April 28, 1953 P. G. SNYDER 2,636,736

APPARATUS FOR PILING SHEET MATERIAL

Filed Dec. 13, 1949 5 Sheets-Sheet 1

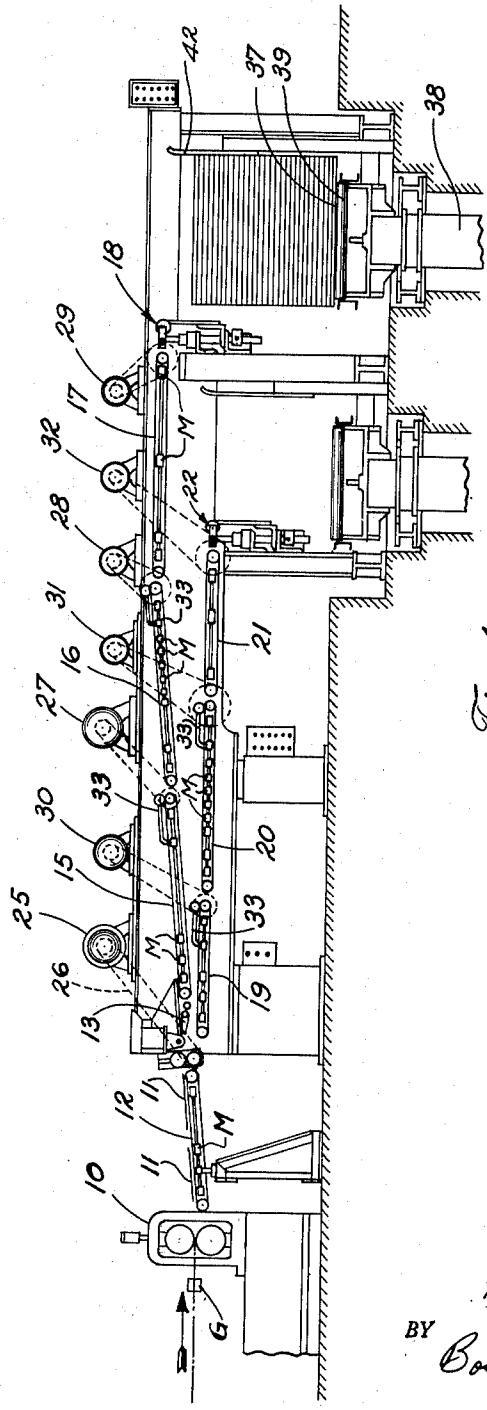


Fig. 1

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APPARATUS FOR PILING SHEET MATERIAL

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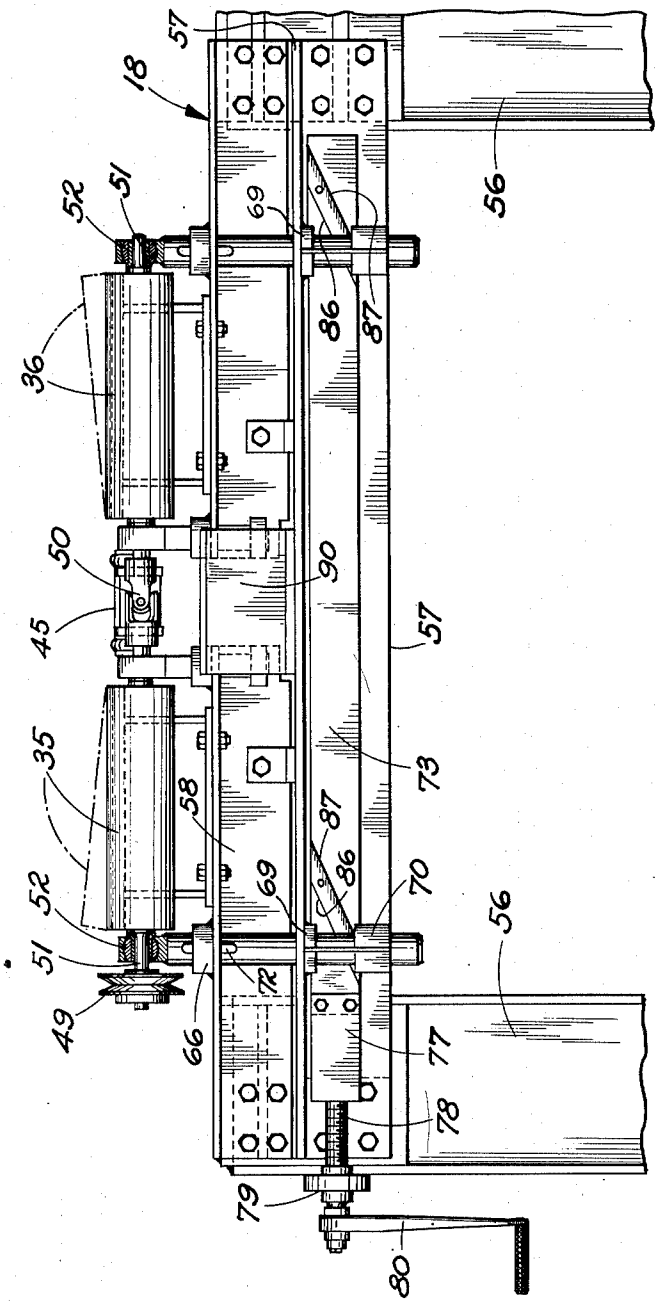


