Aug. 30, 1938. G. F. PAUL 2,128,316

APPARATUS FOR PILING SHEETS AND PLATES

Filed May 7, 1937 2 Sheets-Sheet 1

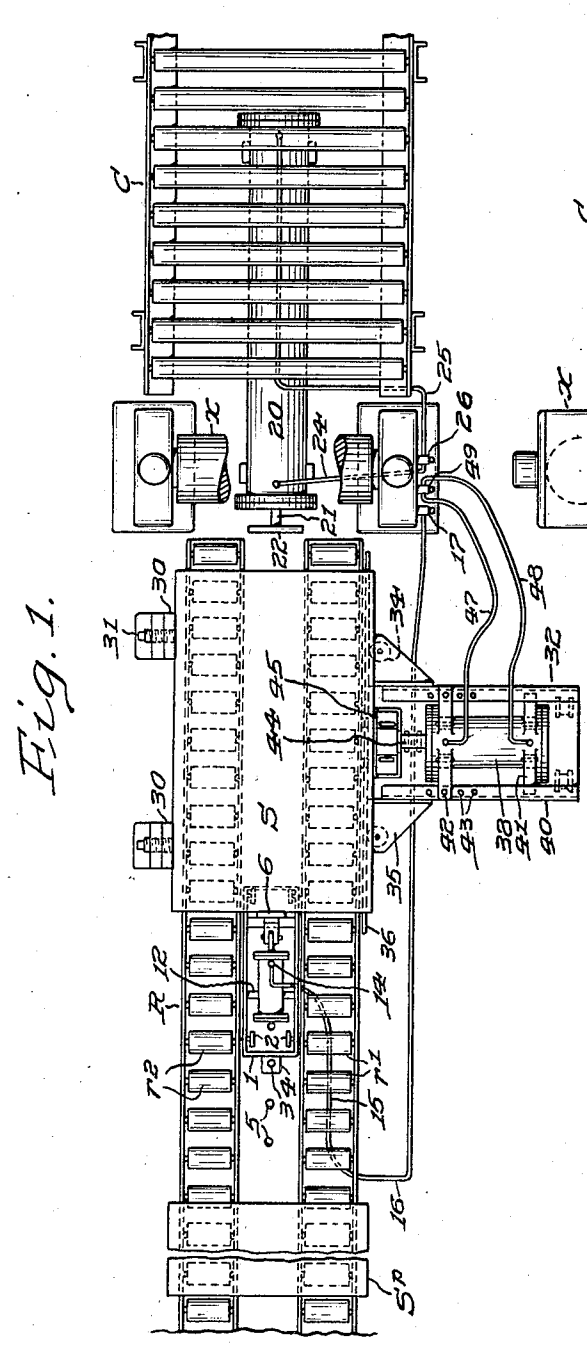


Fig. 1.

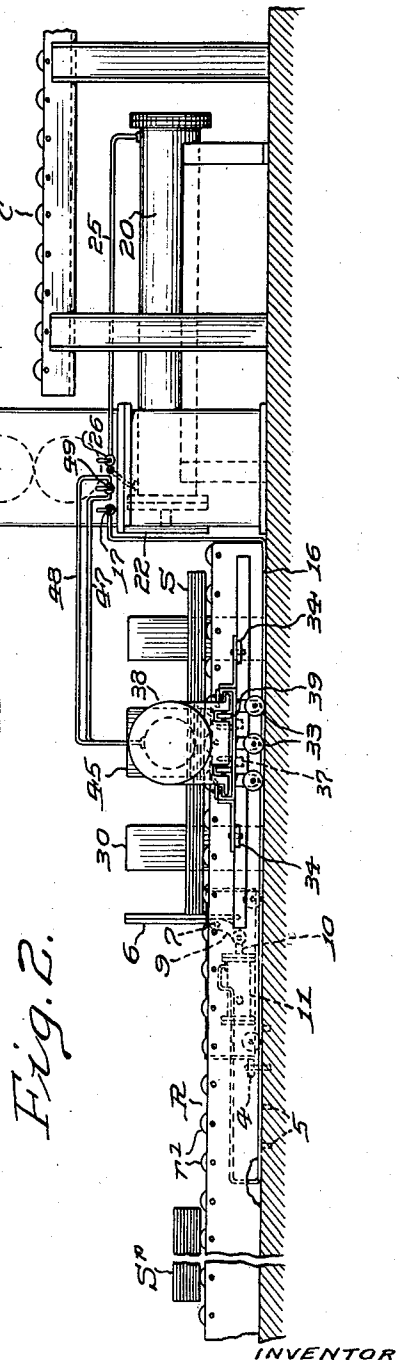


Fig. 2.

