

June 14, 1960

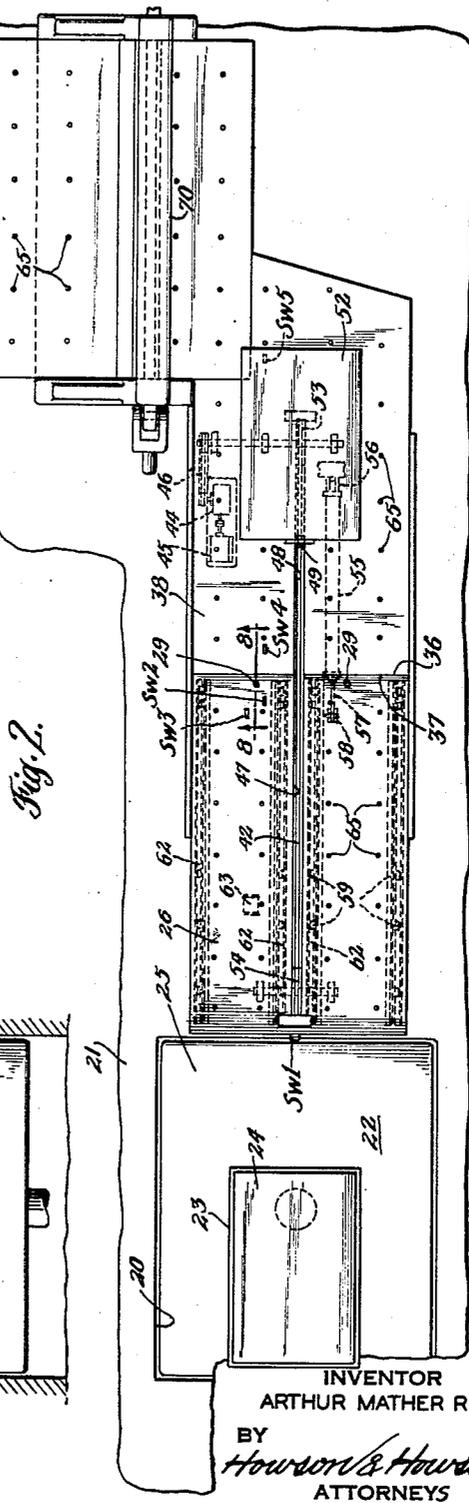
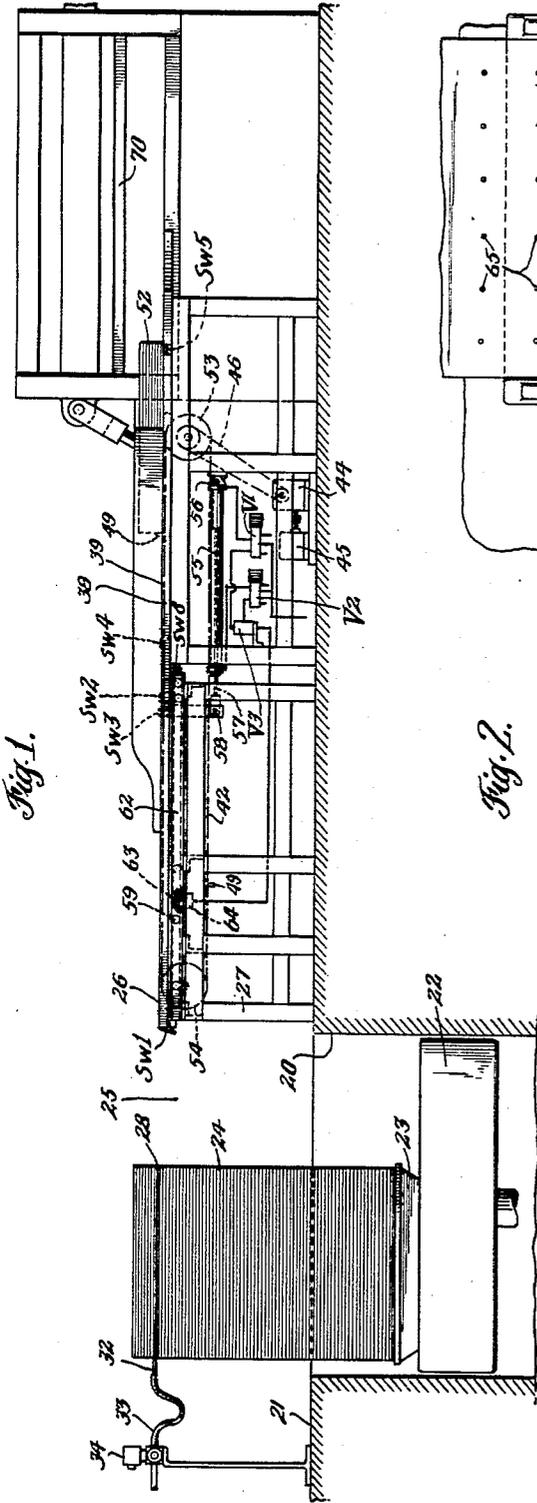
A. M. REED