Fig. 2

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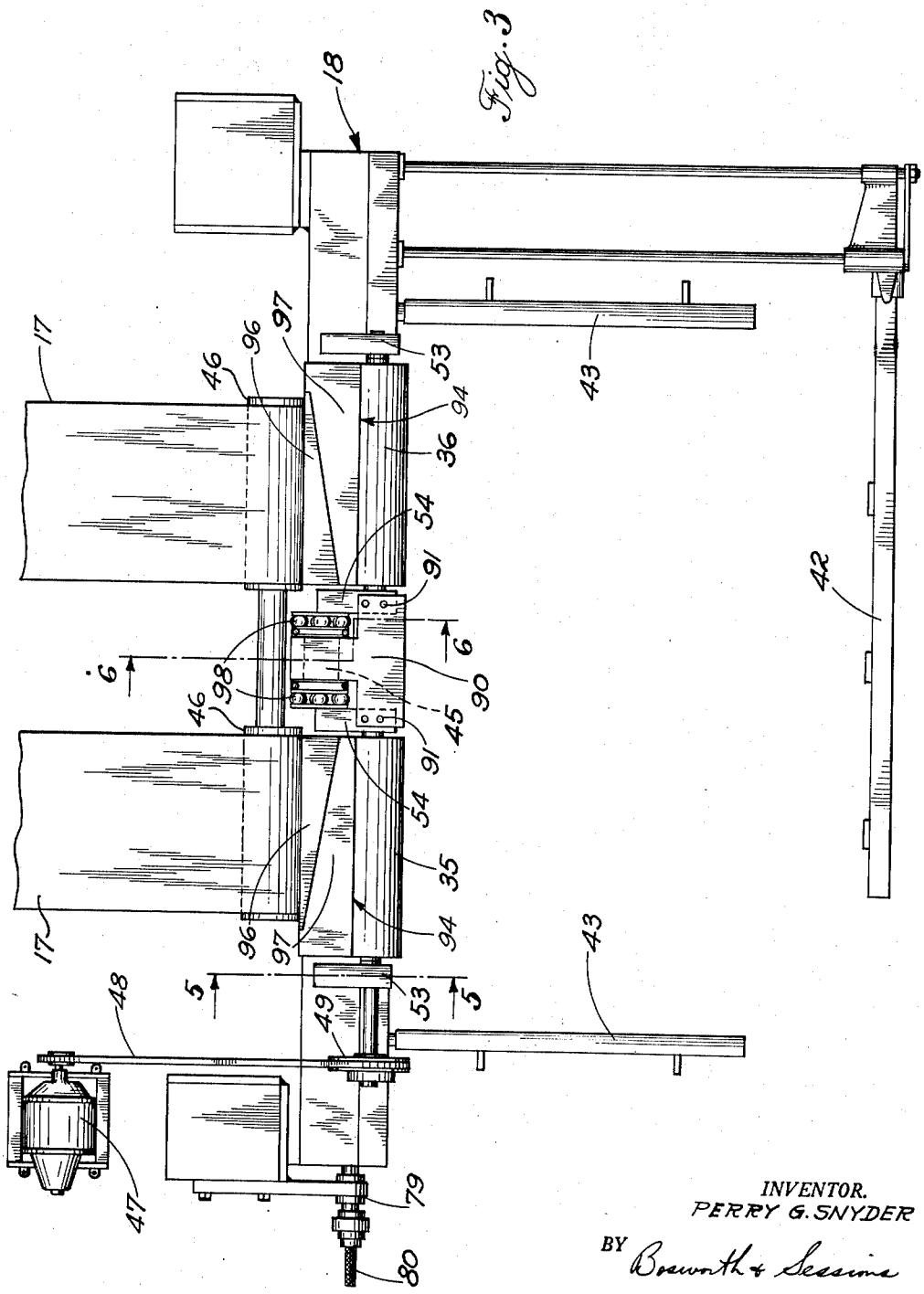
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APPARATUS FOR PILING SHEET MATERIAL

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5 Sheets-Sheet 3

Fig. 3



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APPARATUS FOR PILING SHEET MATERIAL

