July 21, 1953 A. H. JOBERT 2,646,087

MAGAZINE STOCK REEL

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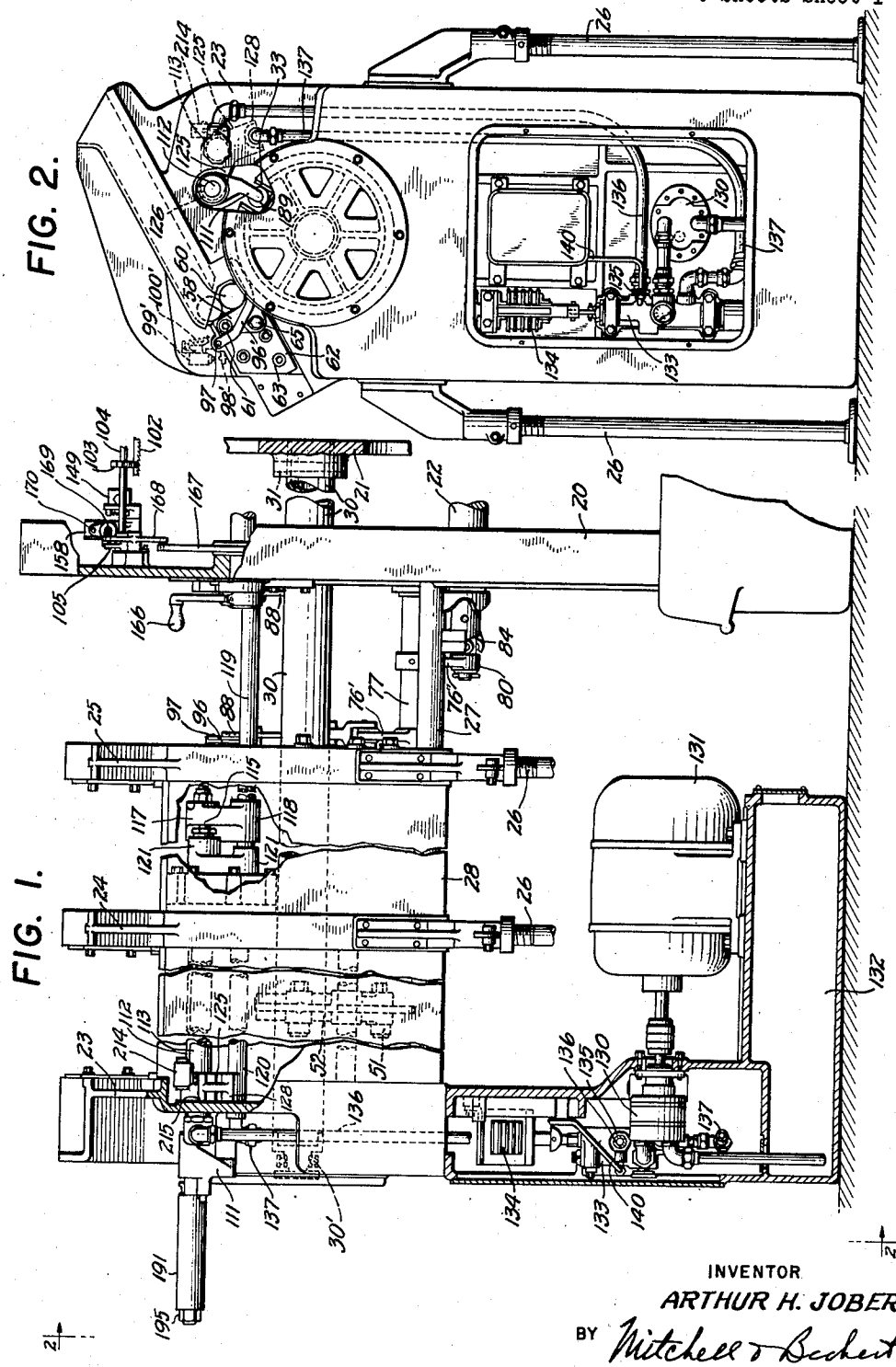


FIG. 2.

FIG. 1.

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FIG. 4.

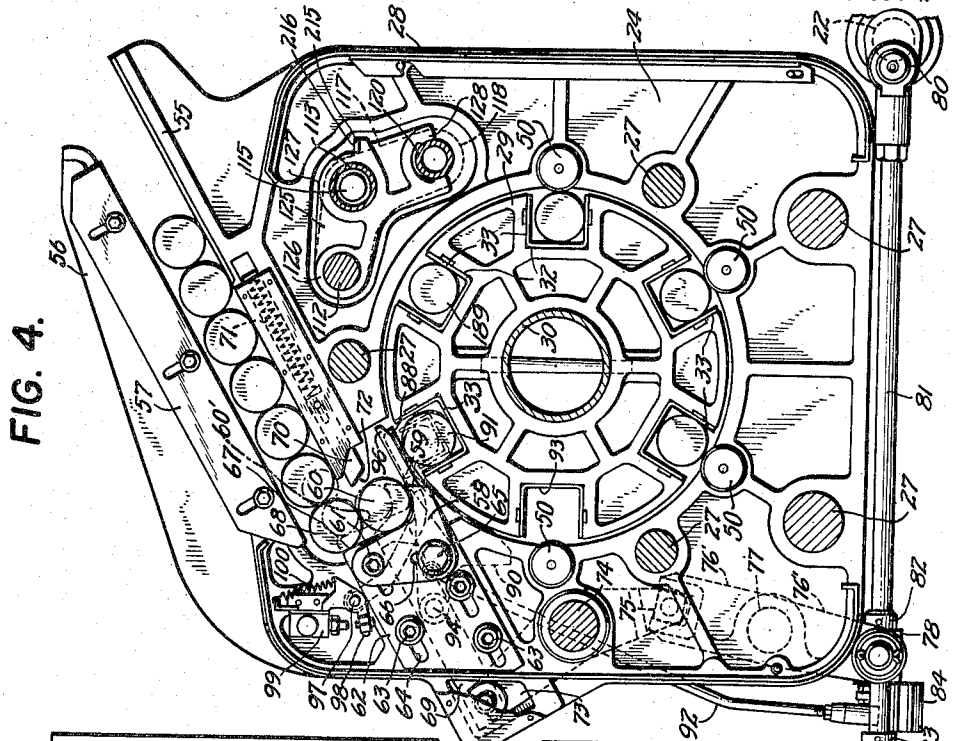
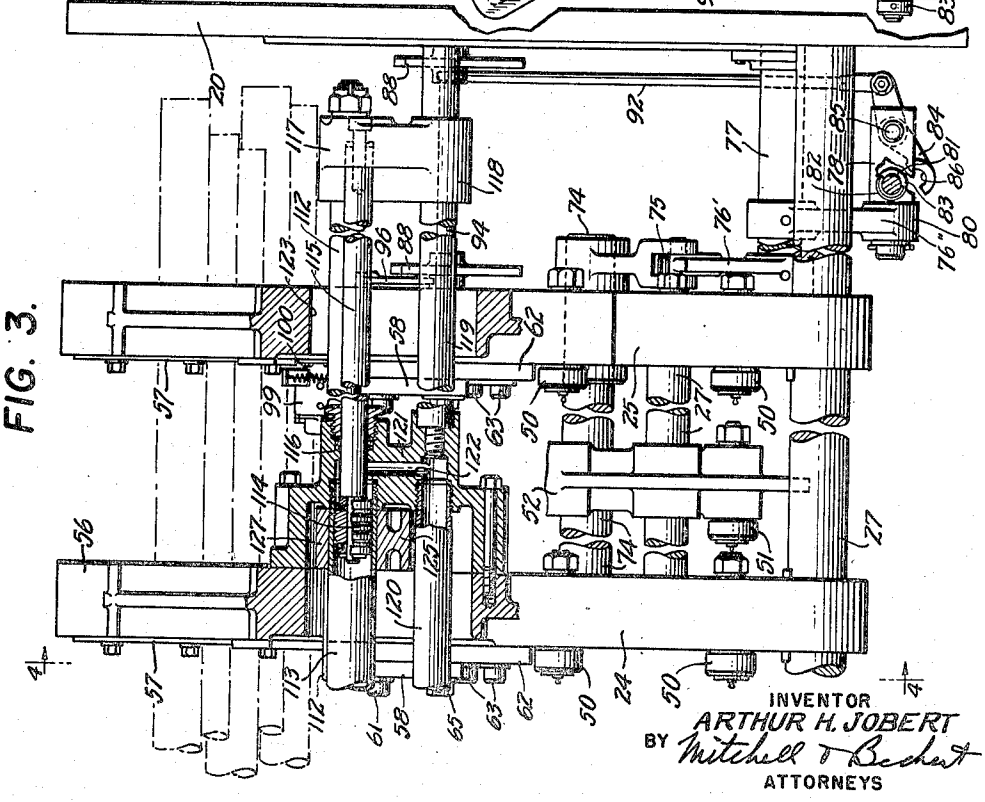


FIG. 3.



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FIG. 5.

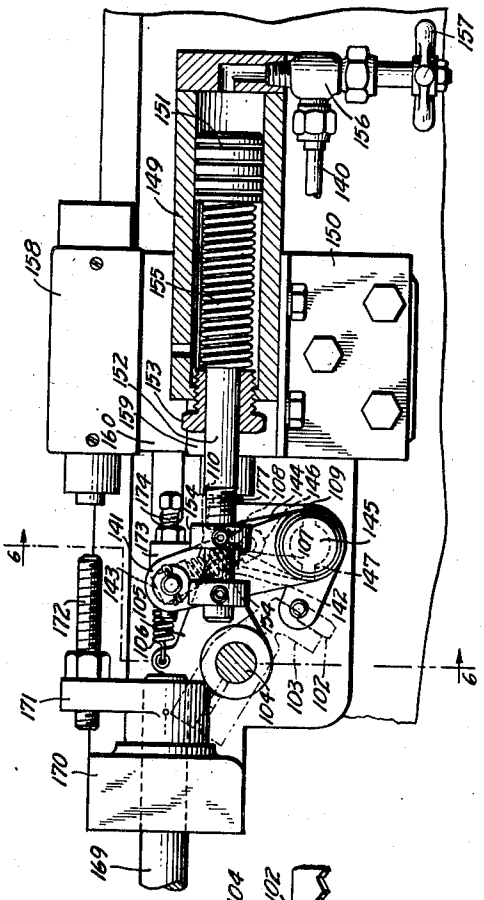


FIG. 7.

