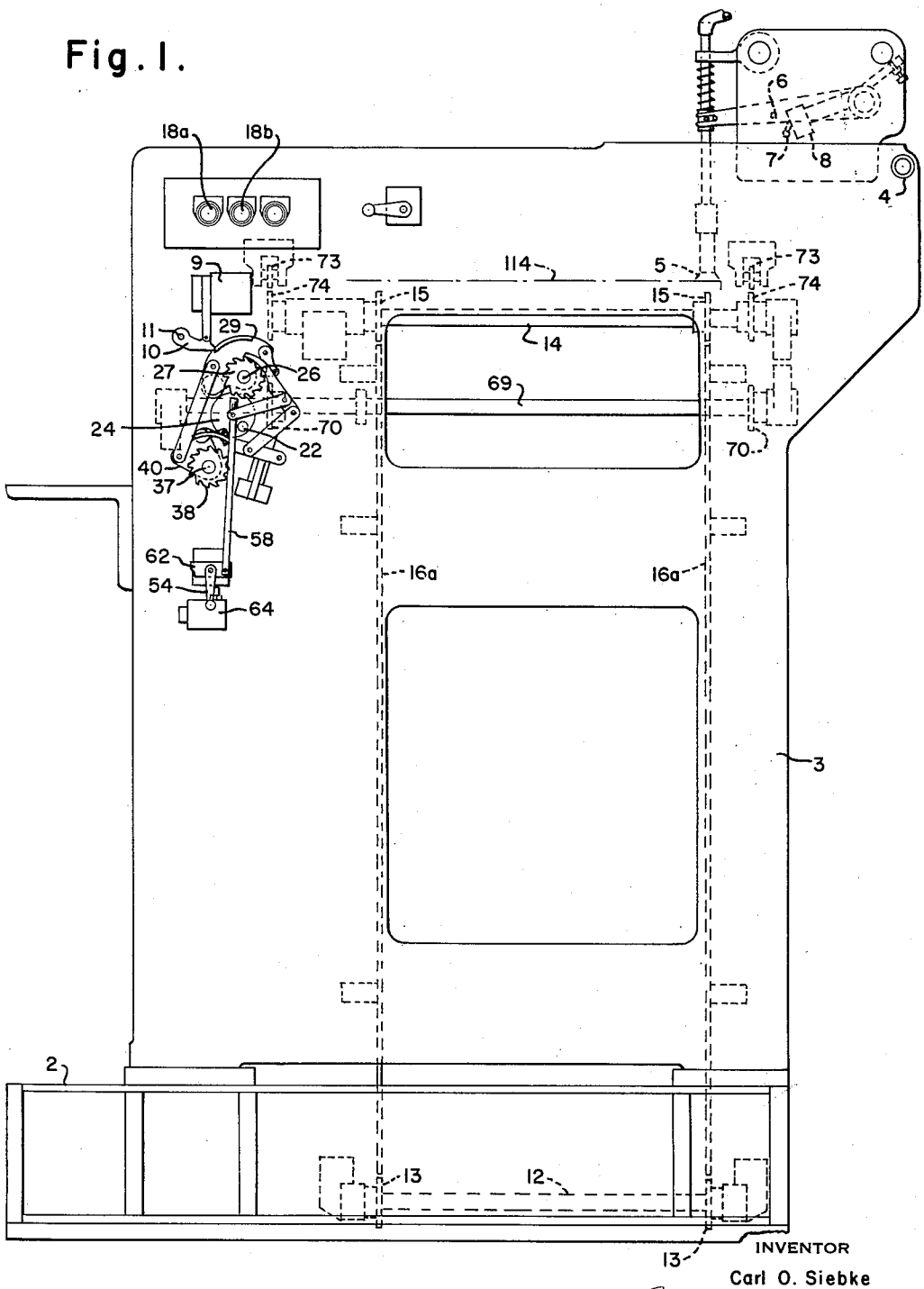
June 16, 1964 C. O. SIEBKE 3,137,498

SHEET FEEDER

Filed May 9, 1962

5 Sheets-Sheet 1

Fig. 1.



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his attorneys

June 16, 1964 C. O. SIEBKE 3,137,498

SHEET FEEDER

Filed May 9, 1962 5 Sheets-Sheet 2

Fig. 2.

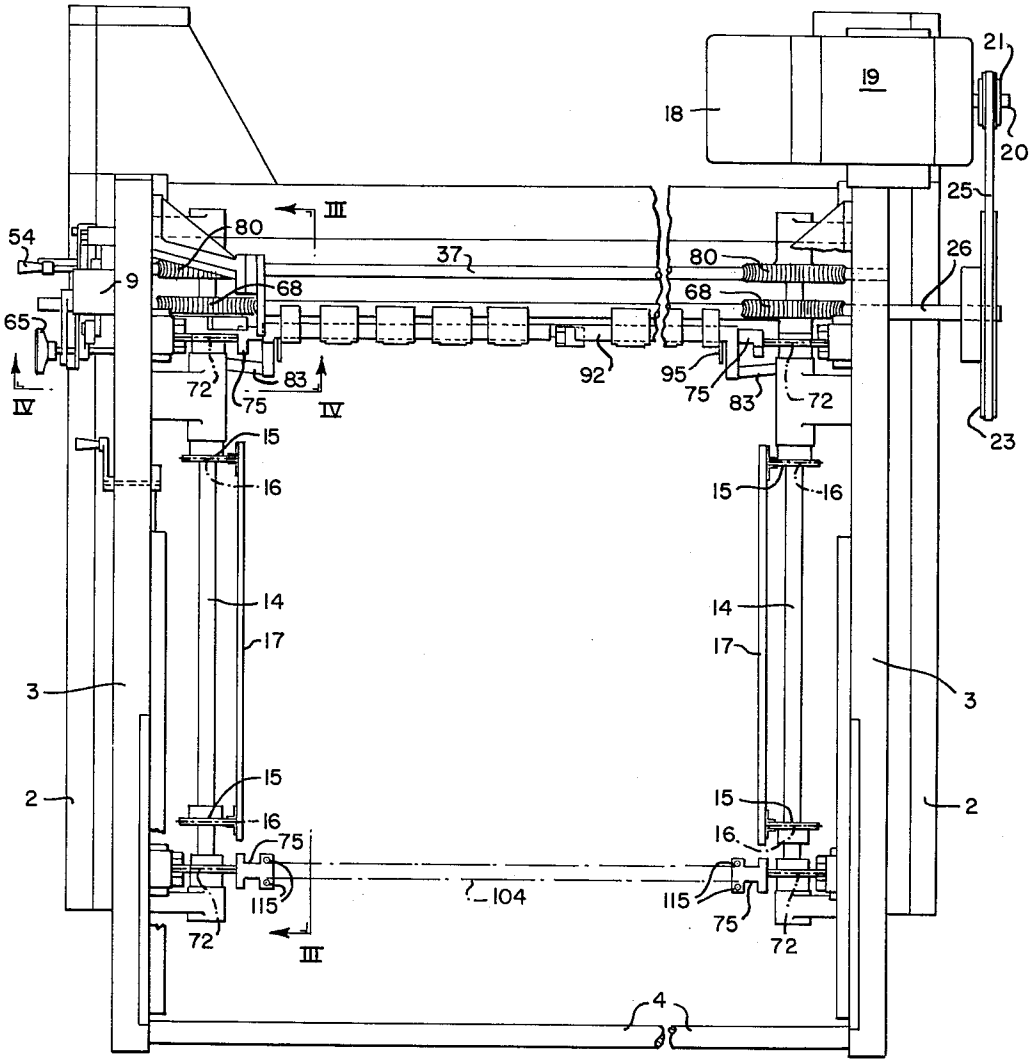
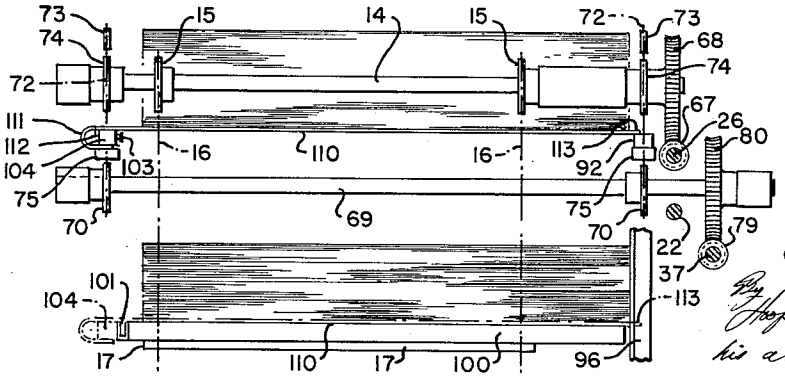


Fig. 3.



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SHEET FEEDER

Filed May 9, 1962

5 Sheets-Sheet 3

Fig. 4.

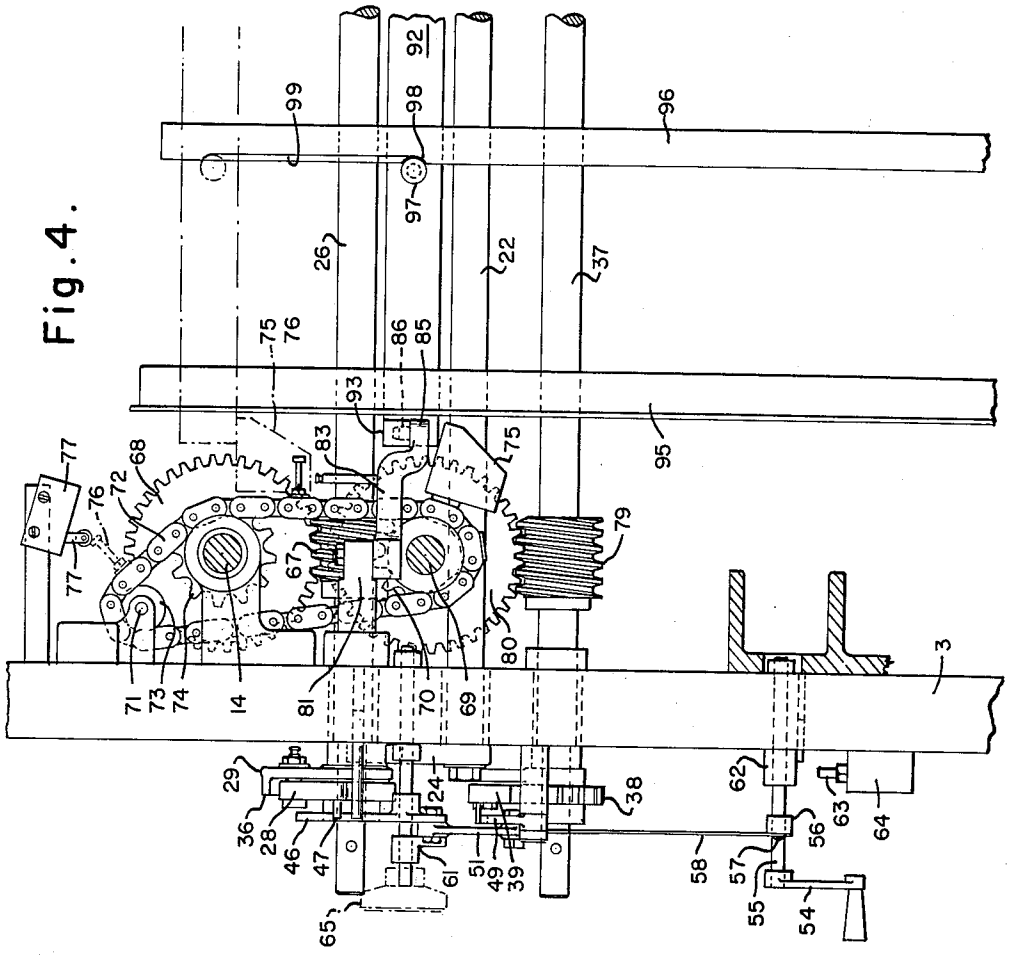
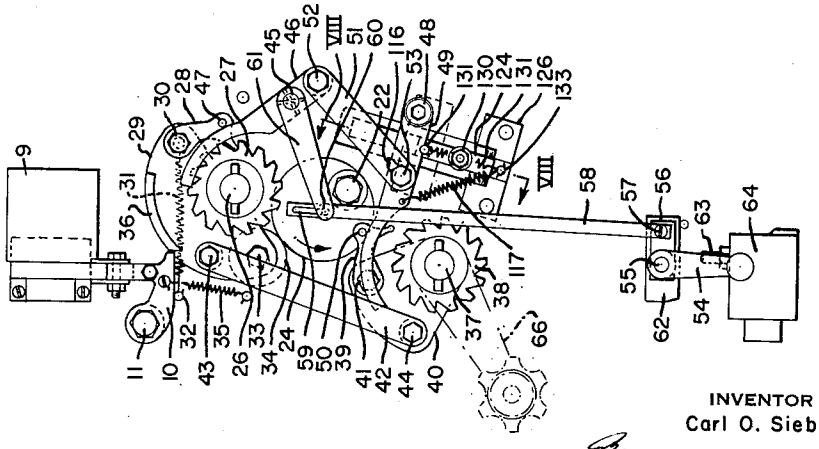


Fig. 5.



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June 16, 1964 C. O. SIEBKE 3,137,498

SHEET FEEDER

Filed May 9, 1962 5 Sheets-Sheet 4

Fig. 7.

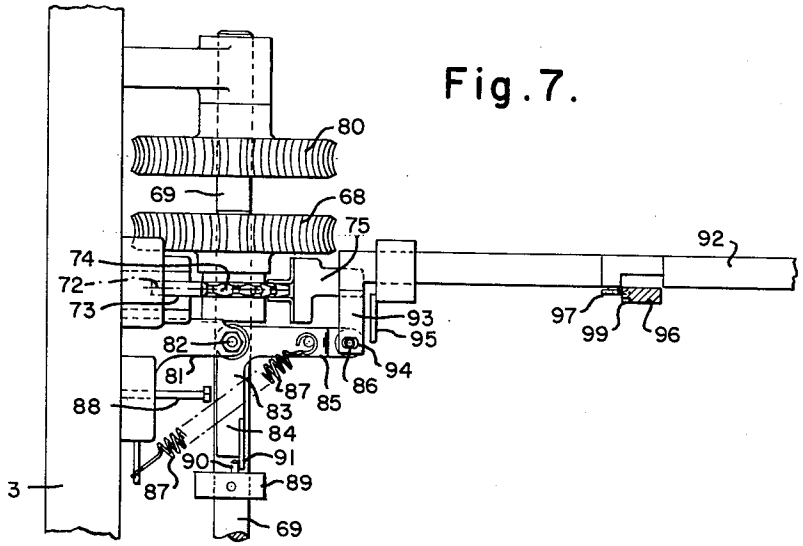


Fig. 8.

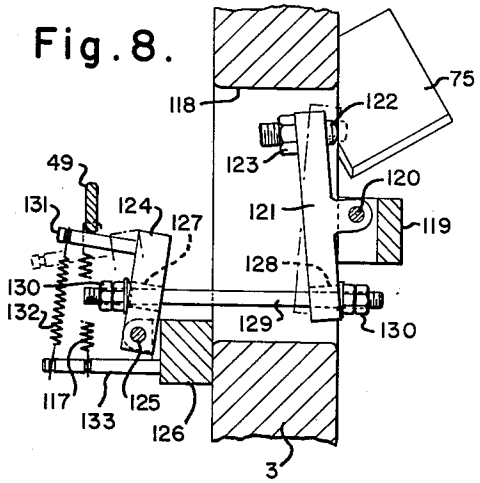
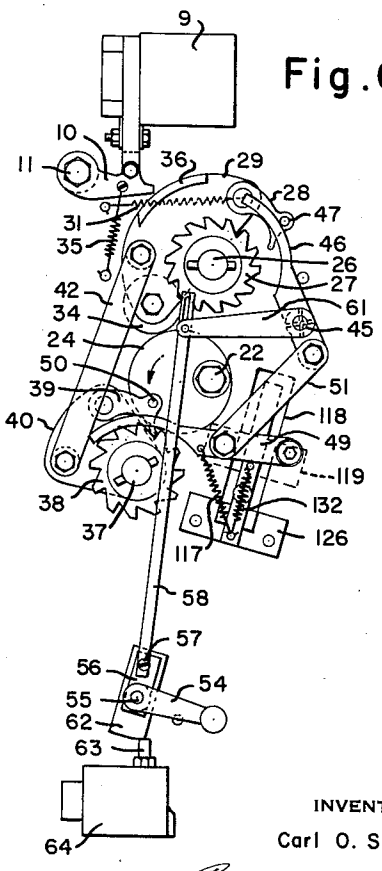


Fig. 6.



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C. O. SIEBKE

3,137,498

SHEET FEEDER

Filed May 9, 1962

5 Sheets-Sheet 5

Fig. 10.

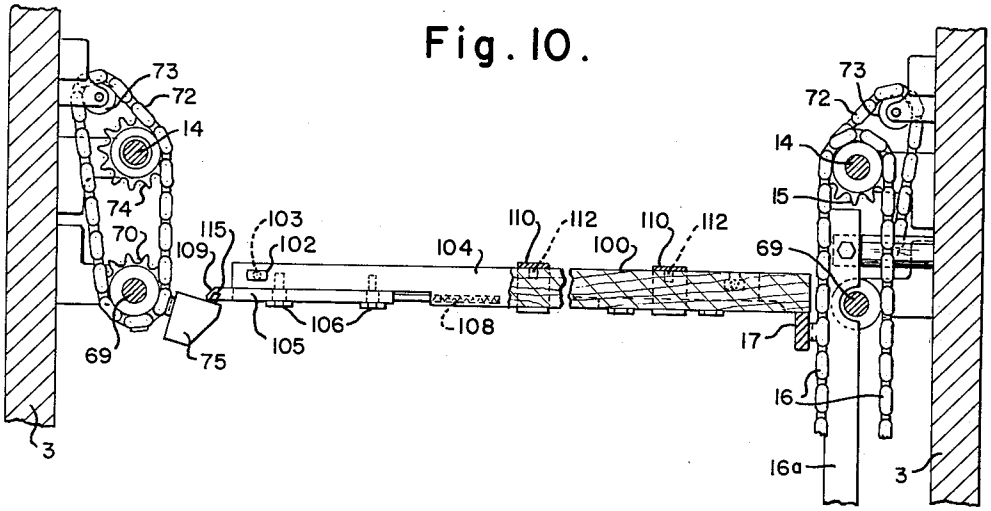
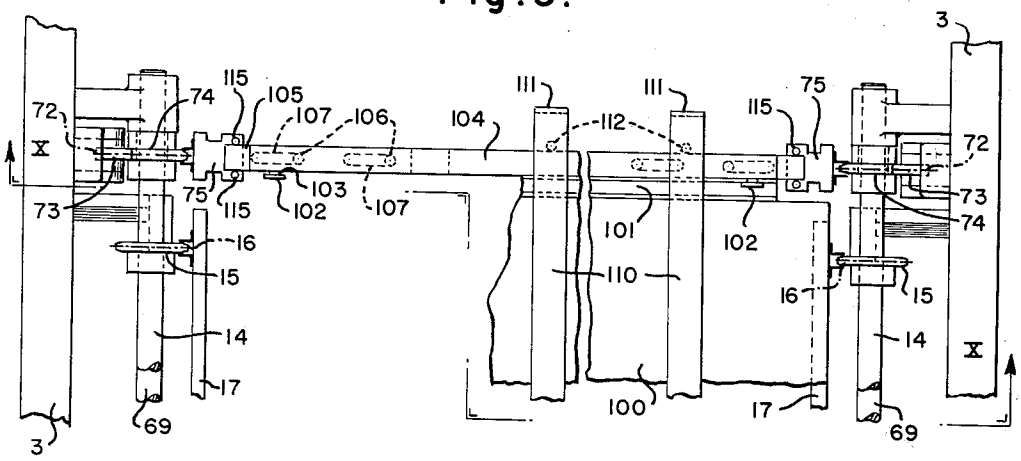


Fig. 9.



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United States Patent Office 3,137,498 Patented June 16, 1964

3,137,498

SHEET FEEDER

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Filed May 9, 1962, Ser. No. 193,549
20 Claims. (Cl. 271—62)

This invention relates to a sheet feeder and particularly to a sheet feeder for use in conjunction with a sheet press, such as a printing press, cutting and creasing press or the like, which is of the continuous type in that it is not necessary to stop the press from time to time to introduce a new pile of sheets.

My sheet feeder comprises means for successively introducing new piles of sheets while the press and feeder continue to operate without interruption. Each pile of sheets is slowly raised in the feeder as sheets are taken from the top of the pile by means which for present purposes may be deemed to be conventional so that each top sheet as it is taken and forwarded to the press is at substantially a predetermined height. The sheets are taken one by one from the top of the pile and forwarded to the press wherein they are printed upon, and the printed sheets are removed from the press by a delivery in which they are piled up. Provision is made for removing the piled up sheets in the delivery without stopping the press so the operation is continuous so long as there is a supply of sheets.

As above indicated, the means for taking and forwarding the sheets from the top of the pile of sheets in the feeder may be conventional and do not constitute the present invention. So far as the present invention is concerned the sheets may be forwarded singly or in a stream, i.e., with the trailing portion of each sheet overlapping the leading portion of the following sheet. While the sheet feeder herein disclosed is a stream feeder the invention is not limited in respect of the manner of forwarding the sheets, i.e., whether singly or in an overlapping stream.

Pile carrying means carrying a pile of sheets are raised in the feeder by primary raising means until the pile carrying means approach the level at which sheets are taken from the top of the pile of sheets. The pile carrying means may comprise a main pile support and supplemental pile supporting means supported by the main pile support. When the pile carrying means approach the level at which sheets are taken from the top of the pile of sheets the supplemental pile supporting means with the remains of the pile thereon are taken from the primary raising means by secondary raising means which continue to raise the same as sheets are taken from the top of the remains of the pile. This frees the primary raising means with the main pile support thereon which can be lowered while the supplemental pile supporting means with the remains of the pile of sheets thereon are being raised at the top of the feeder by the secondary raising means. The primary raising means can then be provided with pile carrying means carrying a new pile of sheets and raised relatively rapidly until the top of the new pile of sheets directly underlies the bottom of the remains of the original pile whereupon the supplemental pile supporting means supporting the remains of the orginal pile may be withdrawn consolidating into a single composite pile the new pile and the remains of the original pile. The composite pile is then raised by the primary raising means until the pile carrying means carrying the composite pile approach the level at which sheets are taken from the top of the pile at which time the cycle as above described is repeated. The cycle is repeated indefinitely so long as a supply of sheets is available and the sheets are to be similarly printed.

The primary and secondary raising means may take various forms. In the form of the invention shown in the drawings the primary raising means comprise four endless chains arranged in opposed pairs with one pair at each side of the pile carrying means, all four chains being driven synchronously so that in normal operation their inner reaches move upwardly together at the same speed. Means are provided on the inner reaches of the chains as they move upwardly for supporting and raising pile carrying means carrying a pile of sheets. In the drawings opposed bars carried by the respective pairs of chains are shown correspondingly positioned at the respective sides of the feeder. The bars at each side of the feeder are supported by and span the space between the chains at that side. A main pile support or feed board may be supported on the opposed bars. I desirably mount upon the outer edge of the feed board a removable transverse bar which may form part of supplemental pile supporting means, and I preferably lay on the feed board and the removable transverse bar mounted thereon a plurality of tines also constituting part of the supplemental pile supporting means, the tines extending lengthwise of the feeder or in the direction of feed of the sheets and having their forward ends projecting beyond the forward edge of the feed board. The pile of sheets is disposed atop the tines.

When the feed board with the transverse bar and tines disposed thereon supporting a pile of sheets approaches the level at which sheets are taken from the top of the pile of sheets the secondary raising means take the bar and the tines with what remains of the pile of sheets thereon from the feed board and continue the upward movement of the bar, the tines and the remains of the pile, while the chains carrying the bars above referred to are driven in reverse direction to lower the bars with the feed board thereon to receive other pile carrying means with a new pile of sheets thereon.

In the upper portion of the feeder the remains of the original pile are raised by secondary raising means which are shown as comprising four relatively short chains positioned generally similarly to the chains of the primary raising means above referred to. The two pairs of relatively short chains of the secondary raising means have similarly positioned inwardly projecting support brackets. Until the pile carrying means reach a predetermined height the support brackets are withdrawn laterally from the path of the pile carrying means. This is done by operating the chains of the secondary raising means in reverse direction, i.e, so that their inner reaches move downwardly, until the support brackets turn outwardly about the axis of the lower sprockets about which the chains are trained. After the pile carrying means have moved upwardly past the lower ends of the chains of the secondary raising means those chains are operated in their forward direction (i.e., their inner reaches are moved upwardly) to project the support brackets into the path of the removable transverse bar carried by the feed board, and upon continued upward movement of the inner reaches of the chains the support brackets move upwardly and engage the under surface of the transverse bar adjacent its respective ends. At the same time a transverse members disposed adjacent the inner edge of the pile carrying means is engaged by means on the chains of the secondary raising means adjacent the inner edge of the pile carrying means and is moved into position to underlie the forward ends of the tines which project beyond the forward edge of the feed board and also moves upwardly along with the chains. Thus the transverse bar which supports the

outer ends of the tines is supported by the outer chains of the secondary raising means through the support brackets and the transverse member underlying and supporting the inner ends of the tines is supported by the inner chains of the secondary raising means. Consequently the secondary raising means takes the transverse bar and tines and the remains of the pile carried thereby from the feed board supported by the primary raising means whereupon the primary raising means are freed to move in the reverse direction as above indicated. The same feed board may be used continuously if desired although it may be more convenient to use a plurality of feed boards. In any event at least two of the removable transverse bars and at least two sets of tines are required since the new pile must be supported upon a feed board having a removable transverse bar and tines applied to it while the previously used bar and set of tines are still functioning to support and raise the remains of the previous pile of sheets.

Sensing means are provided for sensing the height of the top of the pile of sheets at the point where sheets are taken from the pile and forwarded to the press. The sensing means may be conventional. I provide means adapted to be selectively operatively connected with the sensing means for operating the primary and secondary raising means respectively to raise the pile carrying means. I provide driving means and means adapted to be operatively connected with the driving means to drive either the primary raising means or the secondary raising means as desired to raise the pile support. I provide shiftable means which in one position dispose the means for operating the primary raising means in operative relationship to the driving means and in another position dispose the means for operating the secondary raising means in operative relationship to the driving means. In each case operation of the raising means is controlled by the sensing means.

When pile carrying means with a pile of sheets thereon have been moved upwardly to a position above the support brackets and the transverse member for supporting the projecting forward ends of the tines the secondary raising means are preferably operated by hand until the support brackets are in supporting relationship to the ends of the removable transverse bar carried by the feed board and the transverse member is in supporting relationship to the projecting forward ends of the tines. At that time the shiftable member is shifted and the transverse bar and the tines and the remains of the pile supported thereby are supported and raised automatically by the secondary raising means under control of the sensing means.

When the primary raising means have been freed of the removable transverse bar and tines carrying the remains of the pile the primary raising means may be rapidly moved in reverse to position to receive a new pile of sheets by means such as an electric motor suitable connected thereto. Safety means are provided for rendering the electric motor inoperative when pile carrying means are being raised in normal operation by the primary raising means.

After a new removable transverse bar, a new set of tines and a new pile of sheets have been disposed on the feed board in the pile receiving position or a new feed board with such a bar and tines applied thereto and with a new pile of sheets thereon is substituted for the original feed board the primary raising means are operated to rapidly raise such pile carrying means with the new pile of sheets thereon until the top sheet of the new pile presses against the under side of the tines supporting the remains of the previous pile. Immediately thereupon the shiftable member is shifted to place the control of the pile carrying means in the primary raising means. The tines are pulled out forming the composite pile and the secondary raising means are moved manually in the reverse direction to retract the support brackets and the transverse member to permit the pile carrying means carrying the new pile to move past them as such pile carrying means and pile progress upwardly in the feeder.

Means are provided for rendering inoperative all power means for operating the primary raising means when during servicing of the feeder it is desired to apply a handle or crank to the driving shaft for the primary raising means to move the same by hand.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings I have shown a present preferred embodiment of the invention in which

FIGURE 1 is a side elevational view from the operator's side of a feeder embodying my invention, some parts of the feeder not essential to disclosure of the invention being omitted;

FIGURE 2 is a top plan view of the feeder, similarly omitting parts not essential to disclosure of the invention;

FIGURE 3 is a somewhat diagrammatic elevational view, taken generally along the line III—III of FIGURE 2, for the purpose of illustrating how a new pile of sheets is introduced and raised in the feeder to be consolidated with the remains of the preceding pile to form a composite pile;

FIGURE 4 is a fragmentary enlarged detail view taken along the line IV—IV of FIGURE 2;

FIGURE 5 is an enlarged detail view of a portion of the structure shown in FIGURE 1, the parts being shown in the position they occupy when the primary raising means for raising the pile supporting means are operative;

FIGURE 6 is a view similar to FIGURE 5 but showing the parts in the position they occupy when the secondary raising means for raising the pile supporting means are operative;

FIGURE 7 is a fragmentary plan view of a portion of the structure shown in FIGURE 4 but omitting some parts for a clearer showing of other parts;

FIGURE 8 is a fragmentary enlarged cross-sectional view taken along the line VIII—VIII of FIGURE 5;

FIGURE 9 is a fragmentary plan view to enlarged scale of a portion of the structure shown in FIGURE 2; and

FIGURE 10 is a vertical cross-sectional view taken along the line X—X of FIGURE 9.

Referring now more particularly to the drawings, the feeder is mounted on opposed portions **2** of the press frame, the feeder itself having side frame members **3** connected together by suitable transverse members one of which is shown at **4**. The feeder frame structure and its connection with the press may be conventional wherefore details thereof not necessary to disclosure of the invention are not shown.

The feeder has means such as are shown in Patent No. 3,006,638 for separating sheets one by one from the top of the pile of sheets on the pile carrying means of the feeder and forwarding the sheets to the press. Such means include sensing means shown as comprising a sucker **5** cyclically operable in conventional manner to separate sheets one by one from the top of the pile of sheets and start the sheets toward the press in a stream, i.e., with the trailing portion of each sheet overlapping the leading portion of the next lower sheet. The sheets are then taken by other means which may be conventional.

On each feeding cycle the sensing means move downwardly into engagement with the top of the pile. When the top of the pile is above a predetermined height the pile remains stationary. When the top of the pile falls below such predetermined height the member **6** carried by an element connected and movable with the sensing means operates an arm **7** to close a switch **8** which ener-

gizes a solenoid 9 to draw upwardly a detent 10 in counterclockwise turning movement about the pivot 11 resulting in raising of the pile carrying means by means presently to be described. Everything thus far described may be conventional and is disclosed in said Patent No. 3,006,638.

The feeder has mounted for rotation on the inside of each side frame member 3 near the bottom thereof a horizontal shaft 12 carrying spaced sprockets 13. The feeder also has mounted for rotation on the inside of each side frame member 3 near the top thereof a horizontal shaft 14 to which are fixed spaced sprockets 15. Endless sprocket chains 16 are trained about the sprockets 13 and 15 and carry bars 17 at spaced intervals for supporting and raising pile carrying means. The chains 16 and bars 17 are the primary raising means in the structure shown in the drawings. The chains 16 have the outer faces of their inner reaches disposed against back-up bars 16*a*.

The feeder has a cross shaft 22 which is continuously rotated through a connection with the press drive in conventional manner. Since such means for continuously rotating the cross shaft 22 are well known to those skilled in the art they are not shown in the drawings. The shaft 22 has fixed thereto an eccentric cam 24 which is disposed outside the feeder frame at the operator's side. In operation the shaft 22 and the eccentric cam 24 fixed thereto rotate continuously.

A transverse shaft 26 has fixed thereto a ratchet 27 with which cooperates a pawl 28 to turn the ratchet 27 and hence the shaft 26 in the clockwise direction viewing, for example, FIGURE 5. Mounted upon the shaft 26 for limited turning movement about the axis of that shaft is a collar 29 to which the pawl 28 is pivoted at 30. A tension coil spring 31 is biased between a point on the collar 29 adjacent the pivotal connection thereto at 30 of the pawl 28 and a point 32 on the machine frame so that the collar 29 is at all times urged by the spring 31 to turn in the counterclockwise direction viewing FIGURE 5 about the axis of the shaft 26. Mounted on the collar 29 at 33 is a cam following roller 34. The cam following roller 34 is adapted to bear against the cam 24 and to be urged thereagainst when the roller 34 and the cam 24 are in engagement with each other as shown in FIGURE 5 by the spring 31.

The mechanism thus far described would cause the eccentric cam 24 to oscillate the collar 29 through a limited angle about the axis of the shaft 26 when the pawl 28 is disposed in cooperative relationship with the ratchet 27. Upon turning of the collar 29 in the counterclockwise direction viewing FIGURE 5 the pawl 28 will ride up over the teeth of the ratchet 27 but when the collar turns in the clockwise direction the pawl 28 engages with the teeth of the ratchet 27 and turns the ratchet and hence the shaft 26 in the clockwise direction.

The cam following roller 34 is allowed to follow the cam 24 when the cam is disposed generally downwardly relative to the axis of the shaft 22 viewing FIGURE 5 only when the detent 10 is drawn upwardly by the solenoid 9. A spring 35 urges the detent 10 downwardly so the detent is always in the position shown in FIGURE 5 when the switch 8 is open. When the switch 8 is closed the detent 10 is as above described drawn upwardly against the action of the spring 35. When the detent 10 is in the position shown in FIGURE 5 it is disposed opposite a stop member 36 on the collar 29 and hence prevents operative turning of the collar 29. However, when the detent 10 is drawn upwardly by closing of the switch 8 to the position shown in FIGURE 6 the collar 29 is free to turn allowing the roller 34 to follow the cam 24 resulting in turning of the shaft 26 through the pawl 28 and the ratchet 27 when the pawl 28 is disposed in cooperative relationship with the ratchet 27 as shown in FIGURE 5.

A transverse shaft 37 has fixed thereto a ratchet 38 with which cooperates a pawl 39 to turn the ratchet 38 and hence the shaft 37 in the clockwise direction viewing, for example, FIGURE 5. Mounted upon the shaft 37 for limited turning movement about the axis of that shaft is a collar 40 to which the pawl 39 is pivoted at 41. A link 42 is pivoted to the collar 29 at 43 and to the collar 40 at 44, the axes of the shafts 26 and 37 and of the pivots 43 and 44 forming a parallelogram so that whenever the collar 29 turns about the axis of the shaft 26 the collar 40 turns correspondingly about the axis of the shaft 37.

Because of the link connection between the collars 29 and 40 just described the detent 10 controls turning of the collar 40 about the shaft 37 just as it controls turning of the collar 29 about the shaft 26. Turning of the collar 40 about the shaft 37 causes the pawl 39 coacting with the ratchet 38 to turn the shaft 37 in the clockwise direction viewing FIGURE 5 when the pawl 39 is disposed in cooperative relationship with the ratchet 38.

For reasons which will presently appear the eccentric cam 24 should, when permitted to do so by raising of the detent 10 as above described, turn at any given time only one of the shafts 26 and 37. To that end I provide means for selectively rendering inoperative the pawls 28 and 39 so that the operator can determine which of the shafts 26 and 37 will be turned by operation of the cam 24.

Rotatably mounted in the feeder frame is a spindle 45 to which is fixed a lever 46 which as shown in FIGURE 5 underlies a pin 47 carried by the pawl 28. Pivoted to the feeder frame at 48 is a lever 49 which as shown in FIGURE 5 underlies a pin 50 carried by the pawl 39. A link 51 is pivoted to the lever 46 at 52. Near its opposite end the link 51 has a slot 116 through which passes a headed pin 53 carried by the lever 49. A spring 117 exerts downward pull on the lever 49 and normally maintains the pin 53 at the bottom of the slot 116 although permitting raising of the lever 49 so that the pin 53 moves up in the slot 116 under particular conditions to be described later. In normal operation the spring 117 maintains the pin 53 at the bottom of the slot 116 so that the practical effect is the same as though the link 51 were pivoted to the lever 49 by the pin 53 acting as a pivot and disposed at the lower end of the slot 116.

It will be seen that when one of the levers 46 and 49 is raised the other will be lowered and vice versa. Raising of the lever 46 causes through the pin 47 movement of the pawl 28 to inoperative position relatively to the ratchet 27. Similarly, raising of the lever 49 causes through the pin 50 movement of the pawl 39 to inoperative position relatively to the ratchet 38. In FIGURES 5 the pawl 28 is shown in operative position relatively to the ratchet 27 while the pawl 39 is shown in inoperative position relatively to the ratchet 38. The opposite is true in FIGURE 6 in which the pawl 39 is shown in operative position relatively to the ratchet 38 while the pawl 28 is shown in inoperative position relatively to the ratchet 27.

A crank 54 is fixed to a spindle 55 rotatably mounted in the feeder frame. Also fixed to the spindle 55 is an arm 56 which is pivoted at 57 to a rod 58. The rod 58 extends generally upwardly and has a slot 59 in its upper portion. A pin 60 carried by an arm 61 fixed to the spindle 45 is disposed in the slot 59.

When the crank 54 is in the position shown in FIGURE 5 the pawl 28 is in operative position relatively to the ratchet 27 and the pawl 39 is in inoperative position relatively to the ratchet 38 as above described. When the crank 54 is turned in the counterclockwise direction from the position of FIGURE 5 to the position of FIGURE 6 the rod 58 is moved upwardly. The pin 60 carried by the arm 61 bears against the lower end of the slot 59 and upward movement of the rod 58 causes turning of the lever 46 in the clockwise direction about the axis of

a spindle 45 and consequent raising of the lever 46 to move the pawl 28 to inoperative position relatively to the ratchet 27 and lowering of the lever 49 to move the pawl 39 to operative position relatively to the ratchet 38. Both of the pawls 28 and 39 tend to turn by gravity about their respective pivotal mountings 30 and 41 into operative position relatively to their respective ratchets 27 and 38 so each of the pawls will assume its operative position relatively to the corresponding ratchet when it is not positively moved to inoperative position by the corresponding lever 46 or 49. Thus when the crank 54 is turned back in the clockwise direction from the position of FIGURE 6 to the position of FIGURE 5 the pawl 28 moves to operative position relatively to the ratchet 27 and the pawl 39 is raised to inoperative position relatively to the ratchet 38 as shown in FIGURE 5.

Provision is made for rapidly turning the shaft 26 in either direction. A reversible electric motor 19 equipped with a magnetic brake 18 drives a shaft 20 carrying a pulley 21. The cross shaft 26 has a pulley 23 fixed thereto at the end thereof opposite the end carrying the eccentric cam 24. An endless belt 25 is trained about the pulleys 21 and 23 whereby the motor 19 may turn the shaft 26 rapidly in either direction under the control of the operator. The motor 19 may be operated in one direction by pressing a switch button 18*a* and in the opposite direction by pressing a switch button 18*b*. Each of the switch buttons is spring-pressed outwardly so that the motor operates only when the button is pressed inwardly against the spring action; as soon as pressure is released the button is moved outwardly by its spring, the switch opens and the motor stops. This applies to both of the switch buttons 18*a* and 18*b*.

When the crank 54 is in the position of FIGURE 5 the electrical circuit for driving the motor 19 is open and the motor cannot be operated in either direction. This is a safety device to prevent the operator from attempting to use the motor 19 to drive the shaft 26 in the counterclockwise direction when the pawl 28 is disposed in its operative position relatively to the ratchet 27. However, when the crank 54 is in the position of FIGURE 6 the motor circuit is rendered operative by engagement of an arm 62 fixed to the spindle 55 with the contact member 63 of a switch 64 closing the switch, whereupon the motor may be operated by pressing one or the other of the switch buttons 18*a* and 18*b*. Thus when the pawl 28 is in inoperative position relatively to the ratchet 27 the shaft 26 may be motor-driven in either direction by the motor 19 but when the pawl 28 is in operative position relatively to the ratchet 27 the shaft 26 cannot be motor-driven.

At times it may be desired to apply a hand crank to the shaft 26 to turn it by hand. When that is to be done the spindle 45 is turned in the clockwise direction viewing FIGURE 5 by a knob 65 fixed to the end of the spindle which moves the pawl 28 to inoperative position relatively to the ratchet 27 while the circuit to the motor for driving the shaft 26 is open. Such turning of the spindle 45 causes the pin 60 carried by the arm 61 to move upwardly but due to the fact that the pin 60 is disposed in the slot 59 in the upper portion of the rod 58 that pin will simply move freely in the slot and will not operatively affect the position of the rod 58. Consequently when the shaft 26 is to be turned by hand both the motor for driving that shaft and the pawl for turning it are rendered inoperative.

A hand crank 66 may be applied to the shaft 37 to turn that shaft in either direction when the pawl 39 is in inoperative position relatively to the ratchet 38 or in the clockwise direction viewing FIGURE 5 even when the pawl 39 is in operative position relatively to the ratchet 38.

The shaft 26 has fixed thereto two worms 67 respectively beneath the shafts 14. Each shaft 14 has a worm wheel 68 fixed thereto and meshing with one of the worms 67. Turning of the shaft 26 in the clockwise direction viewing FIGURE 5 causes raising of the bars 17 on the inner reaches of the chains 16 and turning of the shaft 26 in the counterclockwise direction viewing FIGURE 5 causes lowering of the bars 17 on the inner reaches of the chains 16.

At the sides of the feeder parallel to and below the shafts 14 and directly opposite each other are shafts 69. Each shaft 69 has fixed thereto a sprocket 70. A short shaft 71 is mounted at the inside of the feeder at each side frame generally above but somewhat outwardly in relation to the shafts 69 and 14 at that side of the frame and in the same generally vertical transverse plane as each sprocket 70. Thus there are four sprockets 70, two on each shaft 69, and there are four short shafts 71 respectively positioned for cooperation with the respective sprocket 70 as will now be described.

An endless sprocket chain 72 is trained about each sprocket 70 and a guide roller 73 on the corresponding shaft 71 and also meshes with a guide sprocket 74 mounted for free turning movement on the corresponding shaft 14. The chains 72 at each side of the feeder are disposed respectively adjacent the front and rear of the feeder. The inner reach of each chain 72 is guided for vertical movement throughout most of its extent as shown in FIGURE 4 and at its upper portion is guided in an outwardly and upwardly inclined direction from the guide sprocket 74 to the guide roller 73.

Each of the four chains 72 has fastened thereto a support bracket 75 which when the inner reach of its chain 72 moves upwardly is adapted to be swung inwardly and upwardly below and about the axis of the corresponding shaft 69 to operative position as will presently be explained and which when the inner reach of its chain 72 moves downwardly is adapted to be swung downwardly and outwardly below and about the axis of the corresponding shaft 69 to inoperative position. One of the chains 72 also carries at a position spaced somewhat above its support bracket 75 a switch operating detent 76 adapted when it reaches the chain line position shown in FIGURE 4 to engage a switch operating lever 77 to open a switch 78 which opens the circuit to the solenoid 9 and hence acts as a safety device insuring the stopping of upward movement of the support brackets 75 beyond the chain line position shown in FIGURE 4.

The shaft 37 has fixed thereto two worms 79 respectively beneath the shafts 69. Each shaft 69 has a worm wheel 80 fixed thereto and meshing with one of the worms 79. Turning of the shaft 37 in the clockwise direction viewing FIGURE 5 causes upward movement of the inner reaches of the chains 72 and consequent movement of the support brackets 75 from inoperative to operative position and turning of the shaft 37 in the counterclockwise direction viewing FIGURE 5 causes downward movement of the inner reaches of the chains 72 and consequent movement of the support brackets 75 from operative to inoperative position. In FIGURE 4 one of the support brackets 75 is shown in solid lines moving into operative position as the inner reach of its chain 72 moves upwardly. The support brackets 75 form part of the secondary raising means and function as will presently be described.

At the inside of each side frame member 3 at the front or forward portion of the feeder is a bracket 81 to which is pivoted at 82 for horizontal turning movement a double-armed lever 83 having a generally longitudinally disposed arm 84 and a generally transversely disposed arm 85. The arms 85 of the opposed levers 83 project inwardly toward each other at the opposite sides of the feeder. Each of those arms has at its inner end a gooseneck provided with an upwardly projecting pin 86 as shown in FIGURE 4. At each side of the feeder a tension coil spring 87 is biased between the lever 83 at that side of the feeder and the corresponding side frame member 3 tending to turn the lever 83 in such a direction that its arm 85 moves rearwardly of the feeder. A stop member 88 carried by the side frame member at each side of the feeder limits the extent of turning of the lever

83 at that side under action of the corresponding spring 87.

Each shaft 69 has at its forward portion a collar 89 from which projects forwardly a pin 90 disposed adjacent the periphery of the collar and which is therefore eccentric with respect to the axis of the shaft 69 upon which the collar is mounted. The arm 84 of the corresponding lever 83 has a projecting portion 91 which bears outwardly against the pin 90 at that side of the feeder. With the shaft 69 in the position shown in FIGURE 7 the pin 90 restrains the lever 83 from turning under the action of the spring 87 in the clockwise direction. As the shaft 69 turns in a direction such that the pin 90 moves to the left viewing FIGURE 7 the spring 87 turns the lever 83 in the clockwise direction until such turning movement is limited by engagement of the lever with the stop member 88. Thereafter further turning of the shaft 69 is unaccompanied by further movement of the lever 83 and the pin 90 moves away from the portion 91 of the arm 84 of the lever. Upon reverse movement of the shaft 69 the pin 90 engages the projecting portion 91 of the arm 84 and moves the lever 83 back to the position shown in FIGURE 7. Similar structure is provided at both sides of the feeder.

The feeder has at its forward portion a cross bar 92 having at each of its ends a rearwardly extending arm 93 having a transversely elongated slot 94 therein. Rearwardly of the bar 92 are paper guides 95 and 96, the former having side guiding means for guiding the sides of a pile of sheets adjacent the forward face of the pile. With respect to the paper guides and the bar 92 the feeder is symmetrical about its longitudinal center line. At each side of the center of the bar 92 the bar has a rearwardly projecting headed pin 97 disposed immediately adjacent one of the paper guides 96. The paper guide has at its edge a cutout portion 98 (see FIGURE 4) to permit a portion of the head of the headed pin 97 to pass therethrough. The paper guide 96 also has a groove 99 formed in a corner thereof communicating with the cutout portion 98 so that when the head of the headed pin 97 moves through the cutout portion 98 and the bar 92 then moves upwardly the head of the headed pin 97 will ride up in the groove 99, the portion of the paper guide 96 in front of the head of the pin being embraced in guiding relationship between the bar 92 and the head of the pin. This structure is duplicated at opposite sides of the center line of the feeder, the headed pin in each case being disposed toward the outside, i.e., toward the nearer side frame member of the feeder. The result is that upon upward movement of the bar 92 relatively to the paper guides 96 the bar will be guided by the paper guides and maintained in proper orientation. Upon downward movement of the bar to the position shown in FIGURE 4 the heads of the headed pins 97 move down in the grooves 99 until they reach positions in line with the cutout portions 98 whereupon movement of the bar 92 toward the front of the feeder is provided for.

As the inner reaches of the chains 72 move upwardly the pins 90 at the opposite sides of the feeder move outwardly or toward the side frame members resulting in rearward movement of the bar 92 as just described. Upon continued upward movement of the inner reaches of the chains 72 accompanied by upward movement of the support brackets 75 the two opposed support brackets 75 carried by the two opposed forward chains 72 come up underneath the ends of the bar 92 and move the bar upwardly along with the chains 72. Thus it will be seen that as the inner reaches of the forward chains 72 move upwardly the bar 92 first moves rearwardly and then moves upwardly with the chains, being guided in its upward movement by the paper guides 96 as above described. Upon reverse movement of the chains 72 the bar 92 moves downwardly to the elevation shown in FIGURE 4 whence it is free to move forwardly as the pins 90 push ahead of them the portions 91 of the arms 84.

As the bars 17 move upwardly at the lower portion of the feeder they are adapted to support and carry upwardly with them pile carrying means comprising a main pile support in the form of a feed board 100 the side edges of which rest upon the respective bars 17 which are disposed at the same elevation and move upwardly together. The rear edge of the feed board 100 has two laterally spaced apart upwardly open slotted pockets 101 adapted to receive the heads 102 of headed bolts 103 projecting forwardly from a transverse bar 104 whereby the bar 104 may be applied to the feed board 100 at the rearward edge of the feed board by positioning the bar along the edge of the feed board and lowering it so that the heads 102 of the headed bolts 103 are received in the pockets 101, the shanks of the bolts moving downwardly in the slots of the pockets. When the bar 104 is thus applied to the feed board 100 its upper edge is preferably in the same horizontal plane as the upper face of the feed board.

At each end the bar 104 has a latch 105 mounted for longitudinal sliding movement along the bar 104 and guided for such movement by headed bolts 106 passing through slots 107 in the bar. Each latch 105 is resiliently urged to move toward the end of the bar by a compression coil spring 108. Each latch projects beyond the end of the bar proper and has its upper face adjacent its extremity bevelled as shown at 109. The latches constitute retractable end portions of the bar.

When a pile of sheets is to be moved upwardly in the feeder at the lower portion thereof a feed board 100 with a bar 104 applied to the rear edge thereof has a number of tines disposed upon the top of the feed board and extending rearwardly over and beyond the bar 104. One such tine is shown at 110 in FIGURE 3. Its rear end is reversely turned at 111 and it is provided with a pin 112 so that when the tine is laid atop the feed board 100 with the bar 104 applied thereto and moved forwardly its position is determined by engagement of the pin 112 with the bar 104. At such time the forward ends 113 of the tines project beyond the forward edge of the feed board 100. It will also be noted from FIGURE 3 that the forward ends 113 of the tines 110 extend slightly beyond the vertical transverse plane of the rear faces of the paper guides 96. Any suitable number of tines may be utilized and they will of course be positioned so that their forward ends are disposed in between the paper guides. At this point it should also be noted that when the chains 72 have been operated so that their inner reaches move downwardly and the support brackets 75 are withdrawn to inoperative position the rear face of the bar 92 is disposed slightly forwardly of the forward ends 113 of the tines 110.

A pile of sheets is disposed upon the feed board 100 having the bar 104 applied to its rear edge and having the tines 110 disposed upon the feed board and the bar as just described. The bar 104 and the tines 110 constitute supplemental pile supporting means. The pile of sheets is disposed so that its forward face is guided by the paper guides 95 and 96 and its side faces are additionally guided by the side guiding portions of the paper guides 95.

For the initial run of sheets being printed by use of a particular form the pile of sheets is disposed on a feed board 100 provided with the bar 104 and tines 110 as above described and the feed board is poistioned on the bars 17. With the crank 54 in the position of FIGURE 6 the feed board is rapidly raised by the motor 19 until the top sheet is at substantially the elevation of the line 114 in FIGURE 1. Thereupon the crank 54 is moved to the position of FIGURE 5 and the pile carrying means with the pile of sheets thereon is automatically raised step by step by the shaft 26 and associated mechanism

as above described as sheets are fed from the top of the pile. When the pile carrying means with the pile thereon have moved upwardly in the feeder and the pile has been depleted to the extent that the supplemental pile supporting means, i.e., the bar **104** and the tines **110**, are above the level of the bar **92** the operator turns the hand crank **66** to move the support brackets **75** to positions immediately underlying the bars **104** and **92** whereupon the crank **54** is moved to the position of FIGURE 6 which allows pawl **39** to move ratchet **38** and thereby cause the supplemental pile supporting means to be supported by brackets **75** and bars **92** and **104** as above described. The supplemental pile supporting means with the remains of the pile thereon continue to move upwardly as sheets are fed from the top of the pile. The bar **92** supporting the forward ends of the tines is raised by the forward support brackets **75** and the bar **104** supporting the rear ends of the tines is raised by the rear support brackets **75**. The bar **104** and the tines **110** with the remains of the pile of sheets thereon are raised from the feed board **100**, the feed board remaining stationary on the bars **17** as the secondary raising means raise the supplemental pile supporting means with the remains of the pile thereon.

After the secondary raising means have taken the supplemental pile supporting means with the remains of the pile thereon the main pile support, i.e., the feed board **100**, is moved rapidly downwardly by use of the motor **19** and is provided with another bar **104** and tines **110** identical with the original bar and tines, or if deemed preferable a different feed board provided with a bar **104** and tines **110** may be substituted for the original feed board. In either case a new pile of sheets is disposed on the thus constituted pile carrying means and the pile carrying means with the new pile thereon is raised rapidly by the motor **19** until the top of the new pile is against the under side of the tines **110** supporting the remains of the original pile. Thereupon the crank **54** is moved to the position of FIGURE 5 and the tines are withdrawn, forming a composite pile out of the remains of the original pile and the new pile, the composite pile being supported and raised by the primary raising means. Thereupon by use of the hand crank **66** the chains **72** are operated so that their inner reaches move downwardly to return the bar **92** to its initial position and move the support brackets **75** to inoperative position. When the supplemental pile supporting means again move up to an elevation above that of the bar **92** the cycle is repeated as above described.

The latches **105** are provided on the bar **104** to avoid damage in the event that the bar **104** attains the elevation of the rear support brackets **75** when those support brackets are not fully retracted to inoperative position, i.e., out of the path of the bar **104** including the latches **105** projecting from the end of the bar. If the rear support brackets **75** are in the paths of the latches **105** as the bar **104** mounted on a feed board moves upwardly the latches will be cammed back toward the center of the bar **104** by engagement of the support brackets with the bevelled end surfaces **109** of the latches enabling the bar **104** to move upwardly past the support brackets **75** even when the latter are not fully retracted out of the path of the bar **104**.

The rear support brackets **75** are provided with pins **115** projecting upwardly therefrom and spaced apart a distance slightly greater than the width of the latches **105** so that when the support brackets pick up the bar **104** the pins **115** will be disposed on opposite sides of the latches **105** serving to guide the bar **104** and maintain it in place on the support brackets.

The side frame member **3** at the operator's side of the feeder has therethrough an opening **118** besides which is a bracket **119** to which is pivoted at **120** a rocking lever **121** having threaded through its upper end an adjustable contact screw maintained in fixed adjusted position relatively to the rocking lever **121** by a nut **123**. A generally upright lever **124** is pivoted outside the side frame member **3** at **125** to a bracket **126**. The lever **124** has therethrough an opening **127** and the lower end of the rocking lever **121** has therethrough an opening **128**. A double-ended bolt **129** passes through the openings **127** and **128** and has nuts **130** applied to its ends as shown in FIGURE 8. Projecting outwardly from the upper portion of lever **124** and underlying the lever **49** is a pin **131**. The pin **131** is normally urged downwardly by a coil spring **132** biased between the pin **131** and a pin **133** carried by the bracket **126** to which the lower end of the spring **117** is also connected. This causes the rocking lever to normally assume the chain line position in which it is shown in FIGURE 8.

When the rear support brackets **75** are moved fully to their inoperative positions as above described one of them, as shown in FIGURE 8, engages the adjustable contact screw **122** and rocks the rocking lever **121** from the chain line position of FIGURE 8 in which it is normally held by the spring **132** to the solid line position of that figure which turns the lever **124** about its pivot **125** to tilt upwardly the pin **131** and raise the lever **49** so that the pin **53** moves upwardly in the slot **116** insuring that the pawl **39** is inoperative to turn the shaft **37** even when the crank **54** is in the position of FIGURE 6. This is another safety feature to avoid damage to the apparatus.

While I have shown and described a present preferred embodiment of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. A sheet feeder comprising pile supporting means, primary raising means for raising the pile supporting means with a pile of sheets thereon as sheets are fed from the top of the pile of sheets, the primary raising means being constructed and arranged to raise the pile supporting means to a position approaching the level at which sheets are taken from the top of the pile of sheets, secondary raising means carried by the sheet feeder for raising the pile supporting means with the pile of sheets thereon, the secondary raising means being mounted in position laterally of the path of the pile supporting means when the pile supporting means are being raised to said position by the primary raising means, means for rendering the secondary raising means operative for raising the pile supporting means with the pile of sheets thereon when the pile supporting means are in said position, freeing the primary raising means from the pile supporting means, and means for lowering the primary raising means while the secondary raising means are raising the pile supporting means with the pile of sheets thereon.

2. A sheet feeder comprising pile supporting means, primary raising means for raising the pile supporting means with a pile of sheets thereon as sheets are fed from the top of the pile of sheets, the primary raising means being constructed and arranged to raise the pile supporting means to a position approaching the level at which sheets are taken from the top of the pile of sheets, secondary raising means carried by the sheet feeder for raising the pile supporting means with the pile of sheets thereon, the secondary raising means being mounted in position laterally of the path of the pile supporting means when the pile supporting means are being raised to said position by the primary raising means, means for moving the secondary raising means from the position thereof laterally of the path of the pile supporting means to dispose part thereof in the path of the pile supporting means rendering the secondary raising means operative for raising the pile supporting means with the pile of sheets thereon when the pile supporting means are in said position, freeing the primary raising means from the pile supporting means, means for lowering the primary raising

means while the secondary raising means are raising said pile supporting means with the pile of sheets thereon and for rapidly raising the primary raising means with other pile supporting means carrying another pile of sheets on the primary raising means until the top of the second mentioned pile of sheets approaches the level of the first pile supporting means and means for transferring the remains of the first mentioned pile of sheets onto the top of the second mentioned pile of sheets so that the composite pile of sheets thus formed may be raised by the primary raising means.

3. A sheet feeder comprising pile carrying means including a main pile support and supplemental pile supporting means supported by the main pile support, the supplemental pile supporting means comprising tines extending generally parallel to the side frames of the feeder and transversely extending means underlying the tines, primary raising means for raising the pile carrying means with a pile of sheets thereon as sheets are fed from the top of the pile of sheets, the primary raising means being constructed and arranged to raise the pile carrying means to a position approaching the level at which sheets are taken from the top of the pile of sheets, secondary raising means carried by the sheet feeder for raising the supplemental pile supporting means with the pile of sheets thereon, means for moving the secondary raising means to dispose part thereof under said transversely extending means rendering the secondary raising means operative for raising the supplemental pile supporting means with the pile of sheets thereon when the pile carrying means are in said position, freeing the primary raising means and the main pile support from the supplemental pile supporting means, and means for lowering the primary raising means and the main pile support while the secondary raising means are raising the supplemental pile supporting means with the pile of sheets thereon.

4. A sheet feeder comprising pile carrying means including a main pile support and supplemental pile supporting means supported by the main pile support, primary raising means for raising the pile carrying means with a pile of sheets thereon as sheets are fed from the top of the pile of sheets, the primary raising means being constructed and arranged to raise the pile carrying means to a position approaching the level at which sheets are taken from the top of the pile of sheets, secondary raising means carried by the sheet feeder for raising the supplemental pile supporting means with the pile of sheets thereon, the secondary raising means comprising support brackets mounted at the sides of the feeder for movement in a fixed path a portion of which intersects the path of the supplemental pile supporting means, operating means connected with the support brackets for positively moving the support brackets into said portion of the path thereof rendering the secondary raising means operative for raising the supplemental pile supporting means with the pile of sheets thereon when the pile carrying means are in said position, freeing the primary raising means and the main pile support from the supplemental pile supporting means, means for lowering the primary raising means and the main pile support while the secondary raising means are raising the supplemental pile supporting means with the pile of sheets thereon and for rapidly raising the primary raising means and the main pile support with another pile of sheets thereon until the top of the second mentioned pile of sheets approaches the level of the supplemental pile supporting means whereupon the supplemental pile supporting means may be withdrawn transferring the remains of the first mentioned pile of sheets onto the top of the second mentioned pile of sheets so that the composite pile of sheets thus formed may be raised by the primary raising means.

5. A sheet feeder comprising pile carrying means including a main pile support and supplemental pile supporting means supported by the main pile support, the supplemental pile supporting means having portions projecting generally horizontally from the main pile support, primary raising means for raising the pile carrying means with a pile of sheets thereon as sheets are fed from the top of the pile of sheets, the primary raising means being constructed and arranged to raise the pile carrying means to a position approaching the level at which sheets are taken from the top of the pile of sheets, secondary raising means for raising the supplemental pile supporting means with the pile of sheets thereon, means operative when the pile carrying means are in said position for shifting portions of the secondary raising means to position the same under the portions of the supplemental pile supporting means projecting generally horizontally from the main pile support whereby to render the secondary raising means operative for raising the supplemental pile supporting means with the pile of sheets thereon, freeing the primary raising means and the main pile support from the supplemental pile supporting means, means for lowering the primary raising means and the main pile support while the secondary raising means are raising the supplemental pile supporting means with the pile of sheets thereon and for rapidly raising the primary raising means and the main pile support with another pile of sheets thereon until the top of the second mentioned pile of sheets approaches the level of the supplemental pile supporting means whereupon the supplemental pile supporting means may be withdrawn transferring the remains of the first mentioned pile of sheets onto the top of the second mentioned pile of sheets so that the composite pile of sheets thus formed may be raised by the primary raising means.

6. A sheet feeder comprising pile carrying means including a main pile support and supplemental pile supporting means supported by the main pile support, the supplemental pile supporting means including a bar extending transversely of the feeder at the outer edge of the main pile support and tines extending generally longitudinally of the feeder overlying the bar and the main pile support and projecting from the inner edge of the main pile support, primary raising means for raising the pile carrying means with a pile of sheets thereon as sheets are fed from the top of the pile of sheets, the primary raising means being constructed and arranged to raise the pile carrying means to a position approaching the level at which sheets are taken from the top of the pile of sheets, secondary raising means for raising the supplemental pile supporting means with the pile of sheets thereon, means operative when the pile carrying means are in said position for shifting portions of the secondary raising means to position the same under the ends of the bar and the projecting ends of the tines whereby to render the secondary raising means operative for raising the supplemental pile supporting means with the pile of sheets thereon, freeing the primary raising means and the main pile support from the supplemental pile supporting means, means for lowering the primary raising means and the main pile support while the secondary raising means are raising the supplemental pile supporting means with the pile of sheets thereon and for rapidly raising the primary raising means and the main pile support with another pile of sheets thereon until the top of the second mentioned pile of sheets approaches the level of the supplemental pile supporting means whereupon the tines may be withdrawn transferring the remains of the first mentioned pile of sheets onto the top of the second mentioned pile of sheets so that the composite pile of sheets thus formed may be raised by the primary raising means.

7. A sheet feeder comprising pile carrying means including a main pile support and supplemental pile supporting means supported by the main pile support, the supplemental pile supporting means including a bar extending transversely of the feeder at the outer edge of the main pile support and tines extending generally longitudinally of the feeder overlying the bar and the main pile support and projecting from the inner edge of the main pile support, primary raising means for raising the

pile carrying means with a pile of sheets thereon as sheets are fed from the top of the pile of sheets, the primary raising means being constructed and arranged to raise the pile carrying means to a position approaching the level at which sheets are taken from the top of the pile of sheets, secondary raising means for raising the supplemental pile supporting means with the pile of sheets thereon, the secondary raising means comprising pairs of opposed generally vertically movable members, the pairs of such members being spaced apart generally longitudinally of the feeder, said members having means shiftable between retracted inoperative position and projected operative position underlying the ends of the bar and the projecting ends of the tines, means operative when the pile carrying means are in said position for shifting said means to their projected operative positions whereby to render the secondary raising means operative for raising the supplemental pile supporting means with the pile of sheets thereon, freeing the primary raising means and the main pile support from the supplemental pile supporting means, means for lowering the primary raising means and the main pile support while the secondary raising means are raising the supplemental pile supporting means with the pile of sheets thereon and for rapidly raising the primary raising means and the main pile support with another pile of sheets thereon until the top of the second mentioned pile of sheets approaches the level of the supplemental pile supporting means whereupon the tines may be withdrawn transferring the remains of the first mentioned pile of sheets onto the top of the second mentioned pile of sheets so that the composite pile of sheets thus formed may be raised by the primary raising means.

8. A sheet feeder comprising pile carrying means including a main pile support and supplemental pile supporting means supported by the main pile support, the supplemental pile supporting means including a bar extending transversely of the feeder at the outer edge of the main pile support and tines extending generally longitudinally of the feeder overlying the bar and the main pile support and projecting from the inner edge of the main pile support, primary raising means for raising the pile carrying means with a pile of sheets thereon as sheets are fed from the top of the pile of sheets, the primary raising means being constructed and arranged to raise the pile carrying means to a position approaching the level at which sheets are taken from the top of the pile of sheets, secondary raising means for raising the supplemental pile supporting means with the pile of sheets thereon, the secondary raising means comprising pairs of opposed generally vertically movable members, the pairs of such members being spaced apart generally longitudinally of the feeder, said members of the pair nearer the entrance end of the feeder having means shiftable between retracted inoperative position and projected operative position underlying the ends of the bar, said members of the pair farther from the entrance end of the feeder having means shiftable between retracted inoperative position and projected operative position underlying the projecting ends of the tines, means operative when the pile carrying means are in said position for shifting said shiftable means to their respective projected operative positions whereby to render the secondary raising means operative for raising the supplemental pile supporting means with the pile of sheets thereon, freeing the primary raising means and the main pile support from the supplemental pile supporting means, means for lowering the primary raising means and the main pile support while the secondary raising means are raising the supplemental pile supporting means with the pile of sheets thereon and for rapidly raising the primary raising means and the main pile support with another pile of sheets thereon until the top of the second mentioned pile of sheets approaches the level of the supplemental pile supporting means whereupon the tines may be withdrawn transