Dec. 7, 1937. A. BROADMEYER 2,101,328

SHEET PILING MECHANISM

Filed Jan. 11, 1934 4 Sheets-Sheet 1

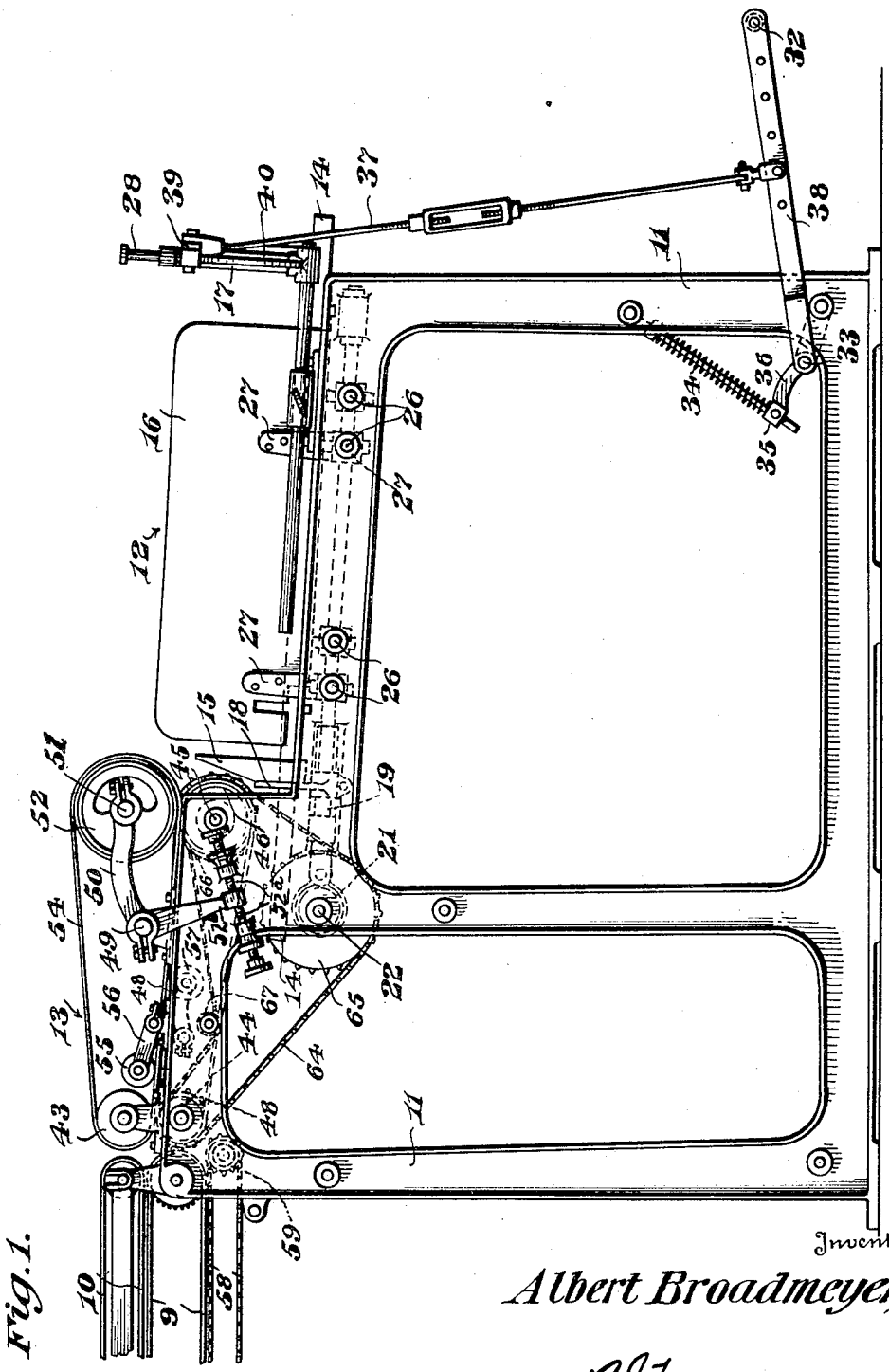


Fig. 1.

