

March 11, 1941.

F. W. GAINES, 3D

2,234,728

FEEDING AND STRAIGHTENING MEANS

Filed July 12, 1939

2 Sheets-Sheet 1

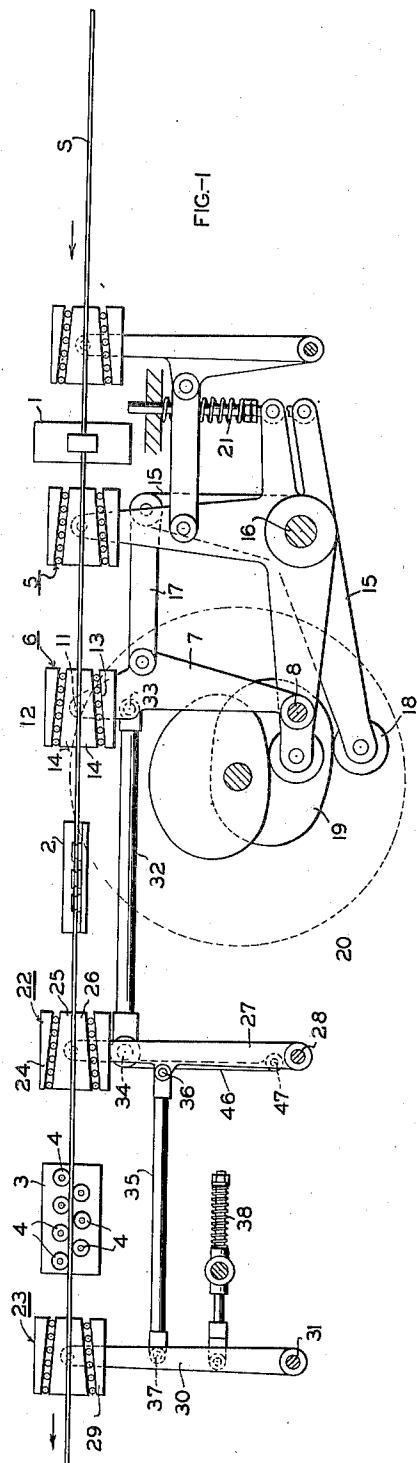


FIG-1

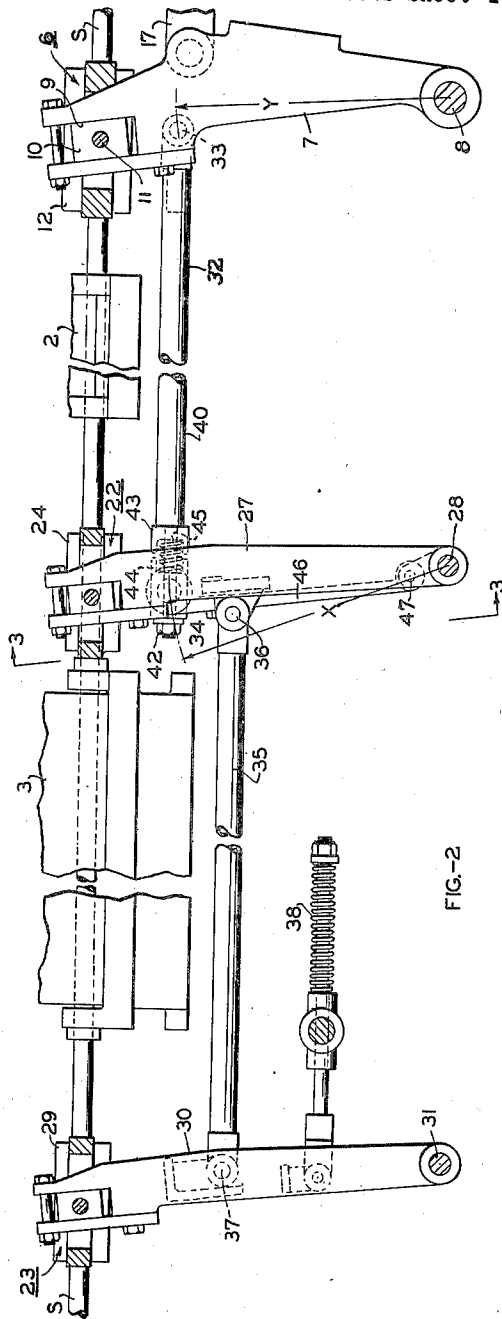


FIG-2

BY

INVENTOR.
FREDERICK W. GAINES III

John H. Leonard
HIS ATTORNEY.

March 11, 1941.

F. W. GAINES, 3D

2,234,728

FEEDING AND STRAIGHTENING MEANS

Filed July 12, 1939

2 Sheets-Sheet 2

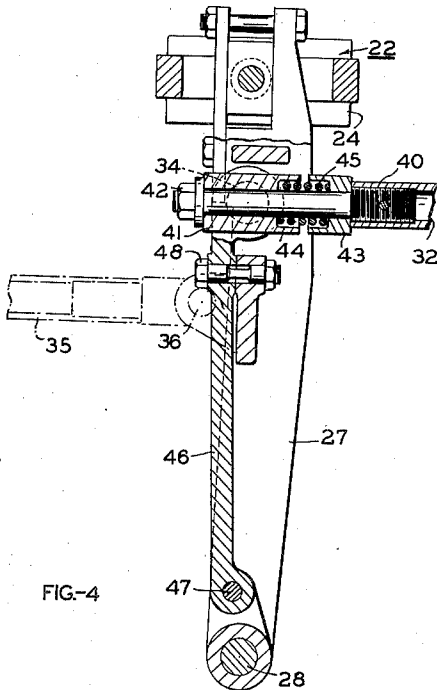


FIG-4

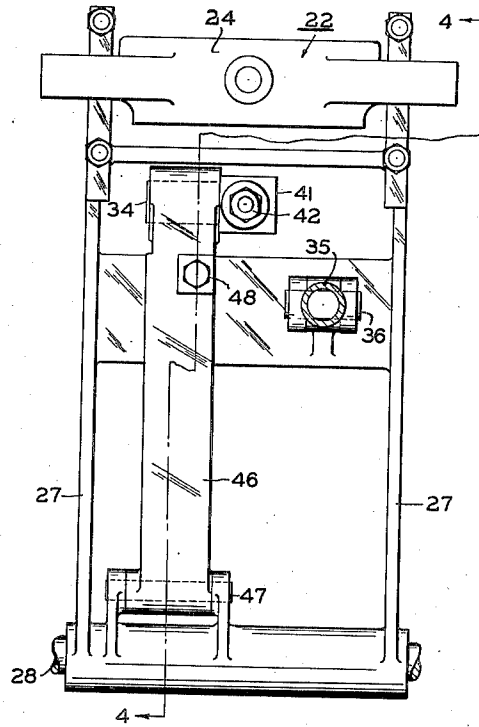


FIG-3

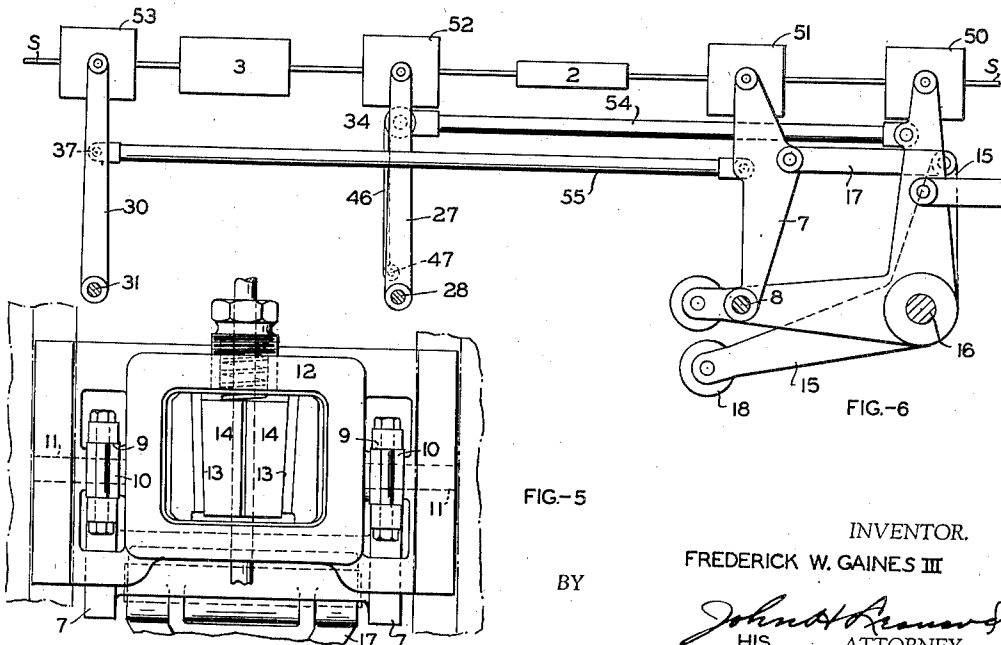


FIG-5

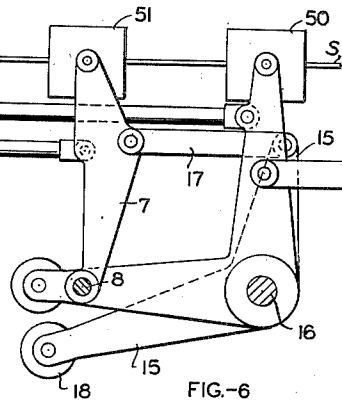


FIG-6

INVENTOR.
FREDERICK W. GAINES III

BY

John H. Leonard
HIS ATTORNEY.

UNITED STATES PATENT OFFICE

2,234,728

FEEDING AND STRAIGHTENING MEANS

Frederick W. Gaines, 3rd, Cleveland, Ohio, assign-
or to The Ajax Manufacturing Company,
Euclid, Ohio, a corporation of Ohio

Application July 12, 1939, Serial No. 284,044

17 Claims. (Cl. 29—34)

This invention relates to a bar stock feeding mechanism and is an improvement on the bar stock feeding mechanism disclosed in United States Letters Patent No. 2,126,453, issued August 9, 1938, jointly to me and William W. Criley.

Further, this invention relates to a combination involving new cooperative relations between the improved bar stock feeding mechanism and fabricating mechanisms such as drawing dies and straighteners.

For the purposes of illustration, the feeding mechanism is described hereinafter in connection with a drawing die and roll type straighteners for bar stock, its application to use with other fabricating mechanisms being readily apparent from the illustrative example.

Heretofore, as more fully disclosed in the above identified Letters Patent, bar stock has been pulled through a drawing die and immediately pushed through a straightener during continuous feed of the stock by alternately operating gripping devices arranged between the die and straightener. The gripping devices of the above Letters Patent are operative, when moved in the direction of stock feed, to grip the stock and pull it through the die and push it through the straightener and, when moved in the opposite direction, to release the stock; but, in the prior structure, feed rolls are located beyond the straightener and are adapted to continue the feeding of the stock through the straightener after the trailing end of the stock has passed beyond the alternately operating gripping devices.

This prior arrangement has proven satisfactory for general use and particularly for use in connection with non-circular stock. In the case of circular stock, however, it is found that after the trailing end portion of the stock has passed beyond the alternately operating grippers in the direction of stock feed and is being fed only by the rolls, the stock often tends to turn about its axis or "snake" through the rolls without being straightened at the trailing portion. If an attempt is made to prevent this turning action of the bar stock about its own axis by the application of sufficient pressure on the feed rolls, the stock is apt to be permanently deformed into "out-of-round" condition; and unless the pressure is great enough to cause this deformation, the rolls cannot always be depended upon to prevent the turning and twisting of the stock.

It is one of the objects of the present invention to constrain the trailing end portion of the stock from turning and twisting after the trailing end portion has passed beyond the alter-

nately operating gripping devices or primary feeding means and is being propelled through the straightener or other fabricating mechanism by supplemental feeding means beyond the mechanism.

An equally important object is to provide a bar stock feeding mechanism in which a primary feeding means propels the stock through a fabricating mechanism, and a supplemental feeding means is provided beyond the fabricating mechanism and is operatively associated with the primary feeding means in a manner such that it travels with the stock without gripping the same during normal feeding of the stock by the primary feeding means but automatically engages the stock for feeding the stock and constraining the stock from twisting upon cessation of the feeding operation of the primary feeding means.

A more specific object is to provide a primary reciprocating gripper feeding means for feeding stock through a fabricating mechanism, and a supplemental reciprocating gripper feeding means which reciprocates during operation of the primary feeding means but at a slightly slower rate of speed, or in an underdrive relation thereto, so that the supplemental feeding means does not tend to drive the stock so long as the primary feeding means is driving the stock, but becomes operative automatically to grip and propel the stock upon cessation of the feeding operation of the primary feeding means with respect to the stock.

A further object is to provide one or more reciprocating devices beyond the fabricating mechanism in the direction of travel of the stock for the purpose of gripping the stock and constraining it from turning about its axis during travel of the stock beyond the primary feeding means.

Another object is to provide a plurality of fabricating mechanisms beyond the primary feeding means and gripping devices adjacent to but beyond the mechanisms, respectively, which devices are operative automatically both to feed the stock after cessation of the feeding operation of the primary feeding means, and at the same time to prevent the stock from turning about its axis.

Another object is to provide a plurality of roll straighteners arranged to straighten the bar stock in angularly disposed planes through the axis of the stock, respectively, with supplemental gripping and feeding means positioned immediately beyond each of the straighteners in the direction of stock travel for feeding the trailing end por-

tion of the stock and for constraining the stock from turning.

- Other more specific objects are to provide between the source of power and one of the feeding means a safety connection which is arranged to break readily so as to protect the mechanism itself, and to provide a lost-motion connection between the primary feeding means and the supplemental feeding means whereby feeding at improper times due to overdriving of the supplemental feeding means with respect to the primary feeding means is prevented.

Other objects and advantages will become apparent from the following specification, wherein reference is made to the drawings, in which:

Fig. 1 is a diagrammatic side elevation of an apparatus embodying the present invention;

- Fig. 2 is an enlarged side elevation, partly in section, of a part of the apparatus illustrated in Fig. 1, showing an operative connection between the primary feeding means and the supplemental feeding means;

Fig. 3 is an end elevation of one of the supplemental feeding means illustrated in Fig. 2, and is viewed from a plane indicated by the line 3—3 in Fig. 2;

Fig. 4 is a sectional view taken on a plane indicated by the line 4—4 in Fig. 3;

- Fig. 5 is a plan view, partly in section, of one of the gripping devices used in the feeding means; and

Fig. 6 is a side elevation illustrating a modification of the invention.

- Referring to the drawings, one embodiment of the invention is illustrated in Fig. 1, wherein the bar stock S is to be fed through fabricating mechanisms at a substantially uniform rate. As disclosed in the above identified Letters Patent, one fabricating mechanism may comprise a drawing die 1 for drawing the bar stock more accurately to the proper gauge. Beyond the die 1 are additional fabricating mechanisms, such as roll straighteners 2 and 3, the straightener 2 being arranged, for example, for straightening the stock in a horizontal plane and the straightener 3 being arranged for straightening the stock in a vertical plane. Any number of straighteners, arranged for straightening in different planes, respectively, through the axis of the stock, may be included.

- The straighteners 2 and 3 are the same in construction and each comprises rolls 4 which are mounted in a suitable frame in slightly offset relation to each other radially of the stock so as to define a serpentine path for the stock therebetween.

- The stock is fed through the die 1 and straighteners 2 and 3 initially by a primary feeding means, such as described in United States Letters Patent No. 2,126,453, hereinbefore identified. As more fully described in said patent, the primary feeding means comprises a pair of alternately operating gripping devices 5 and 6, respectively, each of which is reciprocable along the path of stock travel and is arranged to grip the stock when moved in the direction of stock feed and to release the stock when moved in the opposite direction. An inching gripper, shown at the extreme right in Fig. 1, is used to introduce the stock into the primary feeding means but forms no part of the present invention. Since the gripping devices of the primary feeding means are similar in construction, one only will be described in detail.

- The gripping device 6, for example, preferably

comprises an arm 7 having two laterally spaced portions by which it is pivotally mounted on stub shafts 8 carried by the frame of the apparatus and thus is arranged for oscillating so that its outer end swings along the path of travel of the stock S. The arm, as mentioned, comprises two laterally spaced portions, in the upper ends of which are guideways 9 which extend in a direction radially of the axis of oscillation of the arm 7. Mounted for radial reciprocatory movement within the guideways 9 are blocks 10 which are provided with transverse bores for receiving supporting trunnions 11 of a carriage 12 which is disposed between the upper ends of the arm 7. The carriage 12, in turn, is guided in the frame of the apparatus for reciprocatory movement along the path of travel of the stock, and during this movement, the difference in length of the arcuate path of the outer, or upper, ends of the arm 7 and the lineal path of the stock and carriage 12 is compensated for by virtue of the sliding of the blocks 10 in the guideways 9 and rocking of the carriage 12 about the axis of the trunnions 11. Thus lineal reciprocatory movement may be imparted to the carriage 12.

The carriage 12 is provided with internal cam surfaces 13 which converge in a direction away from the direction of feed of the stock. Mounted in the carriage between the surfaces 13 is a pair of jaws 14 having cam surfaces respectively complementary to the surfaces 13. The jaws 14 are capable of limited reciprocatory movement relative to the carriage along the path of travel and transversely thereof so that the jaws are operated by the cam surfaces when the carriage is moved in the direction of stock feed to grip the stock firmly and feed it while constraining it from turning about its axis, and are released by the surfaces 13 and thereby become operative when the carriage is moved in the opposite direction to release the stock. A spring, as better illustrated in Fig. 5, may be provided to hold the jaws 14 against the stock with sufficient pressure to make the jaws 14 self-gripping in the feeding direction, the spring being sufficiently light so that, upon movement of the carriage 12 in the opposite direction, only a very slight drag of the jaws 14 on the stock occurs.

The arm 7 may be oscillated by means of a suitable bell crank 15 which is pivotally mounted on a stub shaft 16. One arm of the bell crank is connected to the arm 7 by means of a link 17. The other arm of the bell crank 15 carries a cam roller 18 which is held in engagement with a driving cam 19 which is driven by a suitable motor 20. The cam 19, bell crank 15, and connection between the arm 7 and its associated carriage 12 are so related that the arm 7 drives the carriage 12 in the direction of stock feed at a substantially uniform rate during its feeding period. A suitable return spring 21 is provided for returning the arm 7 to its starting position. The cam 19 may have an abrupt drop-off for permitting rapid return of the arm 7 and its associated gripping device 6.

The other gripping device 5 of the primary feeding means is the same as that above described and therefore is not referred to in detail. However, as illustrated in Fig. 1, it is driven and operates in the same manner as the device 6, but its correspondingly functioning oscillating arm is one arm of its associated bell crank. The cam for driving the device 5 is offset circumferentially 180° from the cam 19 so that the feeding strokes of the gripping devices 5 and

6 are in overlapping timed relation and the co-operation of the two devices imparts a substantially continuous uniform lineal movement to the stock.

Beyond the first straightener 2 is a supplemental feeding means comprising a reciprocating gripping device designated generally as 22, the reciprocating gripping device 22 being arranged closely adjacent to the straightener 2. Likewise, beyond the straightener 3 is another supplemental feeding means comprising a reciprocating gripping device designated generally as 23.

The gripping device 22 comprises a carriage 24 corresponding in form and function to the carriage 12 and carrying jaws 25 and 26 constructed and arranged in the same manner as the jaws 14 of the primary feeding means so that upon proper movement of the carriage 24 in the direction of stock travel, the jaws grip the stock and constrain it from turning and feed it, and release it upon movement in the opposite direction. The carriage 24 is driven by an oscillating arm 27, similar to the arm 7 and mounted for oscillatory movement on stub shafts 28.

The gripping device 23 is similar in all respects to the gripping device 22 and comprises a carriage 29 driven by an oscillating arm 30 which is mounted for oscillatory movement on stub shafts 31. It is desirable that the gripping devices 22 and 23 of the supplemental feeding means be reciprocated along the path of stock travel concurrently with the driving of the principal feeding means, but that the devices 22 and 23 be driven at a slightly slower rate of speed than, or in an underdrive relation to, the primary feeding means, for reasons hereinafter to be described.

In order to simplify the design and the timing relation, shafts 31, 28 and 8 are preferably disposed in a common horizontal plane so that each of the arms 30, 27 and 7 is of the same length as the others. The arm 27 is driven by the arm 7 by means of a suitable link 32 pivotally connected at one end by a pivot 33 to the arm 7 and pivotally connected at the other end by a pivot 34 to a member which is rigid with the arm 27. The arm 27, in turn, is connected to the arm 30 by means of a link 35 which is pivotally connected to the arm 27 by a pivot 36 and to the arm 30 by a pivot 37. A suitable return spring 38 is connected to the arm 30 for returning both the arms 27 and 30 to starting position after they have completed their strokes in the direction of stock travel.

In order to provide an underdrive relation of the arms 27 and 30 with respect to the arm 7, the distance Y between the pivot 33 and the axis of the stub shaft 8 is less than the distance X between the pivot 34 and the stub shaft 28. Therefore, for a given oscillatory movement of the arm 7, the arm 27 is oscillated at a slightly less rate of speed. By rearranging the locations of the pivots 33 and 34 with respect to the stub shafts 8 and 28, and also by changing the positions of the shafts 8 and 28, any desired relation between the lineal travel of the carriage 24 and the carriage 12 can be obtained.

The link 32 is provided with a resilient lost motion connection which is operatively disposed between the arms 7 and 27. As better illustrated in Fig. 4, this lost motion connection may comprise a rod 40 which is fixedly secured at one end to the link 32, and the other end of which

extends through a suitable bore in an abutment block 41. The block 41 is mounted on the pivot 34 and the end of the rod 40 is freely slidable endwise relative to the block 41. The outer end of the rod 40 extends beyond the block 41, is threaded to receive a nut 42 which prevents withdrawal of the rod from the bore in the block 41 upon the return movement of the link 32, and thus connects the arms 27 and 7 together for movement in the return direction.

Mounted on the rod 40 and abutting the link 32 is a spring receiving cup 43. A complementary cup portion 44 is formed on the block 41 and a spring 45 is interposed therebetween. The cups 43 and 44 are movable relatively toward and away from each other and are held apart only by the spring 45.

The spring 45 is of such strength that sufficient force for propelling the stock through the straighteners 2 and 3 can be imparted to the arms 27 and 30 through the medium of the spring 45 without compression of the spring. The strength of the spring is insufficient, however, to impart enough force to the arms 27 and 30 to drive the stock both through the die 1 and the straighteners 2 and 3.

This lost motion connection prevents the temporary underrunning of the primary feeding means with respect to the supplemental feeding means. For example, because of this lost motion connection, slippage of the primary feed relative to the stock does not subject the supplemental feeding means to the severe shock which would be occasioned by a rigid connection. Furthermore, in event a hard portion on the metal stock engages the die and causes a certain amount of temporary flexure of the primary feeding means, the load cannot be transferred onto the supplemental feeding means. When this latter condition arises, the spring compresses and the compression of the spring temporarily reduces the travel of the supplemental feeding means in the feeding directions for a sufficient interval to permit the primary feeding means to resume feeding of the stock even when the primary feeding means is under maximum flexure.

By allowing the supplemental feeding means to be driven at a slightly slower speed than the primary feeding means, assurance that the supplemental feeding means are not being subjected to the stress required to pull the stock through both the die 1 and straighteners 2 and 3 is provided.

Due to the shock absorbing features of the lost motion connection, the supplemental feeding means can be driven more closely to the speed of the primary feeding means, though slightly less than the speed of the latter, without danger of overrunning. Consequently, the supplemental feeding means becomes operative almost immediately when the trailing end of the stock passes out of the primary feeding means.

Again, the maintenance of the supplemental feeding means at a very slightly underdriven relation to the primary feeding means and the cushioning effect of the spring constrains the supplemental feeding means from digging into the stock when the supplemental feeding means becomes operative.

It occasionally happens that the supplemental feeding means may be subjected to an undue stress for some reason, and it is desirable to protect it from the full power exerted by the primary feeding means. On that account, a safety connection is made between the link 32 and the arm 27. In the form illustrated, the pivot 34 is

mounted on a member 46 which is pivotally connected at one end, as indicated at 47, to the arm 27, and is rigidly connected to the arm 27 at a location spaced from the pivot 47 by means of a relatively readily breakable break bolt 48. In event of overstressing of either of the supplemental feeding means, the break bolt 48 will break and release the member 46 from the driving relation with the arm 27 and permit the member 46 to swing idly about its pivotal axis 47. This arrangement not only protects the supplemental feeding means but also prevents the other operating parts from being jammed or damaged after the bolt 48 has broken.

In the form illustrated, the supplemental feeding means not only grips the stock to constrain it from turning but also feeds the stock, thus performing a dual function. However, other supplemental feeding means may be used and the gripping devices 22 and 23 utilized only for constraining the stock from turning.

In some instances it is desirable to cause the supplemental feeding means to operate in an overlapping timed relation similar to the overlapping timed operation of the devices 5 and 6 of the primary feeding means. For this purpose, the modified connection illustrated in Fig. 6 may be utilized. In the modification there shown, the primary feeding means may comprise a leading gripping device 50 and a relatively trailing gripping device 51 corresponding, respectively, to the gripping devices 5 and 6 of Fig. 1. The supplemental feeding means may comprise gripping devices 52 and 53, corresponding, respectively, to the gripping devices 22 and 23. In this arrangement, however, the gripping device 52 of the supplemental feeding means is connected to the gripping device 50 of the primary feeding means by the interposition of a suitable connecting link 54 between their driving arms. The gripping device 53, on the other hand, is drivingly connected to the feeding device 51 by a suitable link 55 between their driving arms. Since the devices 50 and 51 of the primary feeding means are driven in such overlapping timed relation that the stock is driven continuously, it is correspondingly driven by the supplemental feeding means but at a slightly slower rate than it is driven by the primary feeding means. Since the rate of drive with respect to the stock is only slightly less in the case of the supplemental feeding means, the entire stock may be fed through the apparatus continuously without an appreciable break in speed when the trailing end of the stock passes beyond the primary feeding means.

I claim:

1. A bar stock feeding mechanism comprising a driven primary feeding means for propelling bar stock at a predetermined speed along a predetermined path, a supplemental feeding means movable along a portion of said path beyond the primary feeding means in the direction of stock travel and including a gripping device operative when it is moved faster than the stock in the direction of stock travel to grip the stock sufficiently tightly for propelling the stock along said path and for preventing turning of the stock, and means for driving the supplemental feeding means at a slightly slower rate of speed than said predetermined speed and while the primary feeding means is being driven, whereby, upon passage of the trailing end of the stock beyond the primary feeding means, the supplemental feeding means automatically becomes operative

to propel the stock and prevent the stock from turning.

2. The combination with a primary feeding means which is normally operative to propel the stock and a supplemental feeding means which is normally inoperative to propel the stock and which primary and supplemental feeding means are driven concurrently in the feeding direction of stock to be fed thereby, of means operatively connecting the primary feeding means and supplemental feeding means for rendering the supplemental feeding means operative automatically to propel the stock upon cessation of operation of the primary feeding means with respect to the stock.

3. In a bar stock feeding mechanism of the type employing devices spaced along the stock and driven concurrently in the stock feeding direction, and which devices are actuatable automatically when moved in the direction of feeding of the stock to grip it and when moved in the opposite direction to release it, means for driving a relatively leading one of said devices at a predetermined speed, and means for driving a relatively trailing one of said devices in underdriven speed relation to the leading device, whereby the trailing device does not tend to drive the stock so long as the leading device drives it.

4. In a bar stock feeding mechanism of the type employing gripping devices which are relatively leading and trailing with respect to each other along the path of travel of the stock, are driven in the stock feeding direction, and which devices are actuatable automatically when moved in the direction of feeding the stock to grip the stock and when moved in the opposite direction to release the stock, means to reciprocate the leading device along the path of stock travel, and means operatively connecting the leading device to the trailing device for movement of the trailing device by the leading device along said path in an underdrive relation to the leading device whereby the trailing device does not tend to drive the stock so long as the leading device drives it.

5. In a bar stock feeding mechanism employing gripping devices which are positioned in leading and trailing relation to each other along the path of travel of stock to be fed and each of which employs grippers operative automatically to grip the stock when moved in the direction of stock feed along the path of travel and to release the stock when moved in the opposite direction, oscillatable arms respective to the gripping devices and connected therewith to move the devices, connecting linkage connecting the arms for concurrent movement of the arms to effect movement of the two devices in the direction of stock feed, the connecting linkage being adapted and arranged to cause underdriving of the trailing gripping device with respect to the leading gripping device.

6. In a bar stock feeding mechanism employing gripping devices reciprocable along the path of travel of stock to be fed and each of which devices is actuatable automatically when moved in the direction of stock feed to grip and propel the stock and when moved in the opposite direction to release the stock; mechanism for driving one of the devices which is relatively leading along the path of travel, and a resilient lost motion connection drivingly connecting the said leading device to one of the devices which is relatively trailing along the path of travel in an underdriving relationship of the trailing device with respect to the leading device.

7. In a stock fabricating apparatus including two fabricating mechanisms spaced relative to each other along the path of travel of stock to be fed through said mechanisms, a first feeding means between the mechanisms for drawing the stock through the leading fabricating mechanism, a second feeding means beyond the first feeding means in a direction of stock travel and operable to propel the stock through the trailing fabricating mechanism and of insufficient feeding capability to propel the stock through both fabricating mechanisms, a driving connection between the stock feeding means for driving the second feeding means by the first feeding means and including a member which is readily breakable relative to the second feeding means.

8. In a bar stock feeding apparatus including feeding devices spaced along the path of travel of the stock, each device comprising an arm mounted for rocking about an axis extending transversely to the direction of stock travel and connected with gripping devices connected to the arms respectively and actuatable automatically, when the associated arms are driven in one direction, to grip and feed the stock, and actuatable automatically when the arms are swung in the opposite direction to release the stock, means for oscillating one of the arms, an abutment pivotally mounted on the other arm for movement about a pivotal axis parallel to the rocking axis of the arm on which the abutment is mounted, a relatively readily breakable means connecting the abutment fixedly to the arm on which it is mounted at a point spaced from the pivotal axis, and a rigid member connecting the first arm to the abutment.

9. The combination with a stock fabricating mechanism including a straightener and means for feeding stock therethrough, of gripping means beyond the straightener in a direction of travel of stock to be fabricated and movable along the path of travel of the stock and operative when moved along said path and in the direction of stock feed to grip the stock and move therewith while constraining the stock from turning.

10. In a fabricating mechanism for bar stock, the combination with a straightener unit employing relatively offset straightening rollers on fixed axes, of a gripper which moves with the stock while gripping it and which is positioned beyond the straightener unit in the direction of travel of the stock to be fabricated and which is operative to prevent turning of the stock in the straightener.

11. In a bar stock straightening apparatus, roll straighteners spaced along the path of travel of the stock to be straightened for straightening the stock in different planes respectively, reciprocating gripping devices, each of which is operative when moved in the direction of travel of the stock to grip and move with and feed the stock while constraining the stock from turning, said gripping devices being positioned beyond the straighteners respectively, and mechanism for reciprocating the devices.

