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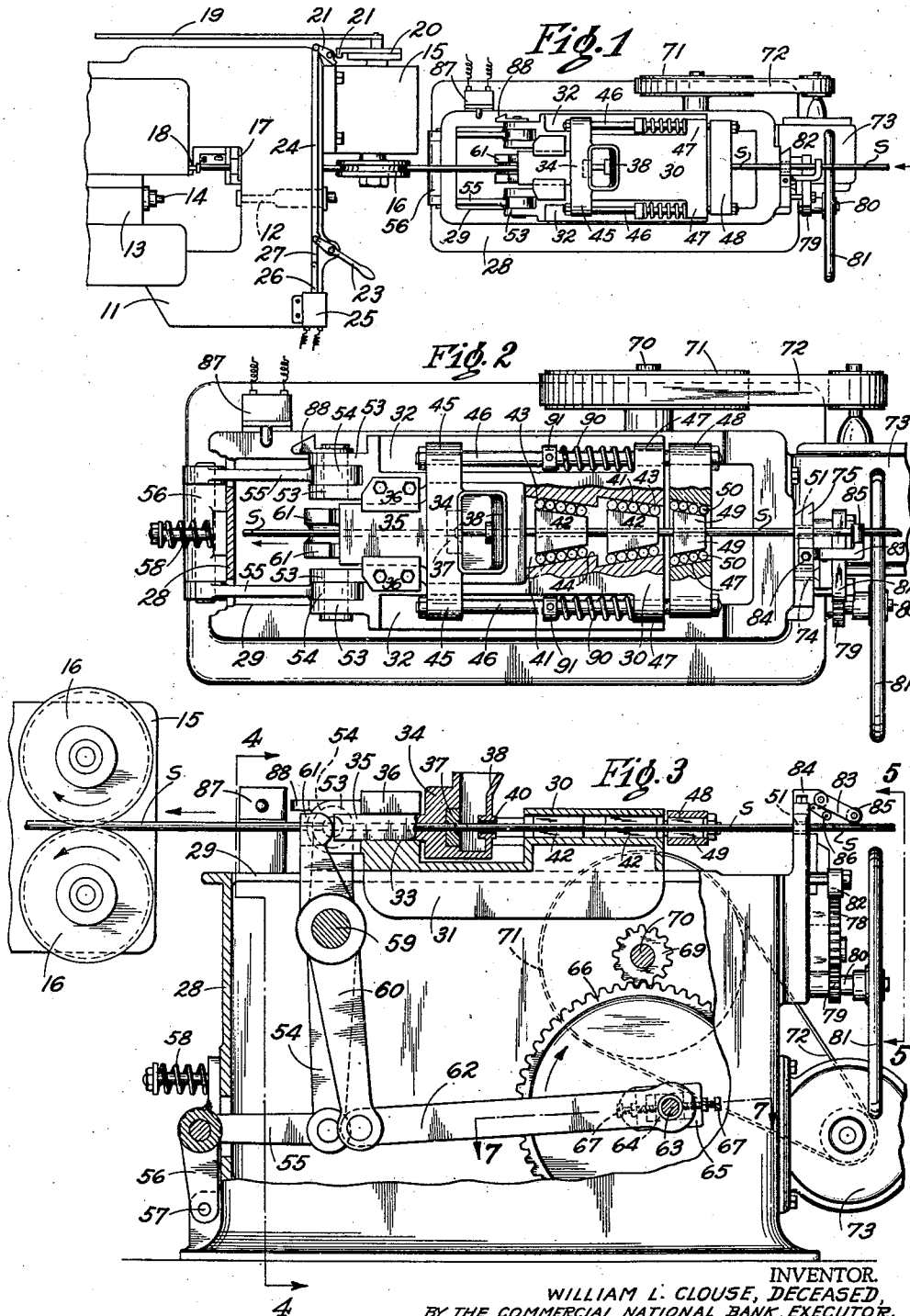
W. L. CLOUSE

