

No. 811,526.

PATENTED JAN. 30, 1906.

R. C. STIEFEL.  
MECHANISM FOR FEEDING TUBULAR BILLETS.

APPLICATION FILED JAN. 2, 1902.

4 SHEETS—SHEET 1.

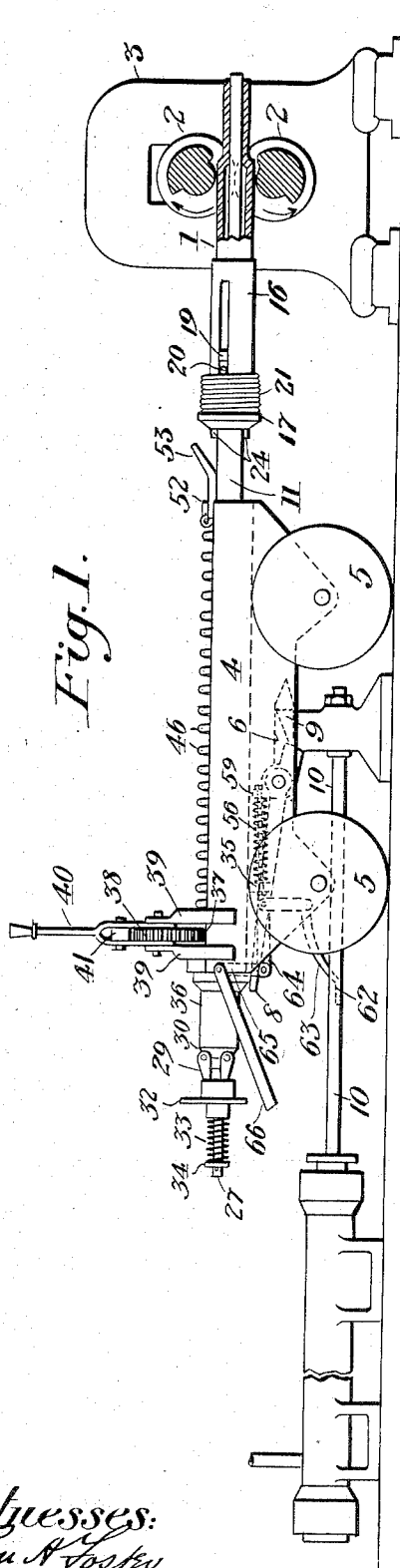


Fig. 1.

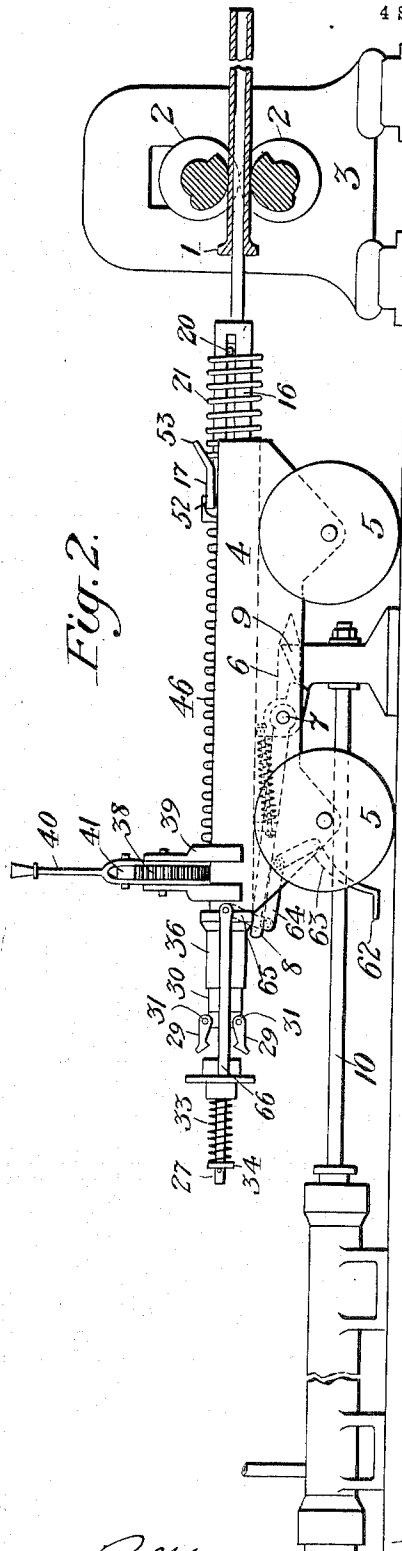


Fig. 2.