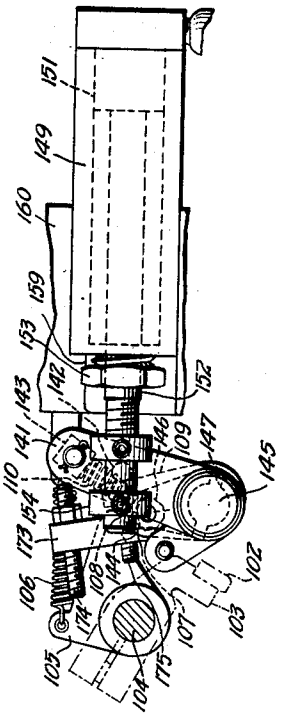


FIG. 6.

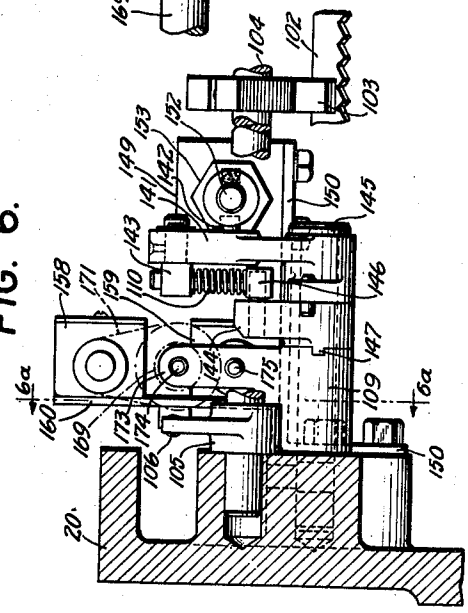
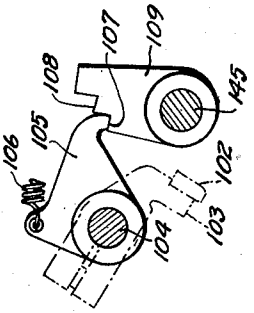


FIG. 6a.



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FIG. 8.

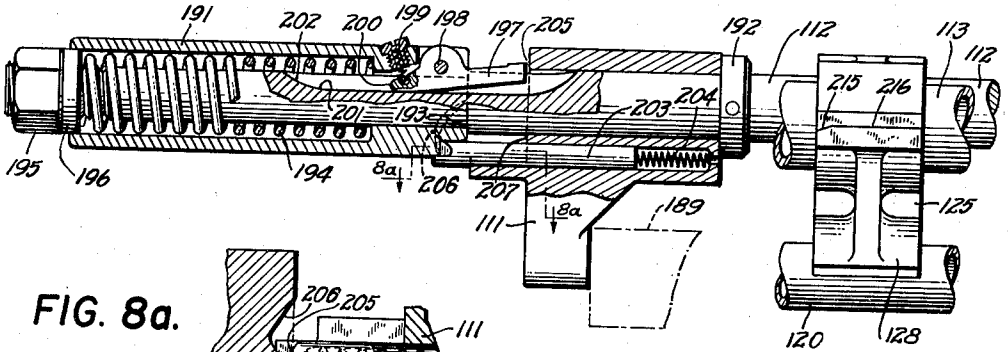
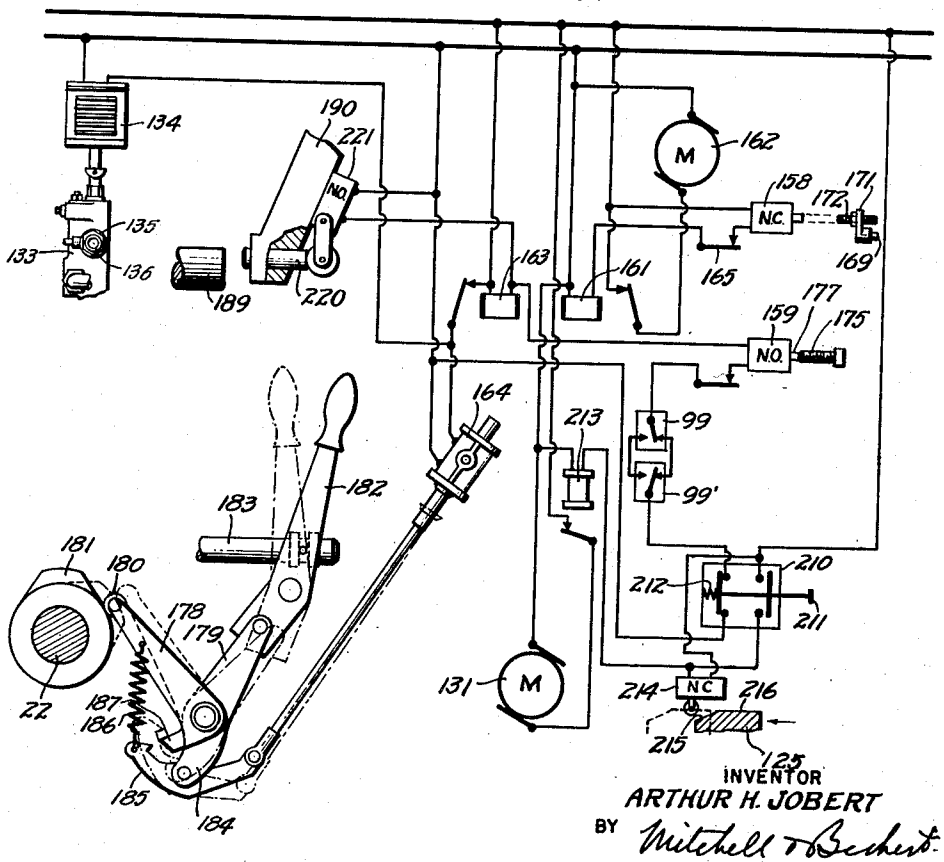



FIG. 8a.




FIG. 9.




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FIG. 11.

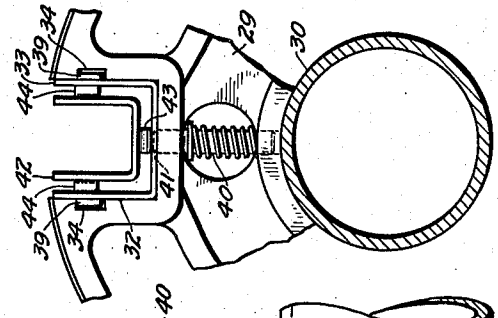


FIG. 10.

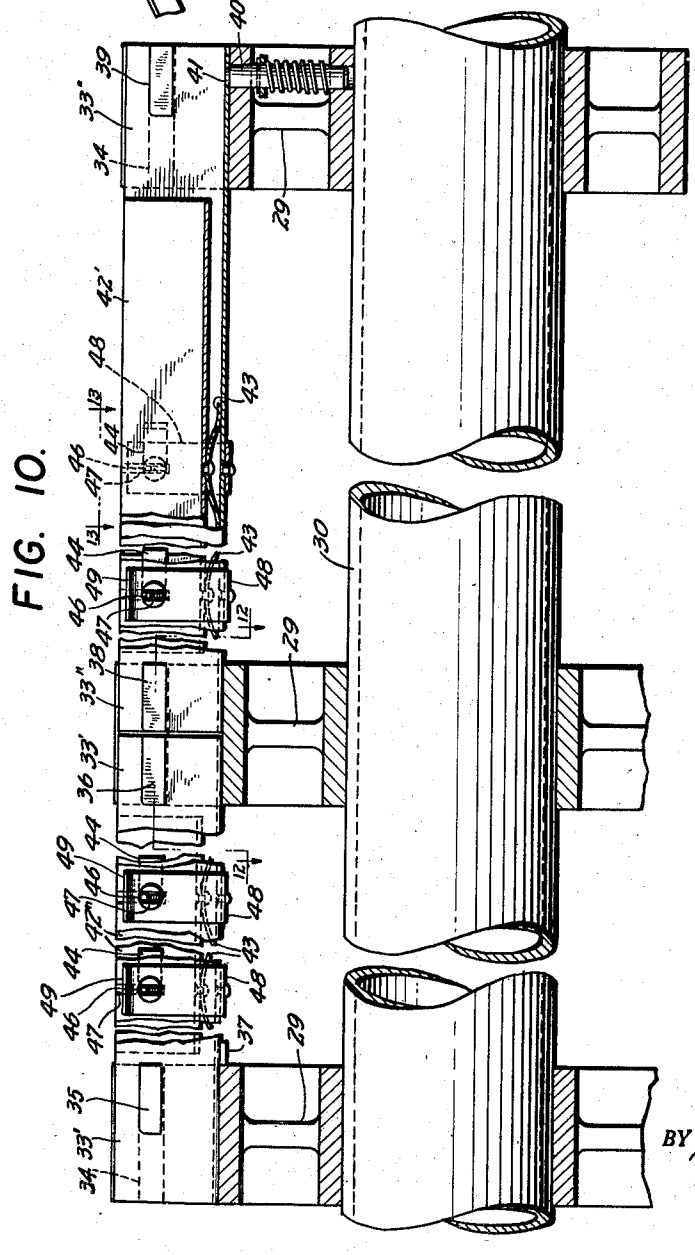


FIG. 14.

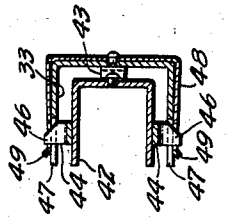


FIG. 13.

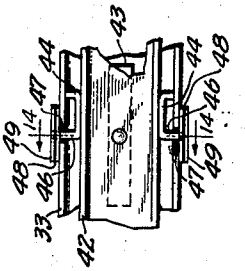
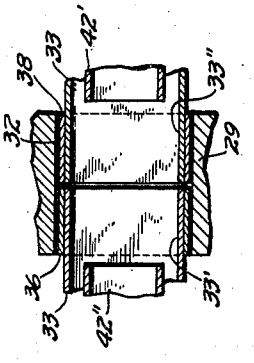


FIG. 12.



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Patented July 21, 1953

2,646,087

# UNITED STATES PATENT OFFICE

2,646,087

## MAGAZINE STOCK REEL

Arthur H. Jobert, New Britain, Conn., assignor to The New Britain Machine Company, New Britain, Conn., a corporation of Connecticut

Application October 1, 1949, Serial No. 119,072

27 Claims. (Cl. 140—126.1)

1

My invention relates to automatic stocking means for bar machines and is in the nature of an improvement over the disclosures in my Patent 2,320,039, issued May 25, 1943, and in my co-pending patent application Serial No. 22,655, filed April 22, 1948.

It is an object of the invention to provide an improved device of the character indicated.

It is another object to provide an improved automatic magazine for a stock reel to supply a bar machine.

It is another object to provide an improved automatic stock-feeding means for a multiple-spindle bar machine.

It is a further object to provide an improved feed mechanism for a bar-feeding device.

It is a specific object to provide an improved magazine and loading mechanism for adapting a device of the character indicated to the handling of a plurality of sizes of bar stock.

It is another specific object to provide an improved reel construction for a device of the character indicated.

Still another specific object is to provide an automatic stock-bumping mechanism.

It is a general object to meet the above objects with a construction featuring the high-speed handling of materials and yet providing a maximum of safety features, as far as the operator and as far as the machine are concerned.

Other objects and various further features of novelty and invention will be pointed out or will occur to those skilled in the art from a reading of the following specification in conjunction with the accompanying drawings. In said drawings, which show, for illustrative purposes only, a preferred form of the invention:

Fig. 1 is a partly broken-away and partly sectionalized side elevation of an automatic stock-reel mechanism incorporating features of the invention and shown in application to a bar machine, which may be a multiple-spindle bar machine, the view being taken from the operator's side;

Fig. 2 is a left-end view of the automatic stock reel of Fig. 1;

Fig. 3 is an enlarged fragmentary partly sectionalized view of certain elements in the feed mechanism of the stock reel of Fig. 1;

Fig. 4 is a sectional view of parts shown in Fig. 3, the view being taken from the left side of the elements shown in Fig. 3, as in the plane 4—4 of Fig. 3;

Fig. 5 is an enlarged fragmentary view in partial section of an automatic device featured in the combination of Fig. 1;

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Fig. 6 is a more or less left-end view of the assembly of Fig. 5, as taken in the plane 6—6 of Fig. 5;

Fig. 6a is a fragmentary view in the plane 6a—6a of Fig. 6;

Fig. 7 is a fragmentary view of certain of the parts of Fig. 5, but showing a different relationship of parts;

Fig. 8 is a longitudinal sectional view of the stock-pushing means employed in the mechanism of Fig. 1;

Fig. 8a is a fragmentary view substantially in the plane 8a—8a of Fig. 8;

Fig. 9 is an electrical wiring diagram schematically illustrating connections for a preferred operation of my machine;

Fig. 10 is a broken-away longitudinal sectional view of a reel assembly for use in the machine of Fig. 1;

Fig. 11 is a fragmentary right-end view of the reel of Fig. 10;

Fig. 12 is a fragmentary sectional view in the plane 12—12 of Fig. 10;

Fig. 13 is a fragmentary top view of a part of the reel of Fig. 10, as viewed from 13—13; and

Fig. 14 is a sectional view substantially in the plane 14—14 of Fig. 13.

Briefly stated, my invention contemplates an improved automatic stocking means for a bar machine. The mechanism may be adapted to multiple-spindle bar machines and in such event may incorporate a magazine-fed stock reel. My improved construction provides means for readily adjusting various parts of the reel and of the loading mechanism associated therewith, so as to accommodate a variety of sizes (that is, diameters) of stock to be fed. Also, means may be provided to assure that, whatever the size of stock for which appropriate adjustment has been made, such stock may be automatically accommodated and fed with the same relative ease and efficiency. Recognizing the practical fact that standard pieces of bar stock may vary in length over a considerable range, my improved mechanism contemplates acceptance of a variety of stock lengths within given limits of length variation.

My construction further contemplates improvements in the feeding mechanism, whereby, if the stock being fed should encounter an obstruction, as when the normal stock-feeding or pusher force is insufficient to ram the stock through the back end of the feed fingers of the bar machine, then the feeding mechanism will be automatically reversed (or at least halted), in order to permit a bumping operation. In the

specific form to be described, I have provided an automatic hammer or bumping-out mechanism in the pusher means; in the case of a hydraulically fed mechanism, such hammer may be effective automatically, upon a rise in feed pressure to a given extent above the normal feed pressure. In a preferred form, however, the automatic bumping-out may not be possible without a deliberate manual operation by the operator, as by his pushing an electric button; in this connection, I have further provided improved safety means, whereby the automatic bumping mechanism may never bump a piece of stock hard against the stock stop, even though the operator may negligently have failed to remove his deliberate manual control of the bumping operation.

In a preferred adaptation of my improved stock-reel mechanism to a multiple-spindle bar machine, I have provided improved means for automatically initiating a stock-feeding operation at the correct index position of the multiple-spindle machine, and if it is desired that stock feeding should not proceed automatically whenever a spindle is ready for a new bar of stock, then my mechanism may provide the desirable feature of setting itself up in correct condition, in readiness for a simple manual operation to start stock feeding. In this connection, various further safety features are provided.

Referring to the drawings, my invention is shown in application to an automatic stock-reel mechanism mounted at the rear of the spindle end of a multiple-spindle bar machine. In Figs. 1 and 3, only the rear frame member 20 of the bar machine is shown, but it will be understood that the bar machine may be of the same general type shown in greater detail in the above-identified copending application. The machine 20 may include a plurality of rotatable spindles having hollow collets or chucks to receive bar stock fed internally through the rear ends thereof. All spindles may be cradled in a spindle carrier, the rear end of which is fragmentarily shown in Fig. 1, as at 21. The principal automatic functions of the bar machine may be governed by a camshaft 22 upon which may be mounted the main feed cam (not shown) and the driving parts of the indexing mechanism for the spindle carrier 21. The shaft 22 will thus be understood to provide a means whereby the spindle carrier 21 may be indexed in synchronism therewith.

The stock-reel and feeding mechanism may be incorporated in a separate assembly comprising a plurality of spaced housing members. In the present case, I have shown a rear frame member 23, a central frame member 24, and a front frame member 25, and it will be understood that, depending upon the required length of the stock-reel assembly, the same or a greater number of housing members may be employed. The various housing or frame members 23—24—25 may rest directly upon the floor, and, in order to provide for accurate leveling and alignment with the machine 20, adjustable pedestal legs, as at 26 for the frame members 24—25, may be employed. The housing members 23—24—25 may be rigidly held in longitudinally spaced relation by suitable clamping to longérons or bars 27, some or all of which may also project forwardly of the stock-reel mechanism for firm anchorage at the rear of the bar machine 20. A protective sheet or cover 28 may surround the main working parts of the stock-reel mechanism for safety purposes.

Referring particularly to Figs. 10 through 14, the stock-reel itself may comprise a plurality of frame members or spiders 29 supported in spaced relation along a central tube 30, and the tube 30 may project forward through the rear end of the machine 20 and as far as the spindle carrier 21; in the form shown, one end of the reel tube 30 is supported in antifriction bearings 30' in the frame 23, and the forward end is locked to the spindle carrier 21 by means of a coupling 31. Each of the spider members 29 of the stock reel may be peripherally recessed at uniformly angularly spaced positions 32, depending upon the number of spindles to be served by the stock reel, and in order to give maximum support to bars of stock within the reel, longitudinally extending generally U-shaped liners 33 may be carried in the various recesses 32. The location of the liners in the stock reel is preferably such that, when the stock in a particular liner is at the loading station, the center of such stock may rest in alignment with the spindle center to be served thereby.

Since the stock supported in parts of the various liners 33 will be more or less continuously rotating with the spindle in which such stock is held, there will necessarily be wear of the liners, and I have provided a liner construction wherein replacement of the liners or parts thereof may be a relatively simple operation.

Each full length of liners 33 may be longitudinally divided into a plurality of parts, as into parts 33'—33''. The first part 33' may span the length between the rear and center reel-spider members 29, and the length 33'' may span the length between the center and front spider members 29. Each of the liner parts 33'—33'' may be formed with retaining lugs welded in place on the sides thereof, and such lugs may be so disposed as to engage longitudinal recesses 34 in the spider members 29. In the case of the liner 33', lugs 35 engage the recess 34 in the rear spider frame 29, while lugs 36 engage the rear half of the corresponding recess 34 in the center spider member 29. Assembly may be made in a rearward sliding movement of the liner part 33' relatively to the frame members 29, as by first inserting the lugs 36 in the recess 34 of the center spider member 29 and by then locating the lugs 35 in the rear spider member 29. A retaining lug 37 on the bottom of liner part 33' may serve to limit such rearward inserting sliding movement.

After thus assembling the liner part 33' to the reel frame, the forward liner part 33'' may be similarly inserted. In the latter case, it will be clear that lugs 38 on liner 33'' may slide into the recesses 34 of the middle spider member 29, and that the lugs 39 may engage the recesses 34 of the forward spider member 29. A simple spring-pressed detent 40 including a short projection 41 may be carried by the forward spider member 29 for coaction with a suitable recess or opening in the bottom of the liner 33'' in order to retain the liner parts assembled on the stock reel. It will be appreciated that my arrangement of forward and rear liner halves may provide a simple means for liner replacement; removal and replacement may be accomplished at the loading station, without removing the reel.

As has been indicated generally above, my stock reel is adaptable to stock of a number of different diameters. The liner 33 closely fits the recess 32 so that the side of the liner 33 essentially determines the maximum size of stock accommodated

by the reel. For smaller sizes of stock, it is desirable that substantially the same stock-centering positions be maintained, so that stock may be properly aligned with the spindles, particularly at the spindle-loading station. For such smaller sizes of stock I provide further insertable liner means, as in the case of the liner 42, which may have a forward half 42' and a rear half 42''.

In order to maintain correct work-centering for a smaller stock size, as within the insertable liner 42, each of the liner parts 42' preferably includes spacer means for appropriately spacing the same from the three walls of the original liner 33. In such case, spring feet 43 may be provided at spaced points along the bottom of each of the liners 42'—42'', and relatively rigid spacer lugs 44 may be affixed to the sides of the liners 42.

In order to permit ready insertion and removal of the insertable liners 42, each liner 42'—42'' may include spaced latching means to be resiliently engaged and held in place. In the form shown, such latching means includes a fixed part or lateral projection 46 which may be formed integrally with the spacer lugs 44. The latching projections 46 may be insertable in transverse guide slots 47 formed in the walls of the outer liner 33, and spring-catch members in the form of appropriately bent strips 48 may engage the latch projections 46. In Fig. 14, the latch projection is shown projecting through a keeper opening in the resilient latching strip 48, for a rigid anchoring of the liner 42' in place. It will be clear that the described construction makes possible quick insertion at any index station, merely by pushing liners 42'—42'' into liners 33'—33'' until the spring catches 48 engage projections 46. In order to remove the insertable liners 42'—42'', as when it is necessary to accommodate a different size of stock, the outwardly bent ears 49 of the latch member 48 may be engaged and pried open, as by the fingers or with a screw driver or the like, and one or the other or both of the liners 42'—42'' may be merely lifted out.

It will be appreciated that at all stations except the loading station, the bars of stock will be rotating with the spindles in which they are held, and the unconsumed lengths of such stock may project out the back frame 20 of the bar machine and may rotate within liner 33. To prevent whip of this long end of stock, I provide an antifriction supporting means therefor, and in the form shown free idler rollers 50 are supported by frame members 24—25 in position effectively to close off all downwardly and laterally open liners 33. If desired, further antifriction support may be provided by rollers 51 mounted on a yoke 52, suspended between frame members 24—25 and upon longérons 27. It will be appreciated that, as long as suitable liners 33 or liner inserts 42 have been inserted in accordance with the diameter of stock to be accommodated by the reel, the rollers 50—51 may, without replacement or adjustment, provide appropriate antifriction anti-whip support for long, and as yet unconsumed chucked bars.

In the form shown, the magazine for loading the stock reel is effective to drop a new bar of stock into an empty liner 33 whenever the mechanism senses that an empty liner 33 is at the station just preceding the feed-out station, at which stock is fed to the spindle. As disclosed in the aforementioned patent, the magazine for supplying stock to the stock reel may comprise an open inclined mouth, as defined between



spaced jaws 55—56 which may be formed as part of each of the main frame members 23—24—25 of the reel housing. For accommodation of various sizes of stock within the magazine slot or mouth, I have provided a transversely adjustable bar 57 on the upper jaw 56, so that the width of the mouth may substantially conform with the stock diameter.

At the lower end of the magazine, I provide means for separating each bar of stock to be fed and for allowing only the separated bar to be dropped into an empty liner 33. Such means contemplates appropriate support for the piece of stock which must next be dropped into the reel, the support being such that, no matter what the size of stock, one and only one piece of stock will be fed in any one magazine-loading operation. My novel supporting means may be applied at each of the frame members 23—24—25, and, for the case of frame member 24, is shown to include a pocket for segregating the bar 60 from the bars which are to be dropped later. The bottom of the pocket may be defined by an adjustably positionable bar rest 58 (see Fig. 4) having a cupped end with a slightly upwardly projecting toe portion 59, which toe portion may serve to support or to retain one side of the bar 60 next to be dropped out of the magazine.

The bar rest 58 may be pivotally supported with respect to the frame, as by means of a bolt 61, which may be tightened against the frame after the position of the rocker bar rest 58 has been determined. Longitudinally between the rocker bar rest 58 and the frame member 24, I have provided a stop-plate member 62 which may be clamped against the frame member 24, as by bolts 63 and 61, and which may serve to provide a second support for the bar 60 and to define the left side of the pocket (i. e. left, in the sense of Fig. 4). The stop-plate member 62 may be guided (preferably in the direction of slope of the magazine jaws 55—56) by means of slots 64 formed therein. A bolt 65 may be threaded in the stop plate 62 and may pass through a slot 66 in the rocker bar rest 58, in order effectively to link or to coordinate the adjusted movements of plate 62 and of bar rest 58.

It will be appreciated that when the bolts 61—63—65 are slackened, a sliding motion of the stop plate 62 may effectively crank the rocker bar rest 58 and raise or lower the toe portion 59 thereof. Coincidentally, the front generally upstanding edge 67 of the stop plate 62 may be positioned so as to provide a second point of support for the bar of stock which must next be dropped out of the magazine. The preferred relationship of the pivotal and cranking centers 61—65 of the rocker bar rest 58 and of the toe 59 (of the rocker bar rest 58) and of the front edge 67 (of the stop plate 62) is such that the locus of contact points between the bar 60 which is just to be dropped out of the magazine and the next bar 68 to be dropped out is (more or less regardless of stock diameter) always essentially in the same inclined plane, this plane having substantially the inclination of the jaws of the magazine. It will be appreciated that with such relationship the plunger 69 which is to be advanced in order to push the stock 60 off the bar rest 59 may always engage the stock 60 and only one piece of stock 60, without fouling the next piece of stock 68 which is to be fed from the magazine. A typical forward adjustment of stop plate 62, accompanied by an upward (gen-

erally transverse of the direction of adjustable movement of plate 62) positioning of the toe 59 of rocker bar rest 58, is shown in phantom outline in Fig. 4, for the accommodation of stock 60' of smaller diameter.

In order to promote the effectiveness of my means for dropping a bar of stock 60 from the magazine and into the stock reel, I employ a spring-urged cam plunger 70 having a normal forward position (as shown) and held therein as by a preloaded spring 71. The forward or projecting end of the plunger 70 may be appropriately sloped, as at 72, to engage the bar stock 60 as it is being pushed forward by the stock-feeding plunger 69, and to engage such bar stock 60 with an ever-increasing downwardly directed ejecting force, as will be clear.

The operation of the plunger 69 for dropping the bar 60 out of the magazine and into the reel may be essentially the same as that described in the above-mentioned patent. Such mechanism may include a rocker lever 73 pivoted as at 74 in the frame member 24 and having a cranked slide-block pivotal connection, as at 75, for actuating rocker or lever means. The lever means may include two arms 76'—76'', both of which are shown clamped to a rocker shaft 77. The cranked end of arm 76'' may carry a block 78 to be actuated in the event that a vacant or empty liner 33 is presented at the magazine drop-out station.

Normally, there is stock in all positions, and actuation of plunger 69 is only required when a reel position becomes empty. The plunger 69 may be driven from the main camshaft 22 of the bar machine, so as to be possibly actuable between each indexing operation of the bar machine; I have shown crank or eccentric means 80 mounted on the main camshaft 22 to establish this relation with the main camshaft 22. The crank or eccentric 80 may drive an actuating rod 81 having normally a lost-motion relation with the block 78. To determine limits of such lost motion, I have provided spaced collars 82—83 on the rod 81, and the spacing between collars 82—83 is greater than the effective thickness of the block 78 to the extent of the lost motion. The block 78 may also carry a transversely rockable lever block 84, pivoted at 85; the effective width of the lever block 84, at least in the vicinity of the rod 81, preferably corresponds to just less than the lost motion of rod 81 in block 78. The lever block 84 may be notched, as at 86, so that when cranked clockwise (with respect to the position shown in Fig. 3), the notch 86 may receive or hug the rod 81, and the main body of the lever block 84 may serve substantially to eliminate the described lost motion. When positioned to eliminate the lost motion, it will be clear that a cranking operation of the eccentric 80 may operate the cranks and levers 73—76 and may force the projection and a retraction of plunger 69 in order to drop the next bar of stock 60 out of the magazine and into an empty liner 33.

In order that the bar 60 may drop only when an empty stock liner 33 is in the magazine-loading position, I provide means responsive to a condition representing an empty liner, such means being effective to produce a clockwise cranking of the lever block 84 and therefore to make possible a feeding operation of the plunger 69. Such means may include an arm or finger member 88 pivoted to the frame 25, as at 94, and including a downwardly depending portion 90. The member 88 may normally rest upon a bar of stock 91, if such bar 91 should be in a liner 33 at the magazine-loading station, and it will be seen that the arcuate lower surface of member 88—90 may serve to keep member 88—90 in a raised position continuously (including during indexing) so long as the liner 33 is not empty. A tie-rod 92 may effectively connect the finger 88 with the lever block 84. It will be appreciated that, if, upon an indexing operation, an empty liner 33 should be presented at the magazine-loading station (as will occur when the liner 93 of Fig. 4 is advanced into the magazine-loading station, with the next indexing operation), then the finger 88 will be allowed to drop, and the lever block 84 will be cranked into a position effectively blocking off lost motion of rod 81 with respect to lever 76''. Therefore, when the finger 88 has dropped, the rod 81 may produce a useful actuation of the plunger 69 so as to drop the next bar of stock 60 into the pocket of empty liner 93, as will be clear.

It frequently happens that bars of standard diameter may not be of uniform length and that variations in stock length may account for virtually the entire longitudinal spacing between the stock-reel frame or housing and the rear frame member 20 of the bar machine. It will be appreciated that, whether the piece of stock is relatively short or relatively long, it is desirable not to drop a new bar of stock out of the magazine until the remaining chucked bar has been consumed to a point where it is safe to drop in a new bar. To provide for the eventuality of non-uniform lengths of stock, I employ duplicate longitudinally spaced means responsive to the presence of a bar at the stock-feeding station; in the present form such means involves twin finger members 88, as shown in Fig. 3. Both finger members 88 may be mounted on a common rocker shaft 94, and one of the finger members 88 may be positioned relatively closely to the front frame member 25 of the stock-reel housing, while the other finger member 88 may be located close to the rear frame 20 of the machine being fed. As shown by the phantom outlines of bars of stock in Fig. 1, I prefer that all bars loaded into the magazine shall be of a length to project over the left hand finger member 88 (in the sense of Fig. 3) and in no event to project beyond the right-hand finger member 88. It will be appreciated that as a piece of stock is consumed in the multiple-spindle machine, the right-hand finger member will continue to guard against the feeding of a new bar into the stock reel for a particular reel pocket or liner, until the stock has been consumed to a point where it is safe to drop into the liner a piece of stock of the maximum expected length.