2,940,617

APPARATUS FOR REMOVING BLOCKS OF SHEETS AND THE LIKE
FROM STACKS AND FEEDING THEM FORWARDLY

Filed March 20, 1957

5 Sheets-Sheet 1



INVENTOR
ARTHUR MATHER REED
BY
Howson & Howson
ATTORNEYS

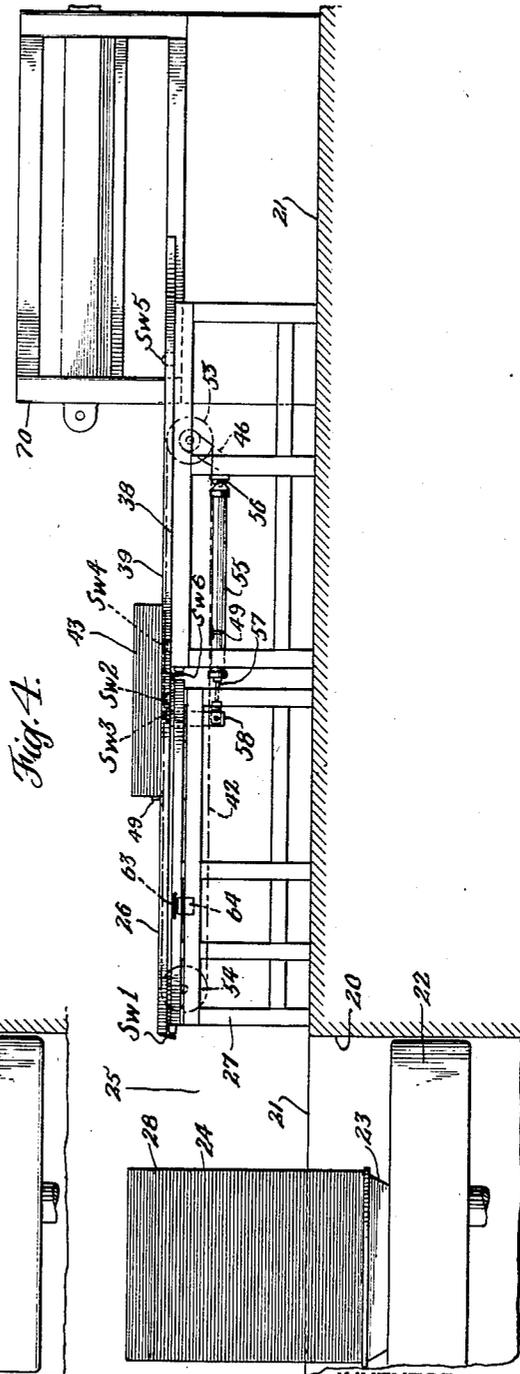
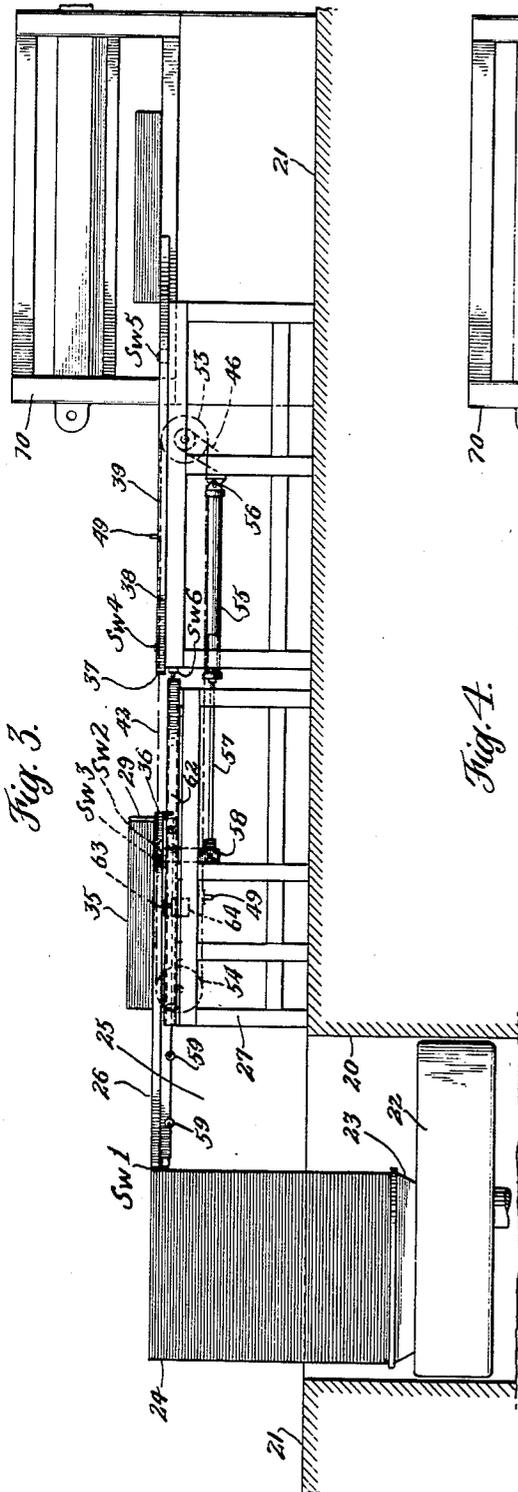
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INVENTOR
ARTHUR MATHER REED
BY
Howdon & Howdon
ATTORNEYS

