

June 26, 1923.

B. M. FINE

1,460,059

SHEET STACKING MECHANISM

Filed Oct. 17, 1921

4 Sheets-Sheet 1

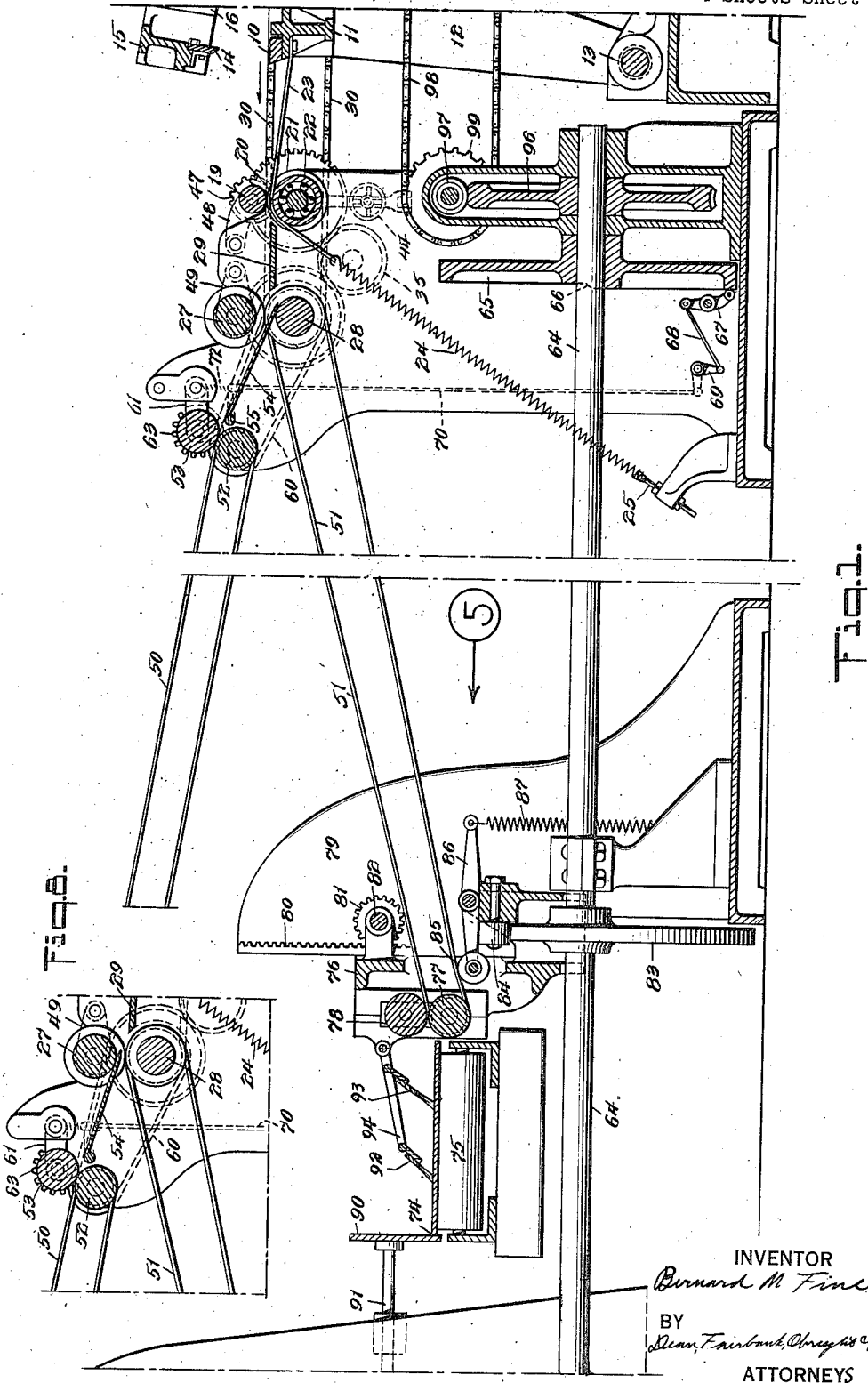


Fig. 1.

Fig. 2.

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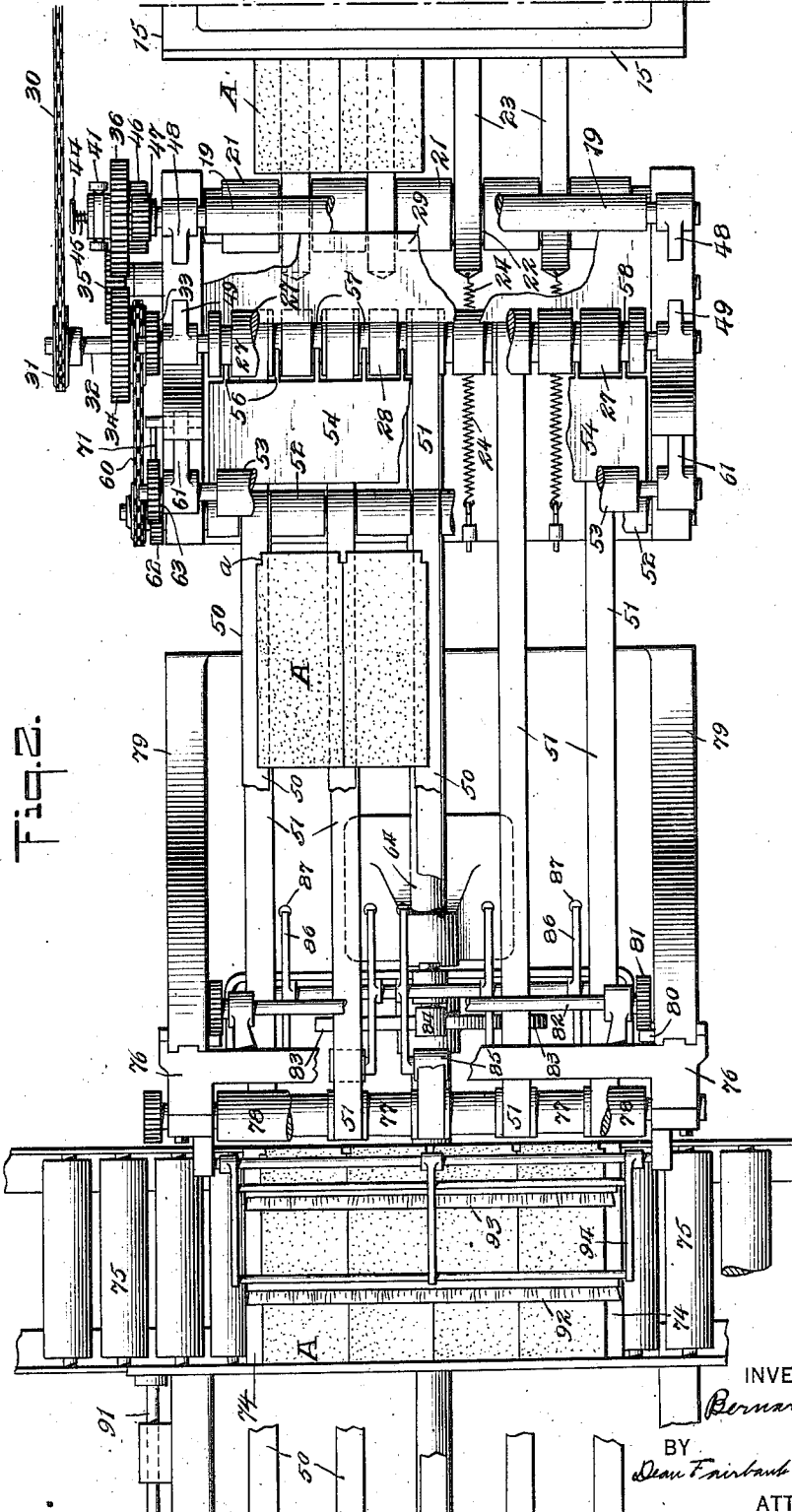
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4 Sheets-Sheet 2



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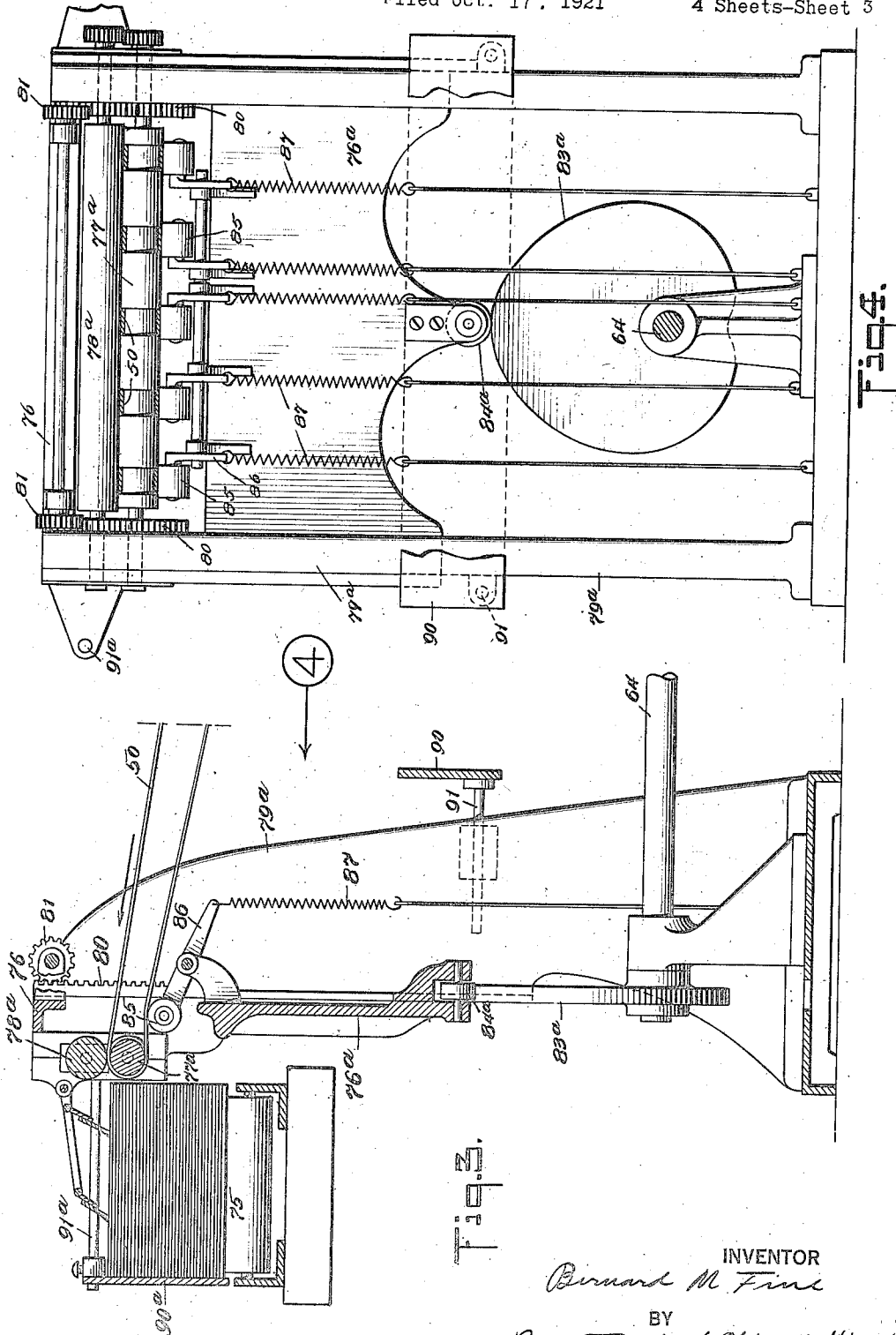
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SHEET STACKING MECHANISM

