting position, releasing the engaging toothed plunger, and urging the carriage rearward until the opposing plunger springs into engagement with its rack, initiating a second punching cycle, then releasing said opposing plunger, and urging the carriage further rearward until the first mentioned plunger again engages its rack, and so on until, by the successive alternate engagement and release of the two opposing toothed plungers, the required number of punchings in the stock are completed. If the operation requires even spacing of perforations of a pitch larger than that resulting as above described, the feed could progress by eliminating the punching cycle in every carriage position determined by one of said toothed plungers, or, if an evenly spaced series of perforated rows was not desired, any one or any number of fixed punching positions could be passed by, any of which modes of operation, however, gives positive assurance that for any given length of stock each cutting therein will retain its exact relative position to each other, regardless of the number of cuttings made therebetween. In the preferred method of such operation the stock to be fed would be of a length at least double the length desired in the finished product. By so providing, the stock may be reversed in the device upon completion of perforations for one finished product with the perforated end now clamped to the table 15 and the former supporting end in position to be fed. The stock would be cut off to desired lengths upon completion of the perforations therein, and in this manner the device permits utilization of a larger portion of the stock, and reduction of the amount of scrap resulting from such operations to a minimum. For operations wherein a series of perforations is desired in a continuous length greater than the path of travel of the stock carriage, the press may be stopped with the punches in depressed position at which time the carriage at its rearward limit of movement, may be released from the stock, withdrawn to its frontmost position, and again secured to the stock to resume the feeding operation, in so doing, maintaining the same relative pitch between all the perforations. Some operations might call for cutting successive rows staggered in relation to each other. For this mode of operation a guide pin 18, protruding from the carriage table 15, would be preferably employed to cooperate with guide holes drilled through the supporting end of the stock a distance apart equal to the stagger pitch desired. To stagger alternate successive rows the stock, while aligned by one of said guide holes, would be fed with a punch cycle initiated only in carriage positions determined by one of the toothed plungers and its associated rack, after which the carriage would be returned to starting

position, the stock realigned in the other of said guide holes and again fed with the punch cycle initiated only in the carriage positions determined by the other of said toothed plungers and its associated rack. Should it be required to stagger rows other than alternate ones, the feed may be manually regulated accordingly, or, should a stagger be required between more than two relative positions, additional guide holes may be drilled in the stock for that purpose.

The above description of some of the various modes of operation in which the mechanism may be used is mentioned herein, not with intent to be all inclusive in that respect, but rather, to suggest the wide flexibility of uses to which the device may be put, in whichever of said uses, however, it becomes apparent that the provision of positive positioning means in the cooperation between the plungers and the racks insures that the distance between the stampings in the stock effected in any two fixed carriage positions remains the exact same distance without regard to the number or spacings of stampings therebetween, and that the same relative positions will be accurately retained in each piece of stock subsequently fed by the device.

While I have described what I consider to be a highly desirable embodiment of my invention, it is obvious that many changes in form could be made without departing from the spirit of my invention, and I, therefore, do not limit myself to the exact form herein shown and described, nor to anything less than the whole of my invention as hereinbefore set forth, and as hereinafter claimed.

What I claim as new and desire to secure by Letters Patent is:

1. A feeding mechanism comprising a stationary base member, a carriage member having means for securing stock to be fed, a plurality of doubly squared toothed racks secured to said base member and adapted to guide the movement of said carriage member, and a plurality of yieldingly withdrawable plungers mounted in said carriage member, each of said plungers being rectangular toothed and singly engageable by the teeth of a cooperating rack in separate positions of said carriage member.

2. A feeding mechanism comprising a stationary base member, a manually movable carriage member, means for securing to said carriage member stock to be fed, a plurality of doubly squared toothed racks secured to said base member and adapted to guide the movement of said carriage member along said base member, and separate doubly squared toothed plungers yieldably mounted in said carriage member and singly engageable with a cooperating rack so as to positively position said carriage member in separate carriage positions in accordance with the position of the teeth in each of said plurality of racks.

3. A feeding mechanism comprising a flat supporting base member, a pair of rectangular toothed racks extending parallel along one surface of said base member, a carriage member slidably mounted for movement in the channel formed by said racks and base member, means for retaining said carriage member within said channel, and a separate rectangular toothed plunger for each of said racks yieldably mounted in said carriage member to bear on and to singly engage with the toothed surface of a cooperating rack so as to positively position said carriage member within said channel in accordance with the positions of the teeth in each of said racks.

4. A feeding mechanism comprising a stationary base member, a stock carrying carriage slidably mounted on said base member, a plurality of rectangular toothed plungers yieldably mounted in said carriage, and a pair of rectangular toothed racks integral with said base member, said racks disposed to provide bearing surfaces for guiding the movement of said carriage and each having teeth arranged to alternately engage with said plungers in successive carriage positions.

5. In a device for feeding material in precisely predetermined successive lineal steps, the combination with a stationary base member and a movable carriage member constrained to be moved in a defined path with respect thereto, of a pair of carriage positioning racks adapted to define said path of movement for said carriage member and provided with doubly squared teeth of a pitch twice the length of one of said predetermined steps, and separate yieldingly withdrawable toothed plungers mounted in said carriage member, each alternately and automatically engageable with the teeth of its corresponding rack upon carriage advance of a distance equal to one of said predetermined lineal steps.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,986,983	Sime	Jan. 8, 1935
713,962	Christie	Nov. 18, 1902
769,020	Reynders	Aug. 30, 1904
934,672	Kilgore	Sept. 21, 1909
1,524,905	Birdsall	Feb. 3, 1925
1,775,359	Thomas	Sept. 9, 1930
1,796,939	Pollasky	Mar. 17, 1931
828,546	Hart	Aug. 14, 1906
732,517	Christie	June 30, 1903
1,875,080	McClintic	Aug. 30, 1932
735,085	Gilbert	Aug. 4, 1903

FOREIGN PATENTS

Number	Country	Date
107,430	Swiss	Nov. 1, 1924
662	British	Mar. 29, 1858
237,254	German	Aug. 5, 1911