In addition to the various described safety features associated with my magazine loading mechanism, I have provided a further safety device to assure against machine operation, and in particular to assure against any indexing operation, should a bar fail to seat itself uniformly in the liner into which it was intended to drop. Such safety means contemplates a probe finger or lever 96 which may be tied by a shaft 97 to rock a lever 98, poised for actuation of an electric switch 99. A spring 100 may effectively counterbalance the probe finger 96 to hold the same in a raised position, spaced slightly off bars of stock in the reel. The probe-finger-and-switch assembly 96—99 may be located on one stock-reel

frame member, such as the member 24, and I prefer to locate another similar probe-finger-and-switch assembly 96'—98'—99' on another frame member, which may be the rear frame member 23 (see Fig. 2). The contacts of switches 99—99' may be interconnected as shown in Fig. 9, and it will be appreciated that, unless both switches 99—99' have been operated in the same way and at the same time, the switches 99—99' will not serve to complete a circuit. The operation of such circuit will be more fully explained below.

Having dropped bars of stock, such as the bar 60, from the magazine into such of the stock liners 33 as may have been empty or vacant, my machine must then wait until the last usable length of otherwise consumed stock has been finished at a particular working station. Having consumed the last usable length, the remaining piece is useless and must be discarded, and automatic means may be employed to condition the machine spindle to receive a new length of stock from the stock-reel mechanism. In accordance with the disclosure in the above-identified copending application, such means may employ mechanism responsive to the loss of grip of the feed fingers (not shown) on the consumed stock; it will be appreciated that, when this event occurs, a rack 102 may be raised so as to rotate an arm 103 about a rocker shaft 104 in order to release a trip-latch mechanism for temporarily disabling the drive to the main camshaft 22 of the machine. The trip latch may comprise a pawl member 105 resiliently urged by a spring 106 into seated relation with one of two steps 107—108 on a latching member 109. It will be appreciated that, when the rack member 102 is raised, as when the last usable piece of stock has been consumed and when the feed fingers are unable to feed the stock any further, the latch member 105 may be dislodged from its latch relation with the step 107, and the latch member 109 may be moved by spring means 110 (to be more fully described) into an unlatched seated relation with the step 108. When unlatched, said mechanism (which is to be more fully described) may stop the main camshaft 22 with the exhausted spindle in the loading station and with thhe collet or chuck thereof open and, therefore, conditioned for removal of the useless butt and for reception of a newly fed bar.

At the feed-out station, my stock-reel mechanism employs pusher means which may include an offset head or arm 111 mounted upon a longitudinally movable drawbar 112. Various means for advancing and for otherwise controlling the position of the drawbar 112 may be employed, but in the form shown I use a hydraulic feed. The hydraulic feed mechanism is shown to include a cylinder 113 which may extend longitudinally from the rear frame member 23 to and through the central frame member 24. A piston 114 may be propelled within the cylinder 113, and a stem or piston rod 115 extends through a suitable gland or packing 116 into driving relation with a crosshead 117. The drawbar 112 may also be fastened to the crosshead 117, and, for alignment stability, I prefer that the crosshead shall include a fork or otherwise suitably formed guide portion 118 to be guided, as by a guide bar 119. Exhaust fluid from the stem end of the cylinder 113 may be returned to the hydraulic supply system via a longitudinally extending pipe 120, and I have employed a cylinder-head member 121 suitably formed with passages, as at 122, to provide the necessary hydraulic connections. The guide bar 119 may be supported at one end in the cylinder head 121, as shown, and at the other end in the rear frame member 20 of the multiple-spindle machine.

It will be appreciated that the forward stock-reel frame member 25 may include a large-enough opening 123 to permit the crosshead to pass through, so that the full movement of the crosshead 117 (and therefore of the pusher 111) may be substantially half the length of stock-reel mechanism, plus substantially the space between the stock-reel frame member 25 and the rear frame 20 of the multiple-spindle machine. For a proper guided support of the pusher 111 and of the drawbar 112, I may employ another guide member 125 which may more or less resemble the crosshead 117. The member 125 may be keyed to the draw-bar, as at the boss portion 126 thereof, and the boss portion 127 may have a sliding fit over the outer surface of the cylinder 113. For stability, a guide fork 128 may ride the outer surface of the hydraulic return pipe 120. Referring to Fig. 1, it will be seen that I prefer that the guide member 125 be mounted on the drawbar 112 as close as possible to the pusher 111.

The hydraulic system for supplying pressurized fluid to the cylinder 113 may include a pump 130 driven by an electric motor 131 and drawing fluid from a sump or reservoir 132. Reversing-valve means 133 may receive the pressurized fluid for distribution either to the head end or to the stem end of the cylinder 113, depending upon the desired direction of movement of the pusher. The valve 133 may be electrically actuated by a solenoid 134, and for purposes of description it will be understood that in the "down" position of the solenoid 134 (as shown in Figs. 1, 2, and 9), the valve 133 passes pressurized fluid through its outlet port 135 and via pipe 136 to the rear end of the cylinder 113, for a stock-feeding displacement of the pusher 111. At the same time, valve 133 establishes an exhaust flow connection from the return pipe 120 via line 137 to the sump. When the solenoid 134 is energized, the reverse connections obtain, and pressurized fluid will be understood to be fed via pipes 137 and 120 to the stem end of the cylinder 113, while exhaust fluid is driven off the rear end of the cylinder for a return to the sump by way of line 136. The valve means 133 will be understood to incorporate safety means in the form of a pressure-relief valve to spill pressurized fluid to the sump, should the pressure exceed a given safe limit; in the form shown, adjustment of the safety-relief pressure may be made at 133'.

As indicated generally above, I have provided means whereby the forward stroke of the pusher 111 may be interrupted and, if necessary, reversed, should sustained abnormal resistance to pushing be encountered. Such means may be viewed as a mechanism for quickly accomplishing the desired feeding function, or in certain cases it may be viewed as a further safety feature. It will be understood that the force normally required to push a bar may be only that necessary to overcome friction of the bar in its liner. Of course, burrs may cause transiently greater friction so that there may be some fluctuation in the force required to push a bar from the reel and into the machine 20. Also, in forcing the new stock into the rear end of the feed

fingers (not shown) of the machine 20, there may be a momentarily greater demand for feeding pressures. My improved mechanism will effectively ignore such transients in the feeding force or pressure, but should the stock become jammed hard against the feed fingers, or for that matter jammed hard in any other position, my mechanism will automatically stop the feed and, in the form shown, effect a reversal, that is, a retraction of the pusher 111.

My safety or reversing mechanism may be pressure-operated and utilize pressures developed at the rear or feeding end of the cylinder 113. In utilizing such pressures, I have made a connection to the feed chamber of the valve 133, as by means of a line 140 (see Figs. 1 and 5), and this line may extend along the framework of the stock-reel mechanism and to the safety mechanism which has been built into the trip-latch 105—109 mounted on the inside of the rear-frame member 20 of the bar machine. The safety mechanism is shown in detail in Figs. 5, 6, and 7, and it will be seen to provide essentially a dashpot-governed resetting of the latch mechanism 105—109.

Latch-resetting may be effected by swinging a toggle from a position in which the spring 110 resiliently holds an unlatched position to a position in which the same spring 110 resiliently holds a latched relation. The toggle elements may include an arm 141 to be actuated from the position shown in Fig. 7 to the position shown in Fig. 6. The arm 141 may carry a pin 142 to be engaged for actuation, and at the upper end the arm 141 may carry a pivoted boss 143 forming part of the toggle mechanism and receiving compressional abutment of the spring 110. The other part of the toggle may comprise another arm 144, mounted on the same stud or pin 145 as the arm 141. The arm 144 may carry a pivoted boss member 146, and a guide pin for the spring 110 may be supported in the boss 146 for guided reciprocation in the boss 143. The toggle arm 144 may be formed as a part of the latch member 108, but in the form shown these are separate members which are dogged, as at 147. It will be appreciated that when actuated into the latched position shown in Fig. 5, the spring 110 may hold the toggle arm 141 in a leftward or counterclockwise position while urging the toggled arm 144 to the right or in a clockwise position. When actuated to the right as shown in Fig. 7, the arm 141 may hold spring 110 so as to position the toggled arm 144 in the left or counterclockwise position, or at least in a position in which latch member 109 is urged against the latching pawl 105.

The dash-pot action for shifting the described toggle mechanism from an unlatched position to a latched position (in which latched position the spring 110 resiliently cocks the latch mechanism for a succeeding latch-tripping operation) may include a cylinder member or bored block 149, which is shown mounted on a bracket 150 on the rear frame 20. The cylinder 149 may be single-acting so as to apply feed pressures over the head of a piston 151; piston 151 may have a stem or rod 152 passing out the tail end of cylinder 149 through a suitable guide bushing 153. The stem 152 may carry a pair of spaced collars 154 in actuating relation with the pin 142 on arm 141. Since the cylinder 149 is single-acting, I prefer to employ a return means for piston 151, and in the form shown a compression spring 155 between bushing 153 and piston 151 may serve this purpose. The pressure required to shift the toggle mechanism from the unlatched position of Fig. 7 to the latched position of Fig. 5 may be adjustably controlled by suitable positioning of the threaded bushing 153 in the tail end of cylinder 149, as will be clear. In order to introduce dash-pot action to the movement of piston 151, I have shown an adjustable throttle or orifice member 156 mounted at the head of cylinder 149 and connected to the feed-pressure line 140. It will be clear that the sluggishness of response of piston 151 to feed-pressure transients may be governed by a manual throttle adjustment at 157.