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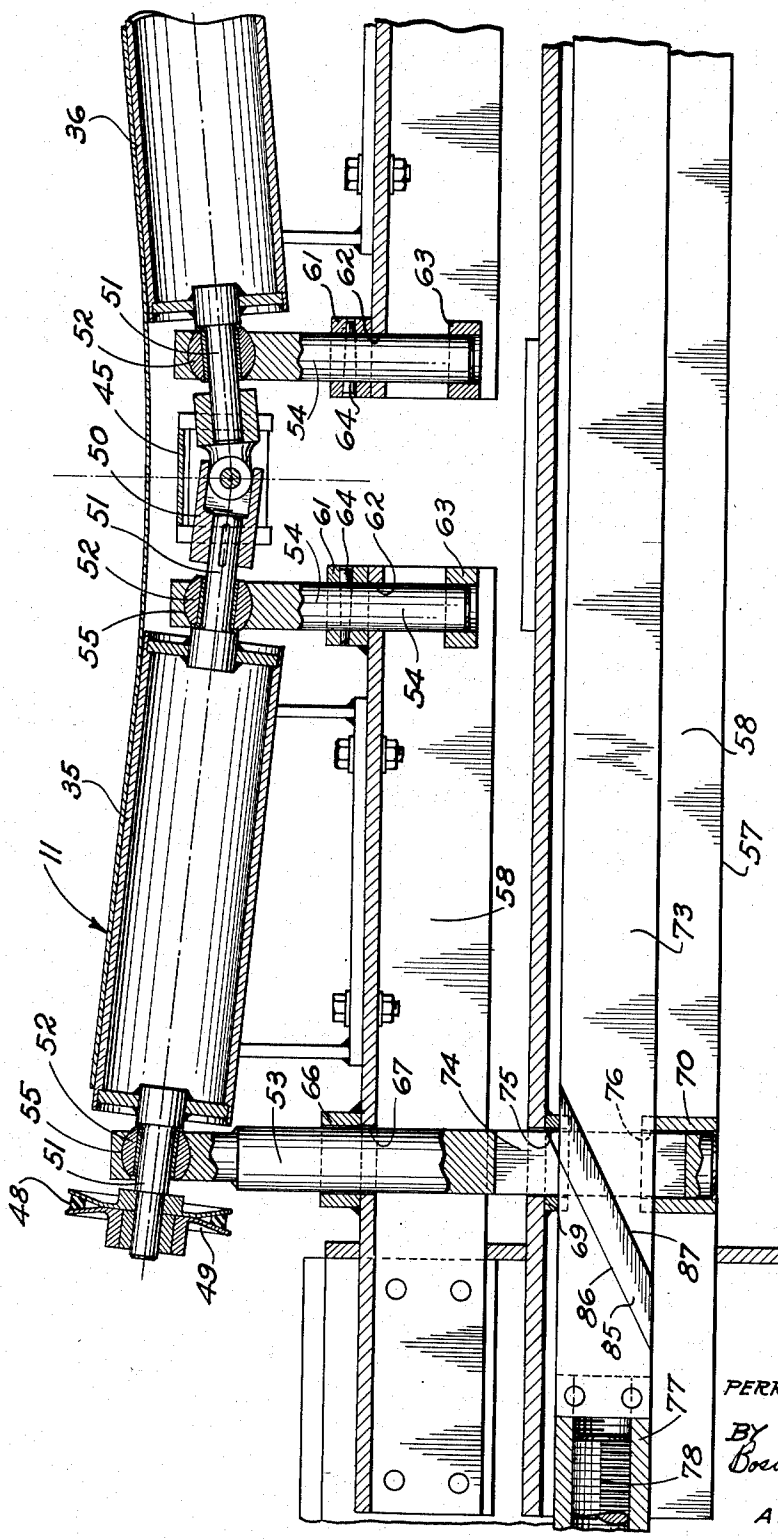


Fig. 4

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APPARATUS FOR PILING SHEET MATERIAL

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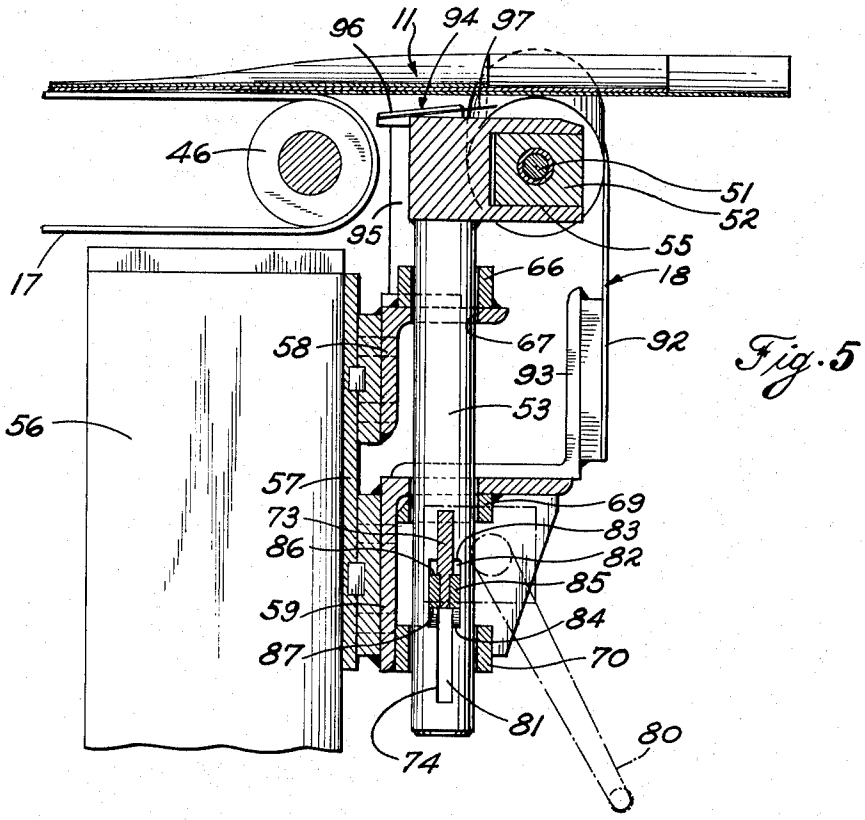