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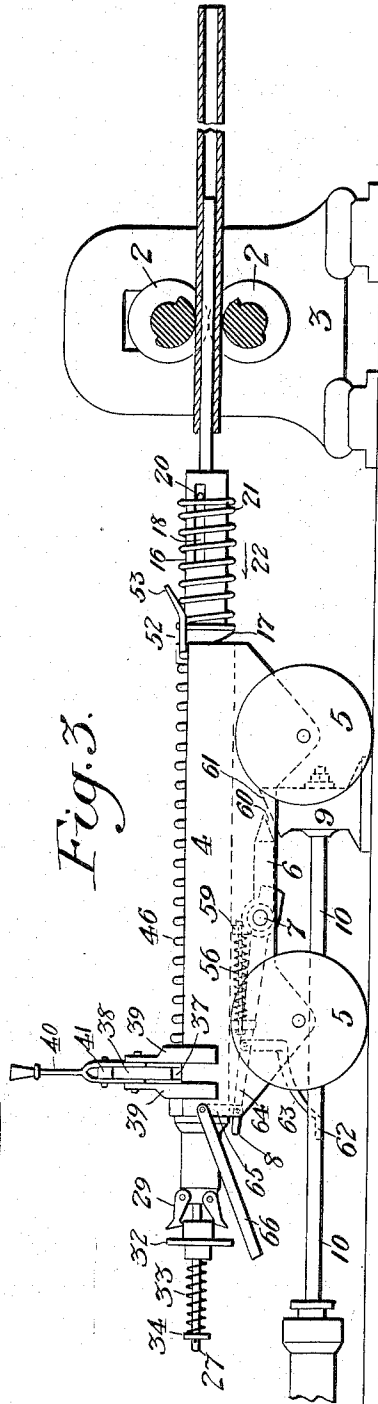


Fig. 3.

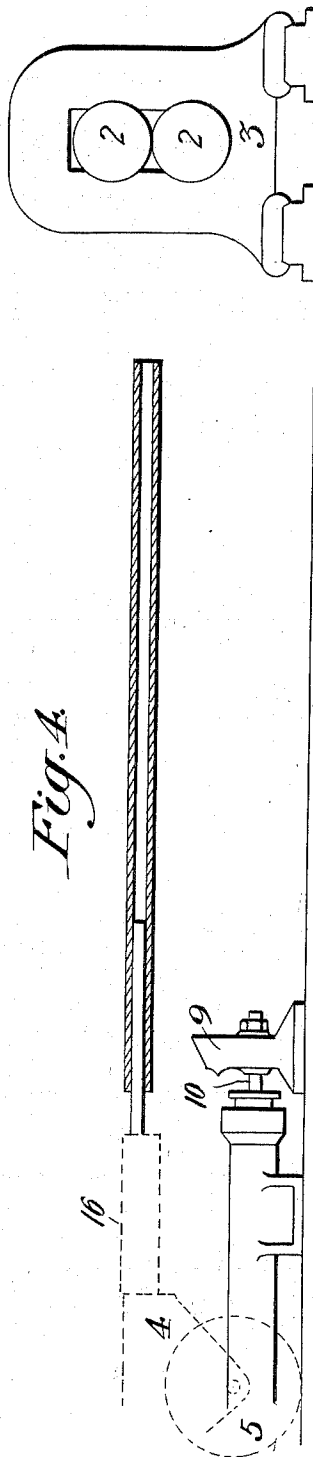


Fig. 4.