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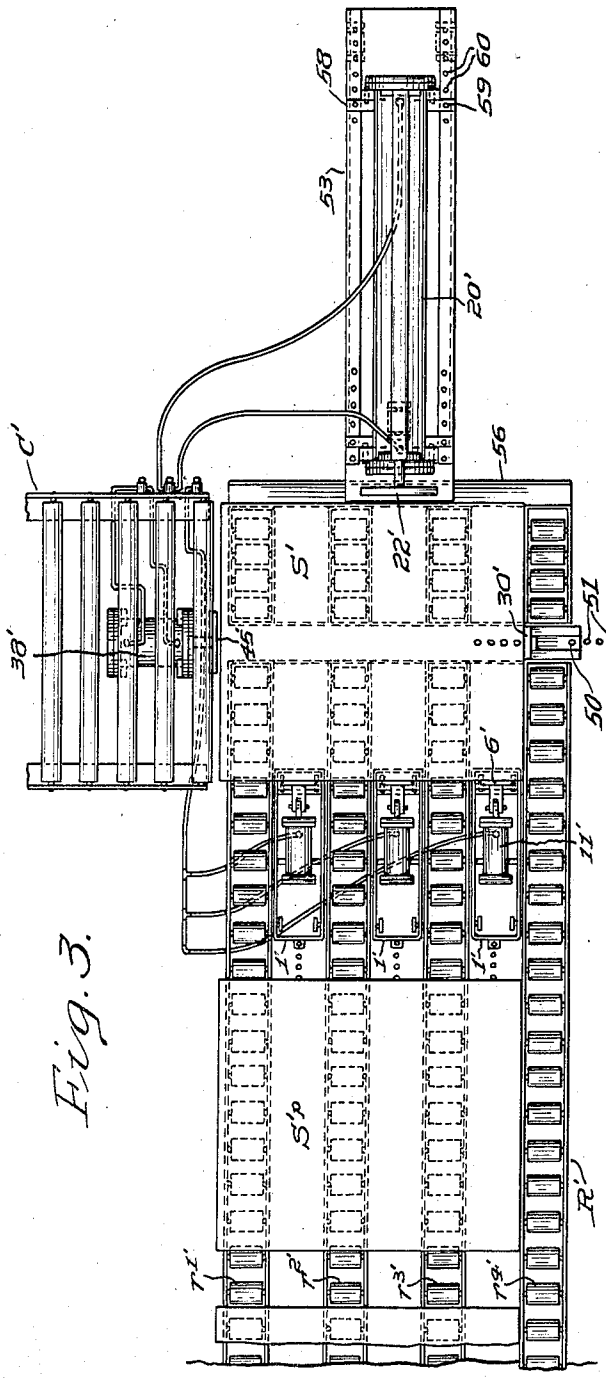


Fig. 3.

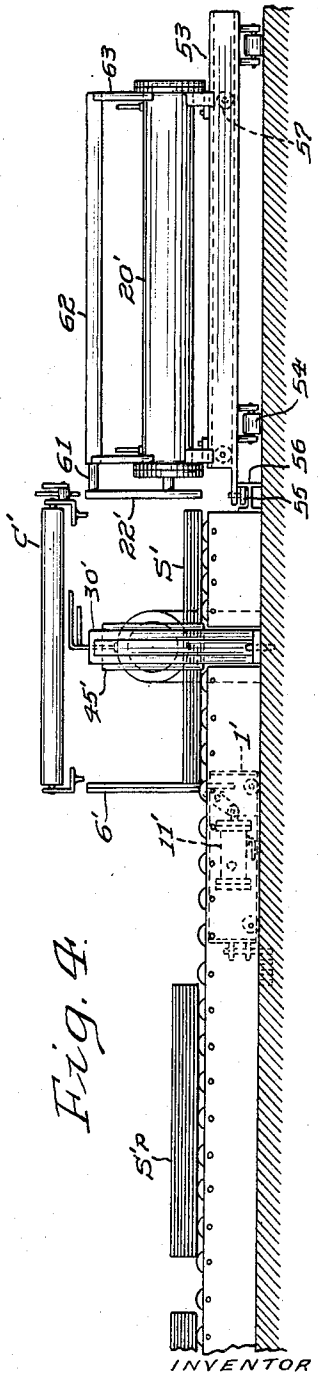


Fig. 4.