2,213,336

ROD EXTRUDER

Filed July 26, 1938

3 Sheets-Sheet 1



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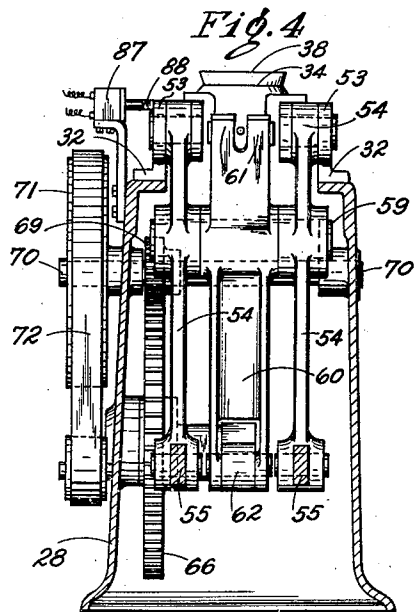
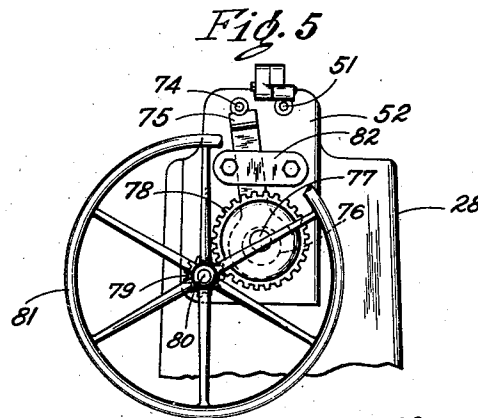
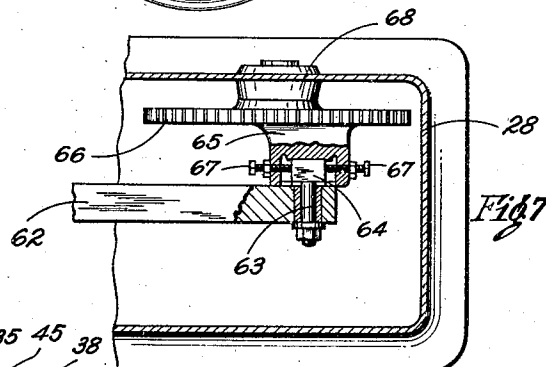
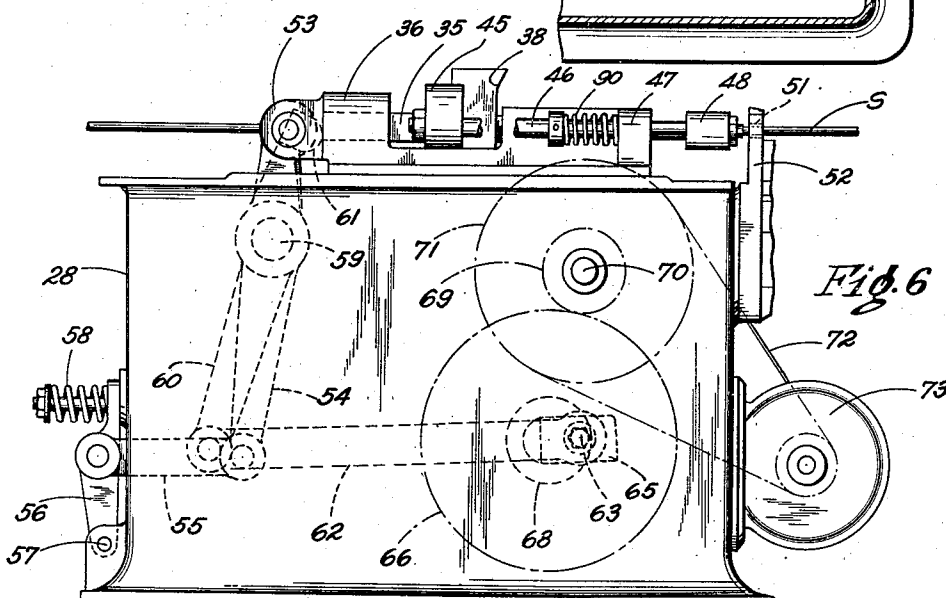
W. L. CLOUSE

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ROD EXTRUDER

Filed July 26, 1938

3 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,213,336

ROD EXTRUDER

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Application July 26, 1938, Serial No. 221,377

49 Claims. (Cl. 29—34)

This invention relates to an extruding device for rods and the like and more particularly to an apparatus that may be attached to or combined with a cold header or similar mechanism to work and reduce the diameter of stock by extrusion immediately before the stock enters the header or other machine.

In the manufacture of bolts, nuts, and the like, in cold headers, it has been customary to use cold drawn wire stock, successive lengths of which are fed into the machine and fabricated into the desired articles. It has been proposed, in an effort to reduce the cost of the material, to use what is known as hot rolled rod stock and interpose a wire drawing mechanism between the coil of stock and the header. Such devices, however, have many disadvantages, among which are the fact that the drawn material must be successively gripped at spaced points with sufficient force to pull the material through the die, thereby marring and deforming the surface of the drawn material; the fact that the force required for the drawing operation is imposed upon the finished material, as in all wire drawing mechanisms, producing considerable variation in diameter of the drawn material resulting from variations in the amount of yielding of different parts of the material under the drawing stress within and beyond the drawing die; and the fact that the starting of a new coil or length of material into the drawing mechanism is difficult and time consuming.

It has been discovered that all of these defects may be avoided, and likewise that unexpected improvements in the quality of the finished articles may be obtained, by employing the process of the patents to Friedman No. 2,017,309 and Cummins, No. 2,017,341 by extruding the material through an extrusion die in advance of the fabricating operations. The commercial practice of these processes, however, has been attended by difficulties, particularly in connection with feeding blanks into the header of exactly the desired length. Ordinary cold drawn wire varies in diameter because of variations in the action of the metal under the drawing stress, and hot rolled rod stock varies in diameter and cross sectional area to a much greater degree. When either of these materials are forced through extrusion dies in successive steps the extruded length varies with respect to the unextruded length in accordance with the variations in diameter and volume of the unextruded stock. In conventional cold headers the feed mechanism grips the stock with a relatively light grip and feeds the stock for-

ward until its leading end abuts a stock gauge, after which the feed mechanism slips slightly upon the wire in order to make certain that the full length desired is fed at each operation of the feed mechanism. If the feed mechanism is arranged to grip the stock with a sufficiently strong grip to drive the stock through an extrusion die, the stock is upset or buckled or otherwise damaged if it is attempted to feed it against a stock gauge and permit the feed mechanism to slip to accommodate variations in length of the extruded blanks. Accordingly, in the apparatus shown in the aforesaid Friedman and Cummins patents the extruded and cut off blanks vary in length in accordance with the initial variations in diameter and cross sectional area of the stock being operated upon.

In addition, it is found to be preferable to use a reciprocating type of gripping mechanism to force the stock through an extrusion die, not only because of its greater economy and simplicity, but also because the necessary driving force may be applied over a greater length of the stock, avoiding deformation of the stock. Such a gripping mechanism, however, cannot be adjusted to extrude in a single stroke the maximum length of blanks desired, since too great an unsupported length of stock between the gripping mechanism and the extrusion die tends to buckle rather than flow smoothly through the die.

The principal object of the present invention is to provide a mechanism for commercially carrying out the processes of the above mentioned Friedman and Cummins patents which will retain all of the advantages of those processes and at the same time permit the feeding of the stock in the exact lengths desired. Another object is to provide for adjustment of the mechanism through the full range of blank lengths which may be accommodated by the header.

A further object of the present invention is to provide a mechanism for extruding, drawing, or otherwise working upon a length of stock being fed to a header or other machine in which substantially all of the working force and the reaction are imposed upon means freely movable with respect to the header so as to avoid transmitting any reaction from the stock to a relatively fixed point. Another object of this invention is to provide a mechanism for reducing stock in successive steps by extruding or drawing in which the length of stock reduced varies in proportion to variations in the diameter or cross sectional area of the stock. A further object is to provide an improved stock gripping arrange-

ment effective to rapidly and conveniently start a new length of stock into the machine, and also operative at all times to insure a complete release of the stock from the gripping mechanism at the conclusion of each operation of the reducing die.