To complete the tie-in between the above-described safety mechanism and certain elements of the machine of the above-mentioned copending application, it should be noted that the described latch mechanism is in controlling relation with two electric switches 158—159, which may be mounted on an upstanding bracket 160 on the rear frame 20 of the machine. As described in said application, the switch 158 may be of the normally-closed variety and in controlling relation with the relay 161 for the main motor 162 (see Fig. 9) of the multiple-spindle machine; the switch 159 may be of the normally-open variety and in controlling relation with the relay 163 governing operation of a solenoid 164 which (when deenergized) may effect a disengagement of the main feed clutch for the camshaft 22.

As explained, the switch 158 will normally be closed so as to permit continued running of the main motor 162 of the bar machine. To stop the machine a manual switch 165 may be opened, or, for coordination with certain other operations, a manual-control handle 166 (see Fig. 1) may be shifted, as described more fully in the said copending application. The handle 166 may be accessible on the outside of the rear frame member 20 of the machine, and a cranking thereof will be understood to actuate a crank 167 and a rocking lever 168. The lever 168 may be in actuating relation with a rod 169 to be transversely shifted when it is necessary to open the switch 158. The rod 169 may be guided in a fixed block or boss 170 (see Fig. 5), and at its inner end the rod 169 may carry an offset arm 171, with an adjustable pin 172 in actuating alignment with the button of switch 158. As also described in said application, the rod 169 may be in alignment with an arm 173 which may be formed as a part of the latching member 109 so that, upon an actuation of the hand crank 166, not only may the connections to the main motor 162 be broken, but the latch mechanism 105—109 may be reset. I have shown an adjustable lock bolt or pin 174 on the arm 173 in alignment with the rod 169, so that a desired relation of latch resetting may be coordinated with operation of switch 158.

The arm 173 may also carry an adjustable pin or bolt 175 in alignment with the button of the normally-open switch 159 (see Figs. 6 and 9), and the relation of parts is preferably such that, when the latch member 109 is set (with the pawl 105 seated against the step 107), the latch member 109 is held in a position depressing the button 177 of the normally-open switch 159, thus closing the circuit governed by switch 159 as long as the latch mechanism is in the set position. When the latch is tripped, as when a feed finger drops off the end of a substantially consumed

piece of stock, the latch member 109 is resiliently shifted away from switch button 177 by toggle spring 110, so as to permit opening of the circuit governed by switch 159.

As described in the said patent application, automatic declutching of the main camshaft 22 results upon a deenergizing of the solenoid 164 (i. e. when the latch mechanism 105—109 has been tripped). Such declutching may be effected by a mechanism which may generate only lost motions as long as the solenoid 164 remains energized (i. e. latch mechanism 105—109 in the "set" position). The lost motion may occur rotationally, as between two mutually pivoted elements 178—179 of a broken bell crank. The element 178 may include a cam-follower roll 180 to ride a cam 181 on the main cam-shaft 22, and the element 179 may be in actuating relation with the hand lever 182 for shifting the main-clutch-actuating rod 183 for the shaft 22.

As explained, as long as solenoid 164 is energized, the elements 178—179 are uselessly related to each other, and for each rotation of the main shaft 22, the cam follower 180 will go through an idle undulation. Member 179, however, also has a projection 184 serving as a pivotal support for a rocking latch member 185, connected to the armature of solenoid 164 and resiliently urged by spring 186 for latching relation with a projection 187 on the member 178. The relation of parts is such that, when solenoid 164 is energized, the latch members 185—187 are positively held away from possible latching engagement. When solenoid 164 is deenergized, as when the feed fingers have detected complete useful consumption of a bar of stock, latching engagement is effective at 185—187 and, upon the next rise of follower 180 or cam 181, the members 178—179 may effectively form a rigid bell-crank member so as to shift the rod 183 and thus to disconnect or to declutch the drive to the main cam-shaft 22.

In accordance with a further feature of the invention, I have provided a self-cocking hammer or bumper which may be included as a part of the pusher means 111 so as to provide strong bumping-out hammer blows against the end of a piece of stock 189 which may have become fouled in the feed fingers or elsewhere, prior to completion of the feed up to the stock stop 190. Referring to Fig. 8, such hammer means may be incorporated as a feature on the end of the drawbar 112 and may utilize a first or head member 111 and a second or sleeve member 191 movable relatively to each other and to the drawbar 112. One axial limit of freedom to the head member 111 may be determined by a stop collar 192 on the drawbar 112; the sleeve 191 may be limited in the same axial direction by abutment with a reduced shoulder 193 on the drawbar 112, and such abutment may be preloaded as by a strong compression spring 194, for which adjustment is provided at the nut 195 on the end of the drawbar 112. In order to locate the sleeve 191, a bushing 196 may be carried at the tail end of the drawbar 112 for a guided sliding fit within the bore of the sleeve 191.

In the position of parts shown in Fig. 8, a latch-key member 197 on one of the members 111—191 is poised to maintain an axial separation of these members after a small relative displacement of one of said members with respect to the other. In the form shown, the latch key 197 is pivoted as at 198 on the sleeve 191, and spring means 199 serves to hold the latch key 197 poised to intercept movement of the pusher member 111 toward the sleeve member 191. The spring 199 may be driven against a heel portion 200 of the latch member 197, and the heel 200 may be slidably guided along a keyway or other suitable recess 201 in the drawbar 112. The rear end of the recess 201 is preferably gradually sloped, as at 202, in order to provide a camming surface for a purpose which will be pointed out.

A longitudinal pin member 203 slidably carried by the head member 111 may be resiliently urged by a compression spring 204 for abutment with the sleeve member 191. The pin 203 thus may serve to provide a normal placement of the head member 111 in abutment with the collar 192, and I prefer that, when so abutted against the collar, the head member 111 will be in slight clearance relation with the end of the latch key 197, as at 205. This clearance will be understood to permit ready resetting of the latch key 197.

As explained more fully in the aforesaid patent, the head member 111 may incorporate the further safety feature of a swiveling action about the drawbar 112, with spring means urging pusher 111 to a position in pushing alignment with a bar of stock. The swiveling may take place about the drawbar 112; and, by forming the projecting end of pin 203 with a suitable nose at 205 to cooperate with a cam-shaped recessed shoulder 206 on the sleeve 191, it will be clear that the head member 111 may always be resiliently urged from a misaligned offset position (as illustrated in Fig. 8*a*) into a position of alignment with the bar 189 to be fed.

In operation, the preloaded compression of the spring 194 is preferably adjusted so as normally to have no give, that is, to permit no displacement of sleeve 191 relatively to the pusher bar 112 as long as normal feed forces are required. If, however, there is an obstruction encountered, the resistance of the obstruction will be transmitted to the sleeve 191 by way of the head member 111 and the key latch 197. With continued application of increasing feed pressure, the pusher bar 112 will be drawn in (i. e., within sleeve 191) so as to compress the spring 194. During such compression, the heel 200 of the key latch 197 will slide along the bottom of the recess 201, and, by the time the heel 200 reaches the cam surface 202, the abutment surface 207 of the head member 111 will have been displaced beyond the sleeve-retaining shoulder 193. Upon further compression of the spring 194, the heel 200 will be cammed by the surface 202 so as to remove the latch key from abutment with the surface 207 of the head member 111. When thus unlatched, it will be clear that the sleeve 191 will be free to respond to the stored energy of the compression spring 194 and that it may be driven with a strong force in a hammering blow at the abutment surface 207 of the head member 111.

As a further feature of my hammer construction, it will be noted that, should a pushed bar strike the stock stop so hard as to rebound, the spring 194 may absorb the rebound and gently and positively urge the stock forward to a position of final rest in abutment with the stock stop, thus avoiding the need to allow for wastage of stock due to rebound from the stock stop.

In a preferred adjustment of my described mechanism, the hammer mechanism is not operable automatically as a hammer, unless the operator performs a deliberate manual operation, as by pushing and holding a button. For safety purposes, I prefer that the pressure required to trip the hammer of Fig. 8 shall be in excess of the

pressure required to set-off the safety reversing mechanism of Fig. 5. Such adjustment may be made by increasing the preload on spring 194 or by decreasing the preload on spring 155, as will be clear. As an ultimate safety device, in the event of unforseeable malfunctioning, the relief-valve means 133' may be set to operate at a pressure in excess of that required to operate hammer 111, as will be clear. In order for the hammer to deliver its blows, I have provided manually-operated means in the form of a switch 210 having a push button 211 normally urged outwardly as by a spring 212, so that operation of switch 210 must be deliberate. The connection and function of switch 210 will be more clearly understood from the following description of a cycle of operation of my machine.

*Operation*

Let it be assumed that the bar machine and that the stock reel have been operating fully automatically and that, for one reason or another, a piece of stock in one position on the spindle carrier 21 has been consumed to a point at which the back end of such piece has just passed into the back end of the multiple-spindle machine 20. When such piece of stock is indexed around to the magazine-loading station, it will (then, and for the first time) be unable to raise the forward trip finger 88; as a result, at an appropriate instant during the regular cycle of the main camshaft 22, the crank or eccentric 89 may be effective to project the magazine-discharge plunger 69, so as to drop the next bar of stock 60 into an empty liner 33. If the stock 60 should fall into the liner 33 properly, then both switches 99—99' will be operated in the same direction, and the circuits of normally-open limit switch 159 and of the clutch throw-out solenoid 164 will be retained in normal operating condition (i. e. with switch 159 held closed, and with solenoid 164 energized). If there should be an accident in which one end of the stock 60 failed to seat in the liner 33 while the other end became so seated, then the circuit through switches 99—99' would not be completed, and the solenoid 164 would be deenergized so as to throw out the main feed clutch, thus preventing a damaging index of the machine.

At the station which has just been loaded from the magazine, the short length of the stock will continue to be consumed with every piece of work that is turned out, and the time will come when there is no longer a piece of usable stock. At such time, and when the unusable piece is in the stock feed-out position (chucking station), the feed finger of the multiple-spindle machine will fail to grip the end of the stock, and the latch mechanism 105—109 will be tripped so as to open switch 159, thus deenergizing solenoid 164 and throwing out the main feed clutch when the collet is in the open position.

If the useless piece of stock remaining in the spindle should be of a length which could not be dropped out when a new bar of stock is pushed into the spindle, then the spindles may be declutched or stopped, as by opening the manual switch 165 in order to permit safe removal of the useless butt. The main motor 162 may then again be started upon closure of switch 165, and the hydraulic feed mechanism of the stock reel may also be started.