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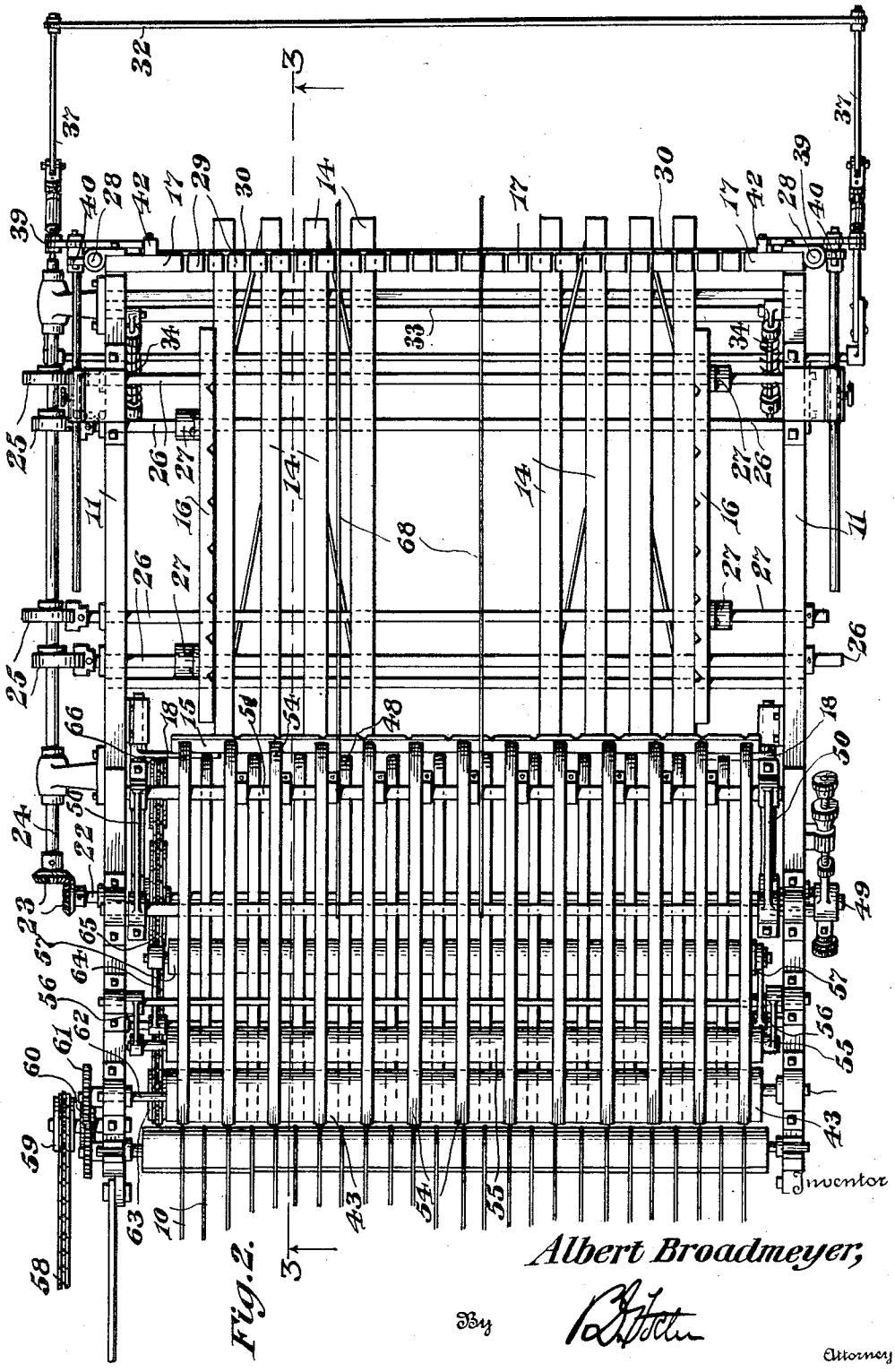


Fig. 2.