Other objects and advantages of this invention will appear hereinafter.

In the accompanying drawings which illustrate the preferred embodiment of this invention:

Figure 1 is a plan view showing one form of extruding mechanism combined with a cold header;

Figure 2 is a plan view of the extruding mechanism alone with parts broken away and on an enlarged scale;

Figure 3 is a side elevation of the extruding mechanism with parts in section;

Figure 4 is a section taken on the line 4-4 of Figure 3;

Figure 5 is a detailed end elevation taken on the plane indicated by the line 5-5 of Figure 3;

Figure 6 is a side elevation of the extruder showing the parts in a different position than in Figure 3;

Figure 7 is a detailed sectional view taken on the line 7-7 of Figure 3;

Figure 8 is a diagrammatic view of the parts in the position they occupy for the maximum length of extruding stroke with a given crank throw;

Figure 9 is a view similar to Figure 8 showing the parts in position for the minimum length of extruding stroke with the same crank throw as shown in Figure 8; and

Figure 10 is a wiring diagram of the mechanism for stopping the feed of the header.

Referring to the drawings, the invention has been illustrated in the form of a unit which may be simply positioned in advance of any conventional cold header to operate upon the stock before it enters the usual feed mechanism of the header. The invention is not limited to such a construction, however, but may, if desired, be combined with the header or mounted upon the frame thereof in any suitable manner.

The cold header illustrated somewhat diagrammatically embodies a bed frame 11 carrying a fabricating die 12 of any desired type and a reciprocating header slide 13 having a suitable tool 14 to co-operate with the die 12 in acting upon a blank. As shown, the header embodies but one bed frame die and one or more tools upon the header slide, as in the conventional single or double blow headers, but it will be understood, of course, that the header may embody any desired number of co-operating dies and tools. The header as shown is provided with a feed mechanism indicated generally at 15 and having a pair of co-operating feed rolls 16 arranged to grip stock and feed the same through an opening in the bed frame 11 into a shear mechanism 17 and against a stock gauge 18. In the normal operation of this mechanism the feed rolls 16 grip the stock relatively lightly and feed a length of the same forward until the end of the stock contacts the stock gauge 18. Thereafter the shear mechanism 17 shears off the projecting end of the stock to form a blank and this blank is then carried into position between the die 12 and tool 14 either by the shear or any desired form of transfer mechanism. In accordance with the usual practice the feed rolls 16 are adjusted to make a partial revolution during each cycle of the machine and to turn through a slightly great-

er distance during each feeding motion than is required for the desired length of stock to insure the leading end of the stock being abutted against the stock gauge, after which the feed rolls 16 slip slightly upon the stock.

Preferably the feed mechanism 15 is driven by a connecting rod or the like 19 reciprocated in any suitable manner from the shaft which drives the header slide and connected through a releasable clutch to one side of a one-way clutch 20 connected to the shaft upon which one of the feed rolls 16 is mounted. This construction is preferably as disclosed in the patent to Clouse No. 1,856,027, and as disclosed in that patent a pivoted rod 21 is provided with an abutment that may be turned to engage a latch 22 and thereby disconnect the drive from the one-way clutch at the conclusion of the next feeding stroke. As illustrated in Figure 1 a handle 23 is mounted in any convenient position and connected through a link 24 to the pivoted rod 21 so that the same may be turned by hand to release the drive of the feed mechanism 15. A solenoid 25 is also mounted on the frame in any convenient position and as shown has its plunger 26 connected by a link 27 to the link 24 so that energization of the solenoid likewise turns the pivoted rod 21 into position to release the drive of the feed rolls.

The stock reducing mechanism consists broadly of a reducing die and stock gripping means which are movable relative to each other to effect reduction of the stock and also movable as a unit with respect to the header so that the reducing operation need not exactly synchronize with the feed to the header. Preferably the gripping means engages the unreduced stock and pushes it through the die, to obtain the advantages of extruding as distinguished from drawing, but the broad principle may also be used with gripper means which engages the reduced stock and pulls the stock through the die.

The extruding mechanism shown is mounted upon a frame 28 which is provided in its upper surface with a guideway 29. A carriage 30 is slidably mounted within the guideway 29 and as shown is provided with depending aprons 31 bearing against the sides of the guideway 29, and laterally extending flanges 32 resting upon the upper surface of the frame 28 on opposite sides of the guideway. The carriage is cut away to form a guideway 33 for a slide 34 which has an end portion 35 bearing upon the guideway 33 and retained in position by bearing caps or the like 36.

The slide 34 is provided with an extrusion die 37 and as shown is also shaped to form an integral cup 38 spaced from the extrusion die 37. The end 35 of the slide 34 is provided with a passageway 39 aligned with the opening in the extrusion die 37 through which the material acted upon by the extrusion die 37 may pass directly to the feed rolls 16. The cup 38 which is provided to hold a supply of lubricant immediately adjacent the extrusion die 37 is also provided with an opening 40 through which the stock enters the cup before reaching the extrusion die 37. The opening 40 is preferably lined with packing material or felt engaging the incoming stock S and preventing escape of the lubricant in the cup 38.

In advance of the slide 34 the carriage 30 is provided with suitable means to grip the stock. As shown, the carriage is formed with pockets 41 receiving stock grippers of the "come-along" 75

type. Two sets of grippers are illustrated, although one or more sets may be employed, if desired. Each gripper embodies a pair of wedge shaped blocks 42 having their meeting faces recessed to grip the stock S. The opposite sides of the blocks 42 diverge in the direction of travel of the stock and bear against rollers 43 which in turn bear against correspondingly diverging side walls 44 of the pockets 41.

