

(No Model.)

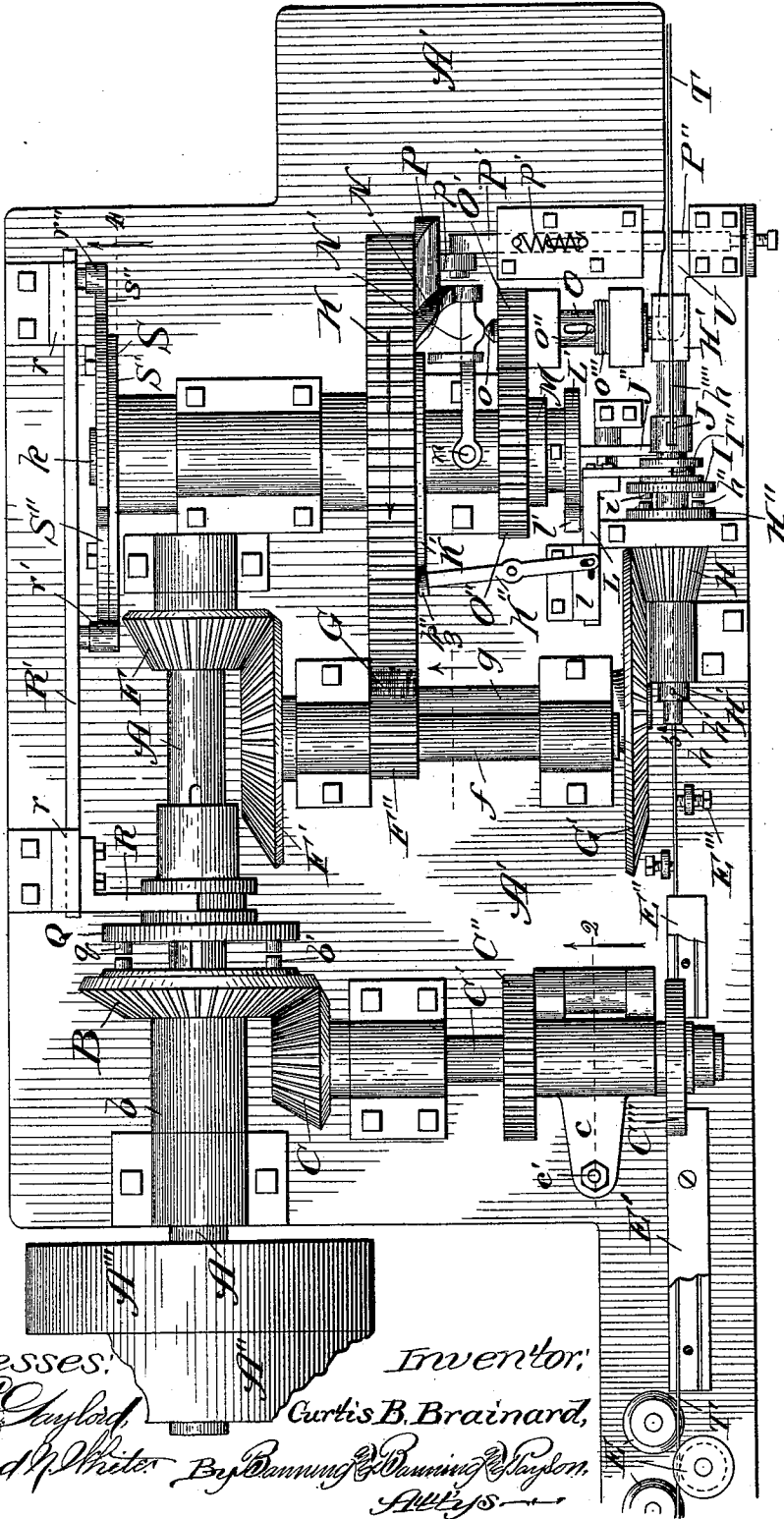
2 Sheets—Sheet 1.

C. B. BRAINARD.
MACHINE FOR MAKING BALE TIES.

No. 463,593.

Patented Nov. 17, 1891.

Fig. 1.



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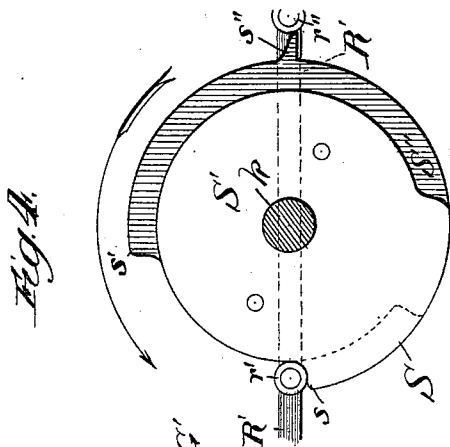


Fig. 1.

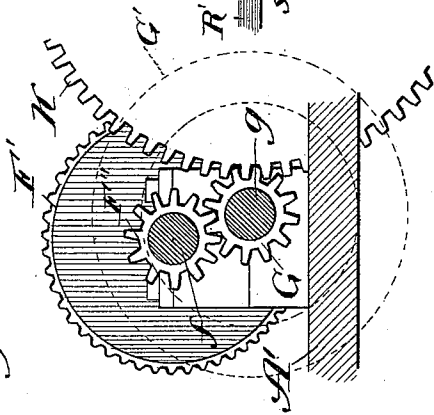


Fig. 2.

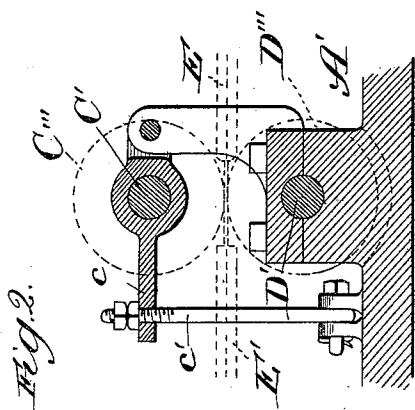


Fig. 3.

Fig. 4.

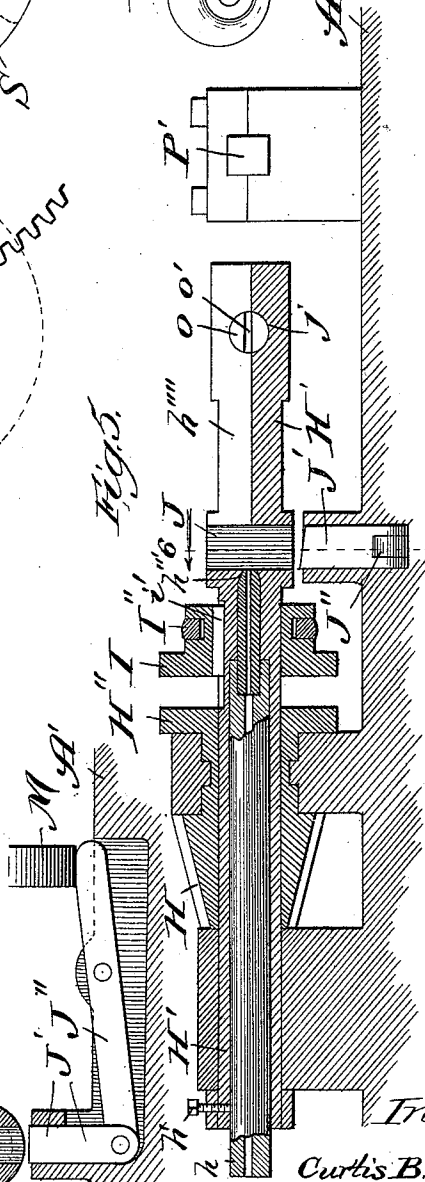
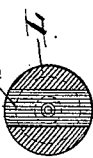


Fig. 5.

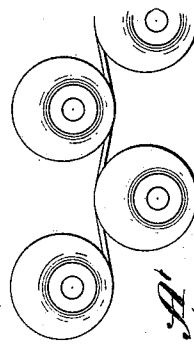
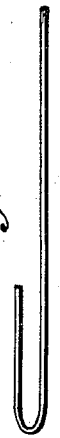


Fig. 6.

Fig. 7.

Fig. 8.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING BALE-TIES.

SPECIFICATION forming part of Letters Patent No. 463,593, dated November 17, 1891.

Application filed February 24, 1891. Serial No. 382,371. (No model.)

To all whom it may concern:

Be it known that I, CURTIS B. BRAINARD, a citizen of the United States, residing at Joliet, Will county, Illinois, have invented a new and useful Improvement in Machines for Making Bale-Ties, of which the following is a specification.

As is well known wire ties are used for fastening bales of hay after they have been compressed in the baling-press and in my former Letters Patent No. 419,917, issued January 21, 1890, I described a machine for forming these ties out of pieces of wire previously cut to a suitable length.

The object of my present invention is to construct a machine which shall dispense with this previous cutting of the wire into lengths and which shall take the wire directly from the rolls, cut it in the machine, and then bend and twist the wire in order to form the requisite loop on the end thereof; and the invention consists in the features and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a plan view of the entire machine. Figs. 2, 3, 4, and 5 are sections taken on the corresponding lines of Fig. 1, looking in the direction of the arrows. Fig. 6 is a section on line 6 of Fig. 5. Fig. 7 is a detail view of the straightening-rollers. Fig. 8 is a view of the tie bent, and Fig. 9 of the tie completed.

In constructing my improved machine I first make a shaft A. This and all other shafts hereinafter described are preferably mounted in suitable bearings on a bed-plate A', as shown in the drawings. The shaft is provided with the ordinary loose pulleys A'' A''', by means whereof power is applied for the purpose of operating the machine. I next construct a beveled gear B of any desired dimensions and mount it loosely upon the shaft A by means of a sleeve b, to which the gear is attached. This gear meshes with a preferably smaller gear C, attached to a shaft C', which shaft also carries the gear C'' and a roller or disk C'''. Directly beneath the shaft C' is a similar shaft D', provided with a gear meshing with the gear C'' and a roller or disk D'', placed beneath the roller C'''. The construction of these parts is shown more par-

ticularly in Fig. 2, since in Fig. 1 the lower shaft, &c., are all hidden by the upper corresponding devices. The rollers C'' D'' serve to convey the wire forward. To adjust them at various distances apart I preferably support the upper roller in a pivoted arm c, which is moved up and down by means of a screw-threaded rod c', attached to the bed-plate, passing through a hole in the arm c and provided with one or more nuts at its upper end, by screwing which up or down the relative position of the rolls is determined. The gear B and feed-rolls are driven as hereinafter described.

The wire coming from the coil (not shown) passes first through a number of rolls set eccentrically, so as to bend or corrugate the wire, taking out of it the curve or "set" it has received while in the coil. (Fig. 7 shows these eccentrically-set rolls.) Then the wire passes through conical rolls E, set alternately, as shown, those on one side of the wire having their larger ends uppermost and those on the other side their smaller ends or apexes. These conical rolls, being set centrally upon their shafts, take out the corrugations received from the eccentrically-mounted rolls and straighten the wire. The object of having the rolls conical and set alternately is to prevent the wire from slipping up or down. After leaving the rolls E the wire preferably passes through a guide E', which consists of a box provided with a cover or lid, in which I form one or more grooves of a suitable size to receive the wire. As shown in the drawings, this guide is provided with two grooves, which may, if desired, be of different sizes to accommodate different sizes and diameters of wire. When it is desired to change the guide it may be unscrewed from the bed-plate and reversed, so as to bring the other groove in line with the end of the straightening-rolls. An adjustable guide-box E'', similar to E', is placed in position to receive the wire after it leaves the feed-rolls. This box is pivotally connected to the bed-plate, can be set at any desired angle to assist in straightening the wire as it passes through the box, and affords a very simple means for so doing. After leaving the guide-box the wire passes by one or more adjustable straightening-screws E'''.

These, as shown, are adapted to be screwed in until they contact with the wire, from which as it passes they remove any bends which the previously-passed devices may have left. If desired, these screws can be so adjusted as to cause the wire to bend in an S-shaped form as it passes them, thus removing any set or bend.

At a suitable point on the shaft A is secured another beveled gear F, meshing with the beveled gear F', which is fastened to a shaft *f*. At a suitable point on this shaft is secured a gear F''. This gear meshes with the gear G, fastened to a shaft *g*, which also carries a beveled gear G'. This latter gear meshes with a gear H, which is loosely mounted upon a hollow shaft H', within which is secured, by means of a screw *h'*, another hollow shaft *h*. Integral with the gear H, or separate from and secured thereto, as desired, is a plate H'', provided with pins or studs *h''*. A similar plate I, provided with pins *i*, is mounted upon the shaft H' and provided with a feather *i'* to enable the plate to move back and forth upon this shaft, but to prevent it from revolving thereon. A fork I'' engages with a collar on this plate and is operated to bring the plate into such a position that the pins *i* shall engage with the pins *h''* or be disengaged therefrom. These two plates, with their respective pins, form a two-part clutch, whereby the motion imparted to the gear H and the plate H'' is communicated to the plate I and shaft H'.

The shaft *h* is provided with a tube of preferably chilled metal *h'''*, which is inserted into the end of the shaft and extends a certain distance inside of the shaft H', the hole in the tube *h'''* being in alignment with that in the shaft *h*. The shaft H' is provided with a hole J, extending vertically through the same, (when in the position shown in the drawings,) and of suitable size to receive a knife J', which is connected to a rocking lever J'', which is operated at certain intervals by means yet to be described to raise the knife through the hole J to cut off the wire, the knife being aided by the tube *h'''*, which acts as a die. The shaft H' is also provided with an opening *j* in one side to receive the twisting-tool, which will be hereinafter described.

The gear G meshes, as shown, with a large gear K, mounted upon a shaft *k*. To the face of this gear are attached three cams. One of these cams K' engages, as shown, with a roller *k''* on the end of a pivoted lever K''. The other end of this lever is attached to a bar L, sliding in a case *l*, to which bar is attached the fork I''. Another friction-roller *l'* is fastened to the side of this sliding bar, engaging with a cam L', mounted upon the shaft *k*. As this shaft revolves, the cam K' moves the roller-bearing end of the lever K'' toward the left, Fig. 1, moving the bar L toward the right, the cam L' being provided with a suitable depression to receive the roller *l'*. As the shaft revolves farther, the cam L' forces the

roller *l'* toward the left, bringing the two parts of the clutch into engagement. In this way the sliding bar L and the plate I are moved first in one direction by the cam K' and then in the other by the cam L', the respective cams and the relative sizes of the gears F'', G, K, G', and H being so adjusted that the two parts of the clutch are in engagement for a sufficient length of time to enable the bale-tie to be given as many twists as may be desired in the manner hereinafter described.

A cam N is fastened to the face or side of the gear K, engaging, as shown, with a lever N', pivoted at *n*. A hollow shaft O is next provided, upon which is mounted a gear-wheel O', meshing with a gear O'', mounted on the shaft *k*. Within this hollow shaft is a bending-tool *o*, having a slot *o'* at one end to receive the wire, as shown in Fig. 5. This tool is provided with a pin *o''*, moving back and forth in a slot in the hollow shaft and abutting against the spring *o'''*, which normally holds the tool away from the shaft H'. The lever N' abuts, as shown, against the end of the tool *o*, and when moved by the cam N into the position shown in Fig. 1 the tool is forced forward into the opening in the side of the shaft to engage with the wire. The instant the cam has passed the spring *o'''* will carry the tool back again away from the shaft H'. As the shaft O and the tool inside of it are being constantly revolved by means of the various gear-wheels described, it will be obvious that the amount of turn or bend given to the wire will depend somewhat upon the size of the cam N, since the larger this cam is the longer the tool will remain in engagement with the wire. In the preferred form the cam should be of sufficient size to enable the tool to give the wire half a turn toward the right and then be withdrawn. A third cam P is also attached to the side of the gear K, engaging with a roller *p* on a sliding bar P'. This bar forms the movable jaw of a vise and is moved toward the fixed jaw P'' by means of the cam and roller and back again when the cam has passed by means of a spring *p'*.

A cam M is mounted upon the shaft *k* and is adapted to engage at certain intervals with the end of the lever J'', depressing the same to raise the knife, which falls by its own weight as the cam revolves out of the way. This cam is of course so adjusted as to bring the knife up at the proper time to cut the wire after a sufficient quantity has been fed in by the feed-rollers to form a bale-tie.

The adjustment of the parts should be such that the various operations lastly described may take place in the following order: The knife should first cut off the wire to the proper length. The bending-tool should then enter the shaft, engage the wire, and give it a turn toward the right, where it should be grasped between the jaws of the vise and then, just as the bending-tool is withdrawn, the cam L' should bring the plates I and H''

of the clutch into engagement in order to revolve the shaft H' and twist the wire. This shaft is provided with a groove h''', running longitudinally from the hole J to the end of the shaft in order to leave space for the wire to pass when it is being bent upward.

It is of course necessary that the motion of the feed-rollers should be intermittent, first feeding in a certain length of wire and then stopping while such wire is being operated upon by the other parts of the machine. In order to secure this I mount loosely upon the shaft A a plate Q, provided with pins q, adapted to engage as this plate is moved toward the left, Fig. 1, with the pins b attached to the rear of the gear B. This plate Q is mounted upon the shaft A by means of a feather in such manner that it can move back and forth with the shaft and revolve with but not upon it. Engaging with the collar on this shaft is a fork R, attached to a rod R', sliding in guides r. At suitable points upon this rod are attached two friction-rollers r' r'', adapted to engage with a cam S, mounted upon the shaft k. This cam is preferably composed of two plates or disks S' and S'' of the form shown in Fig. 4 and capable of being so adjusted upon each other as to increase or diminish the distance between the points s and s'. The plate S'' is provided with a point or tooth s''. As the cam S revolves, the tooth s'' strikes against the roller r'', forcing the rod R' toward the right, Fig. 4, and disengaging the two parts of the clutch B and Q. Just as the tooth s'' strikes the roller r'' the other roller r' passes over the point s and enters the depression between that point and the point s'. As long as the roller remains in this depression, so long will the two parts of the clutch remain in disengagement; but when the point s' reaches the roller r' the latter will rise upon the outer circumference of the plate S'', moving the bar R' toward the left, bringing the two parts of the clutch into engagement, and thereby communicating the motion of the shaft A to the shaft C' and the feed-rollers. It will therefore be obvious that by adjusting the two parts of the cam S the feed-rollers can be allowed to operate for a greater or less amount of time, as desirable or necessary.

The parts having been constructed and put together, as above described, operate as follows: The end of the wire T is brought from the coil, mounted upon a suitable reel, (not shown,) and passed between the rolls E and through the guides E', and inserted between the rollers. These then, revolving, feed the wire through the die-plate E'', past the screws E''', through the hollow shafts, and out past the bending-tool and tongs, as shown. A sufficient length of wire having been once fed out to form a bale-tie, the parts then operate as follows: The clutch Q is disengaged by means of the motion of the cam S and the feed-rollers cease moving, leaving the wire stationary. The knife J' is then forced upward by means of the cam M, passing through the hole in the

shaft and cutting off a proper length of wire. Just as the knife is withdrawn the bending-tool o enters the hole in the side of the shaft H', and grasping the wire gives it the necessary turn toward the right, Fig. 1, which, as above said, is preferably but half a revolution. As the tool completes this, the cam N passes and the spring o''' forces the tool back again. The ends of the wire are then grasped between the jaws of the vise, and at this moment the cam L' operates the fork I'' and brings the plate I into engagement with the plate H''. The motion of the gear H is thus communicated to the shaft H', which revolves, twisting the wire any desired number of times and forming a loop upon the end thereof. The necessary number of revolutions having been given to the shaft H', the plate I is withdrawn by means of the cam K', the parts being so adjusted that the shaft H shall stop with the hole J running vertically up and down in a position to receive the knife and the hole in the side of the shaft being in position to receive the tool o. The jaws of the vice then open and the tie falls through a hole U in the bed-plate. As the tie falls from the machine, the revolution of the cam S again brings the plate Q into engagement with the gear B, operating the feed-rollers to feed more wire for another tie.

It is evident that the number of twists given the wire by the revolution of the shaft H' depends upon the relative sizes of the gears G' and H and also upon the length of time which the cams K' and L' allow the two parts of the clutch on this shaft to remain in engagement. Again the rate of revolution of the cams K' and L' may of course be varied by adjusting the relative sizes of the various gears, &c., which communicate the motion to the shaft k. All of these various changes will suggest themselves to any mechanic, as occasion may require, and being but changes in size and detail need not be further described in this specification. It will also, of course, be understood that all necessary changes in form and detail may be made, and I do not intend to limit myself to the precise machine shown, since various changes may be made as desired. For example, the knife J might be moved in one direction by means of a cam and in the other by means of a spring, and so, also, the bar R' might be moved in the same manner, and any and all of such or similar changes will fall within the spirit of my invention and be covered by my claims.

I claim—

1. In a machine for making bale-ties, a set of straightening-rollers eccentrically pivoted, whereby as the wire passes through the same it is crimped or corrugated, substantially as described.

2. In a machine for making bale-ties, the combination of a set of straightening-rollers eccentrically pivoted to corrugate the wire and a set of rollers centrally pivoted to remove the corrugations received from the first

set and straighten the wire, substantially as described.

3. In a machine for making bale-ties, the combination of eccentrically-set straightening-rollers, a guide to receive the wire as it leaves the rollers, feed-rollers to feed the wire into the machine, and a die-plate to receive and straighten the wire as it leaves the feed-rollers, substantially as described.

4. In a machine for making bale-ties, the combination of straightening-rollers, feed-rollers, a guide arranged at one side of the feed-rollers, an adjustable guide-box at the other side thereof, means for cutting off a suitable length of wire, and means whereby the wire is first bent over upon itself and then twisted to form a loop, substantially as described.

5. In a machine for making bale-ties, the combination of the shaft *k*, means for revolving the same, a cam mounted on such shaft, an apertured shaft *H'*, and a knife attached to a lever engaging with the cam, whereby as the shaft revolves the cam first forces the knife into the aperture and then allows it to fall therefrom, substantially as described.

6. In a machine for making bale-ties, the combination of the shaft *k*, means for revolving the same, cams *K'* and *L'*, attached thereto, a shaft *H'*, a two-part clutch mounted thereon, a slide connected with the movable part of such clutch and engaging with the cam *L'*, and a pivoted lever connected to the slide and engaging with the cam *K'*, whereby as the shaft *k* revolves the two parts of the clutch are alternately engaged and disengaged, substantially as described.

7. In a machine for making bale-ties, the combination of a shaft *k*, means for revolving the same, a cam *N*, and a gear *O''*, mounted thereon, a hollow shaft *O*, revolved by the revolution of shaft *k*, a tool sliding in and revolving with the hollow shaft engaging therewith and with a suitable spring, and a lever engaging with the cam and tool, whereby as the shaft *k* revolves the tool is alternately

moved forward by the cam, revolved, and then moved backward by the spring, substantially as described.

8. In a machine for making bale-ties, the combination of a revolving shaft *A*, a gear *B*, loosely mounted thereon, a shaft *D'*, carrying a gear and a feed-roller, a shaft *C'*, carrying a feed-roller and gears *C* and *C''*, a two-part clutch on shaft *A*, a shaft *k*, revolved by the revolution of the shaft *A* and carrying a cam *S*, and a bar engaging with such cam and the movable part of the clutch, whereby as the shaft *A* revolves the two parts of the clutch are alternately brought into engagement to operate the feed-rollers and disengaged, substantially as described.

9. In a machine for making bale-ties, the combination of feed-rollers to advance the wire, a pivoted adjustable guide-box to receive and straighten the wire as it leaves the feed-rollers, and one or more adjustable screw-points adapted to contact with the wire after it leaves the guide-box to assist in straightening the same, substantially as described.

10. In a machine for making bale-ties, the combination of a hollow twisting-shaft having apertures *J j*, means for intermittently revolving the same, a knife for cutting the wire as it passes through the shaft, means whereby the knife is reciprocated in and out of the aperture *J*, a bending-tool, means whereby such tool is reciprocated in and out of the aperture *j*, a vise, and means for operating the same, whereby the wire is first cut, then bent, and finally twisted, substantially as described.

11. In a machine for making bale-ties, the combination of feed-rollers to advance the wire and a pivoted adjustable guide-box to receive and straighten it as it leaves the feed-rollers, substantially as described.

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