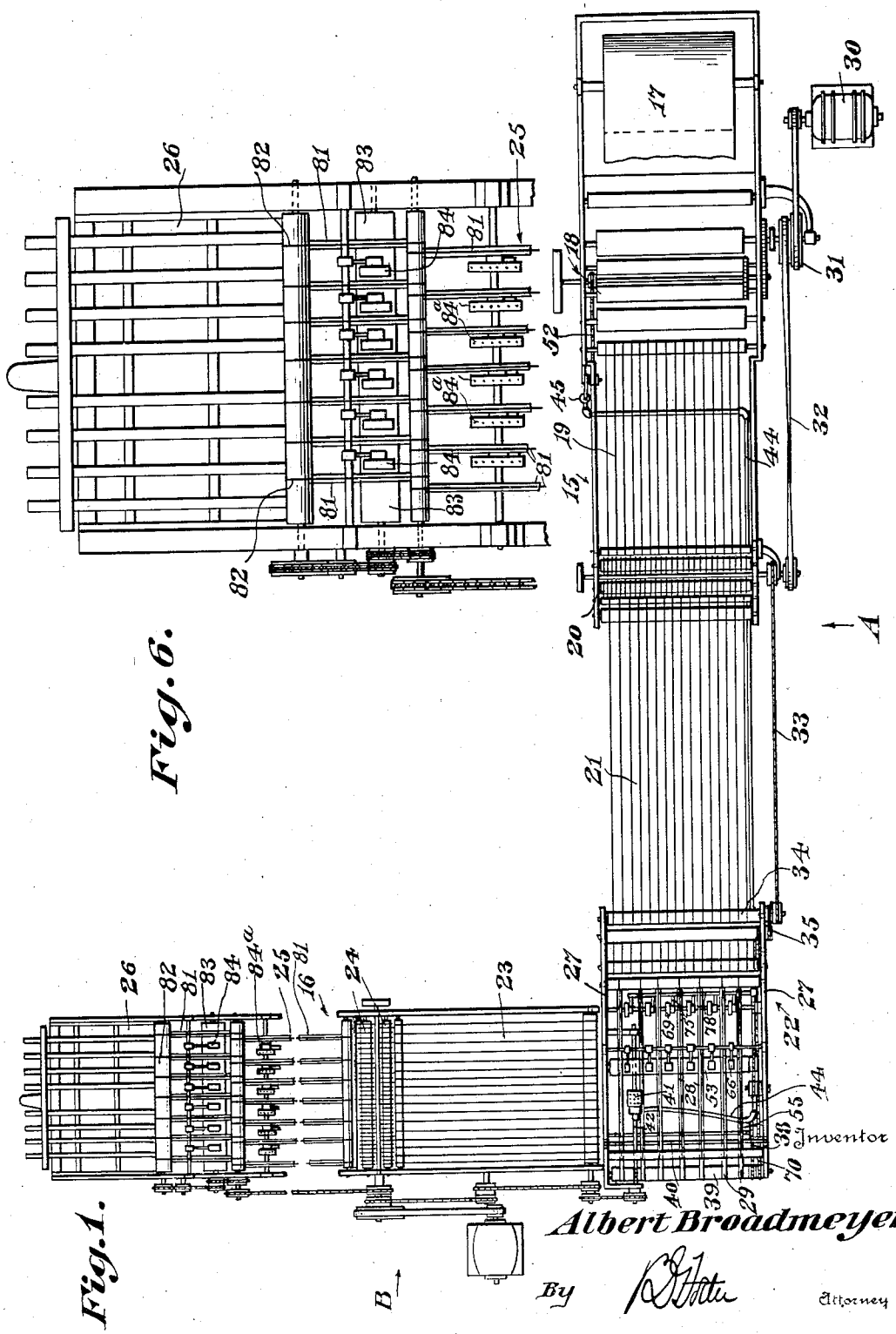
March 12, 1935. A. BROADMEYER 1,994,012

SHEET LAPPING MECHANISM

Filed June 15, 1931 6 Sheets-Sheet 1



March 12, 1935. A. BROADMEYER 1,994,012

SHEET LAPPING MECHANISM

Filed June 15, 1931 6 Sheets-Sheet 2

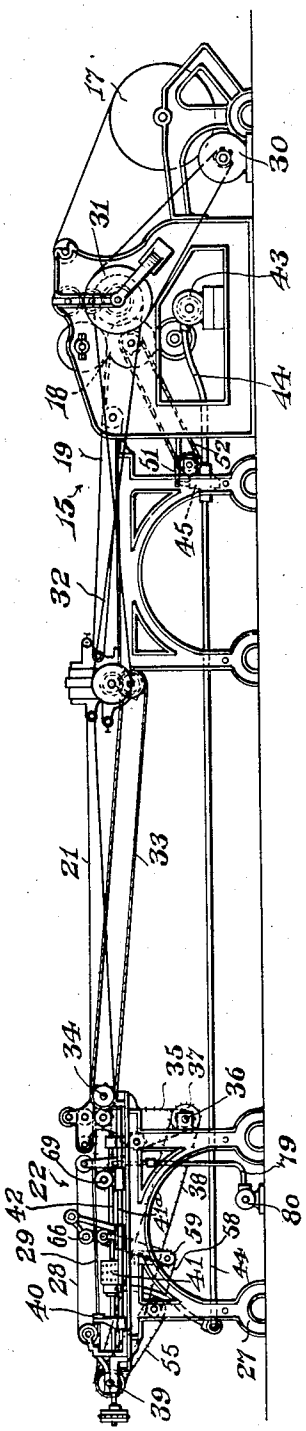


Fig. 2.