Fig. 5

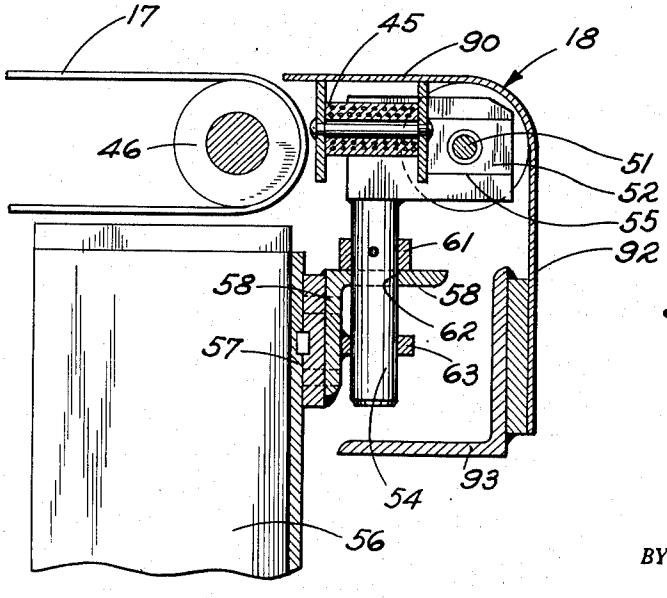


Fig. 6

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Patented Apr. 28, 1953 2,636,736

UNITED STATES PATENT OFFICE

2,636,736

APPARATUS FOR PILING SHEET MATERIAL

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Application December 13, 1949, Serial No. 132,649

14 Claims. (Cl. 271—68)

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This invention relates to piling apparatus for sheet material and more particularly to such apparatus adapted for use with tin plate classifiers.

The final steps in the production of tin plate consist in shearing a continuous strip into sheets of the desired length, classifying and separating the sheets in accordance with their gauge and/or the quality of finish, and then piling or stacking the classified sheets into piles of convenient size for handling and shipping. Devices for performing these steps are known as classifiers. The invention as described herein relates to improvements in the piling apparatus associated with such tin plate classifiers. It is to be understood, however, that the invention may be used in the processing or handling of other materials and in conjunction with other types of apparatus and is not limited in its application to the production of tin plate.

In order to pile sheets accurately, it is a usual practice to project the sheets from a pair of rolls so that the forward edges of the sheets engage a stop which guides them onto a piling platform. In order to classify and pile the sheets at a high rate in terms of numbers of sheets per unit of time, it is necessary that the sheets enter the apparatus at high lineal speeds. To prevent damage to the forward ends of the sheets as they strike the stop, the entering speed of the sheets must be greatly reduced. This necessitates the shingling or overlapping of the sheets as they pass through the apparatus and are discharged from the rolls. When sheets are discharged from flat rolls at low lineal speeds the leading edges of the sheets bend downwardly. This bending, particularly with shingled sheets, is likely to cause jamming of the apparatus and damage to the sheets.

To overcome these difficulties, one form of classifier piling apparatus, as disclosed in United States Patent No. 2,328,859, issued September 7, 1943, to Clarence L. Taylor, embodies a pair of convex and concave rolls adapted to impart a lateral bowing to the sheets to give them stiffness along their longitudinal axes so that they can be projected from the rolls and onto the platform in a manner which permits them to be piled properly.

In the present invention an improved piling apparatus is provided which is adapted to impart a similar lateral bowing to the sheets. The bowing is accomplished in a manner which enables better control in handling the sheets and which minimizes the danger of scratching or otherwise damaging the sheets. The apparatus is capable of varying the amount of bowing which is imparted to the sheets while the apparatus is in operation. Thus the effect of changes in the amount of bowing can be observed and proper adjustment made to obtain the best results.

A general object of my invention is to provide piling apparatus adapted to pile sheets at high rates without damage to the sheets and without jamming of the apparatus. A further object is to provide a piling apparatus which will pile sheets of material in accurate uniform piles with none of the edges or corners protruding in a position likely to result in damage thereto. A further object is the provision of apparatus for bowing the sheets as they are discharged in which the amount of bowing can be varied while the apparatus is in operation. Another object is to provide a piling apparatus which will not mar or scratch the finish of the sheets. Yet another object is to provide a piling apparatus which is easy to install, to operate and to maintain.

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Other objects and advantages will appear from the following description of a preferred form of my invention, reference being made to the accompanying drawings. The essential characteristics of the invention are summarized in the claims.

In the drawings, Figure 1 is a somewhat diagrammatic side elevation of a tin plate classifier having associated therewith a preferred form of piling apparatus embodying my invention; Figure 2 is a fragmentary end elevation on an enlarged scale of the classifier of Figure 1 showing the piling apparatus; Figure 3 is a plan view of the apparatus illustrated in Figure 2, showing, in addition, the stops and lateral guides for the sheets; Figure 4 is a transverse view, partly in section and corresponding generally to Figure 2, but on an enlarged scale, showing the manner of supporting and adjusting the rolls comprising the piling apparatus; Figure 5 is a vertical sectional view taken as indicated by line 5—5 of Figure 3 showing the manner in which the outer ends of the piler rolls are supported; and Figure 6 is a vertical sectional view taken as indicated by line 6—6 of Figure 3.

Briefly my invention comprises improved means for imparting a lateral bowing to the sheets in order to project the sheets horizontally outwardly, thus enabling the sheets to fall onto a pile accurately and uniformly. The lateral bowing is produced by drawing the sheets into contact with a pair of cylindrical rolls whose longitudinal axes are tilted toward each other. To insure contact with the rolls, magnetic means preferably are employed to draw the sheets against the rolls. In this manner the sheets are given a longitudinal stiffness which enables them to project out beyond the piling rolls without bending or sagging of the forward portions and to drop flat onto the pile. Means are also provided to prevent sheets from becoming fouled or entangled with the rolls.

The piling apparatus is particularly illustrated for use with the tin plate classifier shown in Figure 1. In such a classifier, tin plate in continuous strip form is gauged and then sheared into sheets which are then directed according to their gauge to one of a plurality of flights or series of

conveyors, whose function is to convey the sheets to the pilers and to slow the sheets down to a speed which permits accurate piling without damage to the sheets.