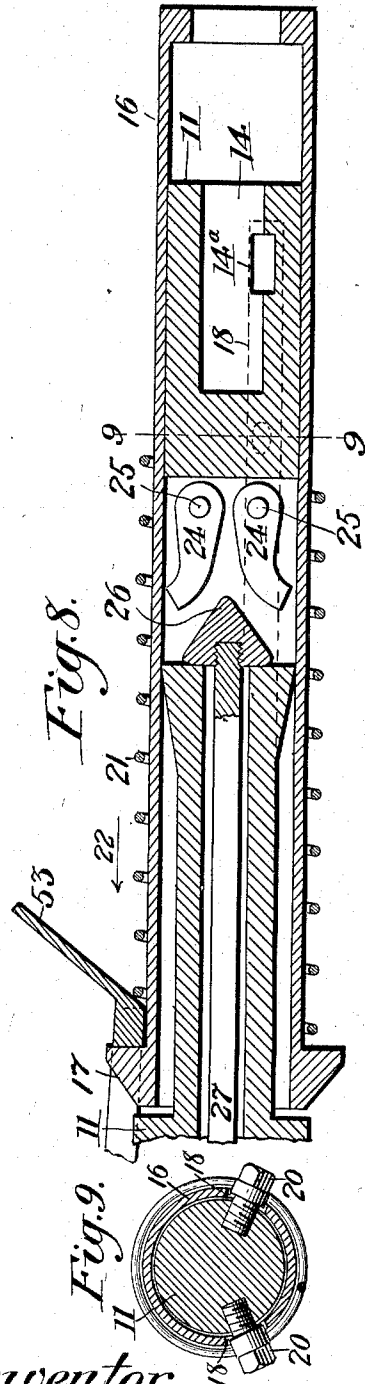


Fig. 8.

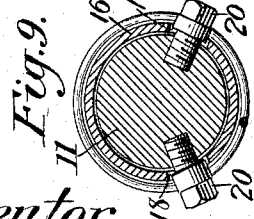


Fig. 9.

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4 SHEETS—SHEET 3.

Fig. 5.

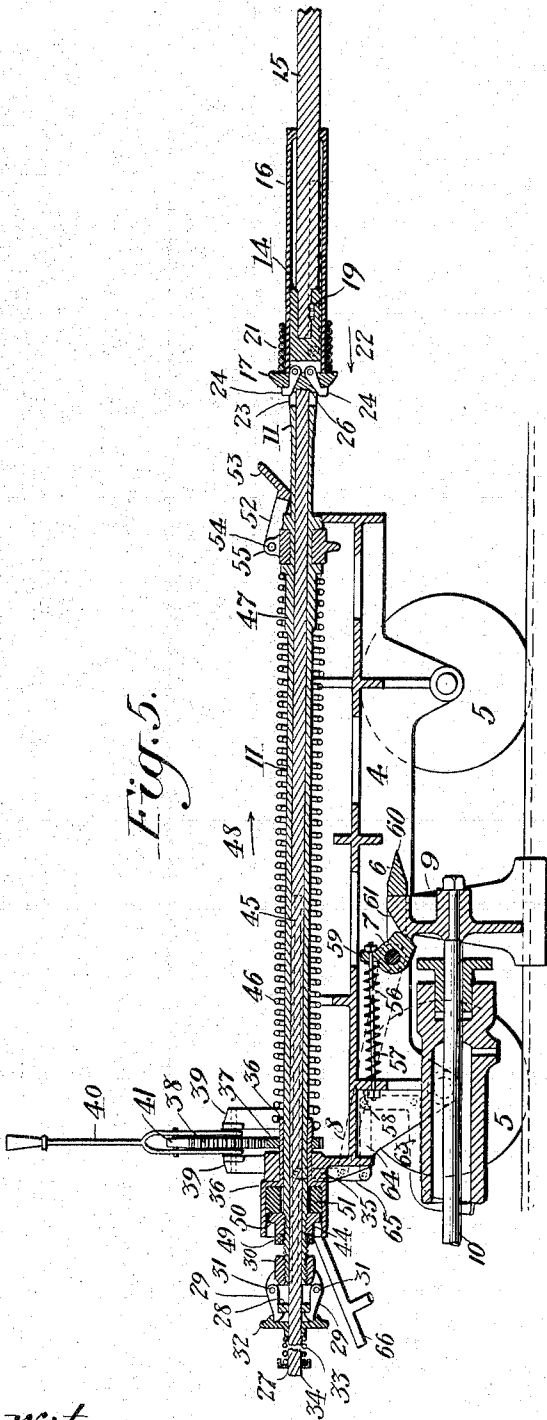
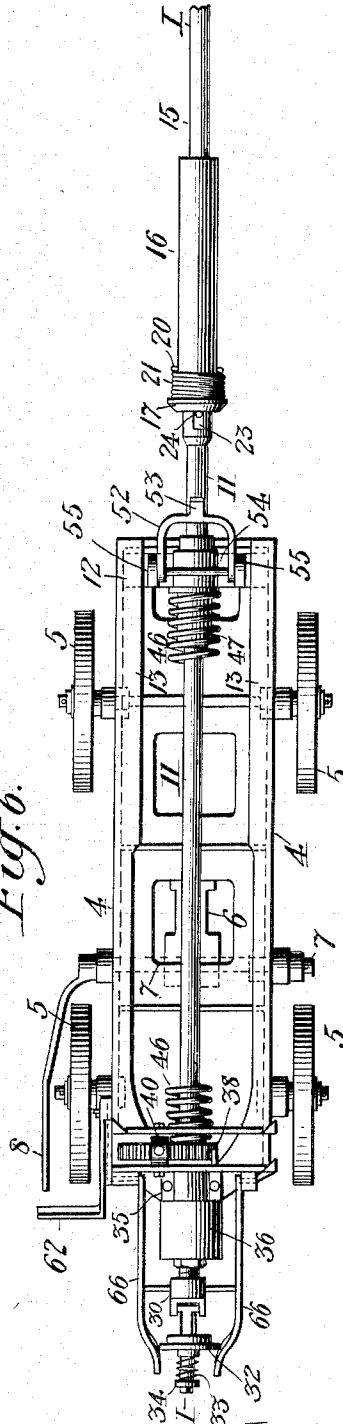


Fig. 6.



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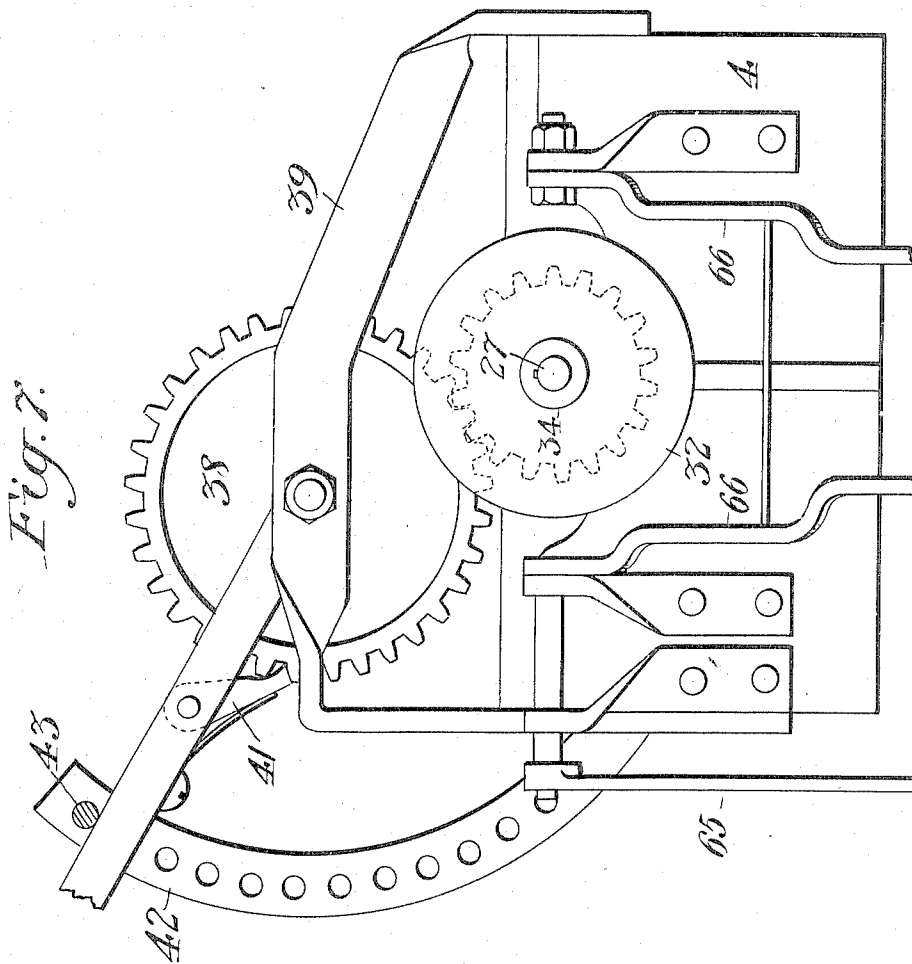
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4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

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## MECHANISM FOR FEEDING TUBULAR BILLETS.

No. 811,526.

Specification of Letters Patent.

Patented Jan. 30, 1906.

Continuation of application Serial No. 56,236, filed April 17, 1901. This application filed January 2, 1902. Serial No. 88,035.

*To all whom it may concern:*

Be it known that I, RALPH CHARLES STIEFEL, engineer, a citizen of the Swiss Republic, residing at Ellwood City, Pennsylvania, have invented certain new and useful Improvements in Mechanism for Feeding Tubular Billets, of which the following is a description, referring to the accompanying drawings, which form part of this specification.

This is a continuation and renewal of and substitution for my application filed April 17, 1901, Serial No. 56,236.

This invention is particularly designed and adapted for use in coöperation with step-by-step swaging-rolls for rolling out tubular billets into longer and thinner-walled tubes. At each rotation of the rolls the billet is fed forward into the pass and is thrust back with its mandrel-bar by the action of the rolls. The use of the invention is not limited to such rolls, however. Its object is to improve the reciprocating and steadily-advancing billet-feeding action and to continue such action as long as may be necessary to properly finish the rear end of the billet. Heretofore very wasteful expedients have commonly been resorted to, such as a red-hot collar placed behind the billet upon the mandrel, in order that the rolling action may be continued to the very end of the billet without endangering the breakage or damage of the rolls which might otherwise occur by their impinging upon a hard metal sleeve, if such were used to press the billet forward.

The present invention, briefly stated, is a feeding mechanism.

In part the invention contemplates an improved end support for the rear end of the billet, which is movable upon the mandrel-bar support and can be drawn back from the billet without stopping the rolling operation when the rear end of the billet is being acted on by the rolls.

Another part of the invention is the means by which this end support of the billet is controlled and released and means for automatically catching it and retaining it in its inactive position, so that it shall not be thrown forward between the rolls.

Yet another part of the invention is the means for giving the forward travel to the entire feeding apparatus.

In addition to these improvements there are several important devices hereinafter specified and enumerated in the claims which accomplish certain important objects, as will presently appear from the following description of the best embodiment of the invention now known to me.

In the drawings, Figure 1 is a side view with the rolls and billet in section seen during the rolling of a tube. Fig. 2 is a similar view showing the billet rolled out to nearly its full length and the supporting-sleeve drawn away from the rear end of the billet. Fig. 3 is a view showing the billet completely rolled. Fig. 4 is a view showing the completed tube withdrawn from the rolls, the carriage being disconnected and drawn back from the feed-ram. Fig. 5 is a central longitudinal section of the carriage and attachments. Fig. 6 is a plan view of the carriage and attachments with the spindle-spring partly broken away. Fig. 7 is a partial rear end view on a larger scale. Fig. 8 is a detail view, in vertical section, of the forward end of the apparatus, showing the supporting-sleeve drawn back. Fig. 9 is a cross-section on the plane 9 9 of Fig. 8.

At 1 is the hollow billet.

2 2 are the segmental rolls, the general character of which are well known in this art.

3 3 are the housings in which the rolls are mounted.

4 is the frame of the feed-carriage, preferably mounted on wheels 5 5. By means of the link 6, pivotally mounted at 7 upon the feed-carriage and operated by a lever 8, the feed-carriage can be rigidly connected with the head 9, fixed to the piston-rod or plunger 10 of a feed-ram, as shown and hereinafter again referred to. By means of the same lever 8 the link 6 can be disconnected from the head 9.

The feed-spindle 11 is mounted in two cross-heads 12 and 35. Through head 35 it is reciprocable. Cross-head 12 reciprocates with it and is guided in grooves 13 13, Fig. 6, on the frame 4 of the feed-carriage. In the front end of the feed-spindle 11 is a recess 14, which receives and holds the rear end of the mandrel-bar 15. The mandrel-bar is secured by a key 19.

The end support for the billet consists of a sleeve 16, which fits loosely over the feed-

spindle. The forward and internally-reduced end of the sleeve may fit closely the mandrel-bar 15, while the rear end of the sleeve fits the spindle, as shown, and is provided with a beveled ring 17. Two slots 18 are cut through the wall of the sleeve 16 in order that the key 19 may extend through them. Two pins 20, screwed into the feed-spindle 11, also extend through the slots of the sleeve. (See Figs. 8 and 9.) The key 19 and the pins 20, although they prevent the sleeve 16 from turning on the feed-spindle, allow the sleeve to slide freely endwise. Between the pins 20 and the taper-shaped sleeve-ring 17 there is a confined coiled compression-spring 21, which presses the sleeve in the direction of the arrow 22. Within a slot 23 (see Fig. 6) in the feed-spindle are pivoted two catches or dogs 24. These dogs 24 may be loose on their pins 25. A wedge 26, controlled and carried by a rod 27, Fig. 8, forces the dogs outward against the rear face of the ring 17 to hold the sleeve 16 rigidly in its forward or active position, as in Figs. 1, 5, and 6. The rod 27 extends centrally the whole length of the feed-spindle 11 and at its rear end is provided with a collar 28, engaged and held by two latches or catches 29, which are pivotally fixed to a ring 30 on the rear of the spindle by means of two pins 31 and which serve to prevent backward movement of the rod 27 until they are released. The latch-ring 30 is screw-threaded onto the spindle 11, and thereby can be adjusted endwise to make the catches 29 bear nicely against the collar 28 without allowing lost motion. The catches 29 are rigidly held to the ring 28 by a disk plate 32, the collar of which fits over the ends of the catches. The disk plate 32 is pressed toward the catches by a coiled compression-spring 33, supported at its other end by a washer 34, fixed to the central rod 27.

At the rear of the carriage-frame 4 the cross-head 35 carries a rotary bushing 36, turning with a pinion 37 keyed to it. Pinion 37 meshes with a pinion 38, which has its bearings in two brackets 39, fastened to the feed-carriage. By means of the lever 40 and spring-pawl 41, which engages pinion 38, the bushing 36 can be turned at will. The segment 42 carries the stops or pins 43 to conveniently regulate the rotative movement of the bushing 36. The bushing 36 is the means of rotating the spindle 11, to which it is splined or keyed—*e. g.*, by a key 44, which has a sliding fit in the keyway 45 in the feed-spindle 11. A compressed coiled spring 46, fitting over the enlargement 47 of the feed-spindle 11 at one end and over the bushing 36 at its other end, is confined between the pinion 37 and the shoulder on the enlargement 47, as in Fig. 5, and therefore presses the feed-spindle forward in the direction of the arrow 48.

In order to properly limit the forward throw of the spindle and at the same time to avoid too violent a shock when the spindle is free to go to the forward limit of its throw, there is provided a resilient cushion 51, held within the cylindrical enlargement of the bushing 36, as shown in Fig. 5, and a cooperating flange or disk 50, which is adjustably screw-threaded onto the spindle 11 and immovably secured to jam-nut 49. The disk 50 forms a loosely-fitting piston in the cylinder-like enlargement of the bushing 36, and by the greater or less closeness of its fit a greater or less pneumatic clamping or checking of the forward throw of the spindle is effected before the disk 50 strikes the cushion or buffer 51. By this means the action may be regulated to a nicety. This is of great importance, because, on the one hand, the hammering action due to the entire inertia of the forward-moving spindle should be restricted to safe limits and, on the other hand, the action should be as quick and sharp as possible in order to give a greater number of strokes in a given period, and thereby enable the rolls to be run at a higher speed and producing a higher efficiency of the entire rolling apparatus. On account of this improvement, for which reason it may be termed a "motion-damping" device, and in pursuance of the latter object a far more powerful spring 46 may be employed than would be practicable without it.

Recurring now to the sleeve-support 16, a stirrup-like catch 52, having an incline 53, cooperates with the beveled ring 17 and is pivoted at 54. When the sleeve 16 springs back toward the catch 52, the catch drops over the ring 17 and secures the sleeve 16 in its rear position out of the way of the rolls. In order to readily release the sleeve, a bell-crank treadle 62, connected by link 64 to lever-arm 65, which turns the two lever-arms 66, is provided. When the arms 66 are raised, as in Fig. 2, the disk 32 strikes them in its forward movement and releases the catches 29. It will be understood that the catch 52 may be released from the ring 17 by lifting the catch through the medium of its inclined portion 53.

The connections between the feed-carriage and the feed-ram head 9, already mentioned, are as follows: The coiled compression-spring 56, mounted on a supporting-rod 57, acts against the lug 59 of the pivoted link 6 and tends to keep the link pressed down. The link neatly fits the head 9, as shown, preventing lost motion in either direction when it is on the head. Fig. 3 shows the feed-carriage disconnected from the feed-ram, and Fig. 4 shows it drawn back after the operation is completed. In order to connect the two, the feed-carriage has merely to be pushed toward the rolls till the inclined face 60 of the

link 6 strikes and rides over the incline 61 of the head 9 and drops down into connection with the head by the action of the spring 56.

The operation of the entire apparatus may be conducted as follows: Let the carriage be drawn back, disconnected from the head 9, the mandrel-bar put in place and secured by the key 19, the end-support sleeve 16 brought forward to its active position and secured by thrusting forward the rod 27 and wedge 26, the catches 29 applied to the collar or disk 28 and held by the disk-plate 32, the ram-head 9 retracted, and the hot billet placed on the mandrel-bar with its rear end against the end support 16. Then the carriage is run toward the rolls till the link 6 strikes and engages the head 9 and the ram is started. By the action of the ram the carriage and all its attachments are carried toward the rolls till they impinge on the forward end of the billet. In Fig. 1 the position is seen after a few inches of the billet have been rolled or swaged and at the instant when the acting faces of the roll-sectors have left the billet and the mandrel-bar and billet have sprung forward into the rolls as far as the buffer 51 and spindle 11 will permit. Each turn of the rolls forces back the billet with the bar and spindle, strongly compressing the spring 46, and an instant later as the rolls release the billet it is thrust forward again into the roll-pass. At each throw of the spindle the operator actuates the lever 40 one stroke, rotating the billet preferably a quarter-turn each time. Progressive advance is accomplished by the action of the ram and the rolling continues until the rear end of the billet approaches the rolls and warns the operator to retract the rear-end-supporting sleeve 16. When this condition is reached, the frictional contact between the swaged and elongated portions of the billet or tube and the mandrel-bar is sufficient to hold the tube upon the bar, and the further use of the end support 16 is dispensed with. The operator therefore without stopping the action of the ram steps for an instant on the treadle 62, thereby forcing up the arms 66, engaging the disk-plate 32 at its next forward throw, and causing the release of the catches 29, rod 27, wedge 26, and dogs 24, thus leaving the spring 21 free to act on the sleeve 16. This spring, aided also by the inertia of the sleeve 16, retracts the sleeve on the spindle at or before the next backward throw of the spindle and sleeve, and the beveled face of the ring 17 passes under the incline 53 of the stirrup-like catch 54, allowing this catch to engage and securely hold the ring 17, and consequently the entire sleeve, in an inactive position retracted from the end of the billet, as seen in Fig. 2. A little later—that is to say, as soon as the rolls have reached and sufficiently finished the rear end of the tube, as shown in Fig. 3—the lever 8 is depressed, raising the link 6 from the head 9

and disconnecting the carriage from the ram. This should be done just when the rolls are about to thrust back the tube, as if this be done the energy of the backward thrust of the billet, mandrel-bar, and spindle storing itself in the powerful spring 46 will be sufficient to cause the recoil of the entire carriage, running it back with or without the aid of the operators to the position shown in Fig. 4 and withdrawing the tube entirely from the roll-pass. The mandrel-bar and tube are now freed from the spindle 11 by knocking out the key 19, and the apparatus is ready for a repetition of the operation upon another billet, the parts being put in position, as already specified.

It will be observed that the several operations of turning the billet during its forward stroke by means of hand-lever 40, the withdrawing the sleeve from the rear end of the billet by foot-pressure on the treadle 62, and the disconnecting of the feed-carriage from the feed-ram for the purpose of withdrawing the finished tube from the rolls may all be performed by a single operator. It will also be observed that in the described device the three levers with which these three distinct operations are performed are located in position to be easily reached in succession by the same operator. The convenient disposition of such levers is one of the many important practical advantages of the apparatus. Perhaps the most important feature of all, however, is the retraction of a movable support from behind the billet at the proper time and securing it at a safe distance without stopping or interfering with the rolling operation.

In the subjoined claims I do not of course limit myself to the particular details of mechanical design shown in the accompanying drawings or described in the accompanying specification. Manifestly these can be modified indefinitely by any skilled mechanic now that the desirable principle on which the machine should work has been set forth.

The following are therefore claimed as the essentially novel and characteristic features of the invention:

1. In a feeding mechanism and in combination with a mandrel-bar and means for supporting and advancing said mandrel-bar, the improvement consisting in an end support for the billet movable relative to the mandrel and from its active position in respect to the billet.