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APPARATUS FOR PILING SHEETS AND PLATES

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Application May 7, 1937, Serial No. 141,207

8 Claims. (Cl. 271—89)

This invention relates to apparatus for mechanically piling sheets and plates as they are successively delivered from forming or finishing mechanism by a suitable conveyor and is therefore of particular utility in steel mills and other plants where such articles are fabricated.

While the invention is equally applicable to the piling of sheets and plates, generally distinguished from each other in the trade on the basis of thickness, for conveniecce the term "sheets" will be used herein generically and will thus be understood as including plates as well as sheets.

As the sheets are sequentially delivered from the production line at a predetermined station they are customarily assembled in symmetrical piles preparatory to packaging for storage or shipment, and it has heretofore been necessary to employ two or more operators to pile them manually and to remove the completed piles as well as an inspector whose sole duty is to examine the sheets being piled to prevent defective sheets being inadvertently included among them, so that the piling and inspection usually require the continuous attendance of at least three individuals, and sometimes more.

The apparatus of my invention, however, is adapted to mechanically pile the sheets in accurate vertical alignment, thus obviating the necessity for any manual handling of them at all, and as it is actuated through the medium of simple and easily operated controls, the inspector alone, without neglecting his normal inspection duties, can readily effect the piling and alignment of the sheets as well as the delivery of each pile when it is completed to a run-off conveyor operative to carry the pile to some remote point.

It is therefore a principal object of the invention to provide means for mechanically bringing a plurality of sheets delivered successively to a piling station into precise vertical alignment in a single pile.

Another object is to provide means of the character aforesaid operable to deliver the completed piles of sheets from the piling station to a run-off conveyor or other mechanism provided for receiving them.

A further object is to provide sheet moving and aligning means which may be easily controlled by a single operator to align in a pile a plurality of separately received sheets with respect to both of their lateral dimensions, either successively or simultaneously, thereby dispensing with the use of manual labor for the purpose.

A still further object is to provide sheet piling and pile moving apparatus which may be controlled by a single operator in such manner as to enable him to subject the sheets to adequate inspection and also to properly pile them and remove the completed piles from the piling station without excessive effort and with maximum efficiency even when the sheets are delivered quite rapidly to the piling station from the production line or the like.

Other objects, purposes and advantages of the invention will hereinafter more fully appear or will be understood from the following description of certain embodiments thereof during which reference will be had to the accompanying somewhat diagrammatic drawings in which:

Fig. 1 is a top plan view of piling apparatus adapted for piling the sheets and thereafter moving the completed piles from the piling station along a path in prolongation of the path of the individual sheets in their movement thereto;

Fig. 2 is a side elevation thereof;

Fig. 3 is a view corresponding to Fig. 1 but illustrating a somewhat different form of apparatus adapted for piling the sheets and for then moving the completed piles away from the piling station along a path at right angles to that of the individual sheets, and

Fig. 4 is a side elevation thereof.

In the several figures the same characters are used to designate the same parts, those in the embodiment of the invention shown in Figs. 3 and 4 corresponding to like parts shown in Figs. 1 and 2 being accompanied by a prime (').

Viewing the invention broadly, it is of course inconsequential whether the piles of sheets to be delivered from the piling station in a path in prolongation of their path thereto, or at a right angle to said path, as the particular direction of their movement will usually be determined in accordance with convenience or other factors in mill design; the embodiments of the invention shown in the drawings and herein described are therefore merely illustrative of mechanisms which, among other things, are adapted to move the piles in the aforesaid directions but are not to be construed as limiting or confining the invention thereto as by suitable modification and adaptation either of the said mechanisms may be arranged to move the piles in any other direction.

More particularly, referring first to Figs. 1 and 2, the piling and delivering apparatus will normally be positioned adjacent the end of a sheet production line the last units of which may be a conveyor C and a rotary flying or other shear

X by means of which a strip delivered by the conveyor C may be successively cut into a plurality of individual sheets, and adjacent the exit side of shear X and preferably some distance below its operating plane is a second conveyor R, of which the part nearest the shear forms the base of the piling station to which the sheets S fall as they are successively cut from the strip by the shear, or are delivered therethrough from the conveyor C if the shear is not being used as when individual sheets, as distinguished from elongated strips, are being carried along conveyor C.

The piling mechanism proper is thus associated more particularly with the conveyor R at the piling station, and comprises a plurality of individual units cooperable to act upon the sheets from several directions to bring a plurality thereof into exact vertical alignment at this station.

The conveyor R as shown comprises a pair of spaced parallel lines of conveyor rollers *r1*, *r2* and in accordance with the invention between them is positioned a wheeled carriage 1 which is adjustable longitudinally of the conveyor on supporting wheels 2, a removable pin 3 extending through a bracket 4 on the carriage and into any one of several suitable holes 5 in the mill floor providing a convenient means for holding the carriage in a corresponding adjusted position longitudinally of the conveyor, this adjustability being desirable to permit the proper piling of sheets of different length at different times.

The carriage 1 supports adjacent its end nearest conveyor C a stop 6 which is mounted on a horizontal pivot 7 in such a way that the stop may be held vertical, as best shown in Fig. 2, or allowed to swing downwardly and rearwardly on its pivot so as to lie beneath the plane of the top of conveyor R and thus out of the way of a pile of sheets being moved along the conveyor. To this end the stop is provided with an actuating arm 9 which is pivoted to the piston rod 10 of an operating cylinder 11 mounted on carriage 1 on trunnions 12, so that the stop may be brought to and held in upright position by retracting the piston in the cylinder by admission thereto of fluid under pressure delivered through a connection 14, the flow of fluid thereto and therefrom through a flexible conduit 15 and pipe 16 being controlled by a suitable valve 17 disposed adjacent the piling station for convenient manipulation by the sheet inspector so that he may at will raise the stop or permit it to fall rearwardly to inoperative substantially horizontal position.

During the piling of the sheets the stop is held upright and therefore forms a vertical abutment against which the ends of the sheets may be aligned when they are delivered to the piling station, and contact of the end of each sheet with the stop is effected by operation of the piston in a fluid cylinder 20 beneath the conveyor C. This cylinder, the piston rod 21 of which has a platen 22 at its end nearest conveyor R, is preferably disposed in alignment with the space between the lines of rollers *r1* and *r2* with the platen extending below the plane of their upper surfaces and is provided with fluid connections 24, 25 controlled by a valve 26 positioned adjacent the valve 17 so that the operator may advance and retract platen 22 at will; thus by suitable manipulation of the valve, the platen may be projected between the lines of rollers to engage the adjacent edges of the sheets as they are successively delivered to the piling station and thereafter move them into contact with stop 6 and thus into alignment with any previously received sheets which have been likewise so positioned. Cylinder 20 and its piston rod 21 are preferably made long enough, as shown, to permit platen 22 to be projected substantially to the far end of the piling station, which is considerably farther than the travel required for aligning the individual sheets against the stop 6, and this capacity for additional travel enables the platen to be used for successively moving the completed piles of sheets *Sp* out along conveyor R, after release of stop 6, so as to clear the piling station for the reception of further sheets for the next pile.

The sheets in each pile are also aligned laterally, in a substantially similar manner, by other mechanism at the piling station, which mechanism comprises a pair of vertical stops 30 positioned at one side of conveyor R and preferably adjustable relatively to the conveyor by screws 31 to accommodate different widths of sheets as well as to insure their alignment with each other and at the opposite side of the conveyor, a carriage 32 which is movable longitudinally of the conveyor on wheels 33 but held in proper position with respect thereto by rollers 34 supported from brackets 35 engaging one side of a rail 36 carried by the conveyor frame and a pair of fingers 37 which overlie this rail and engage its opposite side.

The carriage 32 supports a cylinder 38 movable longitudinally thereof on wheels 39 and tracks or ways 40, which retain the cylinder in position laterally through engagement with guide brackets 41, and means such as pins 42 removably insertable in holes 43 in the tracks and corresponding holes in the brackets are provided to enable the cylinder to be fixed in different positions longitudinally of the carriage to accommodate different widths of sheets.

The piston rod 44 of cylinder 38 has a platen 45 at its outer end adjacent conveyor R which when the cylinder is in properly adjusted position on the carriage may be brought into engagement with the side edges of the sheets as they are successively received at the piling station to thereby move them transversely to engage their opposite side edges with stops 30, the cylinder being provided with flexible fluid connections 47, 48 communicating with a valve 49 adjacent valves 17 and 26 to enable the platen 45 to be reciprocated at will.

From the foregoing it will be apparent that the sheets as they are successively received at the piling station may be brought by suitable operation of platens 22 and 45 into engagement with stops 6 and 30, disposed at right angles to each other, and thus into longitudinal and lateral alignment with preceding sheets to form a pile of any desired thickness, and that after a pile has been completed it may be pushed from the piling station onto the adjacent part of conveyor R by projecting platen 22 to the outward limit of its travel to make room for subsequent sheets to form the next pile and that these several operations may be performed by a single operator merely by manipulation of the several control valves. Moreover, as but a small amount of the operator's time and attention is required for this purpose, there is consequently ample opportunity for him to subject the sheets to careful inspection as they are being delivered to the piling station or after they are received at that station and while they are being piled.

In the embodiment of the invention shown in

Figs. 3 and 4 a run-off conveyor R' consisting of four lines of rollers, r1', r2', r3' and r4' is employed and arranged at a right angle to conveyor C' so as to deliver the piles of sheets along a path normal to their path on the latter.

Accordingly three carriages 1' corresponding to the carriage 1 and thus each embodying a stop 6' and a cylinder 11', are provided while the elongated cylinder 20' is positioned outwardly from the front end of conveyor R' and not under conveyor C'. No shear is shown in these figures in association with this conveyor but of course one may be provided if desired. The conveyor has disposed beneath it a fixed cylinder 38', the sheet engaging platen 45' of which is movable into engagement with the rear edges of the sheets S' after they are delivered from conveyor C' to bring them into engagement with an opposite stop 30' adjustably fixed in position by a pin 50 entering one of several holes 51 in the mill floor; to provide a wide range of adjustment for the position of stop 30' to accommodate various sizes of sheets, conveyor R' is preferably interrupted transversely at a point in alignment with the stop without, however, impairing its ability to afford adequate support to the sheets.

The elongated cylinder 20' which is used for bringing the sheets into engagement with stops 6' in piling them and for moving the completed piles S'p out along conveyor R' is supported from a carriage 53 mounted on rollers 54 and held adjacent the piling station by an additional roller 55 engaging a rail 56 so that it can be moved laterally in correspondence with different sheet sizes to align its platen with the sheet edges at about the center thereof and it is also longitudinally adjustable along the carriage on wheels 57, brackets 58 receiving pins 59 which enter into holes 60 in the carriage serving to maintain it in adjusted position.

Platen 22' of cylinder 20' is somewhat elongated upwardly and is shown as having a rearwardly projecting plunger 61 connected adjacent its upper end and slidable in a tubular guide 62 carried in brackets 63 on the cylinder heads to assist in holding it in vertical position but these and other details of construction are largely a matter of choice and therefore may be varied as desired.

The operation of the apparatus just described is substantially similar to that of the apparatus shown in Figs. 1 and 2 and therefore requires no extended reference, and it will be appreciated that it equally is capable of use with sheets of widely differing dimensions for when sheets S' of relatively large size are being piled, as shown in the drawings, all three of stops 6' come into play and form a firm abutment for engagement by the adjacent edges of the sheets when forced thereagainst by the platen 22' which, under such conditions, is preferably located at about the center of the opposite edge of the sheets; when narrower sheets are being piled, however, cylinder 20' is moved nearer conveyor C' and but two, or in the case of very narrow sheets only one, of stops 6' are engaged thereby.

While I have herein shown and described with considerable particularity certain embodiments of the invention whereby its purposes and objects may be attained, it is to be understood that I do not thereby intend to limit or confine myself thereto in any way as other embodiments differing in form, construction and/or arrangement from those to which I have referred will readily occur to those skilled in the art and may be utilized if desired without departing from the spirit and scope of the invention as defined in the appended claims.

Having thus described my invention I claim and desire to protect by Letters Patent of the United States:

1. Apparatus of the class described comprising a pair of spaced sheet engaging platens independently movable along paths at right angles to each other and respectively adapted to move a sheet horizontally along similar paths, a vertical stop interposed in each path traversed by the sheet when moved by a platen, means supporting one of said stops for movement out of the adjacent path to thereby clear it for the passage of a sheet beyond the stop, and means operable to project said stop into said path and hold it therein.