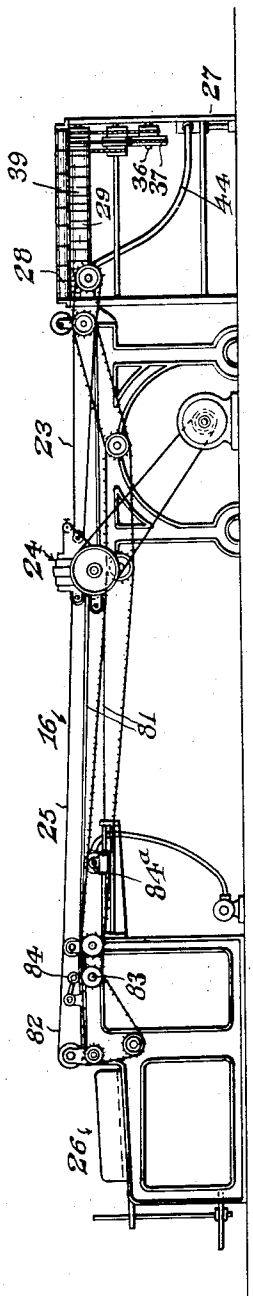


Fig. 3.

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March 12, 1935. A. BROADMEYER 1,994,012

SHEET LAPPING MECHANISM

Filed June 15, 1931 6 Sheets-Sheet 3

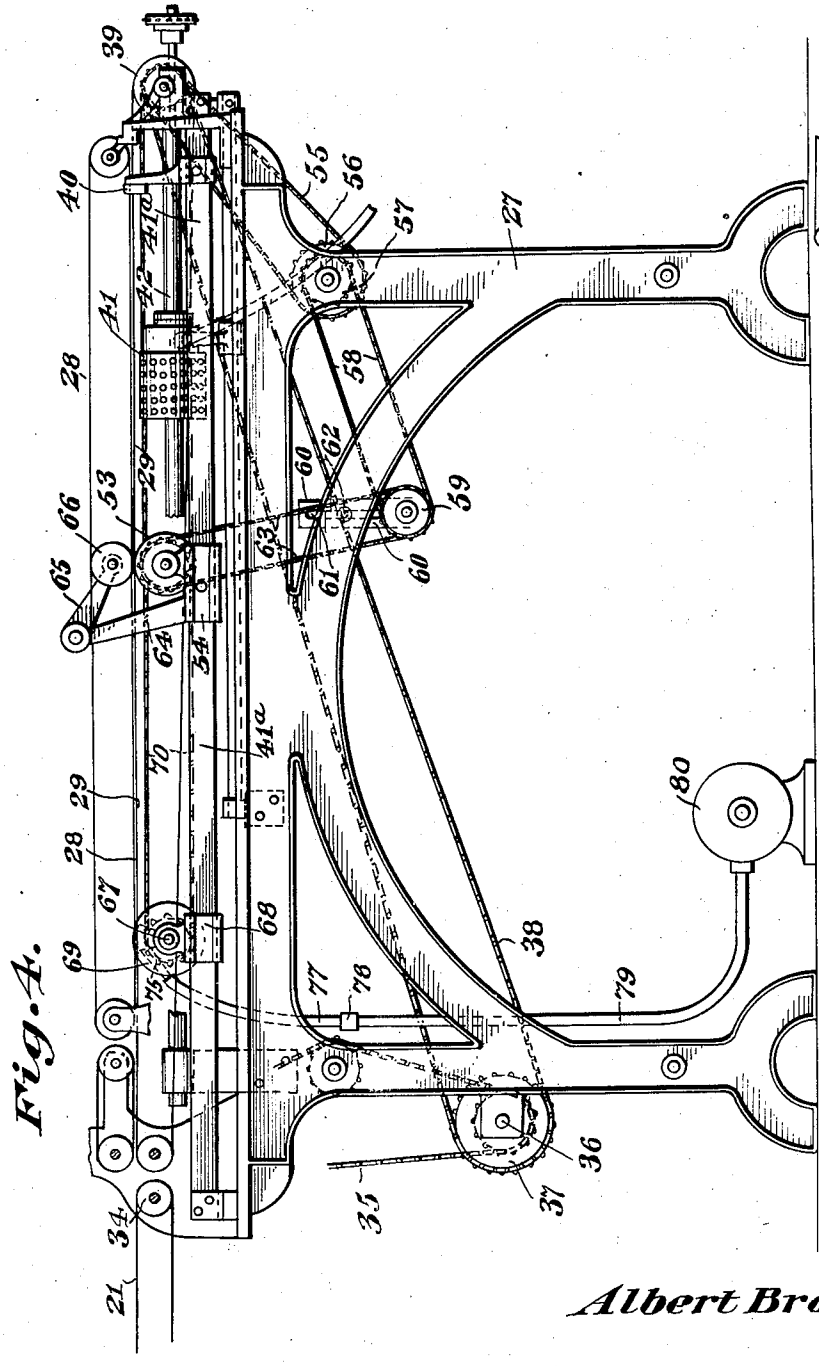

Fig. 4.