2. In a feeding mechanism and in combination with a mandrel-bar and means for supporting and advancing said mandrel-bar, the improvement consisting in an end support for the billet movable relative to the mandrel and from its active position in respect to the billet, and means for securing the end support in and releasing it from an active position.

3. In a feeding mechanism and in combi-

nation with a mandrel-bar and means for supporting and advancing said mandrel-bar, the improvement consisting in an end support for the billet movable relative to the mandrel and from its active position in respect to the billet, and means for engaging and holding the end support in an inactive position.

4. In a feeding mechanism and in combination with a mandrel-bar, means for supporting and advancing said mandrel-bar, the improvement consisting in an end support for the billet movable from its active position in respect to the billet, means for holding the support in and releasing it from its active position, and means for catching it in an inactive position when so released.

5. In a feeding mechanism and in combination with a traveling carriage, a spindle reciprocably and rotarily mounted on the carriage, means for rotating the spindle and resilient means for actuating the spindle longitudinally, the improvement which consists in an end support for the billets or tubes reciprocable relatively to the spindle, and means for securing the end support in and releasing it from an active position.

6. In a feeding mechanism and in combination with a traveling carriage, a spindle reciprocably and rotarily mounted on the carriage, means for rotating the spindle and resilient means for actuating the spindle longitudinally, the improvement which consists in an end support for the billets or tubes reciprocable relatively to the spindle, and means for engaging and holding the end support in an inactive position.

7. In a feeding mechanism and in combination with a traveling carriage, a spindle reciprocably and rotarily mounted on the carriage, means for rotating the spindle and resilient means for actuating the spindle longitudinally, the improvement which consists in an end support for the billets or tubes reciprocable relatively to the spindle, means for holding the support in and releasing it from its active position, and means for catching it in an inactive position when so released.

8. In a feeding mechanism and in combination with a traveling carriage, a spindle reciprocably and rotarily mounted on the carriage, means for rotating the spindle and resilient means for actuating the spindle longitudinally, the improvement which consists in a motion-damping device on the carriage for checking the motion of the spindle.

9. In combination with the reciprocable spindle, a feeding mechanism, a retractable support movable relatively to the spindle, and means for holding the support in position, said means combining a controlling connection extending longitudinally of the spindle, rigid means at one end thereof for holding the support as aforesaid, means for lock-

ing the said controlling connection in the vicinity of its other end.

10. In combination with the reciprocable spindle of a feeding mechanism, a retractable support movable relatively to the spindle, and means for holding the support in position, said means having a controlling connection extending longitudinally of and coaxially with the spindle for the purposes set forth.

11. In a feeding mechanism of the type having a reciprocable spindle and a traveling carriage upon which the spindle reciprocates, the improvement consisting in a power-actuated movable body and a self-coupling connection between the carriage and the said movable body, substantially as set forth.

12. In a feeding mechanism of a type having a reciprocable spindle and a traveling carriage upon which said spindle reciprocates, an improvement consisting in a movable body, means for automatically coupling the carriage to the said body, and means acting on a part of the coupling means for uncoupling the carriage from said body, substantially as set forth.

13. In a feeding mechanism of the type having a reciprocable spindle and a traveling carriage, upon which the spindle reciprocates, an improvement consisting in a power-actuated movable body, and a link on one of said parts for automatically engaging the other, substantially as set forth.

14. In a feeding mechanism of the type having a reciprocable spindle, and a traveling carriage, consisting in a power-actuated movable body, a link on one of said parts for automatically engaging the other, and means for disengaging the link, substantially as set forth.

15. In a feeding mechanism and in combination with a traveling carriage, a spindle mounted on the carriage, and resilient means for actuating the spindle longitudinally, the improvement which consists in an end support for the billets or tubes reciprocable relatively to the spindle, means for securing the end support in and releasing it from an active position, and a power-actuated movable body and a self-coupling connection between the carriage and the said movable body, substantially for the purposes set forth.

16. In a feeding mechanism of the type having a traveling carriage and a spindle reciprocating upon said carriage, the improvement consisting in means for rotating the spindle and means for supporting the end of the billets or tubes, which means reciprocates relatively to said spindle.

Signed this 23d day of December, 1901, at Ellwood City.

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