

Jan. 14, 1941.

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2,228,746

COMBINED FEEDING AND COLD DRAWING MECHANISM

Filed June 27, 1938

5 Sheets-Sheet 1

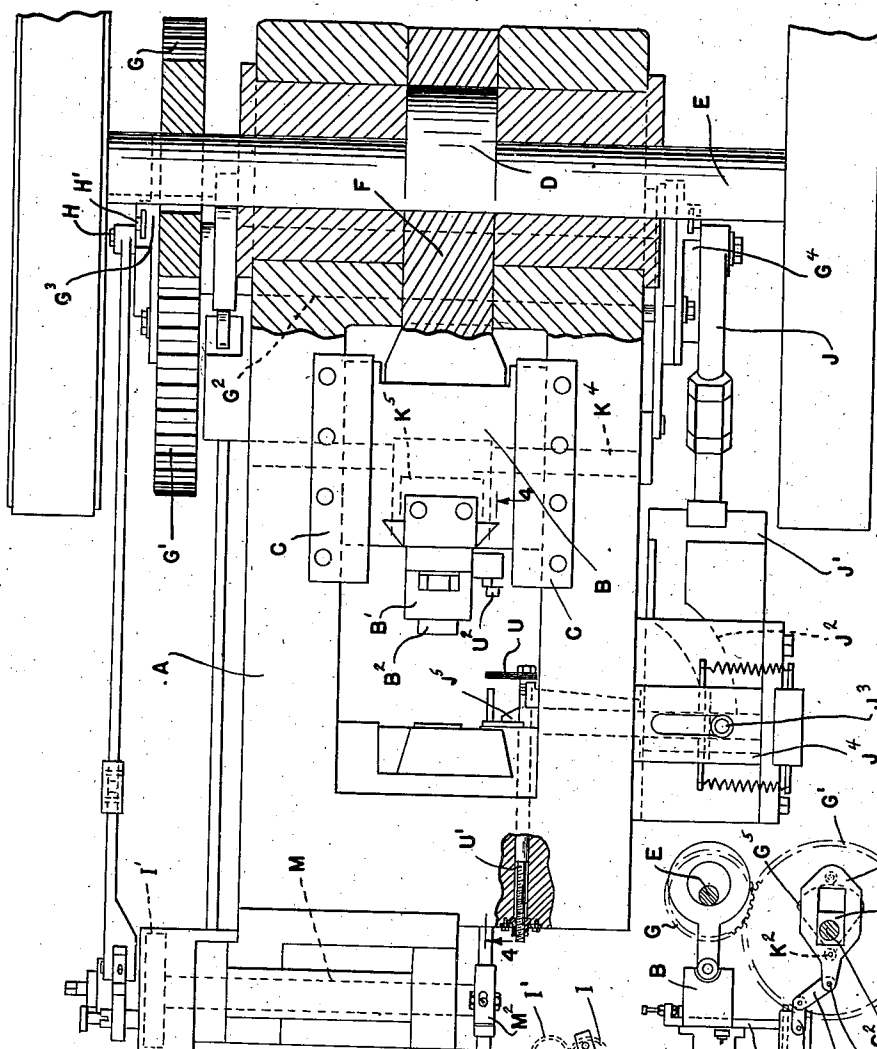


FIG. 1.

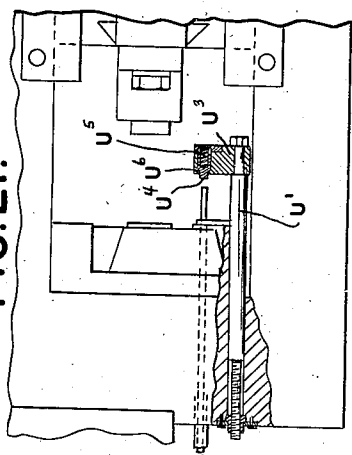


FIG. 21.

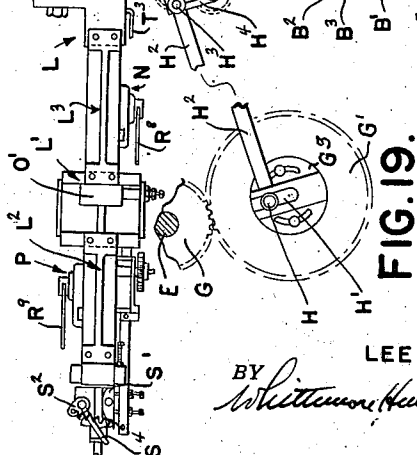


FIG. 19.

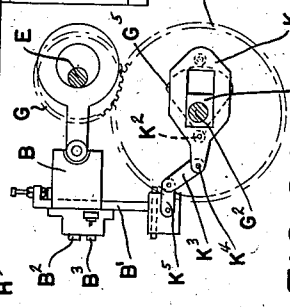


FIG. 20.

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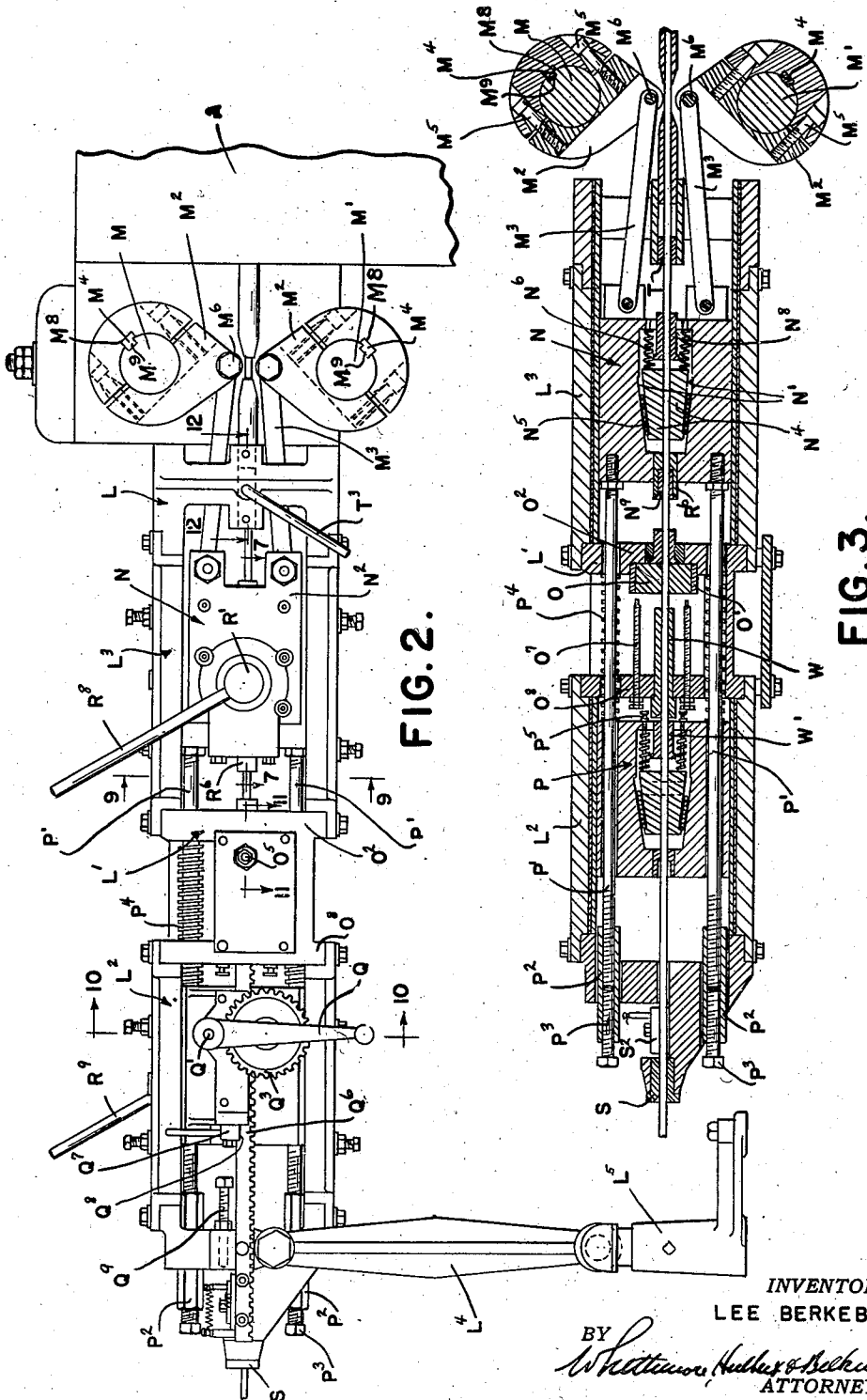
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COMBINED FEEDING AND COLD DRAWING MECHANISM