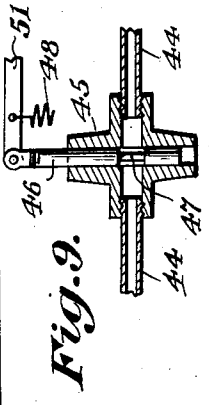

Fig. 9.

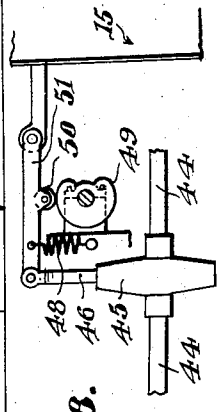

Fig. 8.

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March 12, 1935. A. BROADMEYER 1,994,012

SHEET LAPPING MECHANISM

Filed June 15, 1931 6 Sheets-Sheet 4

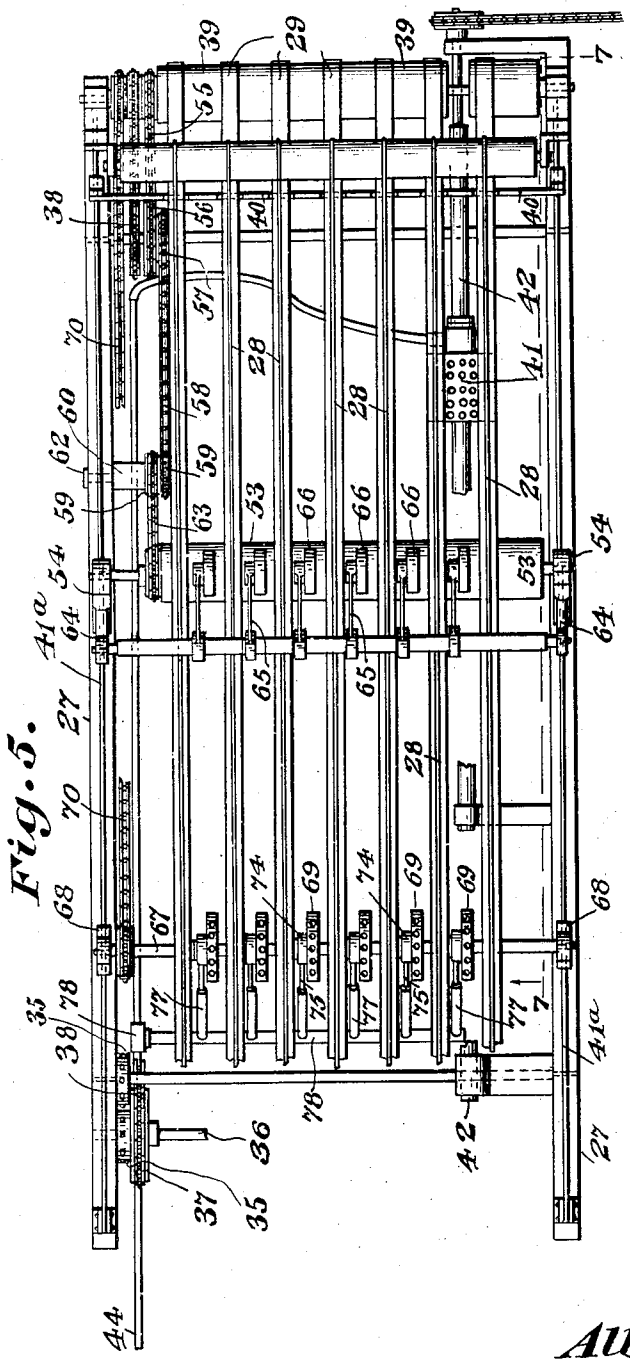

Fig. 5.

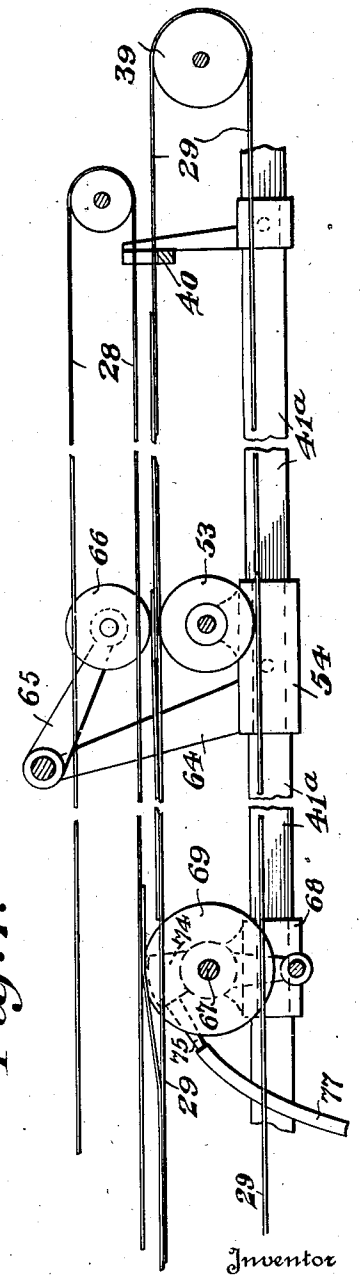

Fig. 7.