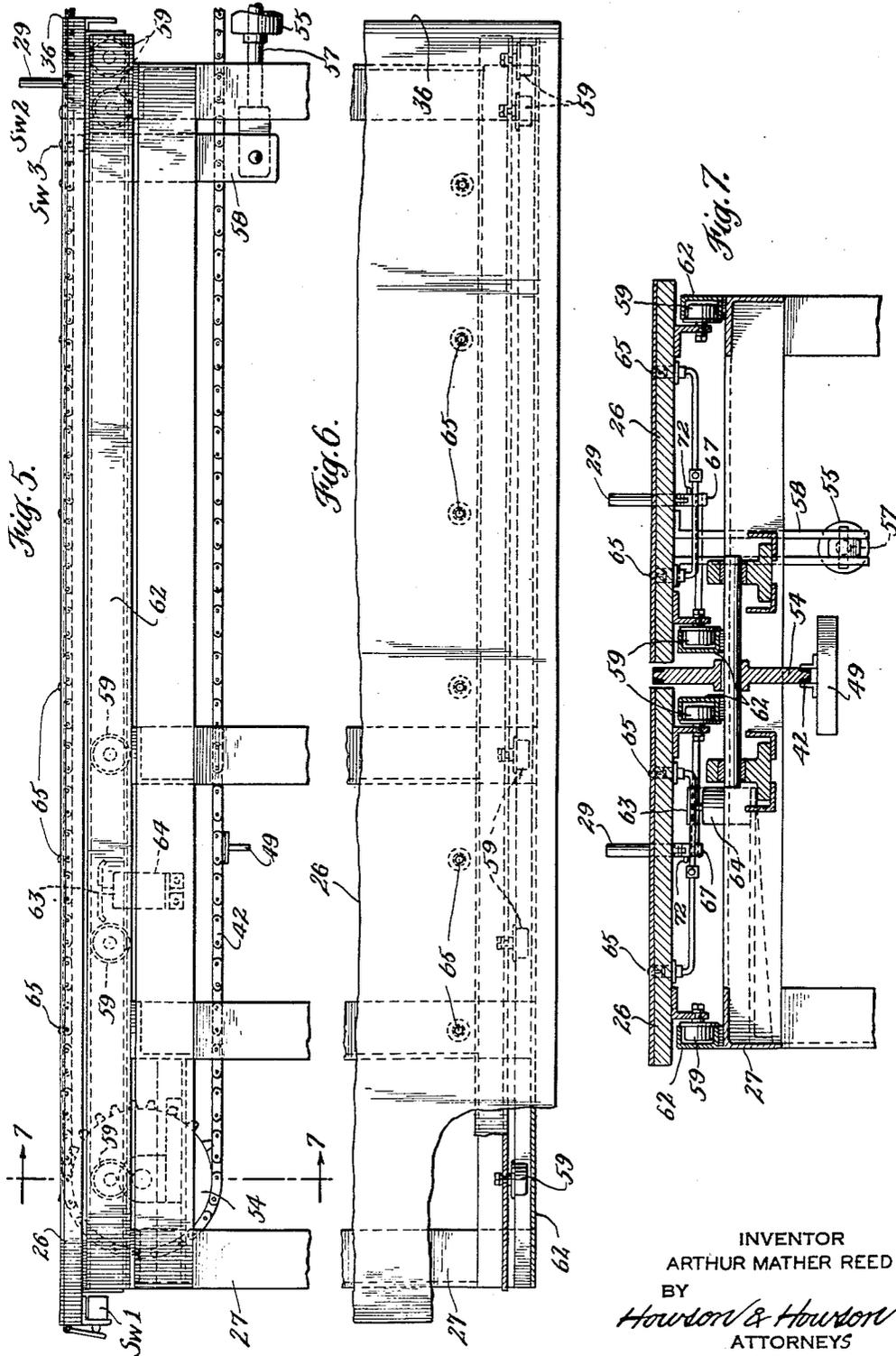
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5 Sheets-Sheet 3