Filed June 27, 1938

5 Sheets-Sheet 2



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COMBINED FEEDING AND COLD DRAWING MECHANISM

Filed June 27, 1938

5 Sheets-Sheet 3

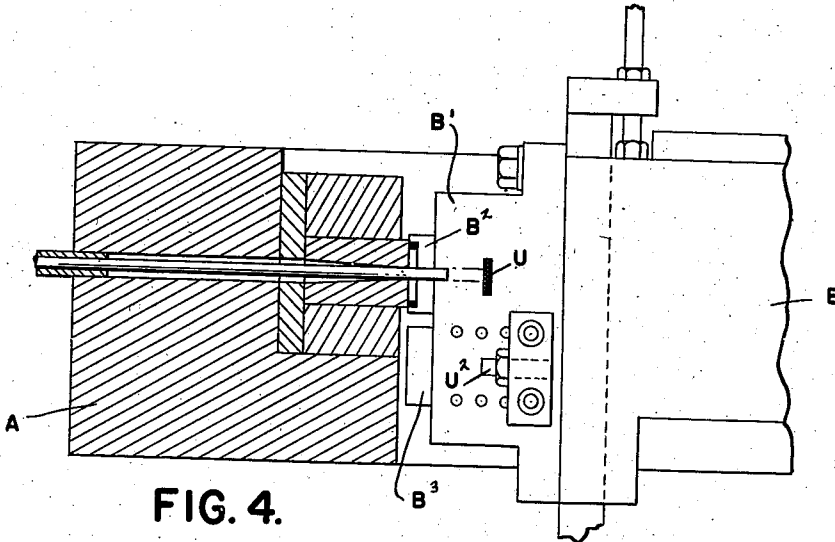


FIG. 4.

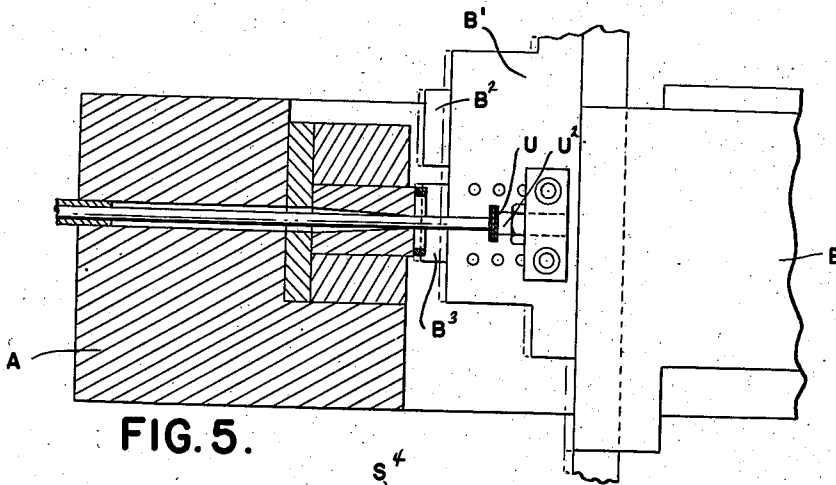


FIG. 5.

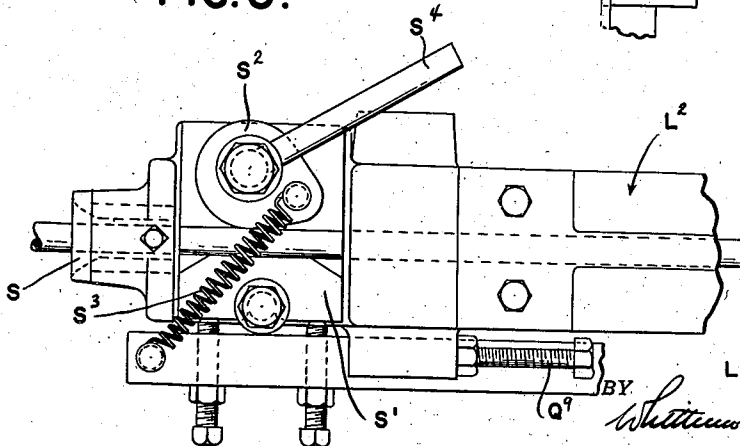


FIG. 6.

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COMBINED FEEDING AND COLD DRAWING MECHANISM

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5 Sheets-Sheet 4

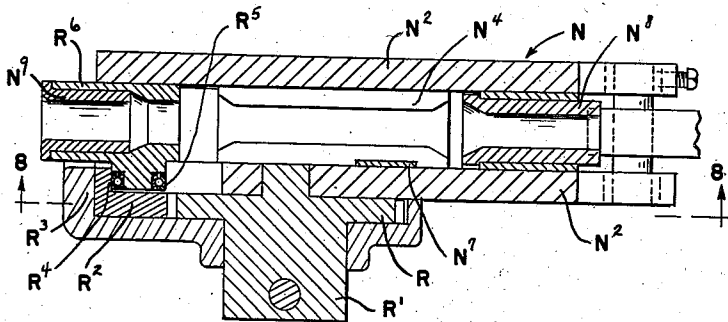


FIG. 7.

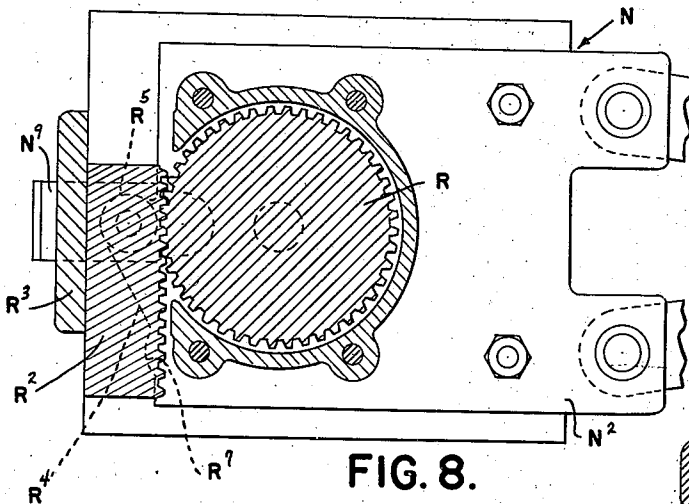


FIG. 8.