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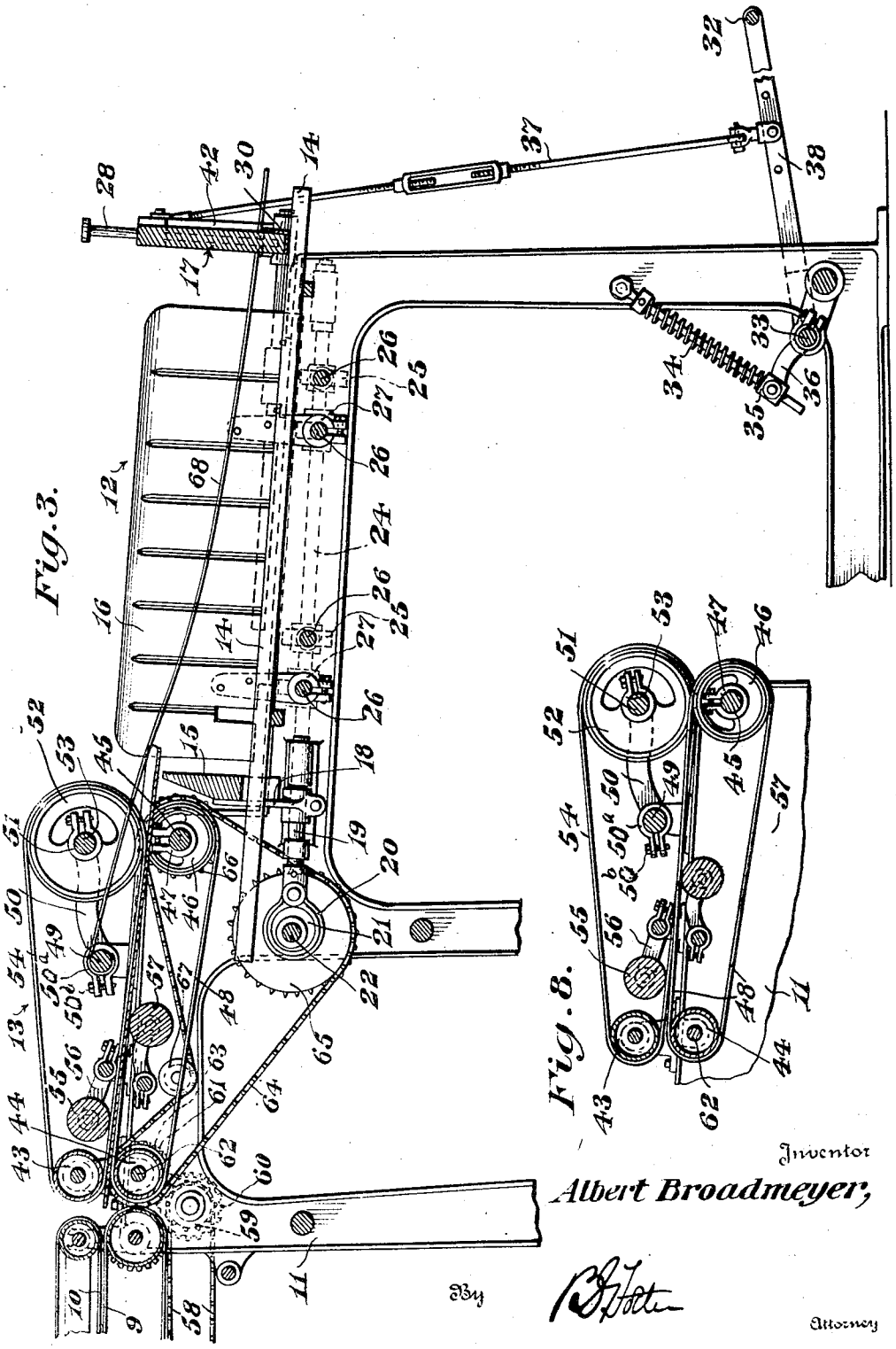


Fig. 3.

Fig. 8.

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SHEET PILING MECHANISM

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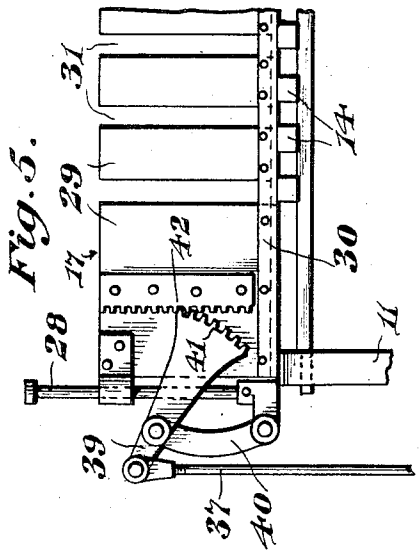


Fig. 5.

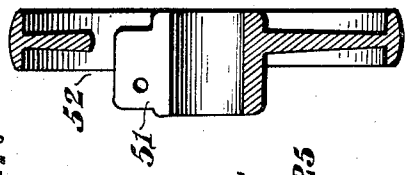


Fig. 7.

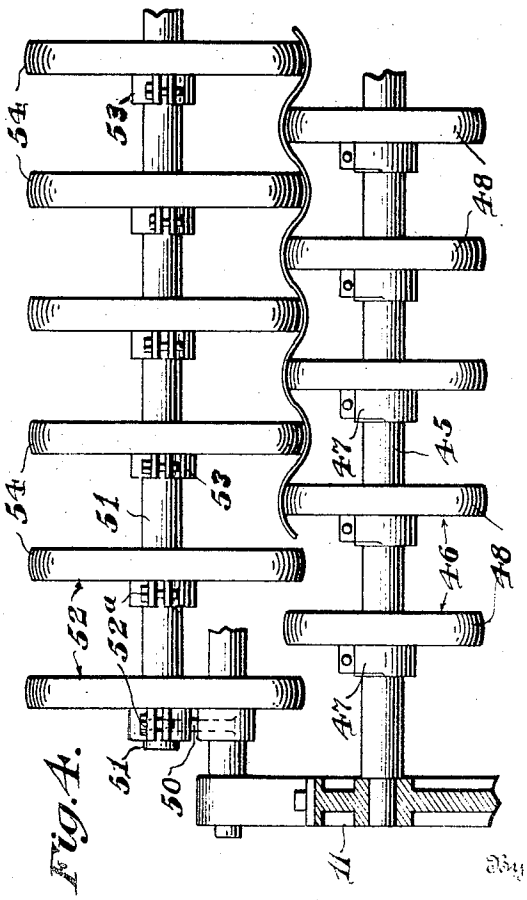


Fig. 4.

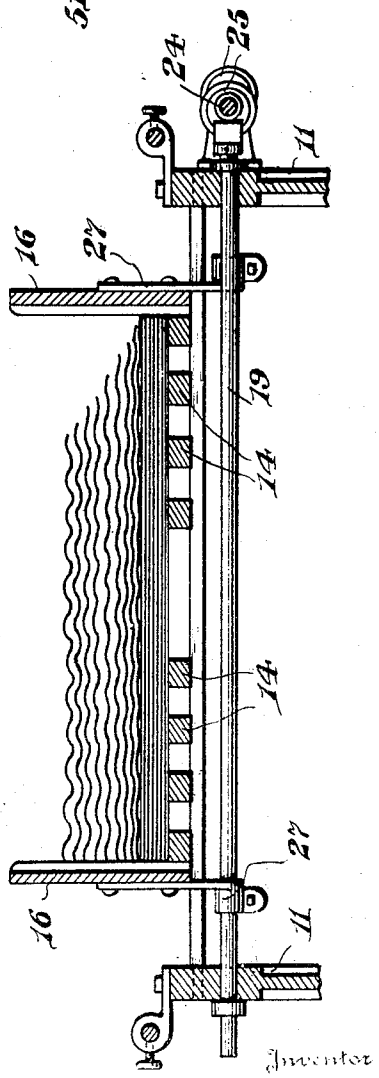


Fig. 6.

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Patented Dec. 7, 1937 2,101,328

UNITED STATES PATENT OFFICE

2,101,328

SHEET PILING MECHANISM

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Application January 11, 1934, Serial No. 706,286

5 Claims. (Cl. 271—68)

In the piling of paper sheets that are delivered successively to a layboy or other receiver, the speed of delivery has been greatly limited because of the tendency of the sheets to rebound when travelling at a high speed and striking the gate or stop wall of the receiver, the striking edge or the advance corners of the sheet moreover tending to bend and thus become folded either upwardly or downwardly, causing them not only to be thus made defective, but also constituting catches for the sheets above or below and preventing the sheets being jogged to form a smooth even pile.

It has usually been the custom to curl the side margins of the sheet in order that they may be in a measure stiffened as they are projected from the delivery means over the accumulating pile, but even this structure has its limitations. It is usually the practice to employ overlying wires under which the sheets are projected, but these involve difficulties, in that variations in their arrangement is required according to the speed of delivery with a consequent necessity of trial and corresponding delays.

The primary object of the present invention is to provide piling mechanism including a means which will so prepare the sheets that they will temporarily retain their rigidity while being projected, and even after they fall upon the pile, they will not pack so quickly, but will have a certain amount of air beneath them which will cause them to substantially "float", thus insuring their easy lateral movement under the jogging action in the layboy and their being eventually flattened as the overlying weight of sheets accumulates. As a consequence it has been demonstrated that the speed of delivery can be greatly augmented and it can be varied easily within a range of from one sheet per minute to two hundred and fifty sheets per minute. Furthermore the adjustment of delivery tapes and wires is no longer necessary inasmuch as the mechanism will operate successfully on sheets of varying sizes.

In the accompanying drawings there is illustrated a structure which is at present considered the preferable embodiment of the invention. Therein:—

Figure 1 is a side elevation of a layboy and the means for delivering sheets successively thereto.

Figure 2 is a top plan view of the same.

Figure 3 is a vertical longitudinal sectional view on the line 3—3 of Figure 2.

Figure 4 is a detail rear elevation of the sheet corrugating means.

Figure 5 is a detail rear elevation of a portion of the layboy gate and the associated elevating means.

Figure 6 is a vertical cross sectional view through the layboy, indicating the general arrangement of the sheets as they are piled therein.

Figure 7 is a detail sectional view through one of the corrugating rollers.

Figure 8 is a detail sectional view showing the approximate relation of the conveyor tapes when no sheets are therein.

It will be understood that the sheets may be primarily treated in any desired manner. That is to say they may be cut from a roll and delivered to the layboy or they may be ruled, printed, or otherwise operated upon. From the mechanism that thus acts upon them, they are delivered by a suitable conveyor, the delivery portion of which is shown in the accompanying drawings in the form of a belt 9, the upper stretch of which carries said sheet and on which said sheets may be held by an overlying means, as the tapes or cords 10. This delivery end 9—10 of the conveyor is shown as mounted on the front end of a suitable frame 11, the rear portion of which carries a layboy 12, and interposed between the layboy and the conveyor 9—10 are means 13 for transferring the sheet from the conveyor to said layboy.

The layboy includes a slatted bottom 14, a front wall 15, side walls 16 and a rear gate 17. The front wall 15 is mounted to reciprocate toward and from the gate 17 and to this end it is carried by brackets 18 adjustably mounted on reciprocating rods 19. These rods have straps 20 that surround eccentrics 21 mounted on a cross shaft 22. The cross shaft as shown in Figure 2 is geared at 23 to a side shaft 24 carrying oppositely disposed sets of eccentrics 25. These eccentrics are operatively connected to oppositely reciprocating transversely disposed sets of rods 26 extending across the frame. The side walls 16 have brackets 27 that are adjustably mounted on the rods 26, it being understood that those of one side wall are connected to the rods 26 which are operated by correspondingly arranged eccentrics 25. Therefore the side walls will move toward and from each other when the shaft 24 is rotated.

The gate 17 is mounted to reciprocate vertically on a pair of guide posts 28, and preferably consists of spaced slats 29 mounted at their lower ends in a cross bar 30, and consequently providing vertical slots 31. A treadle 32 is secured to

a rock shaft 33 journaled in the lower rear corner of the frame, and said treadle extends rearwardly of said frame. This treadle is elevated by a coiled spring 34 having a bearing 35 on a rearwardly extending arm 36 fixed to the rock shaft 33. Extensible links 37, connected to the side arms 38 of the treadle, are in turn connected at their upper ends to rocker arms 39 journaled on brackets 40 that are located at the lower ends of the posts 28. The inner ends of the rocker arms are provided with gear segments 41 which engage vertical racks 42 secured to the end portions of the gate. Thus it will be evident that by pressing downwardly on the treadle 32, the gate can be elevated and the pile of sheets removed from the layboy beneath the same.

Considering now the mechanism 13 for projecting the sheets into the layboy, an upper roller 43 and a lower roller 44 are located adjacent to the delivery end of the conveyor 9—10. Just in front of the path of movement of the wall 15 of the layboy is journaled a shaft 45 on which are adjustably mounted spaced pulleys 46, the hubs 47 of the rollers being contractile, so that they can be gripped upon the shaft. Around the lower roller 44 and the respective pulleys 56 pass a lower set of endless tapes 48.

Extending across the frame above these tapes is a rod 49 on which are pivotally mounted supporting arms 50, the hubs 50a of said arms surrounding the rod 49, being adapted to be gripped to the rod. In other words, said hubs are bifurcated and clamping bolts 50b are employed to contract them upon the rod, so as to hold the arms 50 at any desired elevation. Journaled in the rear free ends of said arms is a shaft 51 to which are adjustably fixed upper pulleys 52 arranged in a line above the line of lower pulleys 46, but as will be clear by reference to Figure 4, alternating with said pulleys 46. The hubs 53 of the pulleys 52 are also contractile so that they can be gripped to the shaft 51 and be effectively secured against relative movement thereon. Around the upper roller 43 and the respective pulleys 52 pass an upper set of endless tapes 54. The rock shaft 49 is normally fixed by screws 52a that bear against opposite sides of an arm 52b fixed to one end of the rock shaft 49. By adjusting these screws the rock shaft can be turned and the upper pulleys 52 thereby raised and lowered and obviously fixed in any desired relation.

It will be evident that sheets delivered by the conveyor 9—10 will pass between the upper stretches of the tapes 48 and the lower stretches of the tapes 54, the entrance throat between them being slightly open (see Fig. 8) to permit their ready entry. As will be clear, however, by reference to Figures 3 and 4, the upper rollers 52 and the lower rollers 46 lap. Consequently as the sheets pass between these rollers they will be corrugated. To avoid sharp edges the rollers have transversely rounded peripheries as illustrated in Figure 7.

In order that the active stretches of the tapes 48 and 54 will properly function, a tension roller 55, carried by adjustable arms 56 bears upon the lower stretches of the upper tapes 54, and a correspondingly mounted tension roller 57 is adjusted to press upwardly upon the upper stretches of the lower tapes 48, thus bringing the tapes in almost alined relation, just in rear of the aforesaid entrance throat.

For the purpose of driving the mechanism, a sprocket chain 58, driven from any suitable part of the initial mechanism that operates on the paper sheets, drives a sprocket wheel 59, to which is connected a gear 60 journaled on the rear side of the frame. This gear 60 is in mesh with a gear 61 that is fixed to the shaft 62 of the roll 44. On the inside of the frame this roll 44 carries a sprocket wheel 63, around which passes an endless sprocket chain 64. The sprocket chain 64 is engaged with a sprocket wheel 65 on the shaft 22 of the jogging mechanism, and also passes around a sprocket wheel 66 on the lower shaft 45, carrying the lower pulleys 46. A suitable idler 67 is preferably engaged with this sprocket chain. It will thus be evident that all the mechanism, including the jogging means, constitutes in effect a unit, the parts of which are co-operatively connected and driven.

The operation of the mechanism is substantially as follows. The sheets successively delivered by the conveyor 9—10 enter between the adjacent stretches of the tapes 48 and 54 and are thereby carried toward the layboy 12. As they pass between the sets of pulleys 46 and 52, they are temporarily corrugated as will be evident by reference to Figure 4. These corrugations obviously extend lengthwise of the direction of the movement of the sheets, and said sheets are thereby stiffened so that when they are projected from the pulleys 46 and 52 and from the tapes 48 and 54 over the bottom of the layboy, they will not bend downwardly to any material extent and if driven at high speed they will float above the bottom and above any sheets supported thereon, until they strike the gate 17. They will then be jogged into a pile by the relatively moving side walls 16 and rear wall 15, and as indicated in Figure 6 the corrugations really provide air spaces beneath the upper sheets, so that this jogging action will take place freely and will not be materially interfered with as is the case with flat sheets which often stick together because of their frictional engagement or by reason of static electricity. At the same time they are gradually flatted out by the sheets accumulating above the same, as indicated in Figure 6, so that they soon become flat and become piled with great acuracy and without their corners or front edges being bent or folded.