INVENTOR
ARTHUR MATHER REED
BY
Howard & Howard
ATTORNEYS

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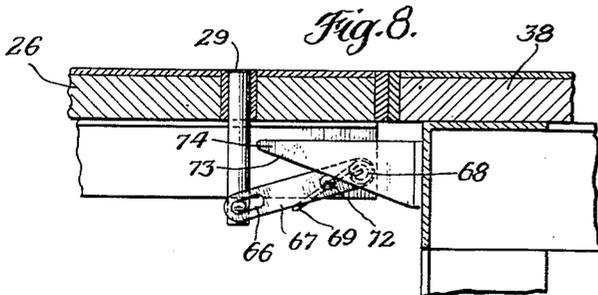
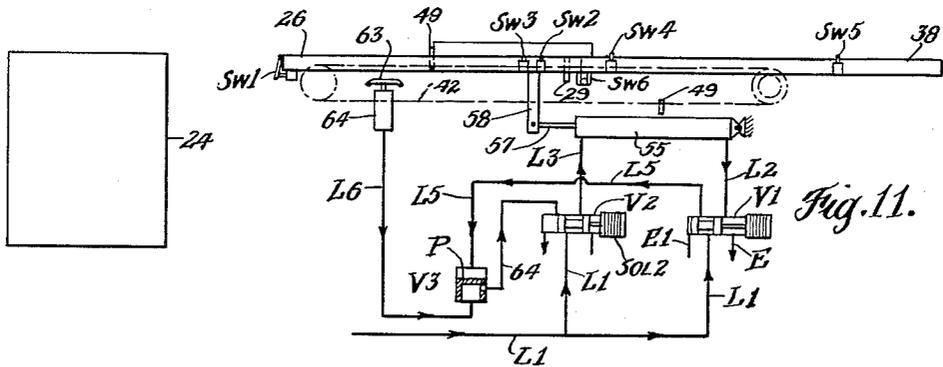
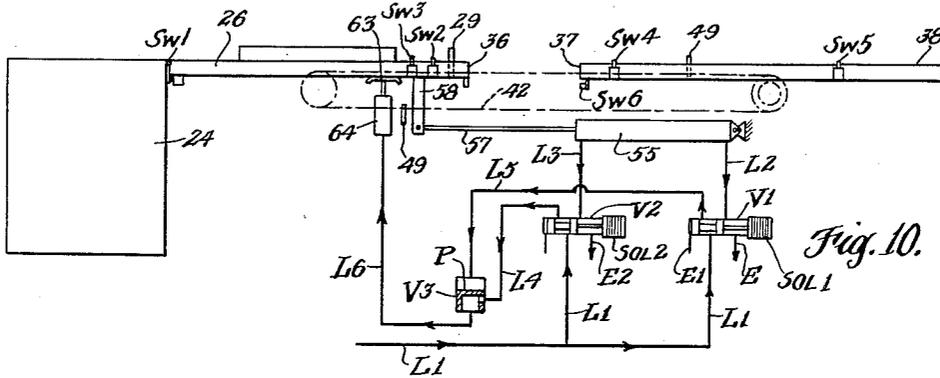
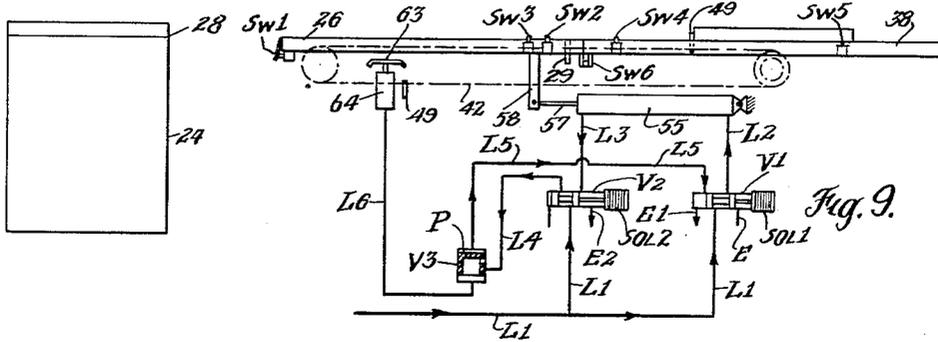
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5 Sheets-Sheet 4