In the form shown, the hydraulic-feed mechanism is started upon pushing the button 211 of switch 210, so as to complete a circuit to the relay 213 for the pump motor 131. It will be recalled that the latch mechanism 105—109 was tripped when the feed fingers slipped off the end of the useless butt, and that, therefore, the switch 159 is in its normally-open position when the pump motor 131 is started. Since switch 159 is open, solenoid 134 for the reversing valve 133 is deenergized, and the valve 133 is positioned so as to direct pressure fluid to the stock-feeding end of the hydraulic cylinder 113. The hammer or head member 111 of the pusher means may then engage the end of the new bar of stock 60, and, as long as no unusual obstruction is encountered, the spring 194 of the hammer-preload mechanism will not be further compressed during the feed stroke.

It will be noted that, once the pusher means 111 has commenced its feeding stroke, a normally-closed switch 214 may serve to hold the pump-motor relay 213 energized. The switch 214 is shown to include a roller to engage a sloping cam surface 215 and a ledge 216, formed as a part of or carried with the guide member 125. As long as the pusher means 111 was fully retracted, so was the guide member 125, and the switch 214 remained actuated so as to present an open circuit. However, upon a certain initial feeding displacement of the pusher means, the guide member 123 will run out from underneath the roller of switch 214 so as to provide a means for holding-in the circuit for the pump-motor relay 213. The operator's finger may then be removed from the button 211, and the feeding of stock may continue.

Now if the forward end of the stock should meet an unusual obstruction, as may be the case when striking the feed fingers, the feed pressure will mount while the pusher head 111 stands still. With mounting pressure the drawbar 112 will be advanced against the increasing compressional force of spring 194. As long as this increased pressure is a steady rather than a transient increase, the safety piston 151 will be displaced until a point is reached at which the safety-toggle means is tripped from the position shown in Fig. 7 to the position shown in Fig. 5. It will be recalled that such tripping of the toggle occurs preferably prior to any hammer operation of the pusher means 111.

Upon tripping the toggle into the position shown in Fig. 5, the latch means 105—109 will have been reset, and, at the same time, the normally-open switch 159 will have been actuated so as to close the circuit to the reversing solenoid 134. Fluid under pressure will then be delivered to the forward or stem end of the hydraulic cylinder 113, and the hammer and drawbar 111—112 will begin to retract away from length of stock which was being fed.

Now, if the operator wishes, he may bump-out the stock through the feed fingers in the normal manner, as by applying a sledge hammer or the like to a sufficiently long rod inserted in the liner 33 and against the obstructed piece of stock 190; the insertion may be made upon nudging the hammer 111 to an offset position, by swinging the same about the drawbar 111. On the other hand, effortless bumping-out may be accomplished merely by again pushing the switch button 211. Upon such depression, the left-hand contacts of switch 210 are opened, and the circuit which energized reversing solenoid 134 is interrupted, so as to position valve 133 once more for feeding.

It will be noted that, after reversal upon encountering an obstruction, continuous feed is only possible as long as the button 210 is main-

tained depressed by a deliberate manual operation (since the circuit to solenoid 134 has been closed through switch 159, by toggle action). Pressing the button 211 effectively overrides any automatic operation of the reversing mechanism, and, when the feed pressure has risen sufficiently, the automatic hammer of the pusher means 111 may be cocked and "fired." If the first hammer blow proves insufficient to bump the stock through the feed fingers, then the operator need only take his fingers off the button 211 in order to reverse or withdraw the hammer and pusher for a resetting of the same. When the hammer has reset itself, the button 211 may be depressed again, and the described "firing" cycle repeated as often as necessary: Once the stock has entered the feed fingers, it may usually be pushed in a single operation as far as the stock stop; but continued depression of the button 211 will be necessary for forward feed, once the machine has gone into the described reverse operation.

Now, ordinarily a skilled operator should be able to judge when to take his finger off the button 221 in order to avoid running the hammer of the pusher means 111 against the stock stop 190. However, in accordance with another feature of the invention I incorporate a safety feature in the stock stop to avoid any possible hammering of the stock stop. This safety feature may involve means including a slidable probe member 220 positioned in the abutment end of the stock stop 190 and preferably slightly projected beyond the abutment surface so as to be poised to intercept the stock bar 189 just before or as the latter strikes the stock stop. A small displacement of probe 220 may be effective to close a normally-open switch 221 connected in series with the relay 163. Operation of the relay 163 (when the stock 189 hits the stock stop) will be understood to energize solenoid 134 and, therefore, immediately to commence withdrawal of the feed mechanism. This event will ordinarily sufficiently remind the operator that he should take his finger off the switch button 211; but it will be appreciated that, even if he should keep the button 211 depressed, the newly fed bar will continue to hold switch 221 actuated, so that withdrawal of the pusher means may nevertheless proceed. Withdrawal of the pusher 111 may continue as long as the motor 131 continues to operate; and it will be appreciated that, when the roller of the normally-closed switch 214 is actuated, the guide member 125 is substantially fully retracted and the pump motor is shut off, thus stopping the hydraulic operation, with the pusher means placed in readiness for feeding out the next bar of stock which may be called for.

It will be seen that I have described an ingenious automatic stock-reel and stock-feeding mechanism. My mechanism may be readily adapted to existing automatic machines, and automatic coordination of my mechanism with operation of the automatic machine may be achieved. My mechanism may be readily adapted to accommodate a range of stock diameters and lengths, with a minimum of "down" time. My mechanism incorporates safety measures so as to assure maximum useful life of the equipment as well as protection for the operator.

While I have described my invention in detail for the preferred form shown, it will be understood that modifications may be made within the scope of the invention as defined in the claims which follow.

I claim:

1. In a stock-feeding mechanism of the character indicated, means for supporting a bar of stock in alignment with a spindle into which the bar is to be fed, pusher means including a double-acting hydraulic cylinder having a feed end and a drawback end, reversing-valve means for connecting said feed end with a source of fluid pressure for a feeding stroke and for connecting said drawback end to the source of fluid pressure for a drawback stroke, and pressure-responsive means connected to said feed end and responsive to a rise in feed pressure above a given value for reversing the position of said valve, whereby upon encountering an abnormal resistance during a feeding stroke, said pusher means may be automatically retracted, and manually operable means for said reversing-valve means and connected to permit a manually selected reapplication of fluid pressure to the feed end of said cylinder at any time during the drawback stroke of said cylinder.

2. In a stock-feeding mechanism of the character indicated, means for supporting a bar stock in alignment with a spindle into which the bar is to be fed, pusher means including a hydraulic cylinder and valve means for controlling the supply of pressure fluid to the respective ends of said cylinder, automatic pressure-responsive reversing means in communication with the feed end of said cylinder and effective to reverse said valve means upon a given rise in feed pressure above a given value, the connection between said pressure-responsive means and the feed end of said hydraulic cylinder including a restrictive orifice, whereby there may be a delayed action of said pressure-responsive means so that normal transient fluctuations in pusher-feed pressure need not cause feed reversal, but whereby said pressure-responsive means may be actuated in response to more sustained pressures in excess of said given rise.

3. In a stock-feeding mechanism, means for supporting a bar of stock in alignment with a spindle into which the bar is to be fed, double-acting hydraulic pusher means for feeding the bar aand including reversing-valve means for reversibly moving said pusher means, pressure-responsive means responsive to a rise in feed pressure above a given value and connected reversibly to position said valve means, and a hammer for said pusher, said hammer including means to be charged as the feed pressure rises above normal feed pressure, and tripping means effective to release the charged hammer upon attainment of a feed pressure in excess of the pressure at which said valve is reversibly positioned by said pressure-responsive means.

4. In a stock-feeding mechanism of the character indicated, means for supporting a bar of stock in alignment with a spindle into which the bar is to be fed, pusher means for feeding the bar and including a hydraulic cylinder and valve means for controlling the supply of pressure fluid to the feed end of said hydraulic cylinder, pressure-responsive means in communication with the feed end of said cylinder and effective upon a rise in feed pressure above a given normal feed pressure to actuate said valve so as to cut off the supply of feed pressure to said cylinder, said pusher means including hammer means with energy-storing means to be charged as and when the feed pressure rises above the normal feed pressure, tripping means effective to release said energy-storing means upon a rise in feed pressure in excess of the rise

required for pressure-responsive actuation of said valve, and manual means for repositioning said valve, whereby said hammer may not be operated automatically but must be operated only by deliberate manual actuation of said manually operated means.

5. As an article of manufacture, drawbar means for a stock-feeding mechanism of the character indicated and including a feed bar with a hammer at one end, said hammer including a head member to abut a bar of stock to be pushed, a second member movable relatively to said head member, spring means between said second member and said feed bar, spacer means holding said members apart during feed-bar-actuated loading of said spring means, and means effective to release said spacer means upon a given relative displacement of said members.

6. A hammer according to claim 5, in which said members include cooperating abutments determining a limit of relative motion with respect to each other, and in which said spring means is preloaded in a direction urging said members against said abutments.

7. A hammer according to claim 6, in which adjustable means are provided for adjustably preloading said spring means.

8. As an article of manufacture, drawbar means for a stock-feeding mechanism of the character indicated and including a feed bar with a hammer at one end, said hammer including a head member to abut a bar of stock to be pushed, a second member movable relatively to said head member, spring means between said second member and said feed bar, spacer means holding said members apart during feed-bar-actuated loading of said spring means, and means effective to release said spacer means upon a given loading of said spring means.

9. As an article of manufacture, drawbar means for use in a stock-feeding mechanism of the character indicated, and including an elongated feed bar to be driven by a feed mechanism and with a hammer at one end, said hammer including, a head member held against axial movement in one direction with respect to said bar and including a stock-thrust head offset from the axis of said bar feedingly to abut a piece of stock to be longitudinally fed, a second member movably carried by said bar, spring means preloaded between said bar and said second member, movable abutment means longitudinally spacing said second member from said head member, and means effective upon a relative displacement of said bar and of said second member to move said abutment means so that it no longer longitudinally spaces said members, whereby upon such removal of said abutment means the energy stored in said spring during the given movement may be released and delivered as a hammer blow to said thrust head.

