June 19, 1928. 1,674,580

A. C. VAN SLUYS

APPARATUS FOR BREAKING THE DRIED COATING ON SHEET MATERIAL

Filed June 28, 1923 8 Sheets-Sheet 1

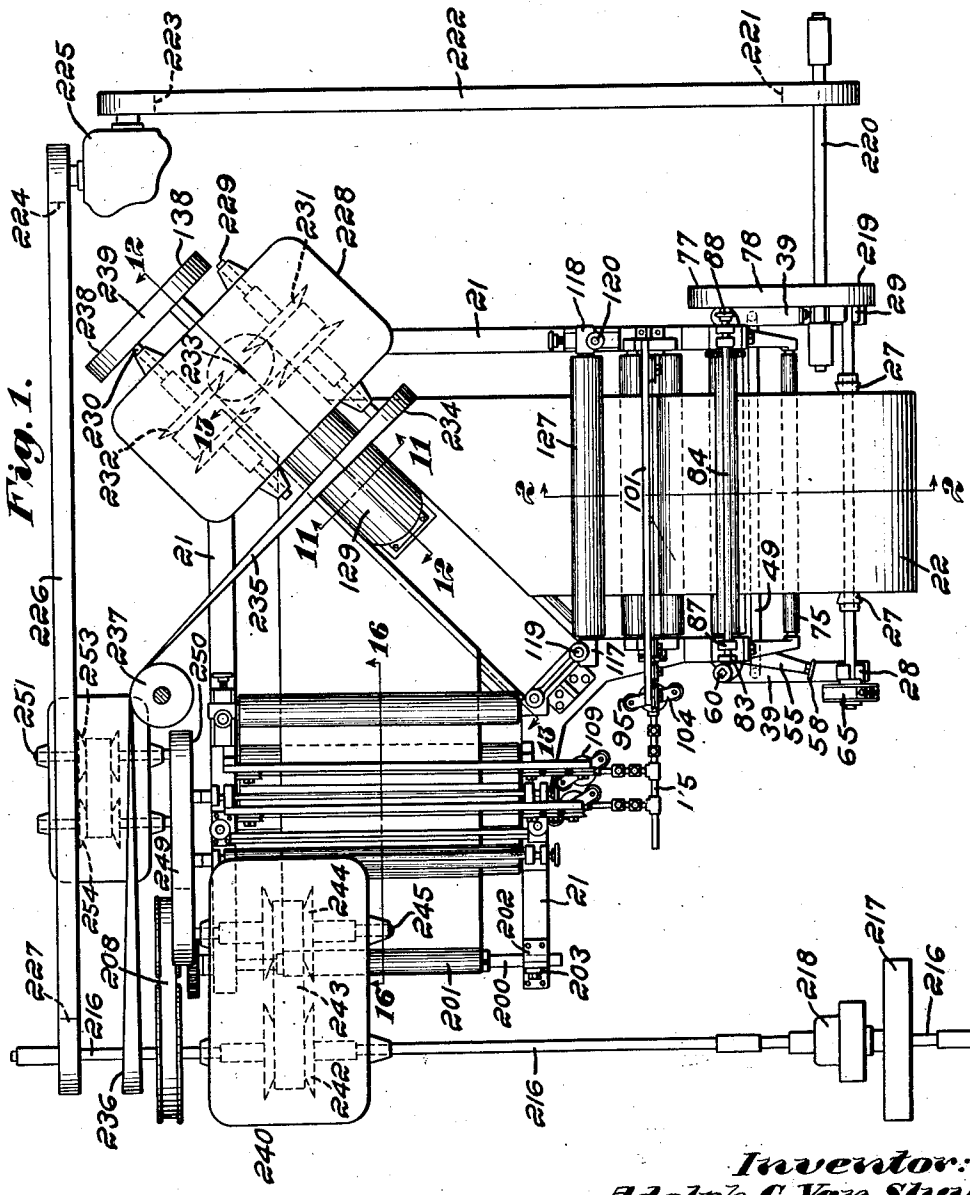


Fig. 1.

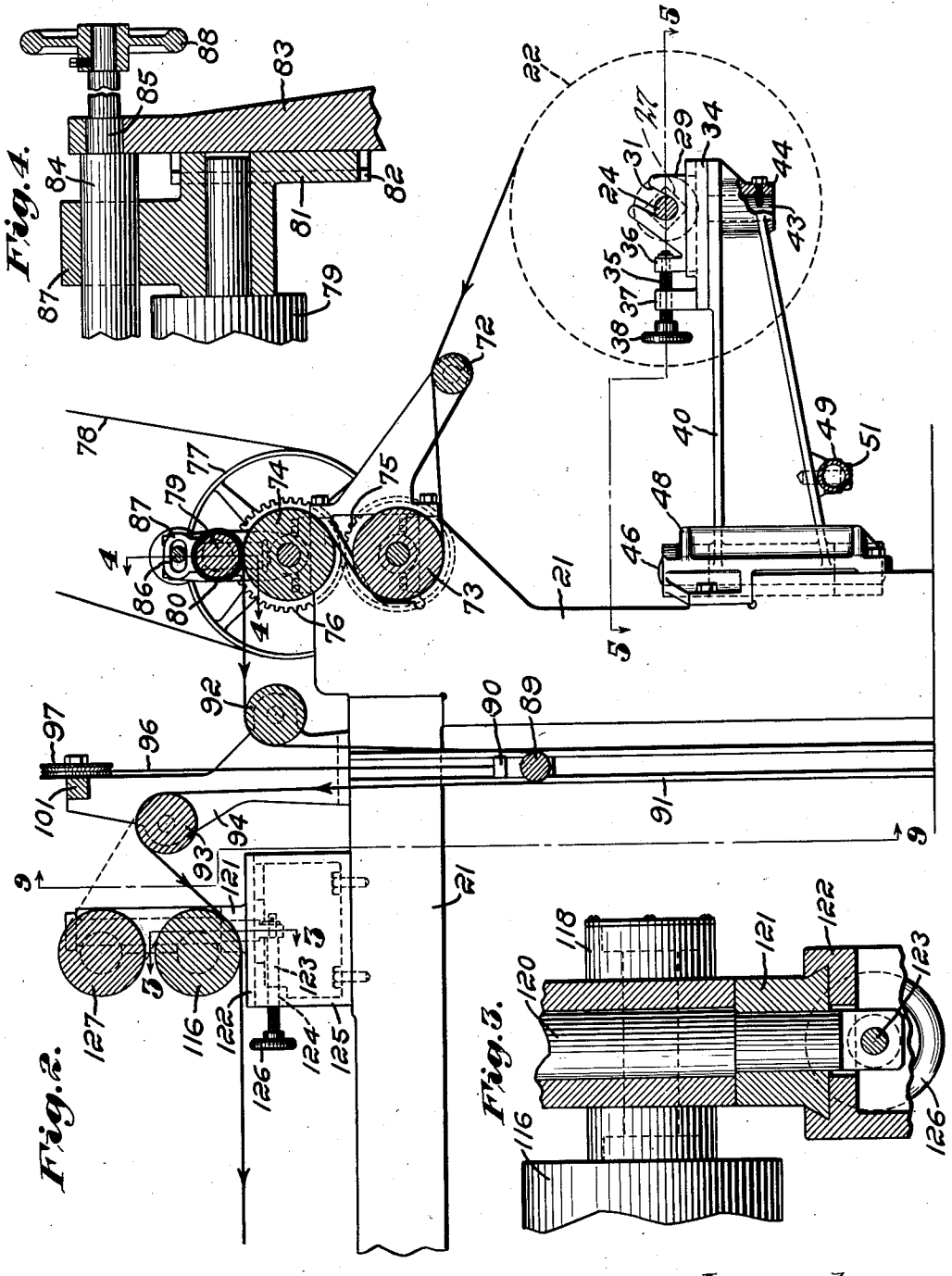
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Filed June 28, 1923 8 Sheets-Sheet 2



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Fig. 6.

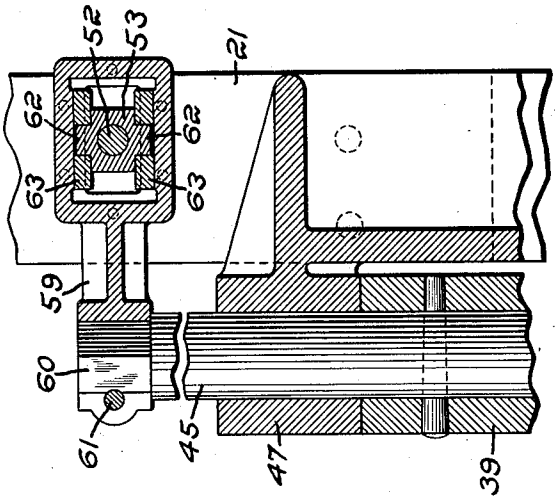


Fig. 8.

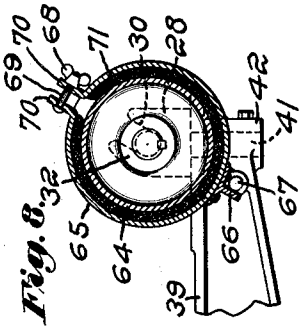


Fig. 5.

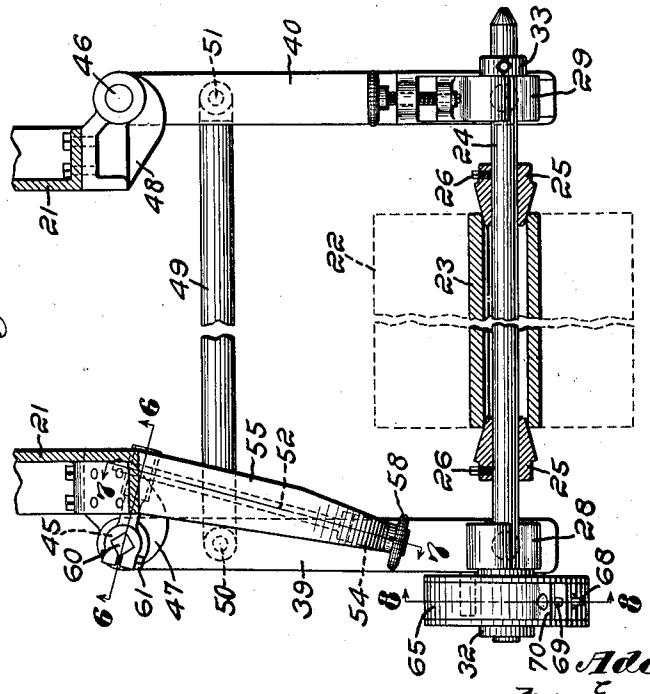
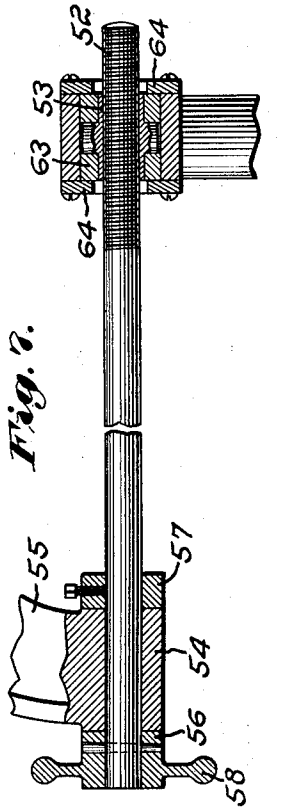


Fig. 7.



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Fig. 10.

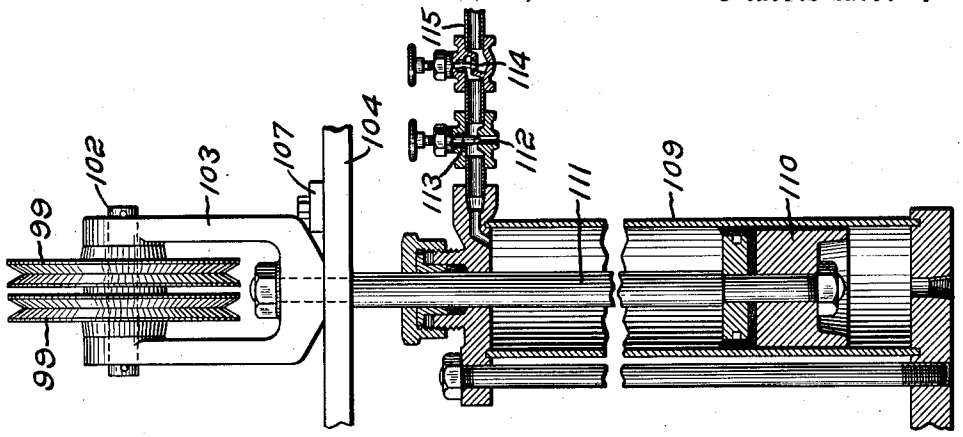
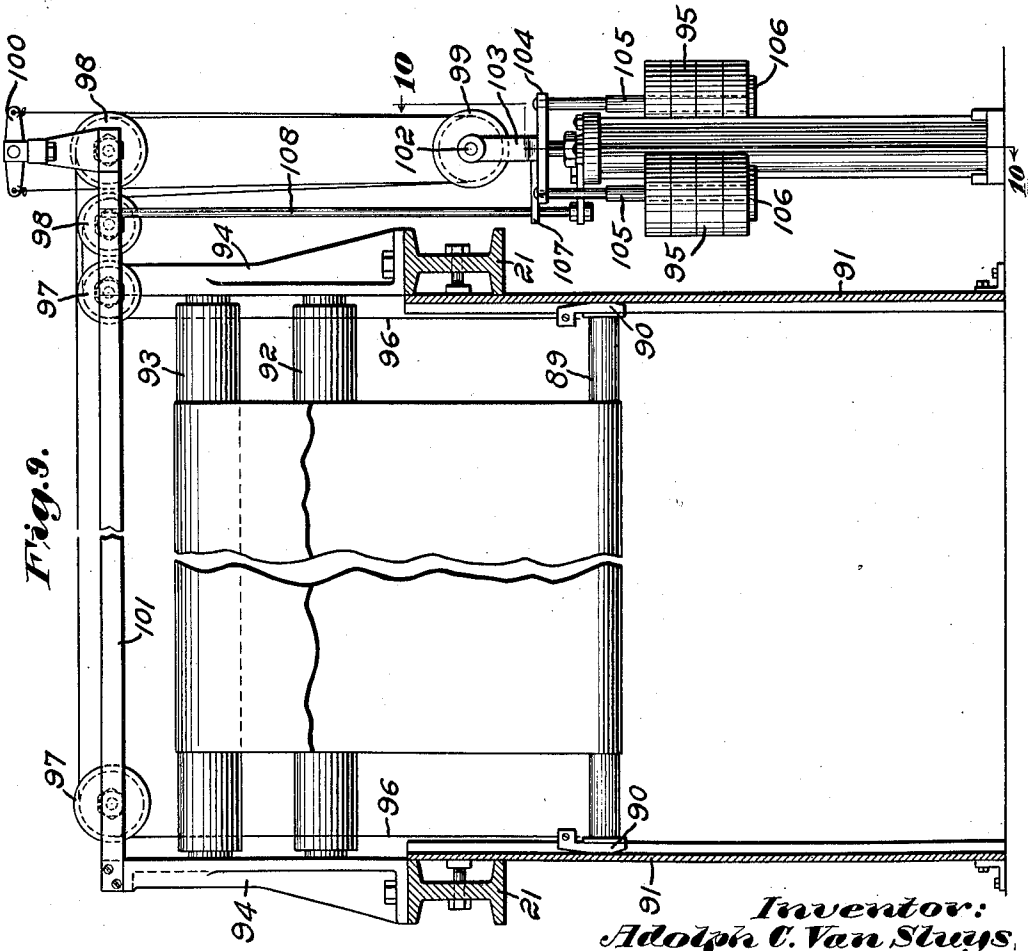


Fig. 9.



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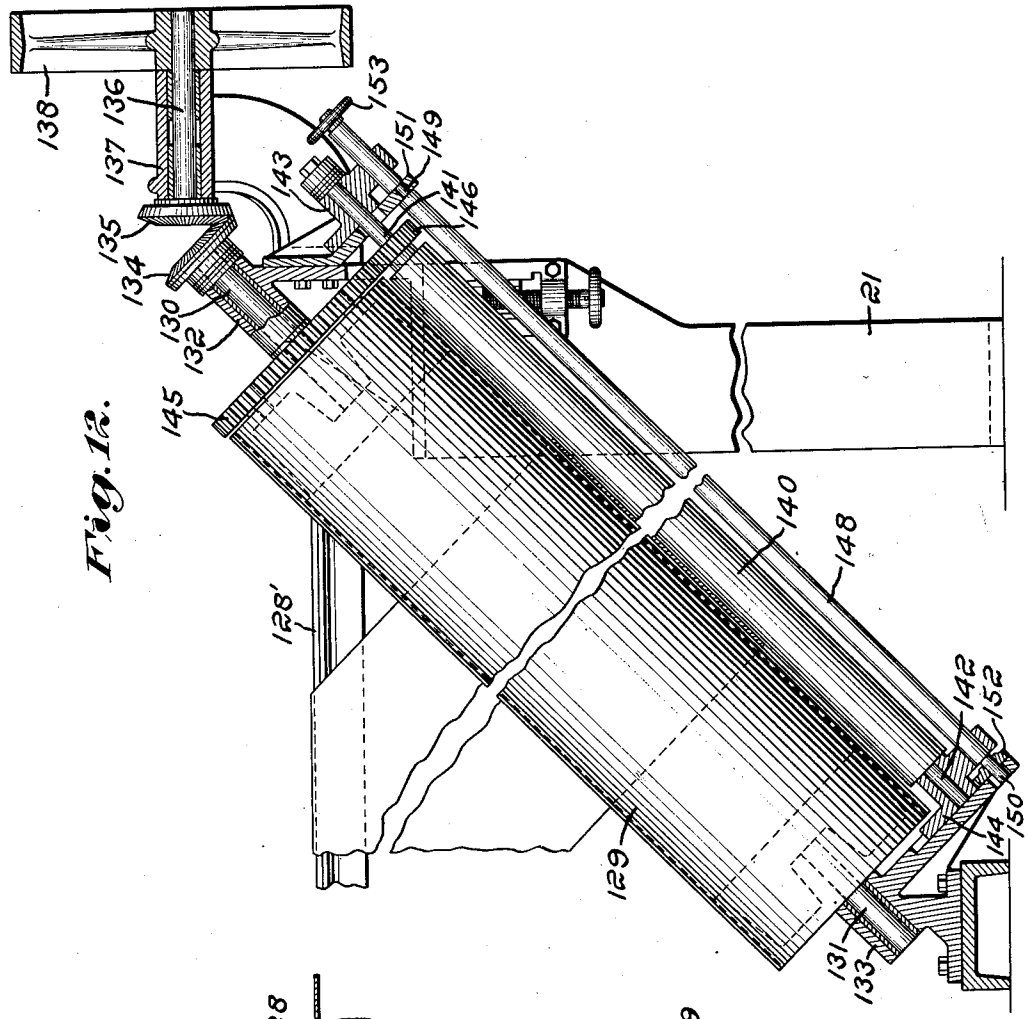


Fig. 12.

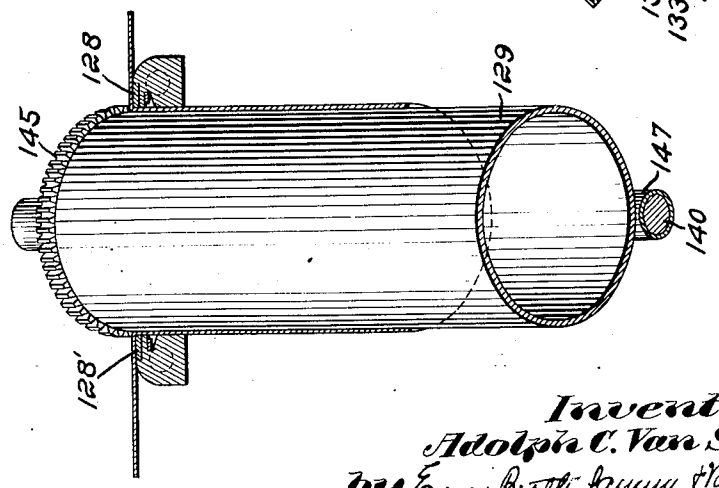


Fig. 11.

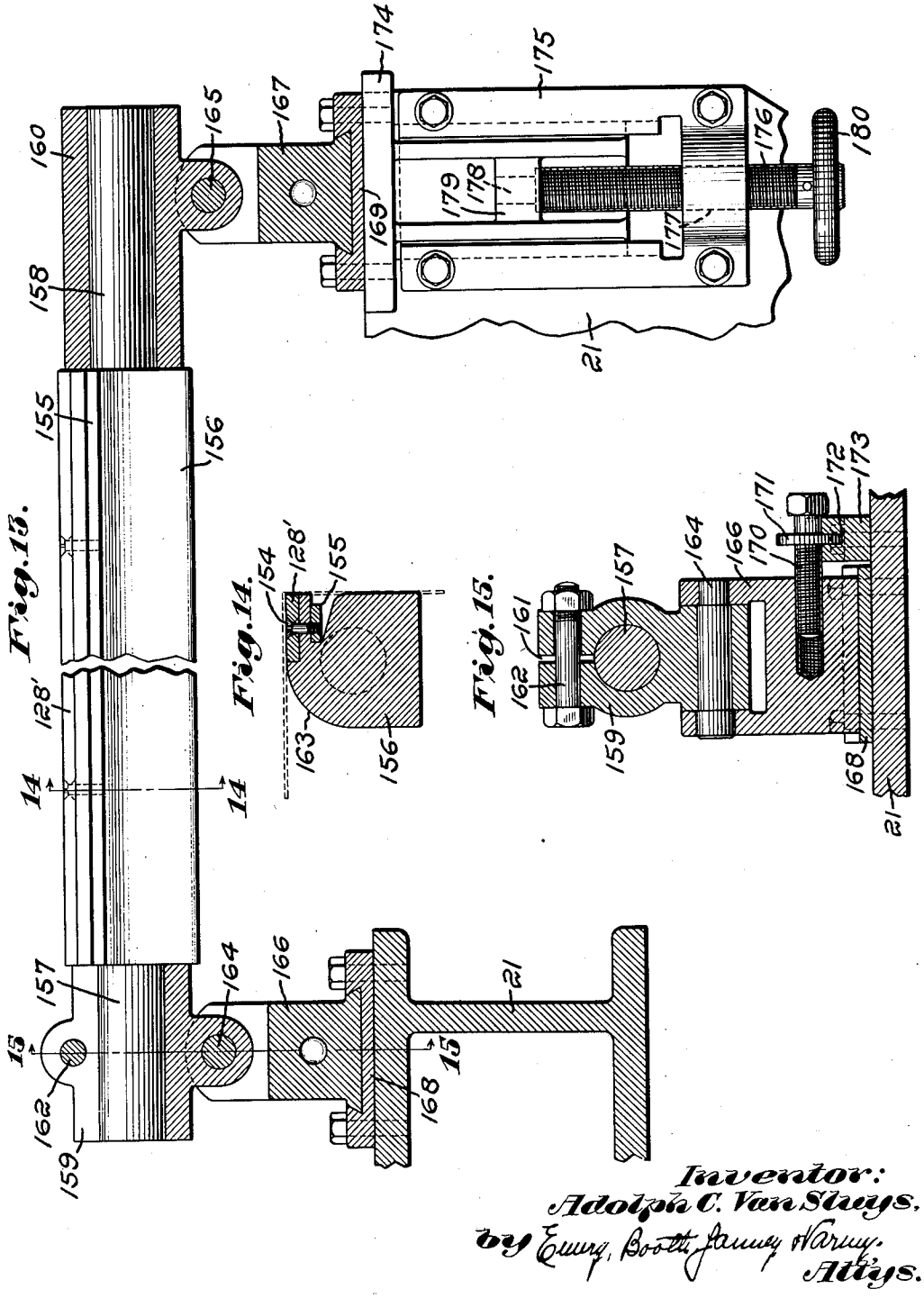
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Filed June 28, 1923 8 Sheets-Sheet 6



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APPARATUS FOR BREAKING THE DRIED COATING ON SHEET MATERIAL

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Fig. 18.

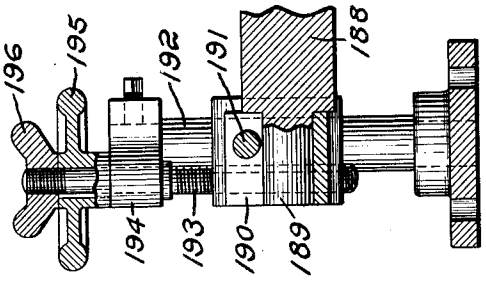


Fig. 16.

Fig. 17.

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APPARATUS FOR BREAKING THE DRIED COATING ON SHEET MATERIAL

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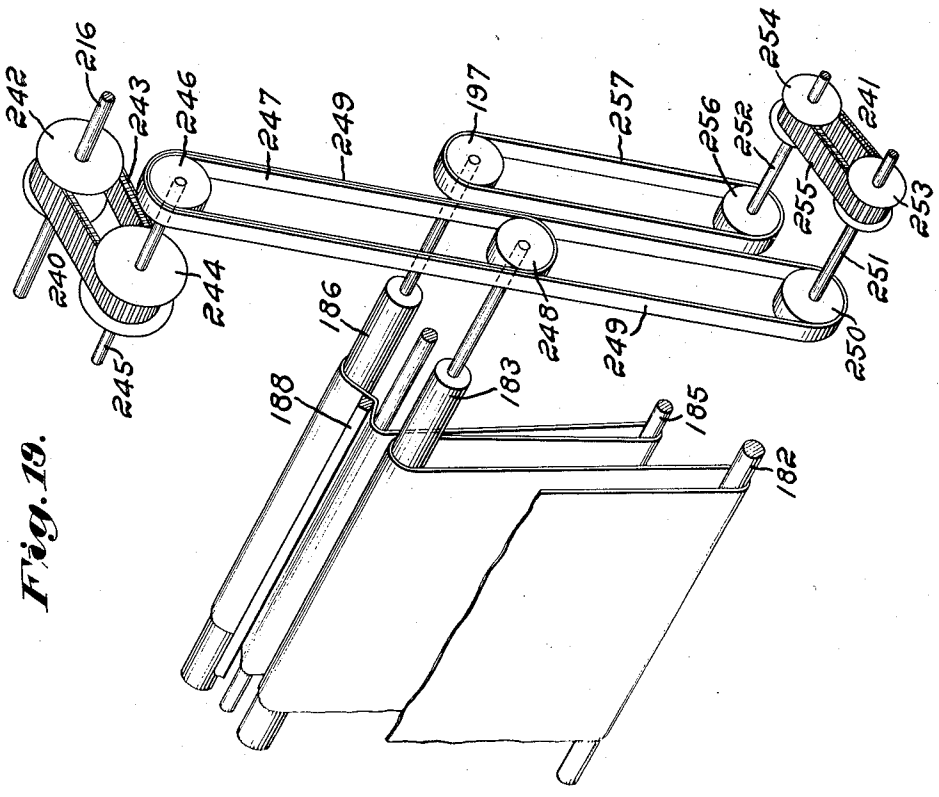


Fig. 19.

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Patented June 19, 1928. 1,674,580

UNITED STATES PATENT OFFICE.

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APPARATUS FOR BREAKING THE DRIED COATING ON SHEET MATERIAL.

Application filed June 28, 1923. Serial No. 648,403.

This invention aims to provide a novel and improved machine for breaking dried coating on sheet material such as gummed paper and cloth, thereby to remove the curling tendency which is consequent upon coating material with gum. The invention will be best understood by reference to the following description, when taken in connection with the accompanying drawings of one specific embodiment thereof, while the scope will be more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a plan of a breaking machine exemplifying the invention;

Fig. 2 is a sectional view on an enlarged scale on line 2—2 of Fig. 1;

Fig. 3 is a sectional view on an enlarged scale on line 3—3 of Fig. 2;

Fig. 4 is a sectional view on an enlarged scale on line 4—4 of Fig. 2;

Fig. 5 is a plan, partly in section, on line 5—5 of Fig. 2;

Fig. 6 is a sectional view on an enlarged scale on line 6—6 of Fig. 5;

Fig. 7 is a sectional view on an enlarged scale on line 7—7 of Fig. 5;

Fig. 8 is a sectional view on line 8—8 of Fig. 5;

Fig. 9 is a sectional view on line 9—9 of Fig. 2;

Fig. 10 is a sectional view on an enlarged scale on line 10—10 of Fig. 9;

Fig. 11 is a sectional view on an enlarged scale on line 11—11 of Fig. 1;

Fig. 12 is a sectional view on an enlarged scale on line 12—12 of Fig. 1;

Fig. 13 is a sectional view on an enlarged scale on line 13—13 of Fig. 1;

Fig. 14 is a sectional view on line 14—14 of Fig. 13;

Fig. 15 is a sectional view on line 15—15 of Fig. 13;

Fig. 16 is a sectional view on an enlarged scale on line 16—16 of Fig. 1;

Fig. 17 is a detail elevation of a portion of some of the parts shown in Fig. 16 viewed in the direction of the arrows 17, 17.

Fig. 18 is a sectional view on an enlarged scale on line 18—18 of Fig. 16; and

Fig. 19 is a perspective view, somewhat conventional and diagrammatic in character, illustrating two of the variable speed transmissions and their connections with certain feed mechanism.

Referring to the drawings and to the embodiment of the invention which is selected for exemplification, and at first more particularly to Fig. 1, the machine is provided with a frame 21 which supports the supply and take-up rolls, the feeding mechanisms, the breaking devices, and other working parts of the machine. The previously coated and dried material comes to the machine in the form of a supply roll 22, which has a wooden core 23 (see Fig. 5). The operator slips the core onto a supply roll shaft 24, to which it is then secured against rotation as by the provision of collars 25, which are secured to the shaft by set screws 26 and have a square formation in cross-section as at 27 (see Fig. 2), which is received in a hole of corresponding cross-section formed in the core 23.

The supply roll shaft is received in bearings 28 and 29, which, to facilitate the removal and replacement of the shaft, are provided respectively with slots 30 and 31 (see Figs. 8 and 2). Lengthwise movement of the shaft in the bearings is prevented by collars 32 and 33 (see Fig. 5), which abut against the outer ends of the bearings 28 and 29, respectively. Angular adjustment of the shaft to insure its parallelism with the feed rollers, presently to be described, is conveniently accomplished by mounting the bearing 29 to slide in ways presented by a guide 34 (see Fig. 2), in which the bearing is adjusted by an adjusting screw 35, which turns loosely in a lug 36 carried by the bearing, said screw being threaded into a nut conveniently formed as a lug 37 on the guide 34. The adjusting screw is provided with a hand-wheel 38, by means of which it may be rotated to move the bearing to and fro.

Both bearings are mounted to turn about upright axes, and are supported by brackets 39 and 40 (see Fig. 5), as by providing a bearing 28 with a depending pivot 41 (see Fig. 8) received in a vertical bearing 42 presented by the bracket 39, and by providing the guide 34 with a similar depending pivot 43, received in a bearing 44 presented by the bracket 40. When, therefore, the adjusting screw 35 is rotated to bring the supply roll

into parallelism with the feed rolls, the bearings of the supply roll shaft turn on vertical pivots.

To insure proper tracking of the sheet material as it is drawn from the supply roll, provision is made to adjust the latter lengthwise while still maintaining its parallelism with the feed rolls. To this end, the supply roll supporting brackets 39 and 40 are mounted on vertical pivots, herein rock-shafts 45 and 46 (see Fig. 5), which are mounted to turn in bearing brackets 47 and 48, respectively, on the frame of the machine. Swinging movement of the feed-roll supporting brackets in unison is enforced by a link 49 (see Fig. 5), connected to the brackets by pivots 50 and 51, respectively. Swinging adjustment of the brackets is conveniently accomplished by the use of an adjusting screw 52 and nut 53 (see Fig. 7). The adjusting screw is mounted in a bearing 54 presented by a bracket 55, which is secured to the frame of the machine, and the screw is held against longitudinal movement in its bearing by collars 56 and 57 secured to the shaft at opposite ends of the bearing. One of these collars presents a hand-wheel 58, by means of which the shaft may be rotated.

The nut is appropriately connected to the rock-shaft 45 as by the provision of an arm 59 conveniently secured to the upper end of the shaft by providing the latter with a squared portion 60 about which the arm is clamped by a clamping screw 61. Connection between the nut and the arm, in the present example, is by trunnions 62 presented by the nut and received in bearing blocks 63, which, as best shown in Fig. 7, are mounted to slide lengthwise of the arm in guides 64 carried by the latter (see Fig. 7). When, therefore, the screw is rotated to adjust the swinging bearing bracket about the vertical axis of the rockshaft 45, the bearing blocks 63 swing about the trunnions 62 and slide lengthwise in the guides 64.

As the material is unwound from the supply roll, rotation of the latter is resisted by an appropriate frictional resistance herein afforded by a brake (see Fig. 8) comprising a brake-band 65, which encircles a brake-drum 64, the latter herein conveniently formed as a part of the collar 32. Rotation of the brake-band is prevented by the provision of a lug 66 secured to the band and resting against a pin 67 secured to the bracket 39. Adjustment of the brake to afford varying degrees of frictional resistance according as circumstances may require is afforded by a wing-nut 68 and a bolt 69, the latter extending through lugs 70 presented by the brake-band. The latter is provided with a suitable lining 71. The brake in nowise interferes with the convenient removal of the supply roll shaft, as the lug 66 simply rests against the pin 67, and when the shaft is lifted out of its bearings, the brake goes with it.

The material is drawn from the supply roll by feeding mechanism now to be described, reference being had to Figs. 2, 3 and 4. After leaving the supply roll, the material passes over an idle roller 72, which removes the curl from the edges of the material, and it passes thence in succession about feed rolls 73 and 74, which are geared together as by gears 75 and 76, and are driven at a uniform speed by a pulley 77 and belt 78. Cooperating with the upper feed roll is a pinch roll 79, having a non-slipping surface conveniently afforded by a rubber covering 80. The pressure of this roll against the one beneath may be varied by the provision of vertically adjustable bearings 81, in which the ends of the pinch roll are journaled, said bearings being mounted to slide in vertical guides 82 presented by brackets 83 (see Fig. 4). Vertical adjustment of the bearings in unison is conveniently accomplished by an eccentric shaft 84, having reduced portions 85 journaled in bearings presented by the brackets 83, said shaft having intermediate portions received in horizontally disposed slots 86 (see Fig. 2) provided in lugs 87 which project upwardly from the bearings. Secured to one end of the eccentric shaft is a handwheel 88, by means of which the shaft may be rotated to raise and lower the pinch roll.

After leaving the feed mechanism just described, and before reaching the first breaking instrumentalities, the material is subjected to a tension by the tension mechanism now to be described, reference being had to Fig. 2. The tension is produced by a weight, herein a roller 89, which is supported by the material, and is journaled in bearings 90, which are constrained to move vertically by guides 91, best shown in Fig. 9. Referring again to Fig. 2, the tension roll 89 is hung in a loop formed by two rolls 92 and 93, both of which are journaled in bearings presented by brackets 94, which are secured to the main frame 21.

The amount of tension may be predetermined by the use of one or more, herein a plurality of counterweights 95, (see Fig. 9) appropriately connected to the bearings 90, as by cords 96 attached to the bearings, extending thence in an upward direction to sheave wheels 97, thence horizontally to sheave wheels 98, thence in a downward direction to and part way about sheave wheels 99, and thence in an upward direction to a fixed yoke 100, to which the two remaining ends of the cords are secured.

The said sheave wheels 97 and 98 are mounted on a bar 101, which is supported by the brackets 94, while the sheave wheels 99 are journaled on a pin 102, carried by a clevis 103, to which is attached a cross-

head 104. Secured to and depending from the ends of this cross-head are rods 105, provided at their lower ends with heads 106, which support the counterweights 95. By simply placing a greater or less number of counterweights on the rods, the effective weight of the tension roll on the material can be varied at will. The cross-head is guided and held against turning movement in the present example by an arm 107, fixedly secured to the cross-head and sliding up and down on a guide rod 108.

In case the material should break, it is desirable to provide means to cushion the fall of the tension roll and the rise of the counterweights. Moreover, in rethreading the material through the machine, the tension roll should be capable of being raised easily and conveniently. To these ends, I have provided a cylinder 109, having a piston 110 working therein, and connected by a piston rod 111 with the cross-head 104. The most convenient fluid for the control of the piston is air. When the material breaks and the tension roll descends, the piston correspondingly ascends, and its ascent is checked by the use of a vent 112, herein controlled by a needle valve 113, which may be adjusted to vary the resistance presented by the air in the upper end of the cylinder, as the piston rises under the influence of the tension roll. When, on the other hand, the operator wishes to raise the tension roll, compressed air may be supplied to the upper end of the cylinder by closing the vent 112 and opening a valve 114, which controls the admission of compressed air from a suitable source of supply through a conduit 115. When the machine is again ready to run, the operator closes the valve 114 and opens the valve 113.

Between the tension mechanism just described and the first breaking instrumentalities presently to be described, it is found that sometimes one edge or the other of the material will be slack, and this is likely to cause undesirable results unless it is corrected. To this end, therefore, I have provided what may be termed an evener roll 116 (see Fig. 2), over which the material passes. This evener roll is angularly adjustable relatively to the path of the material, as by mounting the same in journals 117 and 118 (see Fig. 1), which are mounted on vertical pivots 119 and 120, respectively. The pivot 120 is conveniently adjustable lengthwise of the path of the material by mounting the same on a slide 121 (see Fig. 3), which is mounted in a guide 122, in which the slide is adjustable by means of a screw 123, which is loosely received in the lower end of the pivot, and is threaded as at 124 in a bracket 125, in which the guide 122 is formed. Secured to the adjustable screw is a hand-wheel 126, by means of which it may be rotated to move the slide and the pivot carried thereby lengthwise of the path of the material. In this way, the evener roll is angularly adjusted, and the slack in the edge of the paper is taken up. In the present example, I have shown a second evener roll 127 (see Fig. 2) above the first, and mounted on the same support. Under most conditions, this roll can be dispensed with, but when it is used, the material is led in the course indicated by the dotted lines from the roll 93 in an upward direction part way about the roll 127, and thence to the roll 116. The material passes over breaking instrumentalities so arranged that, as the material is fed, there is progressively developed a sharp bend transversely of the sheet with the gummed coating on the outside of the bend. In the present example, the relation of the breaking instrumentalities to the path of the material is such that the bend in the material which develops the lines of break extends obliquely across the path of the material, so that the resulting cracks or breaks develop in a general direction oblique to the length of the material. Moreover, in the present embodiment, the material then passes over a second breaker, which is also oblique to the direction of travel of the material, but which is so arranged that the resulting cracks or break develop in a direction which is generally perpendicular to the first set. These breaking instrumentalities now will be described, reference being had at first to Figs. 11 and 12.

One convenient and compact arrangement for effecting this result comprises two breaker bars 128 and 128′, which lie in the same plane and are substantially parallel with each other. Between these bars is a feed roll 129, which, as shown in Fig. 12, is disposed obliquely with reference to a plane containing the edges over which the breaking action occurs. In the present example, these edges are disposed at substantially 45 degrees to the direction of travel of the material, and the axis of the feed roll is disposed at substantially 45 degrees to the plane at which the breaking edges lie.

The feed roll is provided with stub shafts 130 and 131, which are journaled in upper and lower bearings presented by brackets 132 and 133, respectively. The feed roll is conveniently driven by bevel gears 134 and 135, one secured to the shaft 130 and the other to a shaft 136, which is journaled in a bearing presented by a bracket 137. To the shaft 136 is also secured a pulley 138. Cooperating with the feed roll is a pinch roll 140, which is provided with upper and lower shafts 141 and 142, journaled in bearings presented by brackets 143 and 144. The pinch roll is driven at the same surface speed as the feed roll by means of spur

gears 145 and 146 secured to the shafts 130 and 141, respectively, the pitch circles of these gears being of the same diameter as the respective rolls 129 and 140. The pitch roll has a non-slipping surface conveniently afforded by a rubber covering 147 (see Fig. 11). The desired pressure of the pinch roll against the material is obtained in the present instance by mounting the bearing brackets 143 and 144 to slide toward and from the feed roll, and by mounting in bearings presented by these brackets a shaft 148 having eccentric portions 149 and 150, which are mounted to turn in fixed bearings 151 and 152. Secured to the upper end of the shaft is a hand-wheel 153, by means of which the shaft may be rotated to move the pinch roll toward and from the feed-roll.

It should now be evident that the described feeding mechanism draws the material forcibly across the edge of the first breaker bar 128, while at the same time the pull of the material is resisted by the previously described tension mechanism, thereby breaking the gummed coating very severely, after which the material passes to the second breaker, and the coating is again broken in a direction perpendicular to the first break.

The two breakers are substantially alike, except that the position of one is reversed to that of the other (see Fig. 11), and the mountings of both are alike. Hence a description of the mounting for the breaker bar 128′ will suffice for both. Referring now to to Fig. 14, the breaker bar 128′ is secured as by screws 154 and a clamping bar 155 to a supporting bar 156, which, as shown in Fig. 13, is provided with reduced portions 157 and 158, mounted in bearings 159 and 160, respectively. The supporting bar 156 is normally held against turning movement in its bearings, as by making the bearing 159 split at 161 (see Fig. 15), and by providing a clamping bolt 162, by means of which the bearing may be contracted about the terminal portion 157. By simply loosening the clamping bolt, the supporting bar and the breaker bar may be rocked about the axis of the bearings, thereby to vary the angle through which the material is bent across the edge of the breaker bar. Moreover, in threading the material through the machine, it is sometimes found convenient to rock the supporting bars to a position in which rounded corners 163 will be presented to the material, instead of the sharp corners of the breaker bars.

Adjustment of the breaker bars toward and from each other, and angularly with relation to each other, may be accomplished by mounting the bearings 159 and 160 on pivots 164 and 165 (see Fig. 13) carried by slides 166 and 167, which are mounted in guides 168 and 169, respectively, extending lengthwise of the travel of material. Suitable means are provided for adjusting the slides lengthwise, and as the adjusting means for one side is the same as that for the other, a description of the one used in connection with the slide 166 will suffice for both. Referring now to Fig. 15, an adjusting screw 170 threaded into the slide 166 and extending lengthwise of the travel of the material is provided with an enlarged collar portion 171, which is received in a slot 172 presented by a bracket 173. By this means, axial movement of the screw is prevented, and consequently rotation of the screw is accompanied by lengthwise movement of the slide.

Angular movement of the bar with reference to the plane of the material may be accomplished by the use of an adjusting mechanism which will now be described, reference being had to the right-hand portion of Fig. 13. The guide 169 is secured to a slide 174, which is mounted to slide vertically in a guide presented by a bracket 175, which is secured to the frame 21. An adjusting screw 176, threaded at 177 into the bracket 175, has a reduced terminal portion 178, loosely received in a bearing 179 presented by the slide 174. A hand-wheel 180, secured to the lower end of the adjusting screw provides a convenient means for rotating the screw, thereby to raise and lower the vertical slide 174. In this way, the corresponding end of the breaker bar is raised and lowered.

After the material passes the second breaker bar, it reaches a second evener roll 181, (see Fig. 16) which is mounted for angular adjustment by means identical with that provided for the evener roll 127, and by this means, should there be any slack in one edge of the material, the difficulty can be corrected by angular adjustment of the roll. The material passes thence to a tension mechanism substantially identical with that hereinbefore described, and comprising a tension roll 182 (see Fig. 16), which is controlled by a counterweight and an air piston and cylinder like unto that described in connection with the tension roll 89. Further illustration and description of the mechanism for the control of the tension roll 182 is therefore deemed unnecessary.

After passing this tension mechanism, the material next reaches a feed mechanism comprising a feed roll 183 and a pinch roll 184, and which is constructed and operates in a manner like unto that of the feed roll 74 and pinch roll 79, hereinbefore described in connection with the first feeding mechanism. It is therefore deemed unnecessary to show or describe the third feeding mechanism in detail. It will be readily understood that the third mechanism exerts on the material the

pull necessary to draw the material across the edge of the second breaker bar, while the second tension mechanism maintains the necessary tension of the material.

With some grades of material and coatings, and under some atmospheric conditions, it is found that the material has a tendency to curl away from the coating, this being due to the fact that the breaking instrumentalities bend the material so severely in such direction. In order to make the material lie perfectly flat after the breaking operation, it has been found desirable to subject it to what may be called a third breaking operation, which probably does not break the coating any further, but simply tends to curl the material in the opposite direction. This additional breaker operates on the coated side of the material, whereas the other breakers operate on the uncoated side. In connection with this last breaker, presently to be described, it is found desirable to employ another tension mechanism like those previously described, and comprising a tension roll 185. It is also found desirable to provide a feeding mechanism similar to those previously described, and comprising a feed roll 186 and a pinch roll 187.

The final breaker comprises a breaker bar 188, which has one or more sharp corners, anyone of which may be presented to the coated side of the material. This corner deflects the material to a greater or less extent, depending upon the depth to which the breaker bar is adjusted by mechanism at each end of the bar,—that for one end being illustrated in Fig. 18. The bar is provided with reduced terminal portions 189, received in bearings 190 to which the bar is secured as by making each bearing split, and by providing a clamping bolt 191 to contract the bearing about the terminal portion of the bar in an obvious manner. Each bearing is mounted to slide vertically on a guide presented by a post 192, while an adjusting screw 193 is threaded into the bearing, and is loosely received in a bearing 194 secured to the upper end of the post. Rotation of the adjusting screw to move the breaker bar vertically is conveniently accomplished by the use of a hand-wheel 195 splined on the adjusting screw, while a lock-nut 196 threaded onto the screw normally preserves the desired adjustment. By varying the depth of the breaker bar, it is possible to counteract to any necessary extent the tendency of the material to curl away from the coating, following the action of the first and second breakers. In operating the machine, it is found convenient from time to time to take samples from the machine and spread them out where any tendency to curl will be noted and be corrected by adjustment of the third breaker bar.

As previously indicated, the material, after passing the third breaker, is fed by the cooperative action of the feed-roll 186 and pinch roll 187, the former being driven by a pulley 197 (see Fig. 17). The material passes thence over a guide-roll 198, which, in the present example, is driven at the same peripheral speed as the feed-roll 186, as by means of gears 198′ and 199 (see Fig. 17).

Finally, the material passes over a winding or take-up mechanism, herein comprising a shaft 200, to which a core 201 is non-rotatably secured, as by providing the core with a square opening, in which a shaft of corresponding cross-sectional shape fits, as shown in Fig. 16. This shaft is mounted in appropriate bearings 202, herein provided with removable caps 203, the removal of which permits the shaft and core, together with the material wound on the latter, to be removed from the machine and replaced by an empty shaft and core.

It is apparent that, owing to the constantly increasing diameter of the roll of material as the latter is wound onto the core, the surface speed should correspondingly change. This situation is conveniently met by providing a frictional driving mechanism, which is so proportioned as to rotate the shaft at all times at a speed greater than that which is necessary to take up the material. One convenient mechanism for accomplishing this is shown in Fig. 16, wherein there is secured to the shaft 200 a gear 204, which meshes with and is driven by a pinion 205, the latter being secured to a shaft 206, to which is also secured a pulley 207 driven by a belt 208. This belt is intended to slip, and its slippage can be regulated by the use of an idle pulley 209, journaled in a bearing presented by a block 210, which is mounted to slide in a guideway presented by a bracket 211. Adjustment of the bearing block lengthwise in the guideway is effected by an adjusting screw 212, threaded at 213 in the bracket and turning loosely at 214 in the bearing block. A hand-wheel 215, secured to the outer end of the adjusting screw, enables the latter to be rotated to adjust the idle pulley from time to time as conditions may require.

It will be remembered that, in addition to the winding or take-up mechanism just described, there are four feeding mechanisms, which feed the material at different points in its travel from the supply roll to the take-up roll. Now it happens that inevitable variations occur in the rates of feed from time to time by these different mechanisms, due to a slight amount of slippage which is bound to take place. These variations are manifested by gradual changes in the height of the tension roll of this or that tension mechanism. These must be watched by the operator, and when a given tension roll moves up or down to a great extent,

compensation must be made by varying the rate of feed of the appropriate feeding mechanism.

The driving mechanism for coordinating the feeding mechanisms, and for making this compensation, will now be described, reference being had to Fig. 1. A main driving shaft 216, shown at the lower left-hand part of Fig. 1, is provided with a pulley 217, to which power is supplied from any appropriate source, such as a motor. A suitable clutch 218 provides a convenient means for enabling the machine to be started and stopped whenever occasion may require. One of the feeding mechanisms may be driven at a constant speed,—that is to say, without provision for variation in case of any slippage which may occur in the feeding rate which it imparts to the material. In the present example, it is found convenient to drive the first feeding mechanism at a constant speed, and to this end, the main driving shaft is connected thereto by driving mechanism including a pulley 219 secured to the countershaft 220, to which is also secured a pulley 221, the latter being connected by a belt 222 to a pulley 223. This pulley is connected to and driven by a pulley 224 by transmission mechanism 225, commercially known as Almon right-angle transmission. The pulley 224, in turn, is connected by a belt 226 with a pulley 227 attached to the main driving shaft.

The second feeding mechanism, including the feed-roll 129, is connected to the main driving shaft by variable speed mechanism, such as one commercially known as the Reeves, designated 228, having driving and driven shafts 229 and 230, which are provided with variable cone pulleys 231 and 232, connected with each other by a V-belt 233, the arrangement being such that the relative diameters of the pitch lines of these pulleys can be altered at will from time to time, as circumstances may require. The details of this variable speed mechanism are too well known to require further illustration or description, and will be readily understood by those skilled in the art. Secured to the driving shaft 229 is a pulley 234, which is connected by a belt 235 to a pulley 236 attached to the main driving shaft. As the variable speed mechanism in the present example is arranged obliquely with reference to the main driving shaft, idle pulleys 237 are provided to give the necessary change of direction to the belt 235. The driven shaft 230 has secured to it a pulley 238, which is connected by a belt 239 to the pulley 138, which, it will be remembered by reference to Fig. 12, drives the angularly disposed feed-roll 129.

By the use of the variable speed mechanism interposed between the first and second feed mechanisms, it is possible to compensate for variations in the rate of feed due to slippage. In so doing, the operator watches the tension roll 89 of the first feeding mechanism (see Fig. 2), and makes suitable correction from time to time as circumstances may require.

The third and fourth feeding mechanisms are variably driven with relation to each other and to the main driving shaft. This is conveniently accomplished in the present example by two variable speed mechanisms 240 and 241, such as the Reeves (see Fig. 19), one of which provides a variable speed drive between the main driving shaft and the feed-roll 183, while the other provides for a variation between the feed-roll 183 and the feed-roll 186.

The transmission 240 comprises a pulley 242 secured to the main driving shaft, and connected by a V-belt 243 to a pulley 244, secured to a shaft 245. To the latter is secured a pulley 246, which is connected by a belt 247 with a pulley 248 secured to the feed-roll 183. By simply varying the relative diameters 242 and 244 in a well-known manner, the speed of the feed-roll 183 may be varied with relation to that of the main driving shaft 216.

In the present example, the pulley 246 conveniently serves to drive a second belt 249, which is connected to a pulley 250, one belt being wrapped about the other, so to speak. This simplifies the drive and tends to reduce slippage. The variable speed mechanism 241 comprises a driving shaft 251, and a driven shaft 252, provided respectively with pulleys 253 and 254 connected by a V-belt 255. The pulley 250 is secured to the driving shaft 251, while a pulley 256 secured to the driven shaft 252 is connected by a belt 257 with the pulley 197 of the feed-roll 186. It follows that variation in the pitch diameters of the pulleys 253 and 254 will result in a corresponding variation in the relative speed of the feed-rolls 183 and 186. The operator watches the tension rolls 182 and 185, and if either rises or falls to a sufficient extent to warrant, the operator makes a corresponding adjustment of the proper variable speed mechanism to compensate for the variation in the rate of feed evidenced by the position of the tension roll.

The general operation of the machine should be evident without further description.

Having thus described one embodiment of the invention, but without limiting myself thereto, what I claim and desire by Letters Patent to secure is:

1. In a machine of the class described, the combination of supporting means to support a supply of paper in the form of a roll, feed rolls to which the paper passes from the supply roll, and means for moving said

supporting means and supply roll together lengthwise while simultaneously maintaining said supply roll in parallelism with said feed rolls.

2. In a machine of the class described, the combination of a supply roll shaft, fastening means to secure the supply roll in fixed position on said shaft, feed rolls to which the paper passes from the supply roll, and means for adjusting said shaft, said fastening means and the supply roll lengthwise while simultaneously maintaining said shaft in parallelism with said feed rolls.

3. In a machine of the class described, the combination of a shaft adapted to support a supply of paper in the form of a roll, feed rolls to which the paper passes from the supply roll, pivoted supports for said shaft, a link connecting said supports, and means for swinging said supports to cause lengthwise movement of said shaft.

4. In a machine of the class described, the combination of a shaft adapted to support a supply of paper in the form of a roll, feed rolls to which the paper passes from the supply roll, bearings for said shaft, pivoted supports to which said bearings are pivoted, the pivotal axes of said bearings being generally parallel with the pivotal axes of said supports, a link connecting said supports, and means for swinging said supports to cause lengthwise movement of said shaft.

5. In a machine of the class described, the combination of supporting means to support a supply of paper in the form of a roll, feed rolls to which the paper passes from the supply roll, means for varying the angular relationship between the axis of the supply roll and said feed rolls by varying the angular relationship between said supporting means and said feed rolls, and means for adjusting said supporting means lengthwise while simultaneously maintaining the angular relationship.

6. In a machine of the class described, the combination of a supply roll shaft, bearings therefor, upright pivots for said bearings, means for adjusting one of said bearings horizontally, transversely of its pivot and of said shaft, supports which receive said pivots, upright pivots for said supports, means to swing one of said supports about its pivot, and means to cause the second support to swing in unison with the first.

7. In a machine of the class described, the combination of a supply roll shaft, bearings therefor, upright pivots for said bearings, means for adjusting one of said bearings horizontally, transversely of its pivot and of said shaft, supports which receive said pivots, upright pivots for said supports, means including a worm and worm gear to swing one of said supports about its pivot, and a link connecting said supports to cause the second one to swing in unison with the first.

8. In a machine for breaking dried coating on coated, flexible, sheet material, the combination of two breakers over which a web of the sheet material passes in succession, said breakers being obliquely disposed with reference to the path of the web, and sheet feeding means interposed between said breakers considered with reference to the travel of the web, said feeding means comprising two cooperating feed rolls also obliquely disposed with reference to said path and between which rolls the web is passed, and means for applying power to said feed rolls.

9. In a machine for breaking dried coating on coated, flexible, sheet material, the combination of two breakers over which a web of the sheet material passes in succession, said breakers being obliquely disposed with reference to the path of the web, and sheet feeding means interposed between said breakers considered with reference to the travel of the web, said feeding means comprising two cooperating feed rolls also obliquely disposed with reference to said path and between which rolls the web is passed, means for applying power to said feed rolls, and means to adjust one roll toward and from the other.

10. In a machine for breaking dried coating on coated, flexible, sheet material, the combination of two breakers over which a web of the sheet material passes in succession, said breakers being obliquely disposed with reference to the path of the web, and sheet feeding means interposed between said breakers considered with reference to the travel of the web, said feeding means comprising two cooperating feed rolls also obliquely disposed with reference to said path and between which rolls the web is passed, means for applying power to said feed rolls, and gearing connecting said rolls.

11. In a machine for breaking dried coating on coated, flexible, sheet material, the combination of two breakers over which a web of the sheet material passes in succession, and sheet feeding means interposed between said breakers considered with reference to the travel of the web, said feeding means comprising two cooperating feed rolls between which the web is passed, means for applying power to said rolls, gearing connecting said rolls, and means to adjust one roll toward and from the other to vary their pressure on the web.

12. In a machine for breaking dried coating on coated, flexible, sheet material, the combination of two breakers over which a web of the sheet material passes in succession, and sheet feeding means interposed be-

tween said breakers considered with reference to the travel of the web, said feeding means comprising two cooperating feed rolls between which the web is passed, means for applying power to said rolls, bearings for one of said rolls, and means to adjust said bearings simultaneously to move such roll toward the other roll to vary their pressure on the web.

13. In a machine of the class described, the combination of two sets of feed rolls for feeding a strip of paper lengthwise, breaking means operatively interposed between said sets, sheet tension means operatively interposed between one of said sets and said breaking means, and tension means interposed between said breaking means and the second of said sets, each tension means comprising a weight supported by said paper.

14. In a machine of the class described, the combination of two continuous feed mechanisms comprising sets of feed rolls for imparting a continuous feeding movement to a strip of paper lengthwise, and tension means operatively interposed between said sets, said tension means comprising a weight supported by and taking up the slack of said paper intermediate said sets, and means for varying the feeding rate of one of said continuous feed mechanisms relatively to the other thereby to vary the amount of slack.

15. In a machine of the class described, the combination of two continuous feed mechanisms comprising sets of feed rolls for imparting a continuous feeding movement to a strip of paper lengthwise, and tension means operatively interposed between said sets, said tension means comprising a roll supported by a loop of said paper intermediate said sets, and means for varying the feeding rate of one of said continuous feed mechanisms relatively to the other thereby to vary the size of said loop.

16. In a machine of the class described, the combination of two sets of feed rolls for feeding a strip of paper lengthwise, and tension means operatively interposed between said sets, said tension means comprising a roll supported by a loop of said paper intermediate said sets, counterbalancing means for said roll, and means for varying the feeding rate of one of said sets relatively to the other thereby to vary the size of said loop.

17. In a machine of the class described, the combination of two continuous feed mechanisms comprising sets of feed rolls for imparting a continuous feeding movement to a strip of paper lengthwise, and tension means operatively interposed between said sets, said tension means comprising a weight supported by said paper intermediate said sets and means at will to change the elevation of said weight by changing the feeding rate of one of said mechanisms.

18. In a machine of the class described, the combination of two sets of feed rolls for feeding a strip of paper lengthwise, and tension means operatively interposed between said sets, said tension means comprising a weight supported by said paper intermediate said sets and pressure fluid operated means at will to raise said weight.

19. In a machine of the class described, the combination of two sets of feed rolls for feeding a strip of paper lengthwise, and tension means operatively interposed between said sets, said tension means comprising a weight supported by said paper intermediate said sets and means to interpose a yielding resistance to the descent of said weight should said paper break.

20. In a machine of the class described, the combination of two sets of feed rolls for feeding a strip of paper lengthwise, and tension means operatively interposed between said sets, said tension means comprising a weight supported by said paper intermediate said sets and pressure fluid means to check the descent of said weight should said paper break.

21. In a machine of the class described, the combination of two sets of feed rolls for feeding a strip of paper lengthwise, and tension means operatively interposed between said sets, said tension means comprising a roller supported by a loop of said paper intermediate said sets, bearings for said roller, guides for said bearings, and pressure fluid means for modifying the action of said weight.

22. In a machine of the class described, the combination of two sets of feed rolls for feeding a strip of paper lengthwise, and tension means operatively interposed between said sets, said tension means comprising a roller supported by a loop of said paper intermediate said sets, bearings for said roller, guides for said bearings, and pressure fluid means for raising said weight and for checking its descent.

23. In a machine of the class described, the combination of two sets of feed rolls for feeding a strip of paper lengthwise, and tension means operatively interposed between said sets, said tension means comprising a weight supported by said paper intermediate said sets and a variable counterweight opposed to said weight.

24. In a machine for breaking the dried coating on coated flexible, sheet material, the combination of means to break the coating by bending the material in one direction, and means to bend the material in the opposite direction to counteract subsequent tendency to curl in the first direction.

25. In a machine for breaking the dried coating on coated, flexible sheet material,

the combination of two bars, and means for drawing the material coated side outward across one bar and across the other bar coated side inward.

26. In a machine for breaking the dried coating on coated, flexible, sheet material, the combination of two bars disposed obliquely with reference to the travel of the material, means for causing the material to be bent sharply first across one bar obliquely to the longitudinal edges of the material and then obliquely, transversely of the first bend, a third bar disposed transversely with reference to the travel of the material, means for causing the material to be bent sharply across said third bar, and means for drawing the material coated side outward across the first two bars and coated side inward across the third bar.

27. In a machine for breaking the dried coating on coated, flexible, sheet material, the combination of a succession of bars across which the material passes, means for drawing the material coated side outward across part of said bars and coated side inward across the remainder of said bars, and tensioning means associated with each of said bars to cause the material to be bent sharply as it passes over such bar.

28. In a machine for breaking the dried coating on coated, flexible, sheet material, the combination of a succession of bars across which the material passes, means for drawing the material coated side outward across part of said bars and coated side inward across the remainder of said bars, and tensioning means associated with each of said bars, to cause the material to be bent sharply as it passes over such bar, each tensioning means comprising a weight supported by the material.

29. In a machine for operating on coated sheet material, the combination of means for supporting the sheet at two points, at one of which is a bar, means for drawing the sheet material across said bar with the coated side toward said bar, and sheet tensioning means comprising a weight supported by the material intermediate said points and exerting on said sheet a tension which is effective over the whole length of said sheet between said bars.

30. In a machine for breaking the dried coating on coated, flexible, sheet material, the combination of two breaker bars having working edges disposed obliquely to the path of the material and generally parallel with each other, sheet feeding means including a roll operatively interposed between said bars and disposed obliquely to a plane containing said working edges, and means for adjusting said bars to change the angular relationship between said edges and said roll.

31. In a machine for breaking the dried coating on coated, flexible, sheet material, the combination of two breaker bars having working edges disposed obliquely to the path of the material and generally parallel with each other, sheet feeding means including a roll operatively interposed between said bars and disposed obliquely to a plane containing said working edges, and means for adjusting said bars angularly with relation to each other, and adjusting said bars to change the angular relationship between said edges and said roll.

32. In a machine for breaking dried coating on coated, flexible, sheet material, the combination of two breakers over which a web of the sheet material passes in succession, and sheet feeding means interposed between said breakers considered with reference to the travel of the web, said feeding means comprising a feed roll, and means for applying power to said feed roll to cause it to feed the web.

33. In a machine for breaking dried coating on coated, flexible, sheet material, the combination of two breakers over which a web of the sheet material passes in succession, and sheet feeding means interposed between said breakers considered with reference to the travel of the web, said feeding means comprising two cooperating feed rolls between which the web is passed, and means for applying power to both of said feed rolls.

34. In a machine for breaking dried coating on coated, flexible, sheet material, the combination of two breakers over which a web of the sheet material passes in succession, and sheet feeding means interposed between said breakers considered with reference to the travel of the web, said feeding means comprising two cooperating feed rolls between which the web is passed, means to urge one of said rolls toward the other to subject the web to pressure, and means for applying power to said rolls to cause them to feed the web.

35. In a machine for breaking dried coating on coated, flexible, sheet material, the combination of two sets of feeding instrumentalities, breaking means interposed between said two sets, sheet tension means interposed between one of said sets and said breaking means, and sheet tension means interposed between said breaking means and said second set.

36. In a machine for breaking dried coating on coated, flexible, sheet material, the combinaton of three sets of feeding instrumentalities, three breakers, and three sets of sheet tensioning instrumentalities, one set of feeding instrumentalities feeding the web of material from the source of supply to the first breaker, the second set of feeding instrumentalities feeding the web from the first breaker to the second breaker and the third set of feeding instrumentalities feeding the web after the latter passes the third

breaker, one set of sheet tensioning instrumentalities tensioning the web between the first set of feeding instrumentalities and the first breaker, the second set of sheet tensioning instrumentalities tensioning the web between the second breaker and the second set of feeding instrumentalities and the third set of sheet tensioning instrumentalities tensioning the web between the second set of feeding instrumentalities and the third breaker.

37. In a machine for breaking the dried coating on coated, flexible, sheet material, the combination of means for supporting a supply roll of the web of sheet material, means for resisting rotation of said roll, a first web feeding mechanism for feeding the web from the supply roll, a first web tensioning means for tensioning the web after it passes said first web feeding mechanism, a first breaker operating on the web after it passes said first tensioning means, a second web feeding mechanism for feeding the web after it passes said first breaker, a second breaker operating on the web after it passes said second feeding mechanism, a second web tensioning means for tensioning the web after it passes said second breaker, a third web feeding mechanism for feeding the web after it passes said second tensioning means, a third web tensioning means for tensioning the web after it passes said third feeding mechanism, a third breaker operating on the web after it passes the third tensioning means, and a fourth web feeding mechanism for feeding the web after it passes said third breaker.

38. In a machine for breaking the dried coating on coated, flexible, sheet material, the combination of means for supporting a supply roll of the web of sheet material, means for resisting rotation of said roll, a first web feeding mechanism for feeding the web from the supply roll, a first web tensioning means for tensioning the web after it passes said first web feeding mechanism, a first breaker operating on the web after it passes said first tensioning means, a second web feeding mechanism for feeding the web after it passes said first breaker, a second breaker operating on the web after it passes said second feeding mechanism, a second web tensioning means for tensioning the web after it passes said second breaker, a third web feeding mechanism for feeding the web after it passes said second tensioning means, a third web tensioning means for tensioning the web after it passes said third feeding mechanism, a third breaker operating on the web after it passes the third tensioning means, a fourth web feeding mechanism for feeding the web after it passes said third breaker, and a take-up mechanism to which the web passes after it leaves said fourth feeding mechanism.

In testimony whereof, I have signed my name to this specification.

ADOLPH C. VAN SLUYS.