INVENTOR
ARTHUR MATHER REED
BY
Howson & Howson
ATTORNEYS

June 14, 1960

A. M. REED

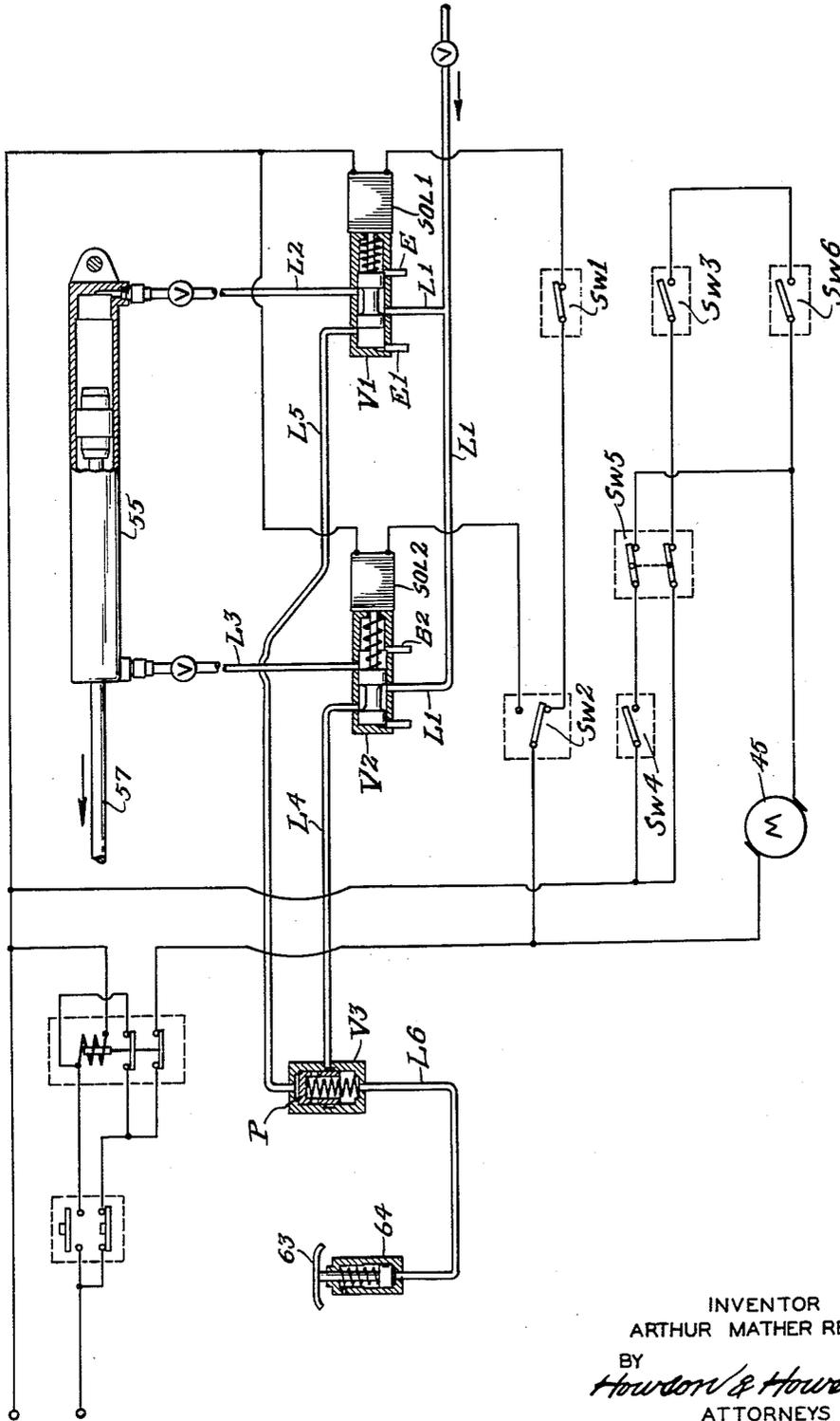
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5 Sheets-Sheet 5

Fig. 12.



INVENTOR
ARTHUR MATHER REED
BY
Howard & Howard
ATTORNEYS

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APPARATUS FOR REMOVING BLOCKS OF SHEETS AND THE LIKE FROM STACKS AND FEEDING THEM FORWARDLY

Arthur Mather Reed, Glens Falls, N.Y., assignor, by mesne assignments, to Charles R. Stevens, Inc., Maumee, Ohio, a corporation of Ohio

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6 Claims. (Cl. 214—8.5)

This invention relates to apparatus for removing articles from a stack of such articles and feeding them forwardly from the location of the stack. It was conceived and perfected as a solution to problems encountered in removal of successive blocks of paper sheets from a stack of such sheets and feeding of said blocks forwardly into position for convenient handling by the operator of a trimming press, and will be described for convenience primarily in relation to such problems.

The handling of such sheets incident to the performance of the trimming operation is essentially a manual operation as is also the removal of the successive blocks of sheets from the stack for trimming treatment. For these reasons, the operations in question do not lend themselves well to a fully timed automatic sequence of operations. On the other hand, it is highly desirable that the operations of removing these successive blocks from the stack and moving them into position for convenient access to the trimming press be performed by automatically operated machinery to the maximum feasible extent, and especially that the elements of laborious effort and danger of injury be minimized. A primary object and feature of this invention has been to attain these ends.

A more specific object and feature of the invention has been to eliminate the lifting of heavy stacks of sheets by the operators, and to provide a system of handling by which such manual operations as are required may be performed from positions of optimum advantage and safety.

A further object and feature has been to improve the neatness of the blocks of sheets passed to the trimming operation, and this feature has been the result in large measure of the improved positiveness of control and ease of handling discussed above.