The slide 34 is provided with laterally extending bosses 45 in which are secured a pair of rods 46 disposed on opposite sides of the carriage 30. Each of the rods 46 passes through a guide bearing formed in a lug 47 at the forward end of the carriage 30 and is secured to one end of a cross piece 48 disposed in advance of the carriage 30 and supported solely by the rods 46. The cross piece 48 is provided with a pocket at its center in which is disposed a gripper consisting of a pair of wedge shaped gripper blocks 49 having their meeting edges recessed to grip the stock and having their opposite edges diverging in the direction of travel of the stock and bearing against rollers 50 in which in turn bear against correspondingly inclined side walls of the pocket in the cross piece 48.

The stock gripping recesses in the gripper blocks 42 and 49 are arranged in the line of travel of the stock and are therefore aligned with the opening 40 in the cup 38, the aperture in the extrusion die 37, and the opening 39 in the slide portion 35. The stock as shown in Figure 3 enters through an opening 51 in an end piece 52 secured to the frame 28 and passes on a straight line through the three sets of grippers, through the extrusion die, and thence through the feed rolls 16.

The carriage 30, which is slidable upon the frame 28, is provided at its rear end with oppositely disposed pairs of lugs 53. The upper end of a lever 54 is pivoted between each pair of lugs 53. The two levers 54 extend downwardly within the frame 28 and are pivoted at their lower ends to a pair of links 55. The links 55 extend out through the frame 28 and are pivotally connected to a member 56 hinged to the frame at 57 and normally held in vertical position against the rear face of the frame by a spring 58.

Intermediate their ends the levers 54 are secured to the opposite ends of a shaft 59. A lever 60 is disposed between the two levers 54 and is journaled upon the shaft 59. The upper end of the lever 60 is formed with a pair of spaced cam heads 61 which straddle the stock S and are arranged to engage the projecting end of the slide portion 35.

The lower end of the lever 60 is pivotally connected to a connecting rod 62, the opposite end of which is journaled upon an adjustable crank pin 63. As illustrated in Figure 7, the crank pin 63 is formed with an enlarged head 64 slidable in a guideway formed in a stub shaft 65 carried on a gear 66. The crank pin 63, as illustrated, may be adjusted to various lengths of throw by manipulation of one or more bolts 67. The gear 66 is journaled in a bearing 68 in the side wall of the frame 28 and is in mesh with a pinion 69 carried upon a shaft 70. The shaft 70 projects through the side wall of the frame 28 and carries a pulley 71 arranged to be driven by a belt 72 from a motor 73.

The motor 73 is preferably of the two speed type, the high speed being double the low speed and the low speed being such that the adjustable crank pin 63 makes one complete revolution for

each forward feeding movement of the feed rolls 16, although, as will be explained, it is unnecessary to have exact synchronization between the speed of operation of the header and the speed of the motor 73.

As previously explained, an end piece 52 is secured to the forward end wall of the frame 28 and is provided with an aperture 51 through which the stock passes in the normal operation of the machine. The end plate 52 is likewise provided with a second aperture 74 spaced laterally from the aperture 51, and both apertures 51 and 74 are bushed or similarly constructed so as to form shear members. A movable shear blade 75 is journaled on an eccentric 76 which is secured to a shaft 77 journaled in the end plate 52. A gear 78 is likewise secured to the shaft 77 and is in mesh with a pinion 79 secured to a shaft 80 journaled in the end plate 52. A hand wheel 81 is secured to the shaft 80 so that rotation of the hand wheel rotates the eccentric 76, through the pinion 79 and gear 78, and thereby reciprocates the shear 75. A guide 82 is secured to the end plate 52 encompassing the shear blade 75 and permitting the latter to occupy either of two positions, one in line with the aperture 74 as shown in Figure 5 and the other in line with the aperture 51. This mechanism is arranged so that the shear blade 75 can be swung into alignment with the aperture 51 and the hand wheel 81 rotated to cause the shear blade 75 to shear off the trailing end of a coil or length of stock being fed into the machine, and likewise can be swung into alignment with the aperture 74 and similarly operated to shear off the leading end of a new coil or length of stock to be started into the machine.

Preferably suitable means are provided to stop the operation of the feed rolls 16 and the extruder when the end of a length of stock being fed reaches the extruder. As shown, a lever 83 is pivoted to a support 84 secured to the end plate 52 and is provided at its end with a roller 85 arranged to rest upon the stock S being fed into the extruder, as shown in Figure 3, so as to hold the lever 83 in a raised position. A switch 86 is likewise mounted upon the support 84 and is arranged to be closed by the dropping of the lever 83 when there is no stock in position to engage the roller 85 and hold the lever 83 raised. As shown in Figure 10 the switch 86 is arranged to close a circuit leading to a relay 92 which operates to stop the motor 73, and also leading to the solenoid 25 which operates to swing the pivoted rod 21 to interrupt the drive from the header to the feed mechanism 15. A limit switch 87 is arranged to be engaged by a closing wedge 88 secured to one of the ears 53 on the carriage 30 when the carriage reaches the limit of its motion to the left as seen in Figures 2 and 3, and is likewise connected to close the circuit to the solenoid 25 so as to energize the same and interrupt the feed.

When the extruder is in operation the crank pin 63 is rotated by the motor 73 and the connecting rod 62 oscillates the lever 60 about the floating shaft 59, the connection between the levers 54 and the links 55 being normally held against movement to the left, as seen in Figure 3, by the spring 58. This produces a relative oscillation of the lever 60 with respect to the levers 54 about the shaft 59, the movement of these parts with respect to the frame 28 depending upon whether or not the carriage 30 moves. The relative movement of the lever 60 and the levers 54 causes the cam heads 61 to push the slide 34 to

the right with respect to the carriage 30 from the position shown in Figure 3. During this relative movement of the slide 34 and the carriage 30, the stock S is prevented from moving to the right, as seen in Figures 2 and 3, by the pairs of gripper blocks 42. Upon any tendency of the stock S to move to the right with respect to the carriage 30, these gripper blocks 42 are wedged tightly against the stock by the inclined side walls 44 of the pockets 41. Accordingly, the relative oscillation of the lever 60 with respect to the levers 54 produced by the rotation of the crank pin 63 drives the extruding die 37 to the right from the position shown in Figure 3 over the stock S, thereby extruding and reducing the diameter of a length of stock.