12. In a stock fabricating apparatus including a leading fabricating mechanism requiring a relatively heavy force for feeding stock therethrough and a trailing fabricating mechanism requiring a relatively lighter force for feeding stock therethrough, a primary feeding device operatively associated with the first mechanism for feeding the stock therethrough, a supplemental feeding device operatively associated with the second fabricating mechanism and capable of feeding

stock therethrough, mechanism for driving the feeding devices, a lost motion connection operatively interposed between the driving means and supplemental feeding device, and said lost motion connection including a resilient means capable of rendering the connection operative to transmit said relatively lighter force to the supplemental feeding device without substantial lost motion.

13. In a stock fabricating apparatus including a leading fabricating mechanism requiring a relatively heavy force for feeding stock therethrough and a trailing fabricating mechanism requiring a relatively lighter force for feeding stock therethrough, a primary feeding device operatively associated with the first mechanism for feeding the stock therethrough, a supplemental feeding device operatively associated with the second fabricating mechanism and capable of feeding stock therethrough, mechanism for driving the feeding devices, a lost motion connection operatively interposed between the driving means and supplemental feeding device, and said lost motion connection including a resilient means capable of rendering the connection operative to transmit said relatively lighter force to the supplemental feeding device without substantial lost motion and capable of rendering the connection operative to transmit said relatively heavy force to the supplemental feeding device upon taking up of the lost motion.

14. In a stock fabricating apparatus including a leading fabricating mechanism requiring a relatively heavy force for feeding stock therethrough and a trailing fabricating mechanism requiring a relatively lighter force for feeding stock therethrough, a driven primary feeding device for feeding bar stock at a predetermined speed through the leading mechanism, a supplemental feeding device movable along the path of travel of the stock beyond the primary feeding device in the direction of travel of the stock and including a gripping device operative when it is moved faster than the stock in the direction of stock travel to grip and thereafter propel the stock along said path, means for driving the feeding devices, a lost motion connection operatively interposed between the driving means and the supplemental feeding device and normally operative to drive the supplemental feeding device at a slightly slower rate of speed than the speed of the primary feeding device while the primary feeding device is being driven in the direction of feed, said lost motion connection including a resilient means capable of rendering the connection operative to transmit said relatively lighter force to the supplemental feeding device without substantial lost motion and capable of rendering the connection operative to transmit said relatively heavy force to the supplemental feeding device upon taking up of the lost motion.

15. The combination with a driven primary feeding means for propelling bar stock along a predetermined path and through a fabricating mechanism which is positioned beyond the primary feeding means in the direction of stock travel, of reciprocating gripping means positioned beyond the fabricating mechanism in the direction of stock travel and reciprocable along the path of travel and operative, when the reciprocating gripping means is moved along said path and in the direction of stock feed at a speed greater than the speed of stock travel, to grip the stock and constrain the stock from turning, means for driving the reciprocating gripping means at a speed less than the speed of travel

of the stock when the stock is being driven by the primary feeding means, whereby the reciprocating gripping means automatically becomes operative upon travel of the trailing portion of the stock beyond the primary feeding means.

- 5 stock beyond the primary feeding means.
16. In a bar stock fabricating apparatus including a leading fabricating mechanism which is relatively leading in the direction of travel of stock to be fabricated, and a pair of stock feeding devices for driving the stock through the first mechanism and along the path of travel, each of said feeding devices being reciprocable along the path of travel of the stock and operative when moved in the direction of stock travel to grip and
- 10 propel the stock, and operative when moved in the opposite direction to release the stock, means for driving said devices alternately in the stock feeding direction in overlapping timed relation, a pair of relatively trailing fabricating mechanisms spaced from the leading mechanism and from each other in the direction of stock travel, characterized in that supplemental feeding devices are operatively associated with the trailing
- 15 fabricating mechanisms respectively, each of said supplemental feeding devices being operative to grip and propel the stock when driven in the direction of stock travel and to release the stock

automatically when driven in the opposite direction, and means drivingly connecting one of said supplemental feeding devices to one of the primary feeding devices and the other of said trailing feeding devices to the other of said primary feeding devices.

17. In a feed mechanism, a pair of spaced oscillating arms, stock gripping mechanisms carried on the arms, respectively, and operative when the arms swing in the direction of stock travel to grip and feed the stock, and to release the stock when the arms swing in the opposite direction, means drivingly connected to one of said arms for oscillating the same at a predetermined speed, a connecting rod connected to the driven arm in spaced relation from the axis of oscillation and from the gripping mechanism of the driven arm in a direction radially from said axis, whereby the travel of said connecting rod is different from the travel of the gripping mechanism associated with said driven arm in the direction of stock travel, and said connecting rod being connected to the other arm in such spaced relation to the axis of oscillation of said other arm that a differential in the speed of travel of the gripping mechanisms of the two arms is maintained.

FREDERICK W. GAINES, 3RD.