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March 12, 1935. A. BROADMEYER 1,994,012

SHEET LAPPING MECHANISM

Filed June 15, 1931 6 Sheets-Sheet 5

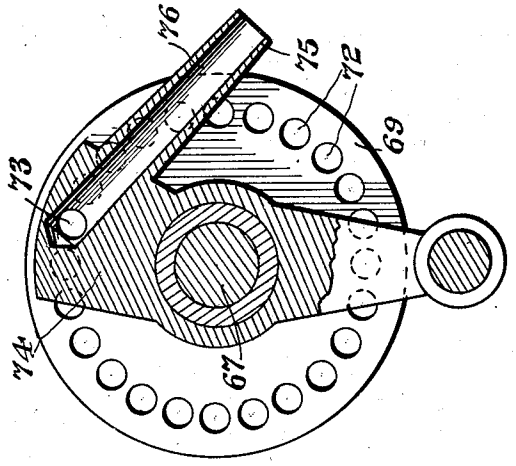

Fig. 12.

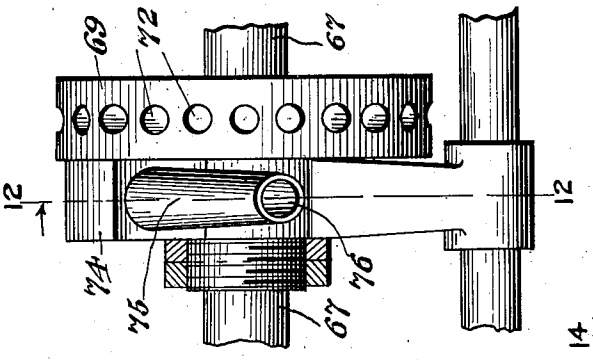

Fig. 11.

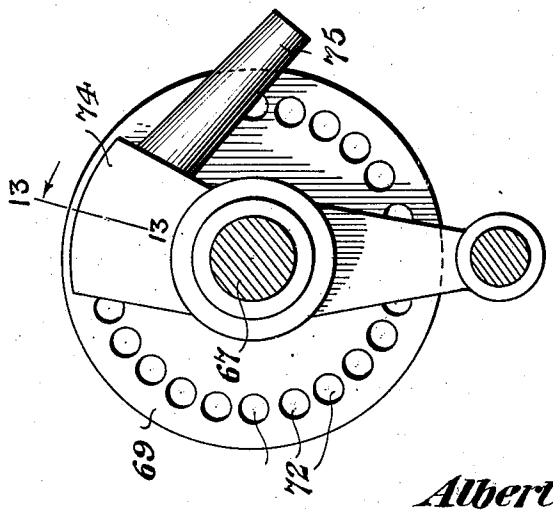

Fig. 10.

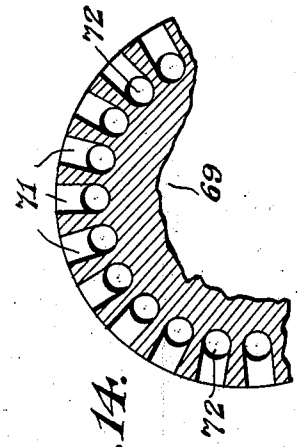

Fig. 14.

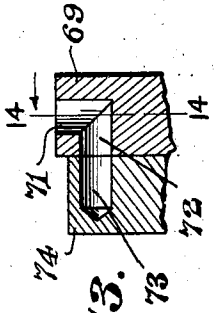

Fig. 13.