During the movement of the slide 34 to the right with respect to the carriage 30, as seen in Figure 2, the rods 46 and cross piece 48 are likewise moved to the right with respect to the carriage 30. This movement of the cross piece 48 is permitted by the gripper blocks 49 because such relative motion of the gripper blocks 49 and the stock S tends to move the gripper blocks to the left in the wedge pocket in the cross piece 48 which releases the hold of the gripper blocks 49 upon the stock. Springs 90 surround the rods 46 and engage between the lugs 47 and collars 91 secured to the rods 46. These springs move the rods 46, the slide 34 and the cross piece 48 to the left with respect to the carriage 30 when the cam faces 61 recede or move to the left from the slide portion 35. During this motion induced by the springs 90 the grippers 49 grip the stock S and move the same to the left with respect to the carriage 30. Movement of the stock to the left with respect to the gripper blocks 42 releases the hold of these gripper blocks upon the stock. Thus the point on the length of stock which was disposed within the extrusion die 37 at the end of the movement of this die to the right with respect to the carriage 30 remains in the extrusion die during the return movement of the same.

The movement of the slide 34 and the parts connected thereto as described above is purely relative movement with respect to carriage 30, since the force derived from the crank pin 63 produces relative motion of the upper ends of the levers 54 and the cam heads 61 and this force and its re-action are, therefore, applied only to the slide 34 and the carriage 30. The stock S is fed into the header by the feed rolls 16 which are intermittently given a partial rotation to advance the stock at the proper time in the cycle of the machine. Since the feed rolls 16 are driven by the connecting rod 19 reciprocated by an operating shaft of the header, there is not exact synchronization between the operation of the feed rolls and the rotation of the crank pin 63. However, each partial rotation of the feed rolls 16 advances the desired length of stock. If the slide 34 is moving to the right with respect to the carriage 30 at the time the feed rolls operate, the carriage 30 is pulled to the left by the feed rolls, the slide 34 and the die 37 remaining substantially stationary with respect to the frame 28. If the slide 34 is being moved by the springs 90 to the left with respect to the carriage 30 at the time the feed rolls rotate, the carriage 30 remains approximately stationary with respect to the frame 28 and the slide 34 moves to the left at the same speed as the stock. Obviously, any combination of these movements may occur resulting from other possible relations between the

movement of the feed rolls and the rotation of the crank pin 63.

Regardless of the part of the cycle of relative movement of the carriage 30 and the slide 34 during which the partial rotation of the feed rolls occurs, the amount of stock taken by the feed rolls during any period of time may be extruded during that same period of time by proper adjustment of the length of throw of the crank 63 and the speed of the motor 73.

The maximum length of stroke of the slide 34 with respect to the carriage 30 is determined by the maximum length of stock which may be left unsupported between the gripper blocks 42 and the extrusion die 37. This maximum length of stroke is sufficient for most of the work of an ordinary header so that when the header is operating upon such blanks the stroke of the slide 34 with respect to the carriage 30 may be adjusted to extrude substantially the desired blank length by adjustment of the throw of the crank pin 63. When so adjusted the motor 73 is set to run at its low speed, this having been initially determined so that the crank pin 63 makes substantially one revolution during each movement of the feed rolls. If the speed of the motor 73 is slightly too slow or if the throw of the crank pin 63 is slightly too short, less stock will be extruded over a series of cycles of the machine than is used by the feed rolls and, therefore, the carriage 30 will work to the left until the wedge 88 strikes the limit switch 87 and disconnects the drive to the feed rolls 16. The operator then adjusts the crank pin 63 so as to increase its throw and again starts the machine in operation.

Should the speed of the motor 73 be slightly too high or the crank pin 63 be adjusted for slightly too great a throw, the carriage 30 will work to the right from the position shown in Figure 3 to the position shown in Figure 6. The effect of this motion is illustrated diagrammatically in Figures 8 and 9. In the position shown in Figure 8 the levers 54 are substantially vertical and the lever 60 is swung by the crank pin 63 from the full line position to the dotted line position, these positions being about equally spaced on opposite sides of the levers 54. In the position shown in Figure 9 the carriage 30 has been moved to the right, swinging the levers 54 to an inclined position. The lever 60 now swings from the dotted line position to the full line position on opposite sides of the lever 54, but the movement of the cam heads 61 in the line of travel of the slide 34 has become shorter, thereby reducing slightly the relative movement of the slide 34 and the carriage 30 for a given setting of the adjustable crank pin 63.

Since the carriage 30 tends to work to the right in the frame 28 when the amount of stock being extruded exceeds the amount of stock being fed into the header by the feed rolls 16, a slight excess in the amount of stock being extruded will be compensated for by the reduction in the relative stroke of the slide 34 in the carriage 30 as the carriage moves to the right. Thus in normal operation the crank pin 63 is adjusted so that for the speed of the motor 73 slightly more stock is extruded than is needed by the feed rolls, and the carriage 30 works slightly to the right until exactly the same amount of stock is being extruded as is being fed into the header by the feed rolls 16.

Should there be too great an excess of the amount of stock extruded over the amount fed by the feed rolls 16 during a series of cycles the

carriage 30 will continue to work to the right until the cross piece 48 strikes the frame end piece 52. When this occurs the lever 60 and the levers 54 cannot complete their relative oscillations and the links 55 are forced to the left swinging the member 56 against the tension of the spring 58. This member, therefore, acts as a safety permitting the connecting rod 62 to complete its stroke without producing relative reciprocation of the slide 34 and the carriage 30. If desired, a limit switch can be positioned on the frame 28 to be operated by the carriage 30 or the cross piece 48 when the same reach the limit of their movement to the right or to be operated by the hinged member 56 when the same is pushed to the left against the tension of the spring 58 so as to interrupt the circuit to the motor 73 and also, if desired, disconnect the drive to the feed rolls 16.