A further object and feature has been to speed up production in these operations, and this has been attained to a striking degree by combination of the automatic features of operation with other features promoting convenience of handling.

In the attainment of these objects in the preferred form of the invention, there is provided a well extending below floor level and a vertically adjustable support within said well upon which the stack of sheets or the like is supported. This may comprise the so-called "levelator" apparatus familiar in this art. The pallet upon which the stack is supported is placed upon the levelator floor toward the rear thereof, and the level is adjusted until the block of sheets at the top of the stack is at a convenient distance above floor level for removal by pushing movement from an operating station directly behind the well. A shuttle table is mounted for movement between a rearward position in which its rear end is adjacent the stack at the elevation of the bottom of the block of sheets to be removed to a forward position in which its forward end is adjacent the rear end of a stationary receiving table located adjacent the trimming press or other operating machine.

After the stack has been raised to the desired level and

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the shuttle table has been moved to its rearward position, an air nozzle is inserted beneath the lowermost sheet of the block to be removed, and air is applied through the nozzle to provide an air cushion on which the block is partially floated onto the shuttle table in a forward pushing action until its forward end abuts retractable stops on said table. The shuttle table is then moved to its forward position and the stops are automatically retracted to permit the automatic pushing of the block from the shuttle table onto the horizontal receiving table, from which they are manually removed. It will be seen that the only manual steps required in this sequence are the pushing of the sheets from the stack to the shuttle table, the manipulation of the air jets and levelator control and the removal of the blocks from the receiving table. The timing of the automatic control features is, however, controlled by the manual steps of pushing the sheets onto the shuttle table and their removal from the receiving table as discussed hereinafter. These and other features of the invention and the manner in which they have been attained will be evident from reading of the following detailed description in the light of the attached drawing, in which,

Figure 1 is a side elevation of apparatus of the invention in its association with stacked blocks of paper sheets and a trimming press for operation upon said sheets,

Figure 2 is a plan view of the apparatus of Figure 1,

Figure 3 is a view similar to Figure 1 but illustrating parts of the apparatus in a second position after a first feeding step,

Figure 4 is a similar view illustrating the parts after a second feeding step,

Figure 5 is a side elevation on a larger scale of the slide or shuttle table,

Figure 6 is a partial plan view of the apparatus of Figure 5,

Figure 7 is a cross-section on the line 7—7 of Figure 5,

Figure 8 is a cross-section on the line 8—8 of Figure 2,

Figures 9—11 are diagrammatic views corresponding to Figures 1, 3 and 4, respectively, and illustrating the relationships of the air valves, shuttle table operating motor and brake at these stages of the operation, and

Figure 12 is a wiring and carriage operating diagram corresponding to the positions of the parts as the shuttle table moves rearwardly toward the stack.

The apparatus of the invention includes a well 20 extending beneath the level of floor 21 and containing a vertically adjustable stack support such as the conventional levelator 22 supporting a skid or pallet 23, which is located toward the rear of the support so that a stack of paper 24 resting upon the pallet will have its rear edges in convenient position for access from an operating station behind the well. This will leave an open space 25 of more or less width forwardly of the pallet and stack, depending upon their length, and a slide or shuttle table 26 is mounted on a stationary support 27 at the forward side of the well. The movements of this shuttle table are controlled by actuating gear such as a pneumatic motor and linkage which impel it rearwardly across the gap 25 into the position of Figure 3, after the support 22, 23 has been raised to a position in which the lowermost sheet 28 of the block to be removed is in a plane at the top of table 26, and this block is then shoved onto table 26 across gap or space 25 and against end stops 29 as illustrated in Figure 3. By mounting the table 26 at a convenient height relative to the operating station behind stack 24 and by raising support 22, 23 to bring the bottom of the uppermost block of sheets to this height, this block may be shoved onto table 26 from a position of optimum advantage.

In order further to facilitate movement of the block

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of sheets from the position of Figure 1 to the position of Figure 3, nozzles 32 are inserted beneath the lowermost sheet of the block and air is supplied to these nozzles by conduits 33 for a period controlled by timer 34 to provide an air cushion beneath the block during its removal.

Upon completion of movement of a block of sheets into the position indicated at 35 in Figure 3, the shuttle table 26 is automatically given a forward movement until its forward end 36 abuts the rear end 37 of a stationary table 38 whose top 39 is on the same level as the top of table 26. The end stops 29 are retracted beneath table 26 as it moves to this position, and a pusher in the form of a chain 42 is next automatically actuated to push the block of sheets from table 26 forwardly onto table 38, as illustrated at 43 in Figure 4.

The chain 42 is driven over an idler sprocket 54 through gear box 44, chain 46 and sprocket 53 (Fig. 1) by motor 45, and its upper or conveying run underlies central longitudinal forwardly extending slots 47 and 48 in tables 26 and 38, respectively, so that pusher bars or lugs 49 projecting upwardly through the combined slot thus formed in the two tables impel the block forwardly from the forward end of table 26 in its forward position to the position illustrated at 52 in Figure 2.

The shuttle table 26 is driven in its reciprocatory movements by a pneumatic motor including a cylinder 55 located beneath the table 38 and secured at 56 to the framework of the table and a piston whose piston rod 57 is secured through lugs or bars 58 to the under side of table 26, and this table 26 is provided with rollers or wheels 59 which run in guides 62 of the stationary support 27.

A brake shoe 63 is mounted for vertical reciprocation beneath shuttle table 26 by brake cylinder 64 mounted upon support 27, and is pressed upwardly by air in brake cylinder 64 when table 26 reaches the rearward position illustrated in Figures 3 and 10.

A plurality of ball check valves 65 are provided in the tops of all of the tables to supply an air cushion as the balls are depressed by the weight of paper blocks. This is a feature familiar in the art and provides an air cushion to facilitate sliding of the paper blocks along the tables.

As noted above, the end stops 29 are projected upwardly through slots in table 26 except when this table is in the forward position, so that they serve to prevent the block of paper from overriding the end of the table and to position it when it is slid onto the table and transported thereby but are retracted as the table arrives at the forward position to permit removal of the paper forwardly from this table by chain 42 and pusher bars 49 to the position 52 of Figure 2. The mounting of the stop pins 29 and their actuating mechanism to provide this movement is illustrated in Figure 8. Each pin is pivotally mounted at its lower end, through an elongated slot and pin connection 66, upon a lever 67 which is pivoted at 68 to the underframe structure of table 26. Associated springs 69 normally hold levers 67 in positions in which pins 29 project through the table as illustrated in Figure 7. However, as table 26 approaches table 38 in its forward movement a transverse pin 72 on each of levers 67 abuts the diagonal camming surface 73 of the lower edge of a cam plate 74 secured to the rear side of the underframe structure of table 38, with the consequence that the pins 29 will be retracted to the position of Figure 8 as table 26 finishes its forward travel, and held retracted until it again moves rearwardly.

A very important feature of the invention consists in the system of switches whereby the manual and automatic aspects of the operation are subjected to interlocking control. When the master switch is closed, this energizes a solenoid Sol1 (Figs. 9-11) to actuate four-way valve V1 to the position illustrated diagrammatically in Figure 9, so that air is admitted from line L1 to line L2 at the right end of cylinder 55, to move table 26 from the position of Figure 9 to the position of Figure 10. At this

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time the solenoid Sol2 which serves to actuate valve V2 is deenergized with the result that the exhaust line L3 from cylinder 55 is connected with exhaust E2 of valve V2 to permit the table movement, and line L1 is connected with line L4 through this valve. This admits air to valve V3 but no communication is established through that valve to brake cylinder 64 at this time, so that the brake shoe is held retracted by its return spring.

As the table 26 reaches the rearward limit of its travel, a normally closed switch Sw1 is opened by contact with stack 24, thereby deenergizing solenoid Sol1, so that line L1 is interconnected with line L5 to depress piston P (Fig. 10) and establish communication between lines L4 and L6 through valve V3 to admit air to brake cylinder 64 and apply brake shoe 63. The brake is thus applied to hold table 26 firmly in the position of Figures 3 and 10 until the top block of paper from stack 24 has been shoved into the position indicated at 35 in Figure 3.

The movement of the paper into this position actuates a double-throw switch Sw2 from the position of Figure 12 to its opposite position, energizing solenoid Sol2 to reverse the operating connections of the valve V2, as shown in Figure 11, and establish communication between lines L1 and L3 through valve V2 to start the return movement of table 26 by admitting air to the left end of cylinder 55. Since line L2 is already in communication with exhaust E of valve V1 at this time, the return movement of the table will take place until ends of tables 26 and 38 are brought into abutment.

The movement of the block of paper into the position of Figure 3 serves not only to actuate switch Sw2 as discussed above, but also to close a normally open switch Sw3. This does not, however, effect any change in the driving connection for the chain at that time, since switch Sw3 is in series with a second normally open switch Sw6. As the opposing ends of tables 26 and 38 come together, they close this switch Sw6, and chain motor 45 is therefore energized through the circuit branch including switches Sw3 and Sw6, which are now closed, and normally closed double interlocking switch Sw5. In the meantime end stops 29 have been retracted to the position of Figure 8 as discussed above, so that the operation of chain 42 by motor 45 moves the paper block off of table 26 and to the position indicated at 52 in Figures 1 and 2. As the rear end of the block of paper is moved into position beyond switch Sw3, this allows that switch to open again, but the paper has in the meantime advanced over table 38 to the point where it closes switch Sw4, thus providing an alternate branch circuit for energization of the motor so that drive of chain 42 is not interrupted. As the block of paper reaches the position 52 of Figures 1 and 2, this opens switch Sw5 in both of its branches, thereby stopping the motor and maintaining it deenergized until the block of paper is removed from location 52, as for operation by trimming press 70.

As the paper advances to position in which it no longer overlies switch Sw2 solenoid Sol1 will again be energized moving valve V1 into position to interconnect line L5 with exhaust vent E1 and thus restoring valve V3 to the position illustrated in Figures 9 and 12. Solenoid Sol2 will also be deenergized by this switch change and the cycle of operations will be repeated in regard to the movements of table 26, even while the previously removed block is being impelled by chain 42 and retained later at the ready station or location 52. However, when table 26 reaches the position illustrated in Figure 9 with a new block of paper and closes switch Sw6 on its next return movement, this will not operate motor 45 and chain 42 again until or unless switch Sw5 has again been permitted to close by removal of the previously deposited block from location 52.

While the invention has been described specifically only in relation to a single embodiment, persons skilled in the art will recognize that it may be modified and refined in various ways without departing from its inventive

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concepts, and I therefore wish it to be understood that this invention is not to be limited in interpretation except by the scope of the following claims.

I claim:

1. In an apparatus for removal of successive blocks of sheets from a tall stack of said fragile non-rigid sheets, the combination comprising a stationary table mounted above floor level in position to receive said sheets as they are fed forwardly from said stack, a vertically adjustable support within a well extending beneath the floor level and adapted to support said stack of sheets at successive upwardly adjusted positions in which the successive blocks of sheets to be removed from the top of said stack extend at a distance above floor level convenient for handling from an operating station behind said well, a shuttle table movable between a forward position in which its rear end is spaced forwardly of said stack and its forward end is adjacent and abutting said stationary table and with the top of said shuttle table being horizontally aligned with the top of said stationary table and a rearward position in which its rear end is in abutting sheet-receiving relation to said stack at the bottom of the block to be removed and its forward end is spaced rearwardly of said stationary table, means for reciprocating said shuttle table between said forward and rearward positions with continual movement therebetween, means for injecting air beneath said block of sheets to facilitate pushing the same from said stack to said shuttle table when said shuttle table is in its rearward position, and means for pushing said block of sheets forwardly from said shuttle table onto said stationary table after said shuttle table carrying sheets thereon reaches said forward position, said means for reciprocating said shuttle table including means responsive to the presence of a block of sheets thereon to cause the forward movement of said shuttle table, and means responsive to removal of said block of sheets forwardly thereof to return said shuttle table to its rearward position, and said means for pushing said block of sheets forwardly from said shuttle table onto said stationary table including means responsive to the removal of a previously delivered block of sheets from said stationary table to cause said pushing movement.

2. An apparatus as defined in claim 1, in which said shuttle table is provided with forward stop means for limiting the forward position of paper pushed upon said shuttle table from said stack, and including means responsive to movement of said shuttle table to said forward position for retracting said stop means, and means responsive to movement of said shuttle table rearwardly for projecting said stop means above the supporting surface of said shuttle table.

3. An apparatus as defined in claim 1, in which said means for pushing said sheets forwardly from said shuttle table is a chain having a forwardly advancing run located beneath a longitudinal slot in said shuttle table,

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said chain having pusher bars projecting therefrom through said slot into pushing relationship with sheets deposited upon said table.

4. An apparatus as defined in claim 1, in which said means for pushing said sheets forwardly from said shuttle table also includes means responsive jointly to the presence of paper upon said shuttle table and to the forward location of said shuttle table adjacent said stationary table to cause said pushing movement.

5. In an apparatus for removal of successive blocks of fragile non-rigid sheets from a stack of said sheets, the combination comprising a stationary table mounted above floor level in position to receive said sheets as they are fed forwardly from said stack, a vertically adjustable support within a well extending beneath the floor level and adapted to support said stack of sheets at successive upwardly adjusted positions in which the successive blocks of sheets to be removed from the top of said stack extend at a distance above floor level convenient for handling from an operating station behind said well, a shuttle table movable between a forward position in which its rear end is spaced forwardly of said stack and its forward end is adjacent and abutting said stationary table and with the top of said shuttle table being horizontally aligned with the top of said stationary table and a rearward position in which its rear end is in abutting sheet-receiving relation to said stack at the bottom of the block to be removed and its forward end is spaced rearwardly of said stationary table, means for reciprocating said shuttle table between said forward and rearward positions with a continual movement therebetween, means responsive to completion of the rearward movement of said shuttle table to position adjacent said stack to maintain said shuttle table at said rearward position until said transfer of sheets from said stack onto said shuttle table, means responsive to removal of sheets from said stack to said shuttle table for conditioning said shuttle table moving means to impart a continual forward movement to said shuttle table, and means for removing from said shuttle table sheets carried forwardly thereby from said stack.

6. An apparatus as defined in claim 5, in which said means for removing said sheets from said shuttle table is responsive to removal of previously delivered sheets from the location to which they have been removed from said shuttle table by said removing means.

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