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SHEET LAPPING MECHANISM

Filed June 15, 1931 6 Sheets-Sheet 6

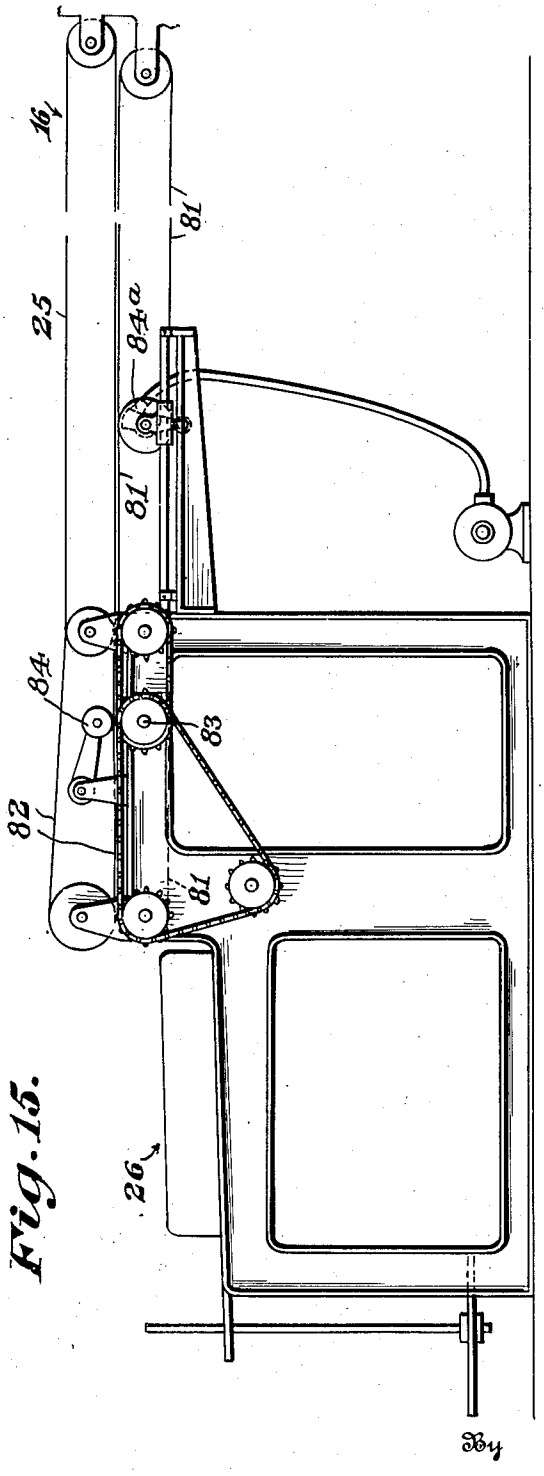

Fig. 15.

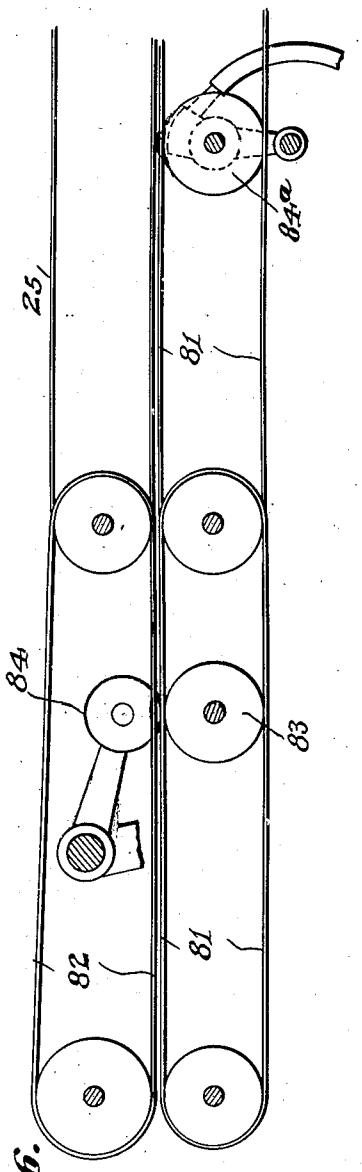

Fig. 16.

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UNITED STATES PATENT OFFICE

1,994,012

SHEET LAPPING MECHANISM

Albert Broadmeyer, Harrisburg, Pa., assignor to W. O. Hickok Manufacturing Company, Harrisburg, Pa., a corporation of Pennsylvania

Application June 15, 1931, Serial No. 544,583

22 Claims. (Cl. 271—46)

In ruling machines and like apparatuses where the sheets after passing through one instrumentality, as for example, ruling mechanism, are brought to a corner and then moved in a different direction to and through another instrumentality, as a second ruling mechanism, the speed of the apparatus as a whole has been limited by the necessity of bringing each sheet to a stop and carrying it out of the way at the corner before the succeeding sheet enters the corner, thus making the speed of the apparatus low as compared to modern machines of other types in this art.

One of the primary objects of the present invention is to provide a mechanism that will receive a relatively large number of sheets in the corner and cause them to lap or pile, the mechanism for taking the sheets out of the corner and the instrumentalities that later operate on said sheets thus being permitted to operate at a higher rate of speed and increasing materially the output of the machine as a whole.

A further and important object is to provide novel lapping mechanism that may be used in other relations.

In the accompanying drawings:

Figure 1 is a plan view of a dual L-ruling machine shown diagrammatically, but it is believed sufficiently to enable one skilled in the art to understand the same.

Figures 2 and 3 are respectively side elevations of the machine shown in Figure 1, and viewing the same from the sides A and B.

Figure 4 is a side elevation on an enlarged scale of the apparatus for delivering the sheets into the corner and removing them therefrom.

Figure 5 is a plan view of the same.

Figure 6 is a plan view on an enlarged scale of the layboy at the delivery end of the machine.

Figure 7 is a detail sectional view taken on the line 7—7 of Figure 5.

Figure 8 is a detail view in elevation of the controlling valve mechanism for the delivery suction roller.

Figure 9 is a vertical sectional view therethrough.

Figure 10 is a detail view in elevation of one of the lapping rolls.

Figure 11 is a side elevation of the same.

Figure 12 is a sectional view on the line 12—12 of Figure 11.

Figure 13 is a sectional view on the line 13—13 of Figure 10.

Figure 14 is a detail sectional view on the line 14—14 of Figure 13.

Figure 15 is a side elevation of the layboy and the means for delivering sheets thereto.

Figure 16 is a detail longitudinal sectional view therethrough.

As is well known, a dual L-ruling machine is made up ordinarily of two ruling apparatuses, and such is intended to be here shown, one of these apparatuses being designated generally by the reference numeral 15, and the other by the reference numeral 16. In the present embodiment the sheets to be ruled are cut from the web of a paper roll 17, the cutting and feeding mechanism being indicated at 18. From this cutting mechanism they are delivered by a conveyor 19 to ruling disks 20, and from said ruling disks they are carried by a conveyor 21 into a corner mechanism 22.

The second apparatus 16 is located at right angles to the first apparatus with its receiving end at said corner, and the sheets are delivered from the corner as hereinafter explained to a conveyor 23 which carries them to ruling disks 24. From these ruling disks the ruled sheets are transported by a conveyor 25 to a layboy 26. The apparatus, as thus far explained, is well-known, and it is believed needs no further detailing.

Referring now more particularly to the "corner" structure, a suitable frame 27 is provided, and mounted on this frame are spaced sets of upper and lower coacting endless conveyor tapes 28 and 29, the upper stretches of the lower tapes 29 and the lower stretches of the upper tapes 28 forming a passageway that receives the sheets from the conveyor 21 of the first apparatus and carries them into the corner. The mechanism for driving these tapes may be varied, but as shown in the accompanying drawings, and particularly in Figure 1, a motor 30 is provided belted to a drive pulley 31 that operates the cutting mechanism 18 and then in turn a belt 32 operates the ruling disk rollers 20. From these rollers extends a drive chain 33 operating on a roller 34, around which pass the cords forming the conveyor 21. The roller 34 has a chain and sprocket drive 35 which includes a drive shaft 36 carrying a sprocket wheel 37. Passing around this sprocket wheel is an endless drive chain 38 that operates a roller 39 around which the lower tapes 29 pass.

The sheets that are carried into the corner by the conveyor tapes 28—29 are brought to a stop by a bar 40 mounted on side bars 41a carried by the frame 27. To carry these sheets out of the corner and deliver them to the conveyor 24 of the second apparatus 16, a suction roller 41 is provided that is mounted on a shaft 42 extend-

ing longitudinally of the conveyor 23—29. Suction is created in the roller 41 by means of a suction pump 43 which as shown in Figure 2 is preferably located at the feeder for the first apparatus 15, a suction conduit 44 extending from the pump 43 to the suction roller 41. In this conduit 44, and preferably at the first apparatus, is a suction controlling valve shown in detail in Figures 8 and 9. This valve includes a vertical casing 45 in which is a reciprocatory plunger valve 46 that is movable to a position to close the passageway through the conduit 44, and has a reduced portion 47 that is movable into communication with the passageway to open the same. The valve 46 is urged to its closed position by a spring 48, and is moved to its open position by a cam 49 operating on a roller 50 that is carried by a swinging arm 51. The arm 51 is connected to the plunger valve 46. The cam 49 is rotated by a chain and sprocket drive 52 from the cutter mechanism 18 (see Figures 1 and 2). It will thus be evident that as the cam 49 rotates, the valve 46 will be reciprocated, thus alternately cutting off and affording communication between the suction pump 43 and the suction roller 41. The result is that the roller 41, which is constantly rotated, is intermittently made active in a manner well understood, so that the sheets which have been brought into the corner, are started by the roller 41 in a right angular direction to their direction of approach to the corner, and are delivered to the conveyor 23. In structures heretofore built, it has been necessary, so far as I know, to have the sheet that is in the corner carried out of the same before the following sheet enters as otherwise they will interfere and this has necessitated a relatively slow operation of the machine as compared to modern straight ruling machines. To overcome this difficulty and thus speed up the machine, means are provided for lapping and in effect piling the sheets in the corner. To this end there is provided in the corner and transversely to the conveyor tapes 28—29 a roller 53 that is located in advance of the suction roller 41 and is mounted on brackets 54 slidably adjustable on the side bars 41*a*. This roller is driven at a slower surface speed than the speed of the conveyor tapes. As shown, the driving mechanism of the roller consists of an endless sprocket chain 55 driven from the roller 39 and operating a sprocket wheel 56 of larger diameter than the sprocket wheel on the roller 39. The sprocket wheel 56 drives a sprocket wheel 57 operating a sprocket chain 58 that drives one of twin sprocket wheels 59. These sprocket wheels 59 are carried on a bracket 60 adjustably mounted on the frame 27. That is to say, the bracket 60 has a longitudinal slot 61 through which passes a fastener 62. The fastener 62 when tight, of course holds the bracket 60 in its adjusted position. From the twin sprocket wheel 59 a sprocket chain 63 drives the roller 53. The bracket 60 is made adjustable in order that the roller 53 may be shifted to different positions along the side bars 41*a* and consequently along the conveyor tapes 28—29. The brackets 54 on which the roller 53 is journaled, carry upstanding arms 64 that extend between the sets of tapes and have pivoted to their upper ends rearwardly extending hangers 65 on which are journaled idler rolls 66 that rest on the roller 53 between the tapes.

It will be evident from the above that as the sheets are brought into the corner, they will be pressed against the slower moving roller 53 by the idler rolls 66, and consequently their speed will be reduced until they come into contact with the stop bar 40.

In advance of the roller 53 is a shaft 67 mounted on brackets 68 that are also adjustable on the side bars 41*a*. This shaft 67 carries a plurality of suction rollers 69, the upper peripheral faces of which extend between the sets of conveyor tapes 28—29 and thus intersect the passageway formed between the tapes of the different sets. The shaft 67 and consequently the suction rollers 69, are driven at preferably the same surface speed as the tapes 28 and 29. To this end the rear roller 39 drives through a sprocket chain 70 the shaft 67. As shown more particularly in Figures 10–14, each of the suction rollers 69 is provided in its periphery with a plurality of suction orifices 71 communicating with lateral orifices 72. The latter successively communicate with a suction port 73 formed in a head 74 that is fixed at one side of each of the rollers. A nipple 75, leading from each head, has a passageway 76 communicating with the port 73 and these various nipples are connected by conduits 77 with a manifold 78 that is in turn connected by a conduit 79 with a suction pump 80. Consequently when the pump 80 is in operation there is partial vacuum at each of the ports 73 and as the suction rollers 60 rotate, their orifices 72 successively register with the ports 73. The ports 73 being then at the tops of the rollers, suction is thus created through the peripheral orifices 71 as they pass through the space between the tapes 28 and 29. It will be clear therefore that sheets entering the said passageway, are caused to adhere to the tops of the suction rollers 69.

Now referring particularly to Figure 7, it will be noted that a sheet is caught between the rollers 53 and 66 and thereby slowed down, just after the sheet has passed the suction rollers 69. The front end of the next oncoming sheet is similarly caught by the suction rollers and as these rollers have their tops slightly above the upper stretches of the conveyor tapes 29 the front end of the sheet is lifted and moves along at a more rapid rate than the advance sheet. The consequence is that the second sheet is brought into overlapping relation with the first sheet and the sheets are therefore lapped and in a measure piled as they are brought against the corner stop 40. This does not interfere, however, with the removal of the sheets by the suction roller 41 for said roller will always operate on the undermost sheet and carry it out of the corner to the receiving conveyor 23.

As a consequence of this structure the apparatus can be operated much more rapidly, for a number of sheets can be delivered into the corner and the suction roller 41 speeded up to take them out as rapidly as desired and irrespective of the amount of lapping or piling that takes place.

This slowing down and lapping structure may be used in other locations as for example in the delivery of the sheets to the layboy. The layboy, designated generally by the reference numeral 26 may be of any desired structure, but the means for delivering the sheets from the second apparatus 16 to said layboy may be constructed as shown in detail in Figures 15 and 16. Thus there is disclosed at the end of the conveyor 25 another conveyor consisting of lower endless tapes 81 and upper coacting endless tapes 82. In the passageway formed between the upper and lower tapes is located a roller 83 similar to the roller 53 above described and operating at a surface speed which is less than that of the tapes 81 and 82. Presser

rolls 84 rest upon the roller 83 and thus insure the engagement of the entering sheets with said roller 83. In advance of the roller 83 and preferably at the rear portion of the conveyor 25 are a series of suction rollers 84ª corresponding to the rollers 69 and cooperating with the roller 83 in a manner already explained. Thus with this structure sheets delivered from the second instrumentality 16 are slowed down by the roller 83 before they enter the layboy 26 and each sheet as it is slowed down is overlapped by the succeeding sheet brought forward by the suction rollers 84ª.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art without further description and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim, is:

1. In apparatus for operating on sheets, the combination with means for conveying sheets successively at a predetermined rate of speed, of means that engage the sheets so conveyed for slowing down their speed while continuing their movement, and means in advance of the slowing down means for causing the oncoming sheets to lap the slowed down sheets.

2. In apparatus for operating on sheets, the combination with means for conveying sheets successively at a predetermined rate of speed, of means that engage the sheets so conveyed for slowing down their speed while continuing their movement, and means in advance of the slowing down means for moving the oncoming sheets at a speed greater than the slowed down sheets and causing said oncoming sheets to lap the slowed down sheets and thereafter be themselves slowed down.

3. In apparatus for operating on sheets, the combination with means for conveying sheets successively at a predetermined rate of speed and in a predetermined path, of means for receiving and slowing down the sheets so conveyed while continuing their movement, and other means in advance of the slowing down means for moving the oncoming sheets out of their path and causing them to lap the slowed down sheets.

4. In apparatus for operating on sheets, the combination with means for conveying sheets in succession, of means for slowing down the sheets to a speed below that given them by the conveying means, and a movable suction device that successively engages the sheets during their movement toward the slowing means and is operated at a speed greater than that of the slowed sheets to cause said sheets moved by the suction device to lap the sheets slowed down.

5. In apparatus for operating on sheets, the combination with a conveyor for carrying sheets in succession, of a roller having a surface speed slower than that of the conveyor and engaging the successive sheets to slow them down, and means operating on the sheets following the slowed down sheets for moving them faster than the latter and causing them to lap the slowed down sheets as they approach the roller.

6. In apparatus for operating on sheets, the combination with a conveyor for carrying sheets in succession, of a roller having a surface speed slower than that of the conveyor and engaging the sheets to slow them down, and a suction roller operating on the sheets following the slowed down sheets for moving them faster and causing them to lap the slowed down sheets.

7. In apparatus for operating on sheets, the combination with an endless conveyor belt for carrying sheets in succession and at a predetermined rate of speed, of a roller associated with the conveyor belt and having a surface speed below that of the belt, means for causing the sheets to be successively engaged and slowed by the roller, and means other than the conveyor belt for moving the sheets following those slowed down at a higher rate of speed than the same and causing them to lap the slowed down sheets prior to the engagement of the following sheets with the roller.

8. In apparatus for operating on sheets, the combination with an endless conveyor belt for carrying sheets in succession and at a predetermined rate of speed, of a roller associated with the conveyor belt and having a surface speed below that of the belt, means for causing the sheets to be engaged and slowed by the roller, and a suction roller for moving the sheets following those slowed down at a higher rate of speed than the same and causing them to lap the slowed down sheets.

9. In apparatus for operating on sheets, the combination with a plurality of spaced endless belts for conveying sheets in succession, of a suction roller having a peripheral suction face operating in the same direction as the belts and between the same, said suction roller engaging the front portion of a sheet, raising it, and causing it to overlap the rear end of the sheet in advance of the same.

10. In apparatus for operating on sheets, the combination with a plurality of spaced sets of upper and lower endless belts for conveying sheets in succession, of a suction roller having a peripheral suction face operating in the same direction as the belts and between adjacent sets, said suction roller engaging the front portion of a sheet, raising it between the belts of the sets and causing said sheet to overlap the rear end of the sheet in advance of the same.

11. In apparatus for operating on sheets, the combination with a plurality of spaced sets of upper and lower conveyor belts for carrying sheets in succession, of a roller having a surface speed less than that of the belts and extending across the same, pressure rollers operating on the roller and pressing the sheets thereagainst to slow the same, and a plurality of suction rollers operating between the sets of belts and having peripheral suction surfaces that engage the front ends of the sheets and move them over the rear ends of the sheets engaged and slowed by the roller.

12. In apparatus for operating on sheets, the combination with a suction feeder for operating on the undersides of sheets to deliver the same, of means for conveying sheets in succession to the suction feeder, and means for slowing down and lapping the sheets over the suction feeder, said feeder successively removing the undermost of the overlying lapped sheets.

13. In apparatus for operating on sheets, the combination with means for conveying sheets in a predetermined direction and stopping them, of a device for moving said sheets from their stopping point in a different direction from their direction of approach thereto, and means for piling the sheets that are conveyed to the stopping point and above the said moving device.

14. In apparatus for operating on sheets, the combination with means for conveying unlapped

sheets in succession and in a predetermined direction, lapping and stopping them, of a device beneath the assembled sheets for moving the undermost sheets successively from their stopping point.

15. In apparatus for operating on sheets, the combination with means for conveying sheets in a predetermined direction, piling and stopping them, of a device for moving the sheets successively from their stopping point, and in a direction different from the direction of approach to said stopping point.

16. In apparatus for operating on sheets, the combination with means for conveying sheets in succession and in a predetermined direction to a predetermined point, of means for lapping the sheets as they approach said point, and means for removing the lower of the lapped sheets from said point and in a direction different from that of their approach thereto.

17. In apparatus for operating on sheets, the combination with means for conveying sheets in succession and in a predetermined direction to a predetermined point, of means for lapping the sheets as they approach said point, and an intermittently operative suction roller that operates to remove the lower of the lapped sheets from said point and in a direction different from that of their approach thereto.

18. In apparatus for operating on sheets, the combination with a sheet receiving corner, of a conveyor for conveying sheets successively to the corner, an angularly disposed conveyor for conveying sheets successively away from the corner, a device for feeding the sheets that have been delivered to the corner successively out of the same to the second conveyor, and means for lapping the sheets as they are delivered into the corner.

19. In apparatus for operating on sheets, the combination with a sheet receiving corner, of a conveyor for conveying sheets successively to the corner, an angularly disposed conveyor for conveying sheets successively away from the corner, a device for feeding the sheets that have been delivered to the corner successively out of the same to the second conveyor, means for slowing down the sheets as they approach the corner, and means for causing the oncoming sheets to lap the slowed down sheets.

20. In apparatus for operating on sheets, the combination with a sheet receiving corner, of a conveyor for conveying sheets successively to the corner, an angularly disposed conveyor for conveying sheets successively away from the corner, a suction device intermittently operable and acting successively on the sheets delivered into the corner for removing them and feeding them to the second conveyor, means associated with the first conveyor for reducing the speed of the sheets as they enter the corner, and means for causing the following sheets to lap the slowed sheets.

21. In apparatus for operating on sheets, the combination with a sheet receiving corner, of a conveyor for conveying sheets successively to the corner, an angularly disposed conveyor for conveying sheets successively away from the corner, a suction device intermittently operable and acting successively on the sheets delivered into the corner for removing them and feeding them to the second conveyor, means associated with the first conveyor for reducing the speed of the sheets as they enter the corner, and a suction roller operating on the following sheets to raise them and carry them over the slowed sheets.

22. In apparatus for operating on sheets, the combination with a rotatable suction roller for operating on successive sheets, of means for rotating the same at a predetermined rate of speed to cause the sheets to be advanced successively at said predetermined rate of speed, means other than said roller for causing a further advance of said sheets at a rate of speed lower than the roller to cause the sheets as they are advanced by the roller to lap the sheets preceding them that are being further advanced at the lower rate of speed.

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