The distance through which the carriage 30 may move on the frame 28 before striking the end piece 52 may be varied as desired. Likewise the length of the levers 54 and 60, and the relation between the length of these levers and the permissible travel of the carriage 30 may be varied to obtain more or less automatic variation in the length of the stroke of the slide 34. It is preferred, however, to maintain the amount of automatic variation in the length of stroke relatively small, since a small reaction is imposed through the stock onto the feed rolls when the carriage 30 is moved on the frame, this reaction being proportional to the amount of automatic variation in the stroke of the slide 34 that occurs during such movement of the carriage.

When it is desired to operate the extruder and the header with blanks longer than can be extruded by the maximum permitted travel of the slide 34 with respect to the carriage 30, the motor 73 is connected to be driven at its high speed during which the crank pin 63 makes two revolutions for each movement of the feed rolls 16. The crank pin 63 is then adjusted to extrude a length equal to one half of the desired blank length during each relative reciprocation of the slide 34 and the carriage 30 and the operation is then continued exactly as previously described, except that each blank length is extruded in two steps.

When the trailing end of a coil of stock being fed passes the roller 85 the lever 83 drops, closing the limit switch 86 and disconnecting the drive to the feed rolls and likewise stopping the motor 73. The operator then swings the shear blade 75 into alignment with the feed aperture 51 in the frame end 52 and rotates the hand wheel 81 to crop the trailing end of the coil of stock, leaving a substantially square sheared end on the stock. Unless the leading end of the next coil of stock to be fed in the machine has already been prepared, the operator then swings the shear blade 75 into alignment with the aperture 74 and turns the hand wheel 81 to cut off a short length of the leading end of the new coil of stock. The squared end of the new coil of stock is then held by the operator against the squared end of the remainder of the old coil and the machine again started in operation. The operator simply holds the end of the new coil of stock in contact with the trailing end of the old coil until the leading end of the new coil has passed through the feed aperture 51 and the gripper blocks 49 into the first set of gripper blocks 42. As soon as the leading end of the new coil of stock is between

both the gripper blocks 49 and the first set of gripper blocks 42, the stock is gripped and automatically fed at the speed at which the remainder of the old coil of stock is being progressed by the feed rolls 16. This is accomplished by reason of the reciprocation of the cross piece 48, carrying the gripper blocks 49, simultaneously with the relative reciprocations of the slide 34 and carriage 30.

Although a specific embodiment of the invention has been disclosed in considerable detail in an extruding unit to be combined with a standard header, it is to be understood that many of the features of the invention are applicable to drawing as well as extruding devices, and that many of the features may be embodied in a mechanism built into the header, either in combination with, or in substitution for, the feeding mechanism. Likewise many variations and modifications may be made in the device disclosed within the scope of the following claims.

I claim:

1. Stock reducing mechanism comprising a supporting frame, a reducing die for reducing a length of stock supported by said frame for movement in the direction of the length of said stock, grippers for gripping the stock on one side of the reducing die, said grippers being supported by said frame for movement in the direction of the length of said stock and means for relatively reciprocating said reducing die and said grippers, said means being arranged to exert substantially all of its force or reaction on said reducing die and said grippers so as to exert substantially no force or reaction tending to move either said reducing die or said grippers relative to said frame.

2. In the combination of a fabricating machine and a reducing die including feed mechanism for intermittently feeding a length of stock into said machine, the improvement consisting of a reducing die for reducing the length of stock movable toward and away from said fabricating machine in the direction of the length of said stock, grippers for gripping the stock on one side of said reducing die, said grippers being movable toward and away from said fabricating machine in the direction of the length of said stock, means for relatively reciprocating said reducing die and said grippers, said means being arranged to exert substantially all of its force or reaction on said reducing die and said grippers so as to exert substantially no force upon said stock tending to move or hold the same.

3. In combination, a supporting frame, a carriage slidably mounted on said frame, stock grippers and a reducing die carried by said carriage, and means for producing relative reciprocation between said stock grippers and said reducing die to force a length of stock through said reducing die, said carriage being movable on said frame in the direction of the length of said stock.

4. In combination, a supporting frame, a carriage slidably mounted on said frame, a reducing die slidably mounted on said carriage for sliding movement parallel to the direction of movement of said carriage with respect to said frame, and means for reciprocating said die relative to said carriage.

5. In the combination of a fabricating machine and reducing die including means for intermittently feeding a length of stock to said machine, the improvement consisting of a supporting frame, a carriage slidably mounted on said

frame for movement toward and away from said fabricating machine, stock grippers and a reducing die carried by said carriage, and means for producing relative reciprocation between said grippers and said reducing die to force a length of stock being fed to said fabricating machine through said reducing die.

6. In the combination of a fabricating machine and a reducing die including means for intermittently feeding a length of stock into said machine, the improvement consisting of a supporting frame, a carriage slidably mounted on said frame for movement toward and away from said machine, a reducing die slidably mounted on said carriage and means for reciprocating said die relative to said carriage.

7. Stock reducing mechanism comprising a supporting frame, an extrusion die for reducing a length of stock slidable on said supporting frame in the direction of the length of said stock, grippers for gripping the stock in advance of the extrusion die, said grippers being slidable on said supporting frame in the direction of the length of said stock, and means for relatively reciprocating said extrusion die and said grippers, said means being arranged to exert substantially all of its force and reaction on said extrusion die and said grippers so as to exert substantially no force or reaction tending to move either said extrusion die or said grippers relative to said frame.

8. In the combination of a fabricating machine and a reducing die including feed mechanism for intermittently feeding a length of stock into said machine, the improvement consisting of an extrusion die for reducing the length of stock movable toward and away from said machine in the direction of the length of the stock, grippers for gripping the stock in advance of said extrusion die, said grippers being movable toward and away from said machine in the direction of the length of the stock, means for relatively reciprocating said extrusion die and said grippers, said means being arranged to exert substantially all of its force and reaction on said extrusion die and said grippers so as to exert substantially no force or reaction tending to move either said extrusion die or said grippers relative to said machine.

9. In combination, a supporting frame, a carriage slidably mounted on said frame, stock grippers and an extrusion die carried by said carriage, and means for producing relative reciprocation between said stock grippers and said extrusion die in a direction parallel to the line of movement of said carriage with respect to said frame.

10. In combination, a supporting frame, a carriage slidably mounted on said frame, an extrusion die slidably mounted on said carriage for movement in a direction parallel to the line of movement of said carriage with respect to said frame, and means for reciprocating said die relative to said carriage.

11. In the combination of a fabricating machine and a reducing die including means for intermittently feeding a length of stock to said machine, the improvement consisting of a supporting frame, a carriage slidably mounted on said frame for movement toward and away from said machine, stock grippers and an extrusion die carried by said carriage, and means for producing relative reciprocation between said grippers and said extrusion die in a direction parallel to the line of movement of said carriage with respect to said frame.

12. In the combination of a fabricating ma-

chine and a reducing die including means for intermittently feeding a length of stock into said machine, the improvement consisting of a supporting frame, a carriage slidably mounted on said frame for movement toward and away from said machine, an extrusion die slidably mounted on said carriage for movement in a direction parallel to the movement of said carriage with respect to said frame and means for reciprocating said die relative to said carriage.

13. In combination with a fabricating machine, feed mechanism for intermittently feeding a length of stock to said machine, an extrusion die for acting upon the stock in advance of said feed mechanism, grippers for engaging the stock in advance of said extrusion die, and means producing relative reciprocation between said extrusion die and said grippers.

14. In the combination of a header and a reducing die for reducing the diameter of a length of stock to be fed to said header, the improvement consisting of means for forcing the stock through said reducing die, said reducing die and said means being movable toward and away from said header in the direction of the length of said stock, and means for intermittently feeding the reduced stock to said header.

15. In combination with a header, an extrusion die for reducing the diameter of a length of stock to be fed to said header, means for forcing the stock through said extrusion die, said extrusion die and said means being movable toward and away from said header in a direction parallel with the length of the stock, and means for intermittently feeding the reduced stock to said header.

16. In the combination of a header and a reducing die including feeding means for intermittently feeding a length of stock to said header, the improvement consisting of a carriage movable toward and away from said header, and a reducing die and means for forcing stock through said reducing die carried by said carriage.

17. In the combination of a header, and a reducing die including feeding means for intermittently feeding a length of stock to said header, the improvement consisting of a carriage movable toward and away from said header, and an extrusion die and means for forcing stock through said extrusion die carried by said carriage.

18. In the combination of a header and stock reducing means, including feed mechanism for intermittently feeding a length of stock to the header and a motor for driving said header and feeding mechanism the improvement consisting of stock reducing means comprising a reducing die and stock grippers engaging the stock being fed, and means for relatively reciprocating said reducing die and said stock grippers, and by a separate motor driving said means independently of the drive of said header and said feed mechanism.

19. In the combination of a header and stock reducing means including a motor driving said header and feed mechanism driven by said header for intermittently feeding a length of stock, the improvement consisting of stock reducing means comprising a reducing die and means for forcing the stock being fed through said reducing die, and a motor for driving said stock reducing means independent of the drive of said header and said feed mechanism.

20. In the combination of a header and stock reducing means including feed mechanism for intermittently feeding a length of stock to the header and a motor for driving said header and

feed mechanism, the improvement consisting of stock reducing means comprising an extrusion die and stock grippers engaging the stock being fed, means for relatively reciprocating said extrusion die and said stock grippers, and a separate motor driving said means independently of the drive of said header and said feed mechanism.

21. In the combination of a header and stock reducing means including feed mechanism driven by said header for intermittently feeding a length of stock and a motor for driving said header and feed mechanism, the improvement consisting of stock reducing means comprising an extrusion die and means for forcing the stock being fed through said extrusion die, and a motor for driving said stock reducing means independent of the drive of said header and said feed mechanism.

22. In combination with a header, feed mechanism driven by said header for intermittently feeding a length of stock, means for reducing the stock being fed comprising a reducing die and means for forcing the stock through said reducing die, said stock reducing means being movable toward and away from said header, and means operable to interrupt the drive of said feed mechanism when said reducing means approaches the limit of its movement toward said header.

23. In combination with a header, feed mechanism driven by said header for intermittently feeding a length of stock, stock reducing means including a reducing die and means for forcing the stock being fed through said reducing die, said stock reducing means being movable toward and away from said header and means operable to interrupt the operation of said stock reducing means when said stock reducing means approaches the limit of its motion away from said header.

24. In combination with a header, feed mechanism driven by said header for intermittently feeding a length of stock, a supporting frame, a carriage slidably mounted on said frame for movement toward and away from said header, stock reducing mechanism carried by said carriage operable to reduce the diameter of the stock being fed, and means for interrupting the drive of said feed mechanism when said carriage approaches the limit of its movement toward said header.

25. In combination with a header, feed mechanism driven by said header for intermittently feeding a length of stock, a supporting frame, a carriage slidably mounted on said frame for movement toward and away from said header, stock reducing mechanism carried by said carriage operable to reduce the diameter of the stock being fed, and means for interrupting the operation of said stock reducing means when said carriage reaches the limit of its movement away from said header.

26. In combination with a header, means for intermittently feeding stock to said header, stock reducing means including a reducing die and means for forcing stock therethrough, and means automatically reducing the rate of operation of said stock reducing means when the amount of reduced stock exceeds the amount of stock fed to said header by said feeding means.

27. In combination with a header, means for intermittently feeding lengths of stock to said header, stock reducing means comprising a reducing die and means for forcing stock therethrough, said stock reducing means being movable toward and away from said header and means automatically reducing the rate of operation of

said stock reducing means as the same moves away from said header.

28. In combination with a header, means for intermittently feeding stock to said header, a carriage movable along the stock toward and away from said header, stock grippers and a reducing die carried by said carriage, means for producing relative reciprocation between said grippers and said reducing die operating to reduce the stroke of such reciprocation as said carriage moves away from said header.

29. In combination with a header, means for intermittently feeding stock to said header, a carriage movable along the stock toward and away from said header, stock grippers and an extrusion die carried by said carriage, means for producing relative reciprocation between said grippers and said extrusion die operating to reduce the stroke of such reciprocation as said carriage moves away from said header.

30. In the combination of a fabricating machine and stock reducing means, the improvement consisting of reducing mechanism for a length of stock being fed to said machine comprising relatively reciprocable members, one of said members carrying a set of one-way stock grippers, and the other of said members carrying a reducing die and a second set of one-way stock grippers, both of said sets of grippers being arranged to permit movement of said stock toward said machine and prevent movement thereof away from said machine.

31. In the combination of a fabricating machine and stock reducing means, the improvement consisting of reducing mechanism for a length of stock being fed to said machine comprising relatively reciprocable members, one of said members carrying a set of one-way stock grippers, and the other of said members carrying a reducing die and a second set of one-way stock grippers, both of said sets of grippers being arranged to permit movement of said stock toward said machine and prevent movement thereof away from said machine, said second set of grippers being arranged in advance of said reducing mechanism and operable to feed the leading end of a length of stock into the same.

32. In the combination of a fabricating machine and stock reducing mechanism, the improvement consisting of reducing mechanism for a length of stock being fed to said machine comprising relatively reciprocable members, one of said members carrying a set of one-way stock grippers, and the other of said members carrying an extrusion die and a second set of one-way stock grippers, both of said sets of grippers being arranged to permit movement of said stock toward said machine and prevent movement thereof away from said machine.

33. In the combination of a fabricating machine and stock reducing mechanism, the improvement consisting of reducing mechanism for a length of stock being fed to said machine comprising relatively reciprocable members, one of said members carrying a set of one-way stock grippers, and the other of said members carrying an extrusion die and a second set of one-way stock grippers, both of said sets of grippers being arranged to permit movement of said stock toward said machine and prevent movement thereof away from said machine, said second set of grippers being arranged in advance of said reducing mechanism and operable to feed the leading end of a length of stock into the same.

34. In the combination of a header and stock

reducing mechanism including means for intermittently feeding a length of stock to said header, the improvement consisting of reducing mechanism for the stock being fed arranged in advance of the header and including relatively reciprocable members, one of said members carrying a set of one-way stock grippers, and the other carrying a reducing die and a second set of one-way stock grippers, said second set of grippers being arranged in advance of the reducing mechanism.

35. Stock reducing mechanism including a supporting frame, a carriage slidably mounted on said frame, said carriage comprising relatively reciprocable members, one of said members carrying a set of one-way stock grippers, and the other carrying a stock reducing die and a second set of one-way stock grippers.

36. Stock reducing mechanism including a supporting frame, a carriage slidably mounted on said frame, a reducing die reciprocable on said carriage, a set of one-way stock grippers carried by said carriage arranged to prevent movement of stock away from said reducing die, and a second set of one-way stock grippers movable with said die.

37. In combination with a fabricating machine, means for intermittently feeding a length of stock to said machine, stock reducing mechanism comprising a reducing die, a set of one-way stock grippers, and means for relatively reciprocating said die and grippers, said stock reducing mechanism being movable toward and away from said fabricating machine, and a second set of one-way stock gripper fixed with respect to said reducing die.

38. In combination with a fabricating machine, means for intermittently feeding a length of stock to said machine, stock reducing mechanism comprising an extrusion die, a set of one-way stock grippers, and means for relatively reciprocating said die and grippers, said stock reducing mechanism being movable toward and away from said fabricating machine, and a second set of one-way stock grippers fixed with respect to said extrusion die.

39. In combination with a fabricating machine, means for feeding a length of stock to said machine, a supporting member in advance of said means having a guiding aperture for the stock being fed, and a shear blade mounted on said member operable to sever the end of a length of stock being fed.

40. In combination with a fabricating machine, means for feeding a length of stock to said machine, mechanism for working on the stock being fed arranged in advance of said machine, a supporting member in advance of said mechanism having a guiding aperture for the stock being fed, and a shear blade mounted on said member operable to sever the end of a length of stock being fed.

41. In combination with a fabricating machine, means for feeding a length of stock to said machine, stock reducing mechanism arranged in advance of said machine, a supporting member in advance of said mechanism having a

guiding aperture for the stock being fed, and a shear blade mounted on said member operable to sever the end of a length of stock being fed.

42. In combination with a fabricating machine, means for feeding a length of stock to said machine, means for reducing the stock being fed, and a shear arranged in the line of the stock being fed and operable to sever an end of such stock.

43. In combination with a fabricating machine, stock reducing and feeding mechanism arranged in advance of said machine, and a shear mounted on the entrance end of said mechanism in the line of the stock being fed and operable to sever an end of such stock.

44. Stock reducing means comprising a supporting frame, a reducing die and means for forcing stock therethrough carried by said frame, and a shear mounted on the entrance end of said frame and operable to sever an end of a length of stock.

45. In combination with a fabricating machine, stock reducing means comprising a supporting frame, a reducing die and means for forcing stock therethrough carried by said frame, and a shear mounted on the entrance end of said frame and operable to sever an end of a length of stock.

46. Stock reducing means comprising a supporting frame, a reducing die and means for forcing stock therethrough carried by said frame, means at the entrance end of said reducing means having a pair of shear apertures, and shear means co-operating with said apertures and operable to sever the ends of lengths of stock.

47. In combination, a supporting frame, a carriage slidably mounted on said frame, said carriage comprising relatively reciprocable members operable to work upon a length of stock, a lever pivoted to one of said members, a second lever pivoted to said first lever and operably associated with the other of said members, and means for oscillating said levers with respect to each other.

48. In combination, a supporting frame, a carriage slidably mounted on said frame, said carriage comprising relatively reciprocable members operable to work upon a length of stock, a lever pivoted to one of said members, a second lever pivoted to said first lever and operably associated with the other of said members, a link pivoted to said frame and to the free end of one of said levers, and means for oscillating the free end of the other of said levers.

49. In combination with a fabricating machine, means for feeding a length of stock to said machine, a supporting member, in advance of said means having a guiding aperture for the stock being fed and another aperture adjacent thereto, and shear means cooperating with said apertures for severing stock.

THE COMMERCIAL NATIONAL BANK,
Executor of the Last Will and Testament of William L. Clouse, Deceased.

By R. D. SMITH,
President.