The amount of corrugation can be varied by vertically adjusting the upper set of pulleys 52 so as to more or less lap the lower pulleys 46. Thus if the sheets are extremely thin and consequently are more liable to bend, the corrugations are made deeper, while with relatively heavy stock approaching cardboard, such corrugations may be much lighter.

In order that the sheets may be directed immediately to the pile and not float for any length of time in the upper portion of the layboy, light wires 68 may be employed that are engaged over the rod 49, these wires passing between the pulleys and extending at their rear ends into the lower portion of the layboy, with said ends projecting through the slots 31 of the gate.

Actual demonstration has shown that this mechanism will deliver sheets at high speed and in close order of sequence without injuring the sheets or causing them to "ball up" in the layboy. This "balling up" has been a very serious difficulty in the piling of the sheets, requiring the stopping of the machine, the removal and loss of sheets, making the speed of delivery heretofore one within material limits. As high as two hundred and fifteen sheets per minute have been successfully delivered and accurately piled with this mechanism and this speed has been varied down to one

sheet a minute. The only limit therefore which controls the operation of the piling in the present invention appears to be that determined by the mechanism which is operating on the sheets in advance of the said piling mechanism. Furthermore the mechanism has decided advantages over the means heretofore in general use of simply curling the edges of the sheets, inasmuch as the corrugating means extends across the entire width of the conveyor and consequently will operate on sheets of various sizes without the necessity of adjusting the parts. The only need for adjustment is with regard to the thickness of the stock operated upon, but this is easily done as it merely requires the vertical adjustment of the upper pulleys **52** and said pulleys are adjusted as a unit.

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 mechanism of the character set forth, the combination with a layboy, of a conveyor for projecting sheets to the layboy, said conveyor including upper and lower sets of tapes between which the sheets pass, the tapes of each set being substantially parallel to each other and to the path of the sheets, and corrugating members at the discharge end of the conveyor and about which the tapes pass, said members acting to corrugate the sheets as they are discharged by the conveyor and stiffen them as they are projected from the conveyor to the layboy.

2. In mechanism of the character set forth, the combination with a layboy, of a conveyor for delivering sheets thereto, said conveyor comprising upper and lower sets of tapes, the tapes of each set being substantially parallel to each other and to the path of the sheets, means for directing sheets between the tapes, wheels about which the tapes pass at their delivery ends, and means for supporting the wheels to cause those of one set to alternate with and lap those of the other set, thereby to corrugate the sheets as they pass from the conveyor and are projected into the layboy.

3. In mechanism of the character set forth, the combination with a layboy, of a conveyor for delivering sheets thereto, said conveyor comprising upper and lower sets of tapes, the tapes of each set being substantially parallel to each other and to the path of the sheets, means for directing sheets between the tapes, wheels about which the tapes pass at their delivery ends, and means for supporting the wheels to cause those of one set to alternate with and lap those of the other set, thereby to corrugate the sheets as they pass from the conveyor and are projected into the layboy, said wheel supporting means being relatively adjustable to vary the amount of lap of the wheels.

4. In mechanism of the character set forth, the combination with a layboy comprising a bottom, relatively movable side walls, and means for moving the side walls to jog the sheets delivered between them, of a conveyor for delivering sheets thereto, said conveyor comprising upper and lower sets of tapes, the tapes of each set being substantially parallel to each other and to the path of the sheets, means for directing sheets between the tapes, wheels about which the tapes pass at their delivery ends, and means for supporting the wheels to cause those of one set to alternate with and lap those of the other set, thereby to corrugate the sheets and deliver them to the lay-boy between the side walls, said walls being spaced apart sufficiently to allow the sheets to flatten after being deposited in corrugated condition in the lay-boy.

5. In mechanism of the character disclosed, the combination with a sheet receiver, of means for delivering sheets successively thereto, said means comprising upper and lower sets of tapes, those of one set being staggered with respect to those of the other, staggered and lapped upper and lower rollers at the delivery ends of the tapes and about which said tapes pass, a shaft carrying the upper rollers, a swinging frame carrying the shaft, and means by which the frame may be swung and held in different positions to vary the amount of lap of the tapes and rollers.

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