Thus, as shown in Figure 1, the tin plate in strip form is first gauged by a flying micrometer G and then passed through a flying shear 10 which cuts it into sheets 11 of the required length. From the shear the sheets are carried by a conveyor 12 to a classifying mechanism in the form of a deflector or flipper 13 which is controlled by the micrometer through a time delay mechanism and which causes the "on-gauge" sheets to pass to a prime flight or series of belt conveyors 15, 16 and 17 leading to a piler 18 and diverts the "off-gauge" sheets to a reject flight or series of conveyors 19, 20 and 21 leading to the piler 22. Apparatus of this general type is well known, being disclosed in the aforesaid Taylor patent and in the Kaufman Patent No. 2,146,581.

It should be noted that the conveyor 12 operates at a greater speed than the lineal speed of the shear and the strip entering the shear; for example, if the speed of the strip into the shear is about 1000 feet per minute, the speed of the conveyor 12 would be about 1133 feet per minute. The difference in speed spaces the sheets on the conveyor 12 to give time for the flipper 13 to separate the sheets according to their gauge and to direct them to the proper conveyors.

The prime and reject flights of conveyors operate to slow down the speed of the sheets, and to straighten them if they are askew in their travel along the conveyors, before the sheets reach the pilers 18 and 22. Since the prime and reject flights of conveyors are identical in construction and operation and since the pilers 18 and 22 are likewise identical, only the prime flight of conveyors and the piler 18 will be described.

Each of the conveyors 12, 15, 16 and 17 preferably comprises a pair of parallel endless belts traveling on end pulleys driven by individual motor drives, motor 25 driving conveyor 12 through belt 26, and motors 27, 28 and 29 driving conveyors 15, 16 and 17 of the prime flight, respectively, through similar belts. The conveyors 19, 20 and 21 of the reject flight are driven by similar motors 30, 31 and 32. The speeds of the motors are preferably independently controllable by means not shown so that the speed of each conveyor can be modified to meet various operating conditions. To reduce the speed of the sheets, each successive conveyor is operated at a slower speed so that by the time the sheets reach the piler 18 their speed is in the range of 200 to 450 feet per minute. Thus, whereas in the given example the speed of conveyor 12 is 1133 feet per minute, conveyor 15 is operated at speeds of approximately 1066 feet per minute, conveyor 16 at about 650 feet per minute, and conveyor 17 at about 200 to 450 feet per minute.

This step-by-step reduction in speed of the sheets results in a closer spacing of sheets as they are transferred from one conveyor to the next. For example, if the spacing is about 4 inches on conveyor 12, it will be reduced to a fraction of an inch on conveyor 15, while on conveyors 16 and 17 the sheets will overlap each other in a shingled manner, the overlapping amounting to about 35% on conveyor 16, and to about 60–80% on conveyor 17, see Figure 5.

To insure proper operation of the conveyors, means are preferably provided to keep the fast moving sheets in contact with the conveyor belts to prevent them from sailing or planing through the air; to facilitate the transfer of sheets from one conveyor to the next; and to straighten the sheets if they should be out of alignment. Thus a plurality of magnets M are disposed beneath the belts of each conveyor in order to draw the sheets into contact with the conveyor belts. Certain of these magnets are so disposed and operated so as to have the additional functions of straightening the sheets with respect to the belts and of aiding in the transfer of the sheets from one conveyor to the next. Also, hold-down rolls 33, located at the ends of conveyors 15, 16, 19 and 20, are provided to assist in the transfer of the sheets to the succeeding conveyors. These and other features of the classifier are, however, described in detail in copending application Serial No. 104,078, filed July 11, 1949, assigned to the assignee of this application, to which reference is hereby made, and hence will not be further described herein. For the purpose of this application, it is sufficient to say that the flights of conveyors making up the classifier deliver sheets to their respective pilers at speeds of, for example, 200 to 450 feet per minute, the sheets being substantially aligned with respect to their line of travel and preferably overlapping each other in a shingled fashion. The sheets are thus delivered from the conveyors to the pilers in a condition which facilitates the piling operation.

The piling apparatus 18, as mentioned above comprises the rolls 35 and 36 disposed adjacent the exit end of conveyor 17 in a position to receive the sheets from the conveyor and to pile them on a receiving platform 37. Preferably the platform is of the elevating type which is raised and lowered by the elevating mechanism indicated at 38. At the beginning of a run the platform is raised to a position slightly below the piling rolls and is then gradually lowered by the operator as the piled sheets accumulate. At the end of the run, or whenever the pile reaches the desired size, the platform is lowered to an unloading position and the piled sheets are removed. The platform itself is provided with rollers 39 to facilitate removing the piled sheets from the platform and transferring the sheets to any conventional conveying means such as a roller conveyor (not shown).

In order to guide the sheets as they are deposited on the platform, a stop member 42 and lateral guides 43 are provided. The construction and operation of the stop member 42 and the lateral guides 43 is described in the aforesaid Taylor patent and accordingly will not be described in detail herein. Suffice it to say that the position of the stop member 42 is adjustable toward and away from the piling rolls in accordance with the size of the sheets and the speed at which they travel and that the lateral guides 43 are similarly adjustable to accommodate sheets of various widths.

In order to insure that the sheets will strike the stop members uniformly and will fall accurately into place on the pile, the sheets are given a lateral upwardly concave bowing by the rolls so that they will be projected substantially horizontally outwardly for their full length before striking the stop members. The lateral bowing imparts stiffness to the sheets and because of this stiffness the front portions of the sheets cannot sag downwardly to any great extent until the sheets are released by the rolls. The shingled arrangement of the sheets holds the trailing portions of the sheets down in back of the rolls. Thus the rolls project all of the sheets toward

the stops 42 in substantially the same manner, which results in accurate piling. The bending also prevents the forward portions of the sheets from sagging downwardly to scrape across the top face of the preceding piled sheet thus enabling the sheets to be piled without scratching.

This lateral concave bowing of the sheets is produced by tilting the longitudinal axes of the rolls 35 and 36 toward each other with the inner ends of the rolls positioned at substantially the same level as the conveyor 17 and with the outer ends of the rolls raised above the inner ends. A magnet, indicated at 45, is located adjacent the inner ends of the rolls, between and somewhat in front of the rolls, and acts to hold the center portions of the sheets down. In this manner the sheets are given the lateral bowing which is required to handle the sheets properly.

The rolls as shown in Figures 2 and 4 are uniform in diameter and preferably are approximately equal in diameter to the end pulleys 46 of the conveyor 17, see Figure 5. The rolls are driven at a speed substantially equal to the speed of the conveyor 17 by means of a motor 47 connected by the belt 48 and pulley 49 to the roll 35 as shown in Figure 3. The flexibilty of the belt drive permits the motor to drive the roll no matter what its tilted position may be. A universal coupling 50 provides a driving connection between the rolls for all degrees of axial tilting between the rolls.

The rolls are adjustable so that the degree of tilting of the longitudinal axes thereof can be adjusted during operation of the apparatus in accordance with the characteristics of the sheets being piled, the rolls being tilted more to impart a greater amount of bowing for sheets of lighter gauge and relatively greater length and being tilted less for sheets of inherently greater stiffness such as sheets of heavier gauge and relatively short length.

Any suitable manner of supporting the rolls may be provided which permits the rolls to be tilted and to be driven in these positions. According to the preferred form of the invention shown in Figures 2 and 4, the rolls have stub shafts 51 journaled in bearing blocks 52 which in turn are supported by outer bearing support posts 53 and inner support posts 54. The bearing blocks are designed to have a limited universal movement to permit the rolls to be canted or tilted. Thus the bearing blocks are preferably cylindrical in shape with the axes of the cylinders extending at right angles to the axes of the rolls and are mounted for turning movement in suitable cylindrical recesses 55 in the bearing support posts 53 and 54. When the bearing support posts are raised or lowered, by means to be described, the bearing blocks will turn in their recesses and permit the rolls to be tilted toward each other. Thus, if the rolls are originally installed with their axes parallel and aligned, raising of the outer support posts 54 while keeping the inner posts 53 fixed will result in tilting of the rolls.

The bearing support posts 53 and 54 in turn are mounted on and supported by a suitable frame and supporting structure consisting of a pair of columns 56, and a beam 57 in the form of a heavy plate bolted or otherwise secured to the columns. The beam or plate 57 provides support for the angled brackets 58 and the bracket 59 which supports the rolls and adjusting mechanism therefor as will now be described.

The support posts 53 and 54 are mounted on and supported by the frame in a manner which

permits the inner posts 54 to remain fixed and the outer posts 53 to be adjusted vertically to give the rolls the desired tilt. The inner support posts have relatively short stems which extend downwardly through the sleeves 61 secured to the brackets 58, through the apertures 62 in the flanges of the brackets, and through the sleeves 63 also fixed to the brackets and spaced vertically from the flanges of the brackets, see Figures 4 and 6. The inner posts are held fixed against vertical movement and against turning movement as well, by means of tapered pins 64 which are driven into tapered holes in the upper sleeves 61 and in the posts. In this manner the inner posts are firmly supported in fixed position.

The outer posts are substantially longer than the inner posts, extending downwardly through the sleeves 66 secured to the brackets 58, through the apertures 67 in the brackets 58, through the apertures 68 in the bracket 59, and through the spaced sleeve members 69 and 70 secured to the bracket 59. The outer posts are provided with vertical slots and the sleeves 66 are similarly slotted to receive keys 72, see Figure 2, which permit vertical sliding movement of the posts but which restrain the posts against turning movement to prevent binding of the rolls and jamming of the adjusting mechanism which might otherwise result from such turning movement.

The outer posts are supported in their vertical position by a horizontal member 73 which extends through slots 74 in the posts and which has sliding movement therein to adjust the vertical position of the posts as will be described. The member 73, as shown, takes the form of a relatively narrow elongated plate, rectangular in section, which is supported by the sleeves 69 and 70, the member fitting within horizontally extending grooves or slots 75 and 76 in the sleeves 69 and 70, respectively, and having horizontal sliding movement therein.

The member 73 is moved horizontally by a conventional feed screw and nut arrangement comprising a nut 77 secured to one end of the member 73, and a screw 78 engaging the nut, see Figures 2 and 4. The screw is journaled as at 79 in a well known manner which secures the screw against horizontal longitudinal movement but which permits the screw to be readily turned by the handle or crank 80 to move the nut and hence the member 73 horizontally.

The slots 74 in the outer bearing posts are cruciform in section, see Figure 5, having a central portion 81 and arm portions 82, the arm portions having upper and lower cam surfaces 83 and 84 which extend slantingly upwardly. The member 73 is adapted to extend within the central portion 81 of the slot and has cam strips 85 affixed thereto, which are rectangular in section and which are adapted to lie within the arm portions 82 of the slots. The strips extend slantingly across the member at the same angle as the arm portions of the cruciform slots so that the upper and lower surfaces 86 and 87 of the strips will coact with the cam surfaces 83 and 84 of the cruciform slots to effect vertical adjustment of the posts when the member is given horizontal sliding movement within the slots.

When the screw 78 is turned in the nut 77, to draw the member 73 to the left, as viewed in Figure 2, the upper cam surfaces 83 of the slots and the upper surfaces 86 of the cam strips coact to elevate the posts and increase the tilt

of the rolls; and when the member 73 is moved to the right the lower cam surfaces 84 of the slots and cam surfaces 87 of the cam strips coact to lower the outer posts and decrease the tilt of the rolls.

The magnet 45 which, as mentioned above, draws the central portions of the sheets downwardly is located, as shown in Figures 3 and 4, between the conveyor 17 and the piling rolls so as to exert the maximum force upon the sheets. While the magnet may be supported in any suitable manner, it is shown as being supported by a member 90 which also acts as a top cover for the magnet and for the universal coupling 50. The supporting member 90 is secured to the inner posts 54 as at 91 and has an apron portion 92 extending downwardly between and in front of the piling rolls, and secured to a bracket 93. It will be noted that the depending apron portion 92 of the member effectively prevents the trailing edges of the sheets from being drawn back under the rolls. With this construction there is no danger of the sheets being entangled under the rolls even though they may rebound from the stop 42.

In order to guide the sheets properly into contact with the piling rolls, sheet metal aprons or guide plates 94 are mounted on suitable supports 95 in position to bridge the space between the conveyor 17 and the rolls. The plates 94, as shown in Figure 3, are rectangular in plan view consisting of the triangular portions 96 which are substantially rigid, and portions 97 which are of thinner stock and are readily flexible. The longitudinal edges of the flexible portions lie close against the rolls when the rolls are straight and parallel and bend upwardly when the rolls are tilted so that the edges continue to remain adjacent the rolls at all times. The flexible portions 97 thus act as guide plates which are effective for all angles of tilt of the rolls, ensuring that the sheets will strike the rolls properly; and particulaly preventing the sheets from striking the rolls below their centers to ride under the rolls. Only the leading edge of the leading sheet strikes the guide plates, the balance of the sheets tending to span the gap between the conveyor and the rolls once the sheets have contacted the rolls. There is thus little danger of the apron scratching or marring the surface finish of the sheets.

It is desirable also to provide rollers 98 on either side of the magnet as shown in Figure 3, to hold the sheets slightly spaced away from the member 90 and to prevent the sheets from being pulled into direct sliding contact therewith. The rollers thus minimize the danger of the sheets being scratched by contact with stationary member 90.

The tilted roll construction just described has a number of advantages. The rolls are easily adjusted as to angle of tilt during operation of the apparatus to impart the desired amount of lateral bowing to the sheets. The sheets are thus given the proper longitudinal stiffness which permits them to be delivered against the stop members in a manner which permits them to drop flat even at low lineal velocities and which permits uniform and accurate piling The magnet which draws the sheet into contact with the rolls enables the lateral bowing to be induced with rolls of uniform diameter and this in turn eliminates the scratching of the sheets which tends to occur with rolls of varying cross-section. Also the strength of the magnet can be adjusted to exert just the proper amount of force to keep the sheets in contact with the rolls but not so much as to draw the sheets into contact with surfaces which might scratch the sheets. With such a construction there is no danger that the sheets will fail to engage the rolls properly, for the guides prevent the sheets from being drawn under the rolls. Also since the rolls are uniform in diameter they may be made of relatively hard material without danger of scratching the sheets, thus obviating the use of fabric covered rolls which when used in the past often caught and snagged the sheets.

Various modifications and changes will occur to those skilled in the art without departing from the scope of my invention and it is to be understood that the particular embodiment of the invention has been described herein only by way of example. The essential characteristics of the invention are summarized in the claims.

I claim:

1. A piling apparatus adapted to receive sheets of magnetic material from a conveyor and to pile the same in vertical piles, comprising a pair of rolls having their longitudinal axes lying in the same vertical plane but tilted with respect to each other, means to drive said rolls, and magnetic means positioned adjacent the lower ends of said rolls and adapted to draw portions of said sheets downwardly from below whereby said sheets are bowed laterally.

2. A piling apparatus adapted to receive sheets of magnetic material from a conveyor and to pile the same in vertical piles, comprising a pair of rolls whose inner ends are at substantially the same level and whose outer ends are substantially above said level whereby the longitudinal axes of said rolls are tilted toward each other, means to drive said rolls at a speed substantially equal to the speed of said conveyor, and magnetic means positioned adjacent the inner ends of said rolls and adapted to draw the middle portions of said sheets downwardly from below whereby said sheets are given a concave lateral bowing.

3. A piling apparatus adapted to receive sheets of magnetic material from a conveyor and to pile the same in vertical piles comprising a pair of rolls having their adjacent ends disposed at the same level and their longitudinal axes tilted toward each other, means to drive said rolls, magnetic means positioned adjacent the inner ends of said rolls and adapted to draw portions of said sheets downwardly from below whereby said sheets have contact with said rolls over a substantial portion of the length thereof, means to adjust the tilted position of said rolls, and guide plate means positioned between said conveyor and said rolls adapted to guide said sheets into contact with the upper surfaces of said rolls.