10. In a stock-feeding mechanism of the character indicated, means for supporting a bar of stock in alignment with a spindle of a bar machine to be fed thereby, stock-stopping means on the bar machine, fluid-pressure-operated feeding means for feeding a bar of stock to said stock stop, reversing means for said feeding means and including means responsive to an excessive fluid pressure for reversing the feed for a retracting stroke, and means responsive to stock reaching said stock stop for automatically rendering said reversing means effective.

11. A machine according to claim 10, in which said feed mechanism includes means requiring a continued deliberate manual operation in order to effect a feeding of stock to said stock stop, and in which said automatic reversing means effectively overrides said deliberate manual feed control.

12. In a stock-feeding mechanism of the character indicated, means for supporting a bar of stock in alignment with a spindle into which the bar is to be fed, pusher means for feeding the bar into the spindle, said pusher means including a reversing mechanism effective to commence retraction of said pusher means upon encountering an abnormal resistance to stock pushing, and manually-operated means requiring a deliberate continued manual operation and effective to override said reversing means to produce a further pushing of the stock only upon said delibrate manual operation.

13. A mechanism according to claim 12, in which further reversing means for said pusher means is effective at a desired limit of feed for the stock, and in which said further reversing means may automatically override said deliberate manual control.

14. In a stock-feeding mechanism of the character indicated, means for supporting a bar of stock in alignment with a spindle into which the bar is to be fed, pusher means for feeding the bar, manual-control means for initiating a feeding operation of said pusher means, safety means effective upon encountering an abnormal resistance to stock pushing for stopping a forward feed of said pusher means, said manual-control means further including means overriding said safety means to produce a further feed of said pusher means upon sustained deliberate manual action thereof, whereby a single manual operation may not only start stock-feeding but may also effectively insist upon stock feeding.

15. In a stock-feeding mechanism of the character indicated, means for supporting a bar of stock in alignment with a spindle into which the bar is to be fed, pusher means including manual-control means for initiating a feeding operation of said pusher means, said manual-control means being normally ineffective to initiate a feeding stroke of said pusher means, and means responsive to a substantial run-out of stock in the spindle for conditioning said manual means for effective operation, whereby a new bar of stock may only be fed into the spindle upon a substantial run-out of stock.

16. In a stock-feeding mechanism of the character indicated, means for supporting a bar of stock in alignment with a spindle to be fed, magazine loading means for automatically supplying a new bar of stock to said first-mentioned means when the bar in said first-mentioned means has been sufficiently fed into the spindle, said magzine loading means including a plurality of longitudinally spaced supports, each support including two interconnected relatively movable longitudinally proximate transversely spaced supporting means to engage beneath and on opposite sides of a piece of stock, automatic dropping means including means laterally positioned and generally transversely movable to engage one side of the stock to be dropped and to push the same off said supports, one of said supports including adjustable means, whereby, for a number of stock diameters, said supports may so support bars of stock with relation to said automatic dropping means that the positive dropping of one and only one bar with each operation of said automatic dropping means may be assured.

17. In a stock-feeding mechanism of the character indicated, a frame, means for supporting a bar of stock in alignment with a spindle to be fed, magazine loading means for periodically supplying bars to said first-mentioned means as needed, said magazine loading means including a plurality of longitudinally spaced rests for a bar to be dropped into said first-mentioned means, each said bar rest including and adjustably fixed support to be positioned beneath and to one side of the bar of stock to be dropped, said bar rest further including automatically movable means engaging and supporting the bar beneath and to the other side of the same, said automatically movable means including an arm pivoted to said frame and connected to be cranked upon an adjusted movement of said adjustable support, said adjustable support being adjustable generally transversely of the direction of movement of said automatically movable means, whereby upon adjustment of said adjustable support in accordance with the stock diameter to be accommodated said automatically movable means may engage only the bottom bar of stock in said magazine for dropping the same out of said magazine and into said first-mentioned means, more or less regardless of the diameter of the stock.

18. In a machine of the character indicated, means for supporting a bar of stock in alignment with a spindle to be fed, magazine loading means for periodically loading a new bar of stock into said first-mentioned means as needed, said magazine loading means including a plurality of longitudinally spaced bar drop-out pockets to receive and hold the bar of stock which is next to be dropped into said first-mentioned means, each said pocket including finger means at the top and to one side thereof and determining one limit of an admission opening to said pocket, bar-rest means beneath the bar to be dropped and including separate supports engaging the bottom of the bar on both sides, one of said supports including a generally upstanding edge defining the other side of said pocket and adjustable effectively to open and close said pocket, the other of said supports being adjustable generally transversely of the direction of adjustment of said first support, and means linking said supports, whereby, upon the adjustment of one of said supports, the other is automatically adjusted, whereby for a range of stock diameters the admission opening may be appropriately limited between said finger means and said generally upstanding edge, and whereby the center of the stock may be appropriately positioned for dropping out of said pocket and into said first-mentioned means.

19. A machine according to claim 18, in which said first support is a slidable plate slidable generally transversely of the opening of said pocket, and in which said second support is an arm pivoted to the frame of said machine with a toe extending beneath the bar to engage the same on the side remote from the pivotal support, and with cranking means tied to said plate.

20. In a stock-feeding mechanism of the character indicated, means for supporting a bar of stock in alignment with a spindle to be fed, magazine loading means for periodically dropping a bar into said first-mentioned means as needed, said magazine loading means including a plurality of longitudinally spaced supports for a bar to be dropped into said first-mentioned means, each of said supports including a bar rest beneath the bar to be dropped, a generally transversely movable drop-out plunger to dislodge the bar from the bar rest in order to drop the same out of said magazine, and a resiliently opposed plunger on the side of the bar opposite said drop-out plunger and including a downwardly sloping cam surface facing said bar rest, said bar rest including means adjustable generally transversely of the direction of movement of said plunger, whereby for any particular one of a range of permissible stock diameters the clearance between said bar rest and said resiliently opposed plunger may be adjusted to be less than the stock diameter, whereby upon a dropping-out operation the bar to be dropped out may be forced over said bar rest and resiliently against the said resilient plunger, so that the cam surface thereof may effectively spring-urge the bar downwardly into said first-mentioned means.

21. In a stock-reel mechanism of the character indicated, a frame including a plurality of longitudinally spaced supports, a reel rotatably supported within said supports and including longitudinally aligned circumferential recesses for the accommodation of bars of stock, said reel to be connected for indexing with the indexing of a multiple-spindle bar machine into discrete indexing positions, and freely rotatable anti-friction means carried by said supports of said frame at index stations for stock in said reel and projecting to engage the bars of stock in said recesses, whereby at least for the stock supported in the lower recesses of said reel there may be a substantial reduction of the friction opposing rotation of the bars in such recesses.

22. In a stock reel of the character indicated, a plurality of longitudinally spaced spider frame members with circumferentially spaced, longitudinally aligned recesses for the accommodation of bars of stock, replaceable liner means extending between the aligned recesses of said spider frame members and serving to provide substantially continuous longitudinal pockets for accommodation of the bars of stock, and locking means coacting between said liner means and said spider frame members for holding said liner means to said spider frame members.

23. In a stock-feeding mechanism of the character indicated, mechanism for advancing bar stock into a machine or the like, said mechanism including a manual control, reversing means for reversing the motion of said mechanism, automatically resettable control means for said reversing means, and manually operable means for advancing said mechanism, said last defined means being effective after said control means has been automatically reset, whereby upon initial automatic reversal there may be a subsequent manually controlled advance of said mechanism.

24. In a stock-feeding mechanism of the character indicated, means for suporting bar stock in alignment with a spindle to be fed, pressure-operated pusher means for feeding the stock to said spindle, pressure-operated hammer means effective at a pressure greater than a normal feeding pressure for hammering a piece of stock that may encounter an abnormal feeding resistance, and safety-relief means operable at a pressure in excess of the pressure required to operate said hammer means.

25. In a stock-feeding mechanism of the character indicated, means for supporting a bar of stock in alignment with a spindle into which the bar is to be fed, hydraulic pusher means offset from and generally parallel to the spindle axis

and including retractable feeding-finger means including a part aligned with the spindle axis for feeding the bar, hydraulic-pressure supply means for said pusher means, said pusher means including self-charging hammer means set to be charged upon a rise in feed pressure above a normal feed pressure, said hammer means including tripping means effective to release said hammer means upon a rise in feed pressure to a given level above the normal feed pressure.

26. In a stock reel of the character indicated, a plurality of longitudinally spaced spider frame members with circumferentially spaced, longitudinally aligned recesses for the accommodation of bars of stock, and replaceable liner means extending between the aligned recesses of said spider frame members and serving to provide substantially continuous longitudinal pockets for accommodation of the bars of stock, liner inserts in said replaceable liner means and of smaller included cross-section than that of said replaceable liner means, whereby stock of smaller diameter may be accommodated in said liner inserts, and means substantially uniformly spacing the sides and bottom of said liner inserts from the sides and bottom of said replaceable liner means, whereby the centers of stock of appropriate diameter accommodated in said replaceable liner means or in said liner inserts may be supported in alignment with the spindle centers of the multiple-spindle bar machine to which said reel may be adapted.

27. In a stock-feeding mechanism of the character indicated, feeding means for advancing a length of stock into a bar machine or the like,



said means including an electric motor to be started for each feeding operation, manual means for starting said motor, control means coordinated with said manual means for connecting the output of said motor to operate said feeding means, means responsive to a loaded condition of the bar machine and in controlling relation with said control means but independent of said manual means, said responsive means rendering said control means ineffective to operate said feeding means as long as a usable length of stock is in the bar machine, said responsive means being effective to condition said manual means for operation upon substantial consumption of a piece of stock in the bar machine, whereby actuation of said manual means will be ineffective to produce a feed of stock unless and until there is no longer a usable length of stock in the bar machine, and hold-in means effective upon an initial feeding displacement of said stock-feeding means to maintain closed the circuit to said electric motor, whereby, once started, stock-feeding may proceed without manual operation.

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