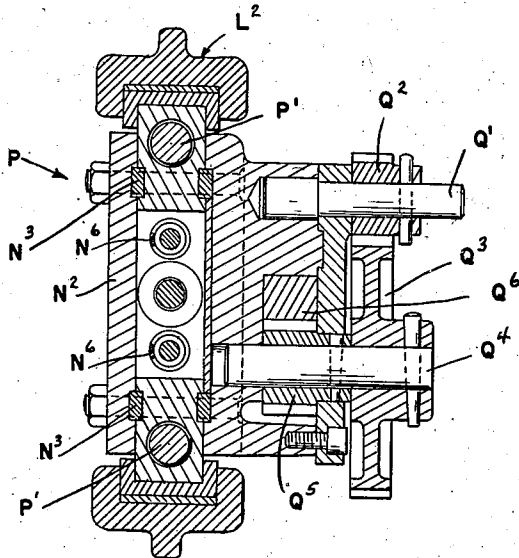


FIG. 10.

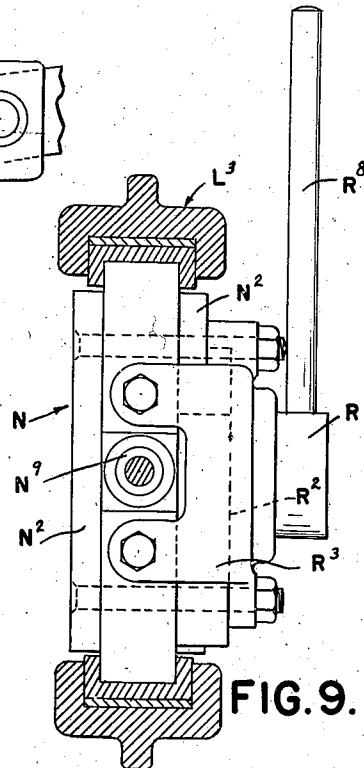


FIG. 9.

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COMBINED FEEDING AND COLD DRAWING MECHANISM

Filed June 27, 1938

5 Sheets-Sheet 5

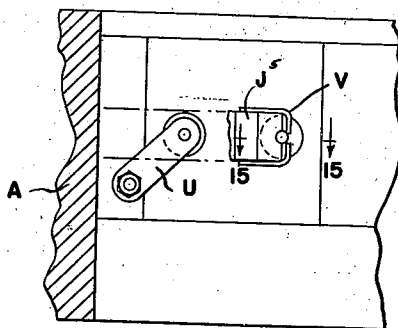
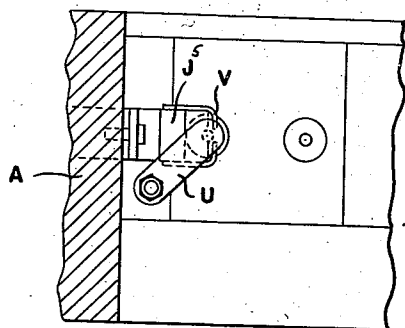
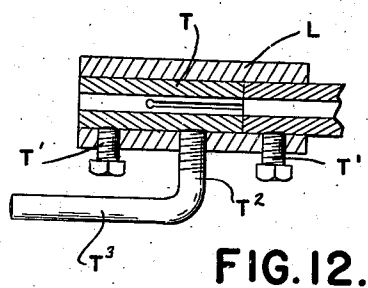
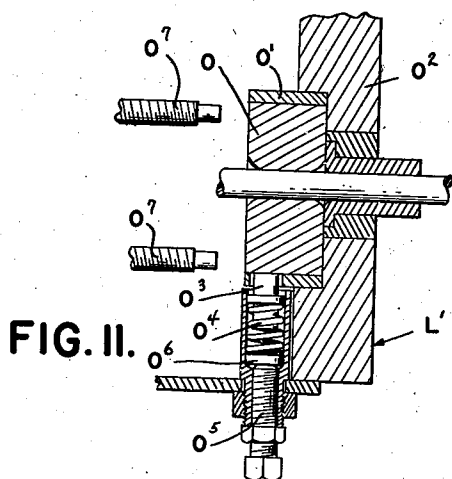


FIG. 13.

FIG. 15.

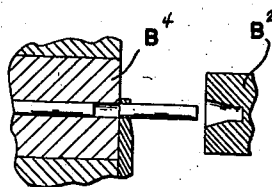


FIG. 16.

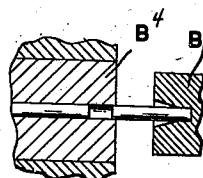


FIG. 17.

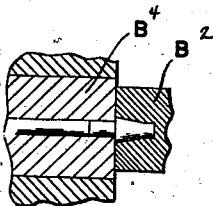


FIG. 18.

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2,228,746

COMBINED FEEDING AND COLD DRAWING
MECHANISM

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Application June 27, 1938, Serial No. 216,134

40 Claims. (Cl. 205—3)

The invention relates to heading machines and the like and has for its object the obtaining of an improved construction which facilitates operation and functions with greater accuracy in the performance of its work. It is a further object to obtain a construction which may be used as an attachment to standard heading machines to improve the performance thereof. With these objects in view, the invention consists in the construction as hereinafter set forth.

In the drawings:

Figure 1 is a sectional plan view of a heading machine to which my improvements are applied;

Figure 2 is a side elevation of the feeding mechanism;

Figure 3 is a vertical central longitudinal section therethrough;

Figure 4 is an enlarged vertical longitudinal section on line 4—4 of Figure 1;

Figure 5 is a similar view showing the parts in a different position of adjustments;

Figure 6 is an enlarged plan view of a portion of Figure 1;

Figure 7 is an enlarged horizontal section on line 7—7 of Figure 2;

Figure 8 is a vertical section on line 8—8 of Figure 7;

Figure 9 is a cross section on line 9—9 of Figure 2;

Figure 10 is a cross section on line 10—10 of Figure 2;

Figure 11 is an enlarged horizontal section through the sizing die, on line 11—11 of Figure 2;

Figure 12 is a horizontal section on line 12—12 of Figure 2;

Figures 13 and 14 are end elevations of the cut-off and transfer means for the blank;

Figure 15 is a section on line 15—15 of Figure 14 showing the heading mechanism;

Figures 16, 17 and 18 are similar views illustrating successive steps in the heading operation;

Figures 19 and 20 are diagrams illustrating the operating and timing mechanism;

Figure 21 is a plan view of a portion of Figure 1 showing a modified construction.