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4 Sheets-Sheet 3



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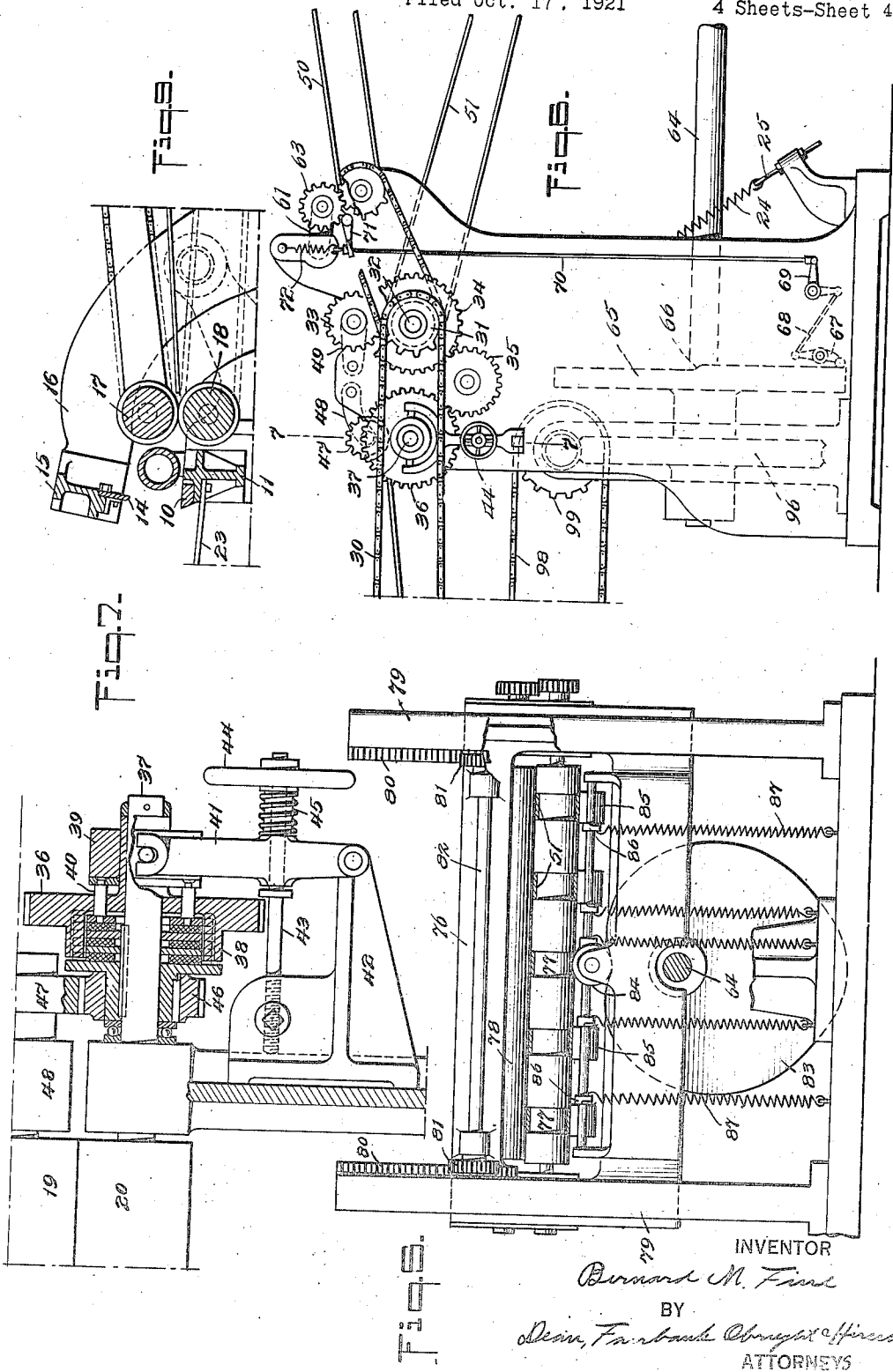
B. M. FINE

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SHEET STACKING MECHANISM

Filed Oct. 17, 1921

4 Sheets-Sheet 4



Patented June 26, 1923.

1,460,059

UNITED STATES PATENT OFFICE.

BERNARD M. FINE, OF DEPTFORD TOWNSHIP, GLOUCESTER COUNTY, NEW JERSEY,
ASSIGNOR TO SAMUEL M. LANGSTON COMPANY, OF CAMDEN, NEW JERSEY, A COR-
PORATION OF NEW JERSEY.

SHEET-STACKING MECHANISM.

Application filed October 17, 1921. Serial No. 508,082.

To all whom it may concern:

Be it known that I, BERNARD M. FINE, a citizen of the United States, and resident of Deptford Township, in the county of Gloucester and State of New Jersey, have invented certain new and useful Improvements in Sheet-Stacking Mechanism, of which the following is a specification.

This invention relates to machines for the stacking or piling of material, and more particularly to sheet material or sections cut from a continuously advancing sheet. My improved machine is designed to cut a continuously advancing sheet into sections, advance the sections at a faster rate than that of the travel of the body of the sheet so as to space the sections apart, and to deliver the sections in predetermined numbers first to one stacking mechanism and then to another, so that while one stack is being built up another may be removed, and the parts restored to proper position for beginning a new stack.

One of the main objects of my invention is to so design, arrange and construct the parts that a very high speed operation is possible and accurate stacking is secured with all of the stacks containing the same number of sheets or sections. I do not wish to be limited to the use of any particular kind of sheet material, although certain features of the construction hereinafter described have been designed for handling sheet material of the same general properties as that employed in the manufacture of composition shingles. Among the important features and objects of my invention are the complete and accurate severing of the sheet into sections without interfering with the uniform and continuous advancement of the sheet, the supporting and conveying of the sections from the cut off mechanism to the feed rolls, the advancing of each section at a faster speed than that of the body immediately upon its severance, the guiding or directing of the sections to separate conveyors, the reversing of the position of the guiding means after a predetermined number of sheets have been delivered to a conveyor, the automatic control of the position of the conveying means in respect to the top of the stack, and the maintenance of proper operative condition of the conveyor in its different adjusted positions. These and various other features will be pointed out more particularly in connec-

tion with the following detailed description of one of many forms which my invention may assume. I do not wish to be limited to the specific form illustrated, except in so far as it is defined in the appended claims.

The claims involving the cutter mechanism have been transferred to a divisional application Serial No. 569,396, filed June 19th, 1922.

In the accompanying drawings:—

Fig. 1 is a vertical longitudinal section of a portion of a machine embodying my invention,

Fig. 2 is a top plan view of the portions of the machine shown in Fig. 1, parts being broken away,

Fig. 3 is a section similar to Fig. 1, but showing the parts at the left of those shown in Fig. 1,

Fig. 4 is a transverse section looking in the direction of the arrow 4 of Fig. 3,

Fig. 5 is a transverse section looking in the direction of the arrow 5 of Fig. 1,

Fig. 6 is a side elevation of the portion of the machine at the right hand side of Fig. 1, but viewed in the opposite direction,

Fig. 7 is a sectional detail on the line 7—7 of Fig. 6, but on a somewhat larger scale,

Fig. 8 is a figure similar to a portion of Fig. 1, but showing the guiding means in the opposite limiting position, and

Fig. 9 is a view similar to another portion of Fig. 1 and showing the feed rolls delivering to the cut off mechanism.

The machine as illustrated may be designed and built independent of any particular machine for the manufacture, slitting, scoring, or other treatment of the material, and in many respects independent of any particular mechanism for cutting the sheet transversely into sections.

So far as certain features of the invention are concerned, it is preferable, if not essential, that the cut off mechanism be of such a type that it does not interfere with the continuous and uniform delivery of sheet material. This is preferably accomplished by employing a cut off mechanism which will move back and forth in the general direction of travel of the sheet, and will cut while traveling with the sheet and at approximately the same speed. A preferred cut off mechanism is that illustrated and claimed in the Langston Patent 1,359,076,

issued November 16th, 1920. I have illustrated in the accompanying drawings only a portion of such a cut off mechanism and reference is to be had to said patent for a more complete disclosure of the construction and operation. The cut off mechanism includes a cutter 10 mounted on a transverse beam 11 which latter is carried by arms 12 mounted to swing about a stationary axis 13. A second cutter 14 is carried by another transverse beam 15, which latter is carried by arms 16 pivoted to the arms 12. The cut off mechanism is operated by a crank connected to the ends of the arms 16 so as to give the cutter 10 a back and forth movement in the general direction of travel of the material, and an approximately elliptical movement of the cutter 14 and intersecting the path of movement of the cutter 10 during the movement of the latter with the material.

Any suitable means may be employed for continuously and uniformly advancing the sheet between said cutters in the direction of the arrow. Merely for purposes of illustration I have shown, in Fig. 9, a pair of driven feed rolls 17-18 for this purpose. The advancing end of the sheet enters between a pair of superposed feed rolls 19-20 spaced just beyond the limiting position of the cut off mechanism. The lower feed roll 20 is made up of a series of axially spaced material gripping or engaging portions 21 (see Fig. 2) and between these portions 21 there are intermediate portions 22 of reduced diameter and preferably in the form of idler rolls free to rotate in either direction in respect to the sheet-engaging portions 21. These idler rolls may be in the form of sleeves or collars mounted on roller bearings.

For supporting the material between the cutter and the feed rolls 19-20, for guiding the sheet to these rolls, preventing the end from dropping down between the cutter and rolls and for acting as conveyors, I provide a plurality of flexible strips or belts 23. These may each have one end secured to the cutter 10 or the supporting beam of the latter, and each may be of a width substantially equal to the width of the idlers 22 and may extend between the feed rolls 19-20 without engaging with the upper feed roll 19. As the two feed rolls rotate about stationary axes and the cutter is movable back and forth in respect to these feed rolls, I provide means for keeping these belts, conveyors or supports taut, or under tension. Such means may include a series of springs 24 each secured to the end of its corresponding belt section, and to an adjusting and securing connection 25 on the base or other stationary part of the machine. Thus, as the cutter 10 moves back and forth the portions of the belts 23 between the cut-

ter and the feed rolls will remain taut and the belts will move back and forth between the feed rolls by the rotation of the idlers 22, first in one direction and then in the other. This movement will not interfere with the proper gripping and advancing of the material between the feed roll 19 and the portions 21 of the lower feed roll. Furthermore, the cut off mechanism and the feed rolls are so positioned in respect to each other and the cut off mechanism operates to make sections of such length that the advancing end of the sheet enters between the feed roll 19-20 before the cutting action takes place, and therefore the return movement of the cutter and belts does not interfere with the continuous advancement of the cut off sections after they have entered between the feed rolls 19-20.

If no lengthwise slitting of the sheet has taken place and the cut off section is therefore of a single piece of full width of the sheet, the number, width and spacing of the belts 23 is comparatively unimportant. In that case it is only essential that there be enough of these belts, and that they be of such width as will properly support the sheet between the cutter and the feed rolls. If the sheet be slitted lengthwise into strips before the cut off action takes place, the cut off section will include a plurality of separate pieces A, and in that event the belts 23 should be properly spaced in respect to these separate pieces. In the manufacture of composition shingles it is customary to cut notches *a* at the corners of the shingles, as indicated in Fig. 2, and these notches may be cut even though the sheet is not slitted lengthwise to make individual shingles. If any such portion of the sheet is cut therefrom either in the making of shingles or any other articles, it is preferable that the belts 23 be so positioned that the small pieces may fall from the cut off section and between adjacent belts 23. As shown, the belts 23 are so positioned as to correspond in number to the shingles A, and each belt comes intermediate the side edges of a corresponding shingle so that the notches *a* come between adjacent belts.

Beyond the feed rolls 19-20 are another pair of superposed feed rolls 27-28 which receive the cut off sections from the feed rolls 19-20. The sections may be guided across from one pair of feed rolls to the other on a supporting platform 29, or in any other suitable manner, but the two pairs of rolls are preferably so spaced in respect to each other than the sheet sections enter between the rolls 27 and 28 before they leave the rolls 19-20. In order to facilitate the operation of the stacking mechanism and prevent the possibility of one section overlapping or interfering with another, I provide means whereby the space between suc-

cessive sections at the transverse cut is opened up by a separating of the cut off sections. This is accomplished by operating the feed rolls 27—28 at a higher speed of surface travel than that of the rate of travel of the body of the sheet, determined for instance, by the speed of surface travel of the rolls 17—18. The rolls 19—20 engage with the advancing end of the sheet both before and after the cut off action, and therefore I provide means whereby the speed of these rolls varies so as to prevent any slipping or grinding action of them on the material and to prevent them from retarding the movement of the cut off sections. The driving mechanism is shown as including a drive chain 30 operated from the same source of power as that which advances the body of the sheet. This chain engages a sprocket 31 on the shaft 32 of the feed roll 28. This shaft has a gear meshing with the gear 33 of the upper feed roll 27 so as to drive the two rolls at the same surface speed. The shaft 32 also has a gear 34 meshing with an intermediate gear 35 transmitting power to a gear 36 on the shaft 37 of the lower feed roll 20. The gear 36 is not directly keyed to the shaft 37 but is connected thereto by a suitable slip friction clutch. One form which this clutch may assume is illustrated in Fig. 7. The gear 36 has an annular flange 38 inclosing a multiple disk clutch, each alternate disk being held against rotation in respect to the flange and the remaining disks being held against rotation in respect to the shaft. A collar 39 is slidable on the shaft and carriers push rods 40 projecting through the gear 36 to press the disks together to give the desired frictional resistance and capability of slipping. The pressure may be accurately adjusted for instance by means of a yoke arm 41 pivoted to a bracket 42 on the frame of the machine and engaging trunnions on the collar 39. A rod 43 engages this arm and carries a hand wheel 44 and spring 45 so that by rotation of the hand wheel any desired resilient pressure may be applied to the clutch and the slipping permitted only when the resistance exceeds the predetermined amount. The shaft 27 has a gear 46 meshing with a gear 47 on the shaft of the upper roll 19. The gear transmission ratio is such that when there is no slipping in the clutch the feed rolls 19—20 will travel with the same surface speed as the feed rolls 27—28, this speed being materially higher than that at which the sheet of uncut material is advanced. The friction of the clutch is so adjusted that as soon as the advancing end of the sheet enters between the rolls 19—20, the slipping takes place in the clutch and the rolls 19—20 rotate with approximately the same surface speed as the sheet. In other words, the speed of these rolls is held down by the resistance which the main body of the sheet offers to an increase in speed. The instant that the cut off action takes place this resistance terminates, and then slipping of the clutch may terminate and the rolls 19—20 will immediately increase their speed to that of the rolls 27—28. Thus, when the cut off section enters between the rolls 27—28 it will be traveling at the surface speed of the latter and there will be no slipping of the sheet material between these rolls. The rolls 19—20 rotate at one speed while engaging with the sheet before the end is cut off, and rotate at a higher speed as soon as the section is cut off. Thus the instant that the cut off action takes place, the cut off section jumps forward to widen the gap between it and the advancing end for the next successive section. The upper feed rolls 19 and 27 are preferably mounted for such vertical movement as is necessary to take care of the variations in thickness of the sheet. As shown, the shaft of the upper roll 19 is mounted in a pair of pivoted arms 48, and the shaft of the roll 27 is mounted in a pair of pivoted arms 49.

My improved machine is particularly designed for high speed operation and building up stacks each containing a predetermined number of sheets. To accomplish this object I provide two separate stack supports and deliver a predetermined number of sheets to one stack and then the same number to the other stack, thus providing time for the operator to remove one and permit the delivery mechanism to return to starting position while the other stack is being piled up. The delivery mechanism includes two conveyors 50—51, each preferably in the form of a set of endless belts. Means are provided for guiding the sheets to one conveyor for a predetermined interval and then to the other conveyor for a similar interval. The feed roll 28 preferably serves as one of the supporting rollers for the conveyor belts 51, and a second pair of feed rolls 52—53 are provided, the lower one 52, serving as one of the supporting rollers for the conveyor belts 50. The feed rolls 52—53 are disposed beyond the rolls 27—28 in the general direction of travel of the material, and preferably at a slightly higher elevation. The conveyor belts 50 are arranged above the conveyor belts 51, and preferably the two diverge, the former slightly inclined upwardly, and the latter slightly inclined downwardly. Means are provided for preventing or permitting the delivery of the sheets from the feed rolls 27—28 to the feed rolls 52—53. This obviously acts to permit or prevent the delivery of the sheets on to the conveyor belts 51. Such a guiding means is illustrated as a plate 54 secured to a pivot 55 just in advance of the line of tangency of

the feed rolls 52—53, and presenting fingers 56 projecting through between the rolls 27—28. The lower roll 26 has a series of spaced portions of reduced diameter for receiving the belts 51 and between adjacent belts there are additional portions 57 of reduced diameter registering with corresponding portions 58 of reduced diameter in the upper roll 27. The fingers 56 project into the passages between the rolls formed by these reduced diameter portions 57 and 58, and are so positioned and of such length that they may be raised or lowered and come either above or below the line of tangency of the material engaging portions of the two rolls 27—28. When the guide plate 54 and its fingers are in the lower position, as indicated in Fig. 1, all of the cut off sections or sheets as they pass between the rolls 27—28 will be guided along the upper surface of the plate to the feed rolls 52—53 and will be carried away by the conveyor 50. With the guide plate 54 in its opposite limiting position, in other words, its raised position, as shown in Fig. 8, the end of the fingers comes above the line of tangency and all of the cut off sections or sheets will pass beneath the guide plate 54 and will be carried away on the lower conveyor 51. The feed rolls 52—53 are driven with substantially the same surface speed as the rolls 27—28, and by any suitable driving mechanism. As shown, the shaft 32 of the lower feed roll 28 has a sprocket transmitting power through a chain 60 to a sprocket on the shaft of the lower roll 52. The upper roll 53 has its shaft mounted in pivoted arms 61 to permit of variation in the thickness of the material passing between the rolls, and the two rolls have intermeshing gears 62—63 for driving the upper roll 53. So far as the operation is concerned, the upper conveyor might be a single belt of the desired width, but this is not necessary, and preferably a plurality of narrow belts are employed, each engaging a corresponding reduced diameter portion of the roll 52. To permit the proper operation of the fingers 56, the lower conveyor 51 is made up of the separate spaced belts.

As previously noted, the belts 23 are so positioned that they come intermediate of the edges of the separate pieces of the cut off section, so that cut out portions may fall between. Preferably the belts 50—51 are arranged alternately to the belts 23. In other words, they are so spaced that each piece or shingle A is supported along its two opposite edges as illustrated in Fig. 2. This prevents the side edges from curling down during the comparatively longer run along these conveyors.

For controlling and timing the operation of the guide plate 54 I provide a control shaft 64 with controlling mechanism for re-

versing the position of the guide 54 after each half revolution of the shaft. As shown, the shaft carries a cam disk 65 having one half of its circumferential track spaced from the other half by shoulder or inclined portions 66. The motion may be transmitted from the cam to the guide plate 54 in various different ways, that illustrated including a pivoted lever 67 mounted to engage the working face of the cam, and connected by a link 68 to a bell crank lever 69. The latter is connected by a rod 70 to an arm 71 connected to the guide plate 54 or to the pivotal support for the latter. A coil spring 72 normally tends to lift the rod 71 and thus hold the operating end of the lever 67 against the cam. The cam, during a half revolution holds the rod down and keeps the guide 54 in its lowermost position. When the lever 67 rides off the shoulder 66, the spring is permitted to lift the guide plate 54 to its upper position, as shown in Fig. 8, and the cut off sections or sheets may pass beneath the plate. Thus, the guide plate is positively held in a lowered position, and the spring acts only to hold it in raised position when it is not supporting the weight of any sheets passing over it.

There are two separate stacking mechanisms for the two conveyors 50 and 51. For the present I will consider only the stacking mechanism for the conveyor 51. This includes a support upon which the sheets may be stacked and means for varying the relative elevation of the support and the conveyor as the stack increases in height. This variation in elevation might be accomplished by a gradual lowering of the stack support, or by a gradual rising of the outer end of the conveyor. As shown, the stack support is in the form of a platform 74 which may be laterally movable into and out of operative position on a transverse guide of some character. That illustrated includes a series of rollers 75 along which the platform 74 may move with its load when the stack has been built up to the desired height. Adjacent to the support 74 there is a carriage 76 mounted for vertical movement, and having a pair of rollers 77—78, the lower of which carries the corresponding conveyor belt 51. The carriage 76 is vertically movable on a frame part 79 and tilting or irregular movement may be prevented by providing the frame part with a pair of stationary rack bars 80 meshing with pinions 81 keyed to a transverse shaft 82 mounted on the carriage. The same shaft 64 which operates to control the guide 54 also acts for the raising and lowering of the carriage. As shown, the shaft is provided with a cam 83 engaging with an anti-friction roller 84 on the carriage. The cam is of such form that during a half revolution of the shaft 64 the carriage is raised at a slow and uniform

rate and is lowered during the remaining half revolution of the shaft.

The difference in maximum and minimum radii of the cam is equal to the height of the stack, which it is desired to build up on the platform 74, and the curvature of the cam and speed of rotation of the shaft 64 is such in respect to the thickness of the material operated upon that the carriage will rise a distance equal to the thickness of a sheet for each operation of the cut off mechanism.

As the carriage moves in a vertical direction it tends to bring the conveyor 51 more nearly horizontal and therefore would tend to loosen the belts or reduce their tension. To prevent this I provide automatically operating belt tighteners which are preferably in the form of rollers 85, each mounted to engage with its corresponding belt 51, and each carried by a lever 86 pivoted on the carriage. Each lever is pivoted intermediate of its ends and the end opposite to the roller 85 is connected to some stationary part of the machine by a spring 87. As the carriage rises the fulcrum of the lever rises and the spring acts with gradually increasing force to hold the rollers 85 against their corresponding belts and keep the belts properly taut at all times.

The sheets, as delivered by the conveyor 51 between the rolls 77 and 78 are ordinarily traveling at fairly high speed and even after leaving the rolls tend to continue in the same general direction. For insuring the building up of an even and regular stack, a stop 90 forming a back wall against which the sheets may abut, is provided. This may be carried by a pair of supporting rods 91, and be adjusted toward and from the end of the conveyor in accordance with the length of the sheets being piled. The carriage also preferably carries friction means tending to slow down the speed of the sheets as they pass on to the stack, and prevent any return movement after reaching the stop 90. This is shown as a pair of transversely extending brushes 92—93 carried by a frame 94 pivoted on the carriage and movable upwardly with the latter. The brushes are inclined in the direction of travel of the shafts so that they effectively prevent the sheets from bounding back from the stop 90.

The stacking mechanism for the conveyor 50 may be substantially identical with that for the conveyor 51 except that the conveyor 50 extends over or above the stacking mechanism of the conveyor 51 and therefore the frame part 79 of one stack mechanism is made low, and the frame part 79^a of the other stack mechanism (see Figs. 3 and 4) is made comparatively high. The shaft 64 has a second cam 83^a similar to the cam 83 but with its high part diametrically opposite to that of the cam 83 so that it acts to lower

the carriage 76^a while the cam 83 is raising the carriage 76. As the two cams 83 and 83^a are mounted on the same shaft, the carriage 76^a may differ somewhat in design from the carriage 76 so as to space the rollers 77^a, 78^a to a greater distance above the roller 84^a. The frame part 79^a may serve as the support for the stop 90 and may also carry rods 91^a for supporting the stop 90^a. Otherwise the construction of the stacking mechanism of the conveyor 50 may be substantially the same as that for the conveyor 51. The shaft 64 may be rotated at the proper speed, dependent upon the thickness of the sheet material and the maximum difference in elevation produced by the cams 83 and 83^a. The driving mechanism for the shaft should be connected to or properly timed in respect to the operating mechanism for the sheet feeding and cut off mechanism.

As shown, the shaft 64 has a worm wheel 96 meshing with a worm 97 driven by a chain 98 and sprocket 99. The driving mechanism for the chain may extend to the same driving mechanism that operates the chain 30, and the cut off mechanism. The speed ratio may be varied by any well known mechanical means, such for instance as substituting a larger or smaller sprocket wheel in place of the sprocket wheel 99.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A machine of the class described, including two spaced pairs of superposed feed rolls, the lower roll of each pair having portions of reduced diameter, separate sets of conveyor belts engaging with the reduced diameter portions of said lower rolls, and means for guiding material from one set of rolls to the other, independently of the conveyor belts of the first mentioned rolls.

2. A machine of the class described, including two spaced pairs of superposed feed rolls, the lower roll of each pair having portions of reduced diameter, separate sets of conveyor belts engaging with the reduced diameter portions of said lower rolls, and a guide for preventing or permitting the material passing from one of said pairs of rolls to the other.

3. A machine of the class described, including a support upon which sheet material may be stacked, a conveyor for delivering sheets to said support, guide means for controlling the delivery of sheets to said conveyor, and a pair of cams operatively connected, one cam acting to effect a gradual variation in the relative elevations of said support and conveyor, and the other cam operating said guide to permit the delivery of sheets to said conveyor only during the relative movement of said support and conveyor in one direction.

4. A machine of the class described, in-

cluding a support upon which sheet material may be stacked, a roller adjacent to said support, a conveyor belt extending around said roller, said roller and support
 5 being relatively movable vertically, and a rotatable cam operating during a portion of a revolution to gradually raise one of them to a height dependent upon the height of the stack to be piled on said support, and
 10 during the remainder of the revolution to lower it to starting position.

5. A machine of the class described, having a pair of rolls one arranged above and in advance of the other, separate conveyor
 15 belts extending over said rolls, means for directing subdivided material to one of said rolls, guiding means, and means for operating the latter to direct a plurality of sheets of material from said first mentioned roll to
 20 the second roll and to the conveyor belt of the first mentioned roll, alternately.

6. A machine of the class described, including a pair of superposed rolls, each having portions of reduced diameter, a series of
 25 spaced conveyor belts engaging with the lower roll and guiding means having portions projecting between said rolls at said portions of reduced diameter and movable to prevent or permit the conveying of material
 30 from said rolls on said belts.

7. A machine of the class described, including a pair of superposed rolls, each having portions of reduced diameter, a series of
 35 spaced conveyor belts engaging with the lower roll, and a pivoted guiding member projecting between said rolls and movable to either side of the line of tangency of said rolls to prevent or permit the conveying of material from said rolls by said belts.

8. A machine of the class described, including two pairs of feed rolls arranged in succession, a conveyor belt extending around
 40 the lower roll of one pair and beneath the second pair, a second conveyor belt extending around the lower roll of the second pair and a guide plate pivoted adjacent to the line of tangency of the second mentioned rolls and terminating adjacent to the line of tangency of the first mentioned rolls and
 50 having the last mentioned end adjustable to positions above or below the material passing between the first mentioned rolls.

9. A machine of the class described, including two pairs of feed rolls arranged in
 55 succession, a conveyor belt extending around the lower roll of one pair and beneath the second pair, a second conveyor belt extending around the lower roll of the second pair, a guide plate pivoted adjacent to the line of tangency of the second mentioned rolls and terminating adjacent to the line of tangency of the first mentioned rolls and having the last mentioned end adjustable to positions above or below the material passing between
 60 the first mentioned rolls, and means operat-

ing automatically to move said guide plate back and forth between said positions at predetermined intervals.

10. A machine of the class described, including two pairs of feed rolls arranged in
 70 succession, a conveyor belt extending around the lower roll of one pair and beneath the second pair, a second conveyor belt extending around the lower roll of the second pair and a guide plate pivoted adjacent to the
 75 line of tangency of the second mentioned rolls and terminating adjacent to the line of tangency of the first mentioned rolls and having the last mentioned end adjustable to positions above or below the material passing
 80 between the first mentioned rolls, and means for shifting said plate at predetermined intervals from one position to the other to permit the delivery of predetermined quantities of material over said conveyor
 85 belts alternately.

11. A machine of the class described, including a pair of supports upon which sheet material may be stacked, separate conveyors
 90 extending to points adjacent to said supports, means for raising and lowering the delivery ends of said conveyors, one being raised during the lowering movement of the other, and means for delivering sheet material to each conveyor during the raising
 95 movement of the latter.

12. A machine of the class described, including a pair of supports upon which sheets of material may be stacked, a pair of belt
 100 conveyors, each terminating adjacent to a corresponding support, the delivery ends of said conveyors and said supports being relatively movable vertically, and means for delivering sheet material to said conveyors
 105 alternately.

13. A machine of the class described, including a support upon which sheet material may be stacked, a conveyor belt, means for gradually raising and lowering the delivery
 110 end thereof, and means for delivering sheet material to said belt during the raising movement and preventing said delivery during the lowering movement.

14. A machine of the class described, including an endless belt, a pair of supporting
 115 rolls, one rotatable about a fixed axis, means for raising and lowering the other roll, a guide for permitting or preventing the delivery of sheet material to said conveyor belt, and means for shifting the position of said
 120 guide each time the direction of movement of said second mentioned roll is reversed.

15. A machine of the class described, including a support upon which sheet material may be stacked, a vertically movable carriage adjacent thereto, a conveyor belt, a pair
 125 of supporting rolls therefor, one rotatable about a fixed axis and the other mounted on said carriage, guiding means for permitting or preventing the delivery of sheets to said

conveyor belt, and a control shaft having means for raising said carriage during a half revolution of the shaft and lowering it during the other half, and means for shifting the position of said guiding means twice during each revolution of the shaft.

16. A machine of the class described, including a support upon which sheet material may be stacked, a vertically movable carriage adjacent thereto, a conveyor belt, a pair of supporting rolls therefor, one rotatable about a fixed axis and the other mounted on said carriage, guiding means for permitting or preventing the delivery of sheets to said conveyor belt, and a control shaft having means for raising said carriage during a half revolution of the shaft and lowering it during the other half, and means for shifting the position of said guiding means twice during each revolution of the shaft at time intervals corresponding to the reversal of the direction of movement of the carriage.

17. A machine of the class described, including a support upon which sheet material may be stacked, a vertically movable carriage adjacent thereto, a roller carried thereby, a conveyor belt extending around said roller, and a rotatable cam operating during a portion of a revolution to gradually raise said carriage to a height dependent upon the height of the stack to be piled on said support and during the remainder of the revolution to lower it to starting position.

18. A machine of the class described, including a pair of supports upon which sheet material may be stacked, a pair of vertically movable carriages, one mounted adjacent to each support, delivery means for the sheets, a pair of conveyors, one extending from said delivery means to one carriage and the other to the other carriage, and means for guiding the sheets from said delivery means to either conveyor, a shaft, and a pair of cams thereon for raising and lowering said carriages, the cams being so positioned as to raise one during the lowering movement of the other.

19. A machine of the class described, including a pair of supports upon which sheet material may be stacked, a pair of vertically movable carriages, one adjacent to each support, conveyors extending to said carriages, a control shaft, a pair of cams on said shaft for raising and lowering said carriages, one acting to raise one carriage while the other is lowering the other carriage, and a third cam on said shaft and acting to control the delivery of sheets to said conveyors only during the upward movement of the corresponding carriages.

20. A machine of the class described, including a support upon which sheets may be

stacked, a vertically movable carriage adjacent thereto, a pair of stationary rack bars adjacent to opposite ends of said carriage a shaft carried by said carriage and having pinions meshing with said rack bars, a pair of rollers carried by said carriage and between which the sheets are delivered, and a conveyor belt extending around the lower of said rollers.

21. A machine of the class described, including a support upon which sheets may be stacked, a vertically movable carriage adjacent thereto, a pair of stationary rack bars adjacent to opposite ends of said carriage, a shaft carried by said carriage and having pinions meshing with said rack bars, a roller carried by said carriage and a conveyor belt extending around said roller and acting to deliver sheets to the top of the stack.

22. A machine of the class described, including a support upon which sheets may be stacked, a vertically movable carriage, a roller carried thereby, a second roller rotatable about a fixed axis, a conveyor belt supported by said rollers, and means secured to the carriage for automatically maintaining the tension of the belt during the vertical movement of the carriage.

23. A machine of the class described, including a support upon which sheets may be stacked, a vertically movable carriage, a roller carried thereby, a second roller rotatable about a fixed axis, a conveyor belt supported by said rollers, a lever pivoted to said carriage, a belt-tightening roller carried by said lever, and means for swinging the lever to maintain the tension of the belt during the vertical movement of the carriage.

24. A machine of the class described, including a support upon which sheets may be stacked, a vertically movable carriage, a roller carried thereby, a second roller rotatable about a fixed axis, a conveyor belt supported by said rollers, and means for automatically maintaining the tension of the belt during the vertical movement of the carriage, including a lever pivoted intermediate of its ends on said carriage, tension means connected to one end of said lever, and a belt tightening roller carried by the opposite end of said lever.

25. A machine of the class described, including a pair of supports upon which sheet material may be stacked, and disposed at different elevations, a pair of vertically movable carriages, one adjacent to each support, a pair of superposed conveyor belts, one extending to one carriage and the other extending above said carriage and its corresponding support to the other carriage, means for raising and lowering said carriages alternately and means for delivering

sheet material to said conveyor belts alternately.

26. A machine of the class described, including a pair of supports upon which sheet material may be stacked, and disposed at different elevations, a pair of vertically movable carriages, one adjacent to each support, a pair of superposed conveyor belts; one extending to one carriage and the other extending above said carriage and its corresponding support to the other carriage, means for raising and lowering said carriages alternately and means for delivering sheet material to said conveyor belts alternately, and only during the upward movement of the corresponding carriage.

27. A machine of the class described, including a support upon which sheet material may be stacked, a vertically movable carriage adjacent thereto, a conveyor belt extending to said carriage for the delivery of successive sheets, a stop for preventing movement of the sheets across said support past a predetermined point, and means for preventing return movement of the sheets, said means including a brush pivotally mounted upon the carriage and resting upon the top of the stack and beneath which successive sheets are delivered.

28. A machine of the class described, including a support upon which sheets may be stacked, a vertically movable carriage adjacent thereto, a roller supported by said carriage, a conveyor extending around said roller, a pivoted guide for permitting or preventing the delivery of sheets to said conveyor, and a control shaft having a pair of cams thereon, one operating to raise and

lower said carriage, and the other operating to move said guide.

29. A machine of the class described, including a support upon which sheets may be stacked, a vertically movable carriage adjacent thereto, a roller supported by said carriage, a conveyor extending around said roller, a pivoted guide for permitting or preventing the delivery of sheets to said conveyor, a control shaft having a pair of cams thereon, one operating to raise and lower said carriage, and the other operating to move said guide, a guide for controlling the delivery of sheets to said conveyor, and a cam operating in synchronism with the first mentioned cam for operating said guide.

30. A machine of the class described, including a pair of rollers, a conveyor belt supported thereby, means for delivering sheets to said belt adjacent to one of said rollers, said roller and said delivery means being relatively movable to permit or prevent said delivery, sheet receiving means adjacent to the other roller, said last mentioned roller and said last mentioned means being relatively movable vertically, and control means for preventing delivery of sheets to said conveyor during relative movement of said receiving means and said last mentioned roller in one direction, and permitting delivery during relative movement in the opposite direction.

Signed at Camden in the county of Camden and State of New Jersey this 13th day of October A. D. 1921.

BERNARD M. FINE.