4. Apparatus according to claim 3 wherein said guide plate means has a resilient flexible portion having a longitudinal edge adapted to lie closely adjacent said rolls and adapted to bend to remain adjacent said rolls when said rolls are adjusted as to degree of tilt.

5. Apparatus according to claim 4 and a plate extending between said rolls and downwardly in front of said rolls whereby to prevent said sheets from engaging the lower surfaces of said rolls.

6. Apparatus according to claim 5 and roller means positioned adjacent said magnetic means for preventing said sheets from being drawn into contact therewith.

7. A piling apparatus adapted to receive sheets of magnetic material from a conveyor and to pile them in vertical piles, comprising a pair of rolls of uniform diameter having their inner, adjacent ends disposed at the same level and their longitudinal axes tilted with respect to each other, means to drive said rolls, and magnetic means positioned between the rolls and adapted to draw the sheets into contact with the rolls to bow the sheets laterally, means to adjust the tilted position of said rolls comprising pairs of posts supporting the inner and outer ends of said rolls, one pair of said posts being fixed, the other pair of posts having cam surfaces, a member having cam surfaces adapted to coact with said post cam surfaces whereby to adjust the vertical position of said posts when said member is moved relative to said posts, and means to move said member.

8. Piling apparatus according to claim 7 and means to secure said second pair of posts against turning movement while permitting vertical sliding movement of the same.

9. A piling apparatus adapted to receive sheets of magnetic material from a conveyor and to pile them in vertical piles, comprising a pair of rolls of uniform diameter having their longitudinal axes tilted toward each other, means to drive said rolls, and magnetic means positioned between the rolls and adapted to draw the sheets into contact with the rolls to bow the sheets laterally, means to support and to adjust the tilted position of said rolls, comprising pairs of posts supporting the inner and outer ends of said rolls, respectively, one of said pairs of posts being fixed, the other pair of posts being vertically adjustable, said second pair of posts having slots with interior cam surfaces, a member slidable within said slots and having cam surfaces adapted to coact with said slot cam surfaces and to adjust the vertical position of said posts when said member is given sliding movement within said slots, and means to move said member horizontally in said slots to adjust the vertical position of said slotted bearing posts.

10. A piling apparatus adapted to receive sheets of magnetic material from a conveyor and to pile them in vertical piles, comprising a pair of rolls of uniform diameter having their longitudinal axes tilted with respect to each other with the outer ends of the rolls higher than the inner ends, means to drive said rolls, and magnetic means positioned between the rolls and adapted to draw the sheets into contact with the rolls to bow the sheets concavely in a lateral direction, means to adjust said rolls comprising pairs of posts providing journaled support for the inner and outer ends of said rolls, respectively, said rolls having shafts journaled in bearing blocks supported by said posts, said blocks providing universal movement permitting said rolls to be tilted and driven in tilted position, a frame having sleeve members affixed thereto supporting said posts, means to fixedly secure the pair of posts supporting the inner ends of said rolls within their supporting sleeves certain of said sleeves supporting said other pair of posts having horizontally extending grooves, a member slidable within said grooves and supported by said sleeves, said second pair of posts having slots with interior cam surfaces, said member being slidable within said slots in said posts and having cam surfaces adapted to coact with said interior cam surfaces to adjust the vertical position of said posts when said member is given sliding movement within said slots, and means to move said member.

11. A piling apparatus adapted to receive sheets of magnetic material from a conveyor and to pile them in vertical piles, comprising a pair of rolls of uniform diameter having their adjacent ends disposed at the same level and their longitudinal axes disposed in the same vertical plane and tilted with respect to each other, means to adjust the tilted position of said rolls, means including a flexible driving connection to drive said rolls for all tilted positions thereof, and magnetic means positioned adjacent said rolls to draw said sheets into substantially full contact with said rolls whereby to impart a lateral bowing to said sheets.

12. Apparatus according to claim 11 in which said flexible driving connection is secured to one of said rolls and said rolls are connected by a universal coupling.

13. Apparatus according to claim 12 wherein said means for adjusting the tilting of the rolls comprises a pair of posts supporting the outer ends of said rolls, a pair of posts supporting the inner ends of said rolls, and a member simultaneously engaging and supporting the posts of at least one of said pairs of posts and adapted to adjust the vertical position of said posts when said member is moved relative to said posts.

14. A piling apparatus adapted to receive sheets of magnetic material from a conveyor and to pile them in vertical piles, comprising a pair of rolls of uniform diameter having their longitudinal axes disposed in the same vertical plane and tilted toward each other, means to drive said rolls, and magnetic means positioned between the rolls and adapted to draw the sheets into contact with the rolls to bow the sheets laterally, means to support and to adjust the tilted position of pairs of posts supporting the inner and outer ends of said rolls, respectively, one of said pairs of posts being fixed, the other pair of posts being vertically movable, said second pair of posts being provided with slots generally cruciform in longitudinal section, each slot having a main portion and lateral arm portions, the arm portions having upper and lower cam surfaces extending laterally and upwardly, a member comprising a rectangular elongated plate adapted to extend within and through the main portions of said cruciform slots and having cam strips affixed thereto adapted to lie within said arm portions, said cam strips having cam surfaces adapted to contact said upper slot cam surfaces and said lower slot cam surfaces; and means for moving said member comprising a nut secured to said member and screw means engaging said nut adapted to move said member through said slots when said screw is rotated.

PERRY G. SNYDER.

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