My improvements are applicable to various types of heading machines and the like and may also be used as attachments or replacements on machines of different constructions. I will, therefore, describe only in a general way one type of heading machine to which my improvements may be applied. As shown in Figure 1, A is the bed or frame and B a reciprocating head slid-

ably engaging ways C and actuated by a crank or eccentric D on the main driving shaft E, through the medium of a connecting rod F. On the head B is mounted a vertically reciprocating slide B' which carries a plurality of heading dies B², B³. The stock for forming the blanks is advanced in a plane laterally offset from the plane of the dies B², B³. It is then cut off in predetermined lengths and the blanks thus formed are transferred into the plane of the dies to be successively operated upon thereby. The mechanism for accomplishing these functions includes a gear wheel G on the shaft E which drives an intermeshing gear wheel G' in a 1 to 2 ratio. The gear wheel G' is upon a shaft G² which extends transversely of the bed parallel to the shaft E. At opposite ends of the shaft G² are variable throw cranks G³ and G⁴; the one for operating the stock feeding mechanism, and the other for operating the blank shearing and transfer mechanism. There is also a cam G⁵ on the shaft G² which operates a mechanism for actuating the slide B' so as to alternately place the dies B² and B³ in registration with a cut-off blank in its transferred position. More in detail and as shown in Figure 19, the crank G³ is provided with a crank pin H, which is adjustable radially in a slot H' to increase or diminish the throw thereof. A rod H² connects this crank pin with an adjustable pin H³ on the lever H⁴ for oscillating a gear wheel I, the arrangement being such that for two revolutions of the crankshaft E one revolution is imparted to the crank G³. Also, the length of the arc through which the gear wheel I is oscillated may be varied by adjustment of the crank pins H and H³. This gear wheel forms a part of my improved stock feeding and drawing mechanism which will be hereinafter described.

The crank G⁴ is connected by a rod J with a slide J' which has a cam slot J² engaging a pin J³ on a transversely movable slide J⁴. The slide J⁴ actuates the shearing and transfer member J⁵ as will be later described.

The mechanism for operating the slide B' is shown in Figure 20 and comprises a slotted member K slidably mounted on a bearing K' on the shaft G² and reciprocated by the cam G⁵ which engages rollers K² on said member K. The member K is connected to a rock arm K³ on a rock-shaft K⁴, which extends transversely of the bed and has a rock arm K⁵ connecting the same with the slide B'. The cam G⁵ is so fashioned as to intermittently actuate this mechanism to raise and lower the slide B' with a dwell at each end of the movement thereof.

The construction thus far described is, as above stated, only one form of heading machine to which my improvements may be applied, the general functions performed by this machine being: 5 the intermittent advancement of the stock; the shearing off of predetermined lengths thereof; and the transfer of the sheared blanks into the plane of the dies which successively operate thereon. My improvements, however, relate to 10 the mechanism through which the stock, preferably hot-rolled, is straightened; passed through a sizing die, and advanced to the shearing and transfer mechanism, the construction being as follows.

15 Connected to the bed A and arranged in a vertical plane which is laterally offset from the plane of the dies B², B³ is a frame L. This frame is formed in several sections including a central die-holding section L' and sections L² and L³ on 20 opposite sides thereof which constitute slideways for stock feeders. The outer end of the frame is also floatingly supported by a pivotal link member L⁴ which rises from a supporting base L⁵. The stock is advanced through the frame L 25 in a direction from left to right, Figures 1 to 3, and for convenience in description, I will designate the portion to the right as forward and that to the left as rear.

30 Extending across the bed A and the forward end of the frame L are a pair of shafts M and M' which are in the same vertical plane and are connected to each other at one end by the intermeshing gear wheels I and I' fixed to the respective shafts. In central alignment with the frame 35 L are rock arms M² which are connected by links M³ with a sliding head N forming the forward feeder. As this feeder has heavy work to perform it is quite essential that the links M³ should be properly aligned so that the direction of pull will 40 be parallel to the slideways and with no tendency to tilt the slide N therein. Inasmuch as the shafts M and M' are driven through the medium of intermeshing gear wheels, it is necessary that the rock arms M² should be very accurately positioned on said shafts to produce this parallel 45 movement of the links M³ and head N. This is accomplished by first connecting each rock arm to its shaft through the medium of a key M⁴ having a wide portion M⁵ engaging the keyway in the rock arm and a narrow right angularly extending portion M⁶ engaging a keyway in the shaft. Thus 50 by reversing the key M⁴ the rock arm will be circumferentially adjusted upon the shaft a distance equal to the variation in widths of the portions M⁵ and M⁶. Further and more accurate angular adjustment is accomplished by forming the rock arm in two sections embracing the shaft and 55 connected to each other by clamping screws M⁵. Sufficient clearance is provided between the adjacent faces of these sections, so that by loosening one screw and tightening the other, one section may be angularly adjusted with respect to the other. The section which has the pivot pin 60 M⁶ connecting with the link M³ is the adjustable section, while the other section contains the key M⁴ for attachment to the shaft. Thus by means of these two adjustments the required accuracy and positioning of the rock arms may be accomplished.

70 The slide head N of the forward feeder has spaced upper and lower portions forming wedge surfaces N' which taper from forward to rear. These portions are held in rigid elation to each other by side plates N² and splines N³, N⁴ are 75 clamping jaws within the recess and having their

outer surfaces parallel to the surfaces N' with rollers N⁵ arranged therebetween. The jaws N⁴ embrace the stock which is to be fed and during the forward movement of the head N the resistance or load will tend to draw the jaws rearward, 5 thereby wedging the same to tightly grip the stock. On the other hand, when the member N is moved rearward, this will instantaneously release pressure on the jaws so as to permit the same to slide rearward over the stock. Springs 10 N⁶ within the recess and bearing against the forward ends of the jaws will hold the same in frictional engagement with the stock. A spline N⁷ extending vertically and engaging spline ways in the jaws N⁴ hold the same in alignment while per- 15 mitting movement toward or from each other. There are also bushings N⁸ and N⁹ in the sliding head N for guiding the stock passing there-through.

The intermediate section L' holds the die member O through which the stock is passed to slightly reduce the diameter and finish the surface thereof. This die member, as shown in Figure 11, is mounted to permit a slight longitudinal movement thereof against frictional resistance. 25 For this purpose the die is surrounded by an annular member O' which is fixed in the forward wall O² of the section L'. A friction shoe O³ extending through a recess in the annular member O' bears against the die O, and a spring O⁴ 30 places a tension on the shoe. This tension may be varied by an adjusting screw O⁵ which bears against the follower O⁶ forming an abutment for the spring. To limit the sliding movement of the die within the annular member O' screws O⁷ 35 extend through threaded apertures in the rear wall O⁸ of the section L' into proximity to the die, and these screws may be adjusted to obtain the desired amount of movement.