2. In combination with sheet conveying means, a platen movable along a path substantially parallel therewith, a fluid cylinder and a piston therein for moving the platen, a stop disposed adjacent the conveying means in opposed relation to the platen, means for sequentially delivering a plurality of sheets to the conveying means for movement thereon by said platen towards the stop, fluid operated means interconnected with the stop operable to project it into the path of movement of the sheets along the conveying means, another stop disposed adjacent one side of the conveying means, a carriage adjacent the opposite side thereof, a fluid cylinder and piston mounted on the carriage and a platen adapted to be reciprocated by the piston laterally of the conveying means to thereby move a sheet disposed thereon into engagement with the last mentioned stop.

3. In combination with sheet conveying means, a platen movable along a path substantially parallel therewith, a fluid cylinder and a piston therein for moving the platen, a stop disposed adjacent the conveying means in opposed relation to the platen, means for sequentially delivering a plurality of sheets to the conveying means for movement thereon by said platen towards the stop, fluid operated means interconnected with the stop operable to project it into the path of movement of the sheets along the conveying means, another stop disposed adjacent one side of the conveying means, a carriage adjacent the opposite side thereof and longitudinally movable with respect thereto, a fluid cylinder and piston mounted on the carriage and movable toward and away from said conveying means and a platen adapted to be reciprocated by the piston laterally of the conveying means to thereby move a sheet disposed thereon into engagement with the last mentioned stop.

4. Apparatus of the class described comprising means for supporting a rectangular sheet in substantially horizontal position, a pair of movable platens disposed adjacent thereto, means for respectively moving the platens to engage them with adjacent edges of a sheet when disposed on the supporting means to thereby move the sheet horizontally, one of said platen moving means comprising mechanism operable to project its platen substantially entirely across the supporting means, stops respectively adapted to limit movements of the sheet induced by the platens, one of the stops being movable out of the adjacent path of the sheet whereby by projecting said platen substantially to the limit of its movement when said stop is out of said path the sheet may be moved beyond the limit defined by the

stop when in stopping position, and releasable means for positively moving the stop to said position.

5. In combination with means for sequentially delivering a plurality of sheets to a piling station, a pair of spaced vertical stops respectively adapted for engagement by adjacent edges of the sheets, a pair of platens respectively adapted to engage the opposite edges of the sheets, means for independently moving the platens to push the sheets successively into engagement with the stops and operable to move at least one platen substantially from one edge of the station to the other, fluid actuated releasable means for holding in sheet engaging position the stop opposite said last mentioned platen while sheets are being piled at the piling station, and means adjacent said stop for receiving a pile of sheets from the station after being moved therefrom and beyond the stop by said platen after release of said stop holding means.

6. In apparatus of the class described a pair of platens independently reciprocal along paths normal to each other adjacent a piling station, means operable to reciprocate the platens and adapted to project at least one of them from adjacent one edge of the station substantially to its opposite edge, means for sequentially delivering a plurality of sheets to the station, a stop oppositely displosed with respect to each platen adapted to limit movement of each sheet along a path parallel to that of the platen, the stop opposite said projectable platen being movable out of sheet engaging position, and fluid actuated means for holding said stop in sheet engaging position but operable to release it therefrom for movement by and out of the path of the piled sheets when being cleared from the piling station by projection of said platen substantially across the station.

7. In sheet piling apparatus, a piling station, a pair of platens respectively movable transversely thereof along paths normal to each other, means for moving each platen independently, means for sequentially delivering sheets to the station, a stop opposed to each platen to limit the movement imparted to each sheet by the respective platens when aligning the sheets to form a pile, at least one of said stops being movable to and from sheet engaging position, and means cooperative with said movable stop comprising fluid actuated mechanism operable to bring the stop to and maintain it in sheet engaging position and to then release it preparatory to a pile of sheets being projected against it by the platen opposite thereto to thereby allow the pile to move beyond the stop and away from the station.

8. In combination with means for sequentially delivering a plurality of separate sheets to a piling station, a stop adapted for engagement by one edge of the sheets when in stopping position but movable to a non-stopping position, a movable platen adapted for engagement with the opposite edge of the sheets, means operable to move the platen against said edge to successively push the sheets against the stop to align them vertically while a pile of sheets is being formed and to then move the pile past the stop, and means for holding the stop in stopping position during the aligning operation but releasable to allow it to be moved therefrom by the pile under the influence of the platen.

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