The feeder N being forward of the die O it is 40 obvious that some additional means must be provided to advance the forward end of the stock through the die before it can be engaged by said feeder. For this purpose I have provided a second feeder P which is substantially the same 45 in construction as the feeder N and, therefore, will not be described in detail. This second feeder is actuated by the feeder N through the medium of rods P'. The forward ends of these rods threadedly engage the head N and extend 50 rearward therefrom through apertures in the walls O² and O⁸ into the section L² of the frame L. The rear ends of these rods are also threaded and have engaged therewith correspondingly threaded sleeves P² which form shoulders that 55 may be adjusted into different positions. A screw P³ engaging the rear portion of the sleeve P² and bearing against the rod P' serves to lock these members in any desired position of adjustment. The rods P' also pass through channels in the 60 feeder P, and springs P⁴ sleeved on the rods forward of the feeder P yieldably press said feeder rearward toward the limiting stops formed by the sleeves P². There is, however, provision for holding the feeder P forward against the tension 65 of the springs P⁴ so that the rods P' will merely slide through the channels. This means is shown in Figures 10 and 2 and comprises a crank arm Q mounted on a shaft Q' which is journaled in a side plate of the feeder, and a pinion Q² on the 70 shaft intermeshes with the gear wheel Q³ to form a step-down transmission. The gear wheel Q³ is upon a shaft Q⁴ also journaled in the side plate and having a pinion Q⁵ which is in mesh with a stationary rack Q⁶ on the frame L. Thus by ro- 75

tating the crank Q the pinion Q⁵ will be caused to travel along the rack Q⁶ carrying with it the feeder P. If the movement of the crank is sufficient the feeder will be moved completely out of the path of the sleeves P² and may be locked in this position by a cam lever Q⁷ engaging a notch Q⁸ in the top of the rack Q⁶. When it is desired to throw the feeder into action the cam Q⁷ is disengaged from the notch Q⁸ whereupon the tension of the springs P⁴ will return the member P to its normal position. The reciprocation of the rods P' and sleeves P² will then correspondingly reciprocate the feeder P. The crank handle Q is detachable from the shaft Q', but the gears Q², Q³ and Q⁵ together with their shafts Q' and Q⁴ will be oscillated during the reciprocation of the feeder P. It is sometimes desirable to limit the stroke of the feeder P which is accomplished by a stop screw Q⁹ secured to the frame L at its rear end and adjustable into the path of the feeder.

The feeder P when thrown into operation may be used for advancing the stock through the die O and into engagement with the forward feeder N. However, before this is done it is convenient to separate the jaws of the rear feeder against the closing tension of the springs N⁶ so that the stock may be easily inserted by hand therebetween. This is accomplished by the mechanism illustrated in Figures 7 to 9, and the same construction may be applied to both the feeders N and P, but on the former for emergency use only. As shown, a gear wheel R having a stub shaft R' is mounted on one of the side plates N² and is in mesh with a rack bar R² which is vertically slidable in guideways R³ at the rear end of said plate. This rack bar has a cam portion R⁴ contacting with a roller R⁵ on a sleeve R⁶ which latter carries the bushing N⁹. Thus, by rotating the gear wheel R the rack bar can be moved into position where the sleeve R⁶ will contact with the rear ends of the jaw members N⁴ moving them forward against the tension of the springs N⁶ and thus permitting them to separate a sufficient distance for the insertion of the stock therebetween. A notch R⁷ at the end of the cam will hold the parts in this position until the stock has been inserted through the jaws. As shown in Figure 2, this adjustment means is on the front side of the head N and is provided with an operating handle R⁸ for actuating the same. A similar mechanism is placed on the back side of the member P, being operated by a handle R⁹.

The bushings N⁸ and N⁹ for the feeder N may be selected with respect to the diameter of stock to be passed therethrough, and similar bushings are provided for the feeder P which are of a diameter corresponding to that of the stock before it passes through the sizing die O. Still another bushing S is mounted at the rear end of the frame L and the stock is first fed through this bushing and into operative relation to the jaws of the rear feeder P. During the initial operation of the feeder P, it is necessary to hold the stock from moving rearward when the feeder moves in this direction. This function is performed by the mechanism shown in Figure 6, comprising a shoe S' on one side of the stock and a cam shoe S² on the other side of the stock actuated by a spring S³ to produce the required amount of friction. This is greater than the friction of the feeder jaws when moved rearward over the stock so that the latter remains stationary until the jaws again grip the same for

a succeeding step forward. The shoe S² is only left in this position during the feeding of the stock through the sizing die O, after which the friction of the latter will be sufficient to hold it from rearward movement, and the cam shoe S² can be thrown out of action by a handle S⁴ for rotating the same. As soon as the spring S³ passes the center of the cam its tension will act to hold the cam in this position.

It sometimes happens that a section of stock will be bent or fouled in the machine, and it is necessary to withdraw it before the machine can be further operated. The high friction of the portion of the stock which is in engagement with the sizing die O would render it difficult to withdraw it from the die by hand power. I have, therefore, provided a means of locking the jaws of the feeder P upon the stock passing therebetween, so that they will clamp the stock even when the feeder is moved in a rearward direction. This locking means comprises screws P⁵ which threadedly engage the forward end of the member P and adapted to be adjusted against the forward end of the jaws to force the same rearward until they firmly clamp the stock. This clamping is effected when the feeder P has been adjusted to its forward position, as shown in Figure 2, where the cam Q⁷ locks it to the rack bar Q⁶. This cam may then be released and the crank handle Q engaged with the shaft Q' and rotated in the direction to move the feeder P rearward. If the amount of movement is not sufficient to completely withdraw the stock from the die O the screws P⁵ may be adjusted to release the jaws while the member P is again moved forward by the crank handle Q, after which the screws P⁵ are again adjusted to clamp the jaws and the member P is again drawn rearward. In this way fouled stock can easily be extracted from the machine.

When a stock bar is fed forward to the point where its rear end disengages from the sizing die O it will be relieved from the friction of this die. It then becomes necessary to provide other means than the friction of the die O to hold the stock bar from rearward movement when the feeder N moves in this direction. A device for this purpose is shown in Figures 2 and 12 and comprises a split bushing T arranged forward of the feeder and held in position in the frame L by a screw T'. A second screw T² engaging the split portion of the bushing is revoluble by means of a handle T³ to contract said bushing and to place the desired friction on the stock. Thus, the forward feeding of the stock can continue until its rear end disengages from the forward feeder N, after which it is still fed forward by a succeeding stock bar. Thus, the only waste is an end portion too short to form a blank of the required length.

In the operation of the machine the feeding mechanism may be adjusted to advance the stock bar during each forward movement an amount slightly greater than the length of blank which is desired. The stock bar is then moved slightly rearward so that the length actually sheared therefrom is exactly as predetermined. However, during the shearing operation the shear blade must be inserted between the severed blank and the remainder of the stock and as the shearing member cannot itself move rearward, it necessarily forces the severed blank slightly forward. Heretofore, machines of this kind have been provided with stops which during the shearing movement are rigid and hold the forward

end of the sheared blank from any displacement. Such construction is objectionable in not providing for the displacement of the blank during shearing and I have therefore designed an improved construction. This, as shown in Figure 1, comprises a resilient member U secured to an adjustable screw U' and projecting laterally therefrom into the path of the stock bar. The screw U' may be adjusted so that the stop is in advance of the shearing plane a distance corresponding to the required length of blank. Consequently, as the stock bar is overfed a certain amount, it will impinge against this resilient stop and slightly displace it in a forward direction. However, upon the rearward movement of the feeder N the resiliency of the member U will force the stock bar rearward which is permitted by the freedom of the die O to slide rearward in the annular member O'. To insure a positive action independent of the resiliency of the member U, a stop member U² on the slide B' is moved against said member U during alternate rearward movements of the head B. However, before the shearing of the blank takes place, the positive stop is withdrawn which permits the flexible stop member U to be deflected forward the required amount.

A modification of the stop mechanism just described is illustrated in Figure 21, where the positive stop U² is omitted. In this the adjustable screw U' is provided with a rigid laterally extending arm U³ at the end of which is mounted a movable stop member U⁴ pressed rearward by the tension of a spring U⁵ and limited in this movement by a shoulder U⁶. This spring will permit the forward displacement of the stop U⁴ during the overfeeding of the stock bar and also when the blank is displaced by the shearing blade, but the tension of the spring U⁵ is sufficient to return the stop U⁴ to the limiting shoulder U⁶, when the feeder N is moved rearward. The functioning is thus essentially the same as that of the construction shown in Figure 1.

Operation

A complete operation of the machine in the performance of its work is as follows:

The stock which is preferably hot-rolled and coiled is placed in a suitable holder, not shown, and its forward end is passed through the bushing S into engagement with the rear feeder P. Prior to this the handle R³ has been moved to adjust the mechanism shown in Figures 7 to 9, so as to move the jaws of the feeder forward and to permit the same to separate sufficiently for the insertion of the end of the stock bar. The handle R³ is then turned into its normal position which permits the jaws to grip the stock bar and to feed it forward in successive steps. However, the friction device, illustrated in Figures 1 and 6, is adjusted into the position shown in the latter figure where it will hold the stock bar from moving rearward with the feeder P. After the required number of reciprocations of the feeder P the stock bar will be advanced into engagement with the die O and then forced through the latter. The friction device S² can then be adjusted into its inoperative position shown in Figure 1, and the friction of the die O depended upon for holding the stock against rearward movement other than that permitted by the movement of the die against the stops O'. The forward advancement by the rear feeder is continued until the forward end of the stock bar which has been sized by the die O comes into operative engage-

ment with the forward feeder N. The rear feeder may then be thrown out of action by adjustment of the mechanism shown in Figures 2 and 10, the crank handle Q being engaged with the shaft Q' and the latter revolved to transmit motion to the pinion Q⁵ causing it to travel forward on the rack Q⁶. At the end of this movement the cam lever Q⁷ is engaged with the notch Q⁸ which will hold the feeder P forward and in its inoperative position. Thus, while the forward feeder N continues to reciprocate and moves with it the rods P' and sleeves P², the latter do not come in contact with the member P. At the same time the handle R³ is thrown forward, locking the jaws of the rear chuck open, thus preventing them from wearing out.

When the forward end of the stock passes beyond the shearing plane the projecting portion will be cut off and in succeeding operations predetermined lengths will be advanced in each operation. The length of advancement is determined by the adjustment of one or the other of the crank pins H and H³ to increase or diminish the amplitude of oscillation of the shafts M and M'. This length may be, however, somewhat in excess of the length desired for the blank so that the forward end will impinge against the resilient stop U or U⁴ and slightly displace the same. As soon as the feeder N begins its return movement the resiliency of the stop will push the stock rearward carrying with it the die O which slides in the annular member O'. Where the construction shown in Figure 1 is used the stop U² on the slide B' will be brought in contact with the resilient stop U to insure a full return movement of the latter to its normal position. Where, however, the construction shown in Figure 21 is used, the tension on the spring U⁵ will be sufficient to return the stock against any frictional resistance, and the shoulder U⁶ will exactly determine its position. Thus, with either of the constructions the length of blank projecting beyond the shearing plane is predetermined.

The operations of shearing the blank, transferring it into the plane of the heading dies and alternate shifting of these dies into alignment with the blank, are accomplished by the mechanism described, but which forms no part of the present invention. In brief, the movement of the slide J' by the crank G⁴ will through its cam slot J² move the transverse slide J⁴ and shear member J⁵. This shear member has mounted thereon a resilient clip V which holds the sheared blank to the shear member and carries it with it into the plane of the dies B² and B³, as shown in Figures 13 and 14. The shape of the cam slot J² is such as to produce a dwell of the shear member when the blank is in the plane of the dies, and by reason of the 1 to 2 ratio of the gears G and G', there will be two reciprocations of the head B to one reciprocation of the transfer member J⁵. Also, between reciprocations of the head B the mechanism shown in Figure 20 will operate to move the slide B', so that during one reciprocation the die B² is registered with the blank and during the other, the die B³. A cooperating stationary die B⁴ is in registration with the blank in its transferred position. After the initial movement of the die B² sufficient to engage the same with the blank the transfer member J⁵ is withdrawn, the resilient clip V yielding to disengage from the blank. These operations are illustrated in Figures 15 to 18. During the shearing operation the thickness of the shear member will

displace the blank in a forward direction and such movement is permitted by reason of the resiliency of the stops U or U⁴. This is a desirable feature as otherwise the pressure of the blank against a rigid stop might tend to dislodge the same.

When the rear end of a stock bar passes beyond the die O, the friction clamp T shown in Figure 12, is used to hold the bar from rearward movement during the succeeding steps of the feed.

If at any time it should become necessary to remove a portion of the stock bar from the machine, this can be accomplished, as previously described, by adjusting the screws P⁵ and clamping the jaws of the rear feed member P, after which the crank handle Q and mechanism operated thereby can be actuated to withdraw the stock in a rearward direction. The rear feeder P when not in use for advancing the stock still performs the function of straightening the rod as it is drawn therethrough by the forward feeder. The floating support of the frame L by the pivotal link L⁴ permits any slight movement thereof occasioned by the stresses to which it is subjected while maintaining a rigid connection with the main frame or bed A.

When the stock is being advanced by the rear feeder it is necessary to support the portion which is between the feeder and the die, so as to avoid bending or buckling of the same. This is accomplished by supporting sleeves or bushings surrounding the stock and as shown in Figure 3, there is a long sleeve W attached to the rear wall of the section L' and extending forward into proximity to the die O, but leaving sufficient clearance for the floating movement of said die. There is also a shorter bushing W' at the forward end of the feeder P which extends into proximity to the forward ends of the gripping jaws. There is, however, one portion of the stock between the gripping jaws and the die which necessarily remains unsupported, viz: the portion which is between the sleeves W and W' when the feeder P is withdrawn to its rearmost position. For large diameter stock, such for instance as one inch rod, this distance is not enough to materially reduce the rigidity, but with smaller stock for instance one-half inch in diameter, there might be danger of buckling. To avoid such objection the stroke of the rear feeder may be diminished as much as desired, by means of the adjustment screw Q⁹. This forms a stop which limits the rearward movement of the feeder P, so that by adjusting said stop forward the amount of clearance can be reduced to the desired degree. When such adjustment is effected, the stock will be advanced by the rear feeder in short steps, so that the unsupported portion will be relatively short in length.

What I claim as my invention is:

1. In a machine of the character described, the combination with a sizing die, of main and auxiliary reciprocatory feeders arranged respectively forward and in rear of said die, means for reciprocating said forward feeder to advance the stock a predetermined amount during each reciprocation and to draw it through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, means for actuating said rear feeder rearwardly, and means for variably limiting the rearward movement of said rear feeder from zero to the full stroke of said forward feeder.

2. In a machine of the character described, the

combination with a sizing die, of reciprocatory feeders arranged respectively forward and in rear of said die, said forward feeder normally advancing the stock a predetermined amount and drawing the same through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, resilient means for returning said rear feeder during the rearward movement of said forward feeder, a lost motion connection between said draft means and rear feeder, and means for variably limiting the rearward movement of said rear feeder to correspondingly vary the amplitude of movement thereof from zero to the full stroke of said forward feeder.

3. In a machine of the character described, the combination with a sizing die, of main and auxiliary reciprocatory feeders arranged respectively forward and in rear of said die, means for reciprocating said forward feeder to advance the stock a predetermined amount during each reciprocation and to draw it through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, resilient means for actuating said rear feeder rearwardly, means for locking said rear feeder in its forward position to arrest movement thereof, and independent means for variably limiting the rearward movement of said rear feeder from zero to the full stroke of said forward feeder.

4. In a machine of the character described, the combination with a sizing die, of reciprocatory feeders arranged respectively forward and in rear of said die, said forward feeder normally advancing the stock a predetermined amount and drawing the same through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, resilient means for actuating said rear feeder rearwardly, and means for manually actuating said rear feeder either forwardly or rearwardly independent of said draft connection and resilient means.

5. In a machine of the character described, the combination with a sizing die, of reciprocatory feeders arranged respectively forward and in rear of said die, said forward feeder normally advancing the stock a predetermined amount and drawing the same through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, resilient means for actuating said rear feeder rearwardly, means for manually advancing said rear feeder against the resistance of said resilient means independent of said draft connection and to a position out of operative relation thereto, and means for locking said feeder in its advanced position.

6. In a machine of the character described, the combination with a sizing die, of reciprocatory feeders arranged respectively forward and in rear of said die, said forward feeder normally advancing the stock a predetermined amount and drawing the same through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, resilient means for actuating said rear feeder rearwardly, means for manually advancing said rear feeder against the resistance of said resilient means and independent of said draft connection, said means comprising gearing mounted on said rear feeder, a crank handle for operating the same, and a rack on said frame in engagement with said gearing, and locking means

for retaining said rear feeder in its advanced position.

7. In a machine of the character described, the combination with a sizing die, of a main feeder forward of said die for drawing the stock therethrough and advancing the same a predetermined amount, an auxiliary feeder in rear of said die for pushing the forward end portion of the stock therethrough and into engagement with said forward feeder, said die frictionally resisting the reverse movement of the stock therethrough when engaged therewith, and auxiliary friction means for resisting the reverse movement of the stock when out of engagement with said die.

8. In a machine of the character described, the combination with a sizing die, of a main feeder forward of said die for drawing the stock therethrough and advancing the same a predetermined amount, an auxiliary feeder in rear of said die for pushing the forward end portion of the stock therethrough and into engagement with said forward feeder, said die frictionally resisting the reverse movement of the stock therethrough when engaged therewith, manually operable auxiliary friction means for resisting reverse movement of the stock before its engagement with said die, and a second manually operable friction means for resisting reverse movement of the forward portion of the stock after disengagement from said die.

9. In a machine of the character described, the combination with a sizing die, of main and auxiliary reciprocating feeders arranged respectively forward and rearward of said die, means for reciprocating said forward feeder to advance the stock a predetermined amount during each reciprocation and to draw it through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, and means for actuating said rear feeder rearwardly.

10. In a machine of the character described, the combination with a sizing die, of reciprocating feeders arranged respectively forward and in rear of said die, said forward feeder normally advancing the stock a predetermined amount and drawing the same through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, resilient means for returning said rear feeder during the rearward movement of said forward feeder, and a lost motion connection between said draft means and said rear feeder.

11. In a machine of the character described, the combination with a sizing die, of main and auxiliary reciprocating feeders arranged respectively forward and in rear of said die, means for reciprocating said forward feeder to advance the stock a predetermined amount during each reciprocation and to draw it through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, resilient means for actuating said rear feeder rearwardly, and means for locking said rear feeder in its forward position to arrest movement thereof.

12. In a machine of the character described, the combination with a sizing die, of reciprocating feeders arranged respectively forward and in rear of said die, said forward feeder normally advancing the stock a predetermined amount and drawing the same through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward

direction, means for actuating said rear feeder rearwardly, and means for actuating said rear feeder either forwardly or rearwardly.

13. In a machine of the character described, the combination with a sizing die, of reciprocating feeders arranged respectively forward and in rear of said die, said forward feeder normally advancing the stock a predetermined amount and drawing the same through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, means for actuating said rear feeder rearwardly, means for advancing said rear feeder independent of said draft connection and to a position out of operative relation thereto, and means for locking said feeder in its advanced position.

14. In a machine of the character described, the combination with a sizing die, of reciprocating feeders arranged respectively forward and in rear of said die, said forward feeder normally advancing the stock a predetermined amount and drawing the same through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, means for actuating said rear feeder rearwardly, and means for advancing said rear feeder independent of said draft connection, said means comprising gearing mounted on said rear feeder, a crank handle for operating the same, and a rack on said frame in engagement with said gearing.

15. In a machine of the character described, the combination with a sizing die, of a main feeder forward of said die for drawing the stock therethrough and advancing the same a predetermined amount, an auxiliary feeder in rear of said die for pushing the forward end portion of the stock therethrough and into engagement with said forward feeder, said die frictionally resisting the reverse movement of the stock therethrough when engaged therewith, auxiliary means for resisting reverse movement of the stock before its engagement with said die, and a second means for resisting reverse movement of the forward portion of the stock after disengagement from said die.

16. In a machine of the class described, a die for sizing stock, a feeder for pushing stock through the die, a feeder for drawing the stock from the die, and a draft connection between said feeders independent of the die and including a rod secured to one of said feeders and extending freely through the other feeder, an adjustable sleeve on said rod in rear of said other feeder and adapted to move the same forwardly, and a coil spring sleeved on the rod in advance of said other feeder and operable to move the same rearwardly.

17. In a machine of the class described, a die for sizing stock, a feeder for pushing stock through the die, a feeder for drawing the stock from the die, and a draft connection between said feeders independent of the die and including a rod secured to one of said feeders and extending freely through the other feeder, an adjustable sleeve on said rod in rear of said other feeder and adapted to move the same forwardly, a coil spring sleeved on the rod in advance of said other feeder and operable to move the same rearwardly, and means for holding the said other feeder forward against the tension of the spring so that said other feeder will not be moved by said sleeve.

18. In a machine of the class described, a die

for sizing stock, a feeder for moving stock through said die, a rod secured to and projecting from said feeder past said die, a second feeder for moving stock relative to said die sleeved freely on said rod, and means for actuating the second feeder including a coil spring sleeved on said rod at one end of said second feeder, and an adjustable member on said rod at the other end of said second feeder.

19. In a machine of the class described, a die for sizing stock, a feeder for moving stock through said die, a rod secured to and projecting from said feeder past said die, a second feeder for moving stock relative to said die sleeved freely on said rod, and means for actuating the second feeder including a coil spring sleeved on said rod at one end of said second feeder, an adjustable member on said rod at the other end of said second feeder, and means for rendering the second feeder inoperative including means for moving the second feeder relative to said rod against the tension of said spring.

20. In a machine of the class described, a die for sizing stock, a feeder for moving stock through said die, a rod secured to and projecting from said feeder past said die, a second feeder for moving stock relative to said die sleeved freely on said rod, and means for actuating the second feeder including a coil spring sleeved on said rod at one end of said second feeder, an adjustable member on said rod at the other end of said second feeder, means for rendering the second feeder inoperative including means for moving the second feeder relative to said rod against the tension of said spring, and means for holding the second feeder against the tension of said spring.

21. In a machine of the class described, a die for sizing stock, a feeder for moving stock through said die, a rod secured to and projecting from said feeder past said die, a second feeder for moving stock relative to said die sleeved freely on said rod, and means for actuating the second feeder including a coil spring sleeved on said rod at one end of said second feeder, an adjustable member on said rod at the other end of said second feeder, and means adjustable into the path of the second feeder for limiting the stroke thereof.

22. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for causing stock to advance through said die, and a driving connection from one feeder to the second feeder free of the die and including a rod fixed to one feeder and extending freely through the second feeder, and an actuator for the second feeder adjustably mounted on said rod adjacent its free end.

23. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for causing stock to advance through said die, and a driving connection from one feeder to the second feeder free of the die and including a rod fixed to one feeder and extending freely through the second feeder, an adjustable sleeve on the rod adjacent its free end for actuating the second feeder, and an element adjustable relative to the sleeve against said rod to lock said parts in adjusted position.

24. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for causing stock to advance through said die, and a driving connection from one feeder to the second feeder free

of the die and including a rod fixed to one feeder and extending freely through the second feeder, an adjustable member on the rod adjacent its free end for actuating the second feeder, and a spring on the rod between said feeders urging the second feeder toward its actuating member.

25. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for causing stock to advance through said die, and a driving connection from one feeder to the second feeder free of the die and including a rod fixed to one feeder and having a lost motion connection with the second feeder, and means for limiting the stroke of the second feeder.

26. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for causing stock to advance through said die, and a driving connection from one feeder to the second feeder free of the die and including a rod fixed to one feeder and having a lost motion connection with the second feeder, and an element adjustable into the path of the second feeder to limit the stroke thereof.

27. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for advancing stock through said die, and a driving connection between said feeders including a rod fixed to one feeder and extending freely through the second feeder, an actuator for the second feeder on the rod at the free end thereof, yieldable means on the rod between said feeders urging the second feeder toward its actuator, and means for holding the second feeder against said yieldable means so that the actuator will be inoperative.

28. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for advancing stock through said die, and a driving connection between said feeders including a rod fixed to one feeder and extending freely through the second feeder, an actuator for the second feeder on the rod at the free end thereof, yieldable means on the rod between said feeders urging the second feeder toward its actuator, and manually operable means for rendering the actuator inoperative including a stationary rack, a pinion carried by the second feeder in mesh with said rack, and actuating means for said pinion operable to cause the second feeder to travel along the rack away from and out of the path of said actuator.

29. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for advancing stock through said die, and a driving connection between said feeders including a rod fixed to one feeder and extending freely through the second feeder, an actuator for the second feeder on the rod at the free end thereof, yieldable means on the rod between said feeders urging the second feeder toward its actuator, and manually operable means for rendering the actuator inoperative including a stationary rack, a pinion carried by the second feeder in mesh with said rack, and actuating means for said pinion operable to cause the second feeder to travel along the rack to a position out of the path of said actuator, and means for locking the second feeder in said position.

30. In a machine of the class described, a die for sizing stock, a feeder for moving stock through said die, a rod secured to and projecting

- from said feeder past said die, a second feeder for moving stock relative to said die sleeved freely on said rod, and means for actuating the second feeder including elements sleeved on said rod in front and in rear of said second feeder, the rear element being non-yieldable and serving as an actuator for the second feeder, and the forward element being flexible and urging the second feeder toward said rear element.
31. In a machine of the class described, a die for sizing stock, a feeder in rear of said die for advancing stock through the die, a feeder in front of said die for pulling the stock through the die, said feeders being separate and independent of one another, means for driving the front feeder, and means operable by the front feeder for driving the rear feeder including a rod fixed to the front feeder and having a lost motion connection with the rear feeder.
32. In a machine of the class described, a die for sizing stock, a feeder in rear of said die for advancing stock through the die, a feeder in front of said die for pulling the stock through the die, said feeders being separate and independent of one another, means for driving the front feeder, and means operable by the front feeder for driving the rear feeder including a rod fixed to the front feeder and extending freely past the rear feeder, and an adjustable actuator for the rear feeder on said rod in rear of said rear feeder.
33. In a machine of the class described, a die for sizing stock, a feeder for pushing stock through the die, and a draft connection between said feeders independent of the die and including a member secured to one of said feeders and extending longitudinally of the other feeder, an adjustable element on said member in rear of the second feeder and adapted to move the same forwardly, and means sleeved on the member in advance of the second feeder and operable to move the same rearwardly.
34. In a machine of the class described, a die for sizing stock, a feeder for pushing stock through the die, a feeder for drawing the stock from the die, and a draft connection between said feeders independent of the die and including a member secured to one of said feeders and extending longitudinally of the other feeder, an adjustable element on said member in rear of the second feeder and adapted to move the same forwardly, means sleeved on the member in advance of the second feeder and operable to move the same rearwardly, and means for holding the second feeder forward against the action of the last mentioned means so that said second feeder will not be moved by said adjustable element.
35. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for causing stock to advance through said die, and a driving connection from one feeder to the second feeder free of the die and including a member fixed to one feeder and extending longitudinally of the sec-

ond feeder, an adjustable element on the member for actuating the second feeder, and an abutment for said member carried by and adjustable relative to said element for locking the parts in adjusted position.

36. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for causing stock to advance through said die, and a driving connection from one feeder to the second feeder free of the die and including a member secured to one feeder and extending longitudinally of the second feeder, a sleeve adjustable on said member in rear of and engageable with the second feeder, and a screw adjustable in said sleeve relative to said member.

37. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for causing stock to advance through said die, and a driving connection from one feeder to the second feeder free of the die and including a member secured to one feeder and extending longitudinally of the second feeder, a sleeve adjustable on said member in rear of and engageable with the second feeder, an abutment for said member adjustable relative to said sleeve, and a spring sleeved on said member in front of and yieldably pressing the second feeder rearward toward said sleeve.

38. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for causing stock to advance through said die, and a driving connection from one feeder to the second feeder free of the die and including a member secured to one feeder and extending longitudinally of the second feeder, a sleeve adjustable on said member in rear of and engageable with the second feeder, and a spring sleeved on said member in front of and yieldably pressing the second feeder toward the sleeve.

39. In a machine of the class described, a die for sizing stock, two separate feeders respectively in front and in rear of said die for advancing stock through said die, and a driving connection between said feeders including a rod fixed to one feeder and extending freely through the second feeder, an actuator for the second feeder on the rod at the free end thereof, yieldable means on the rod between said feeders urging the second feeder toward its actuator, and manually operable means for rendering the actuator inoperative.

40. In a machine of the character described, the combination with a sizing die, of reciprocatory feeders arranged respectively forward and in rear of said die, said forward feeder normally advancing the stock a predetermined amount and drawing the same through said die, a draft connection between said forward and rear feeders for actuating the latter in a forward direction, means for actuating said rear feeder rearwardly, and means for advancing said rear feeder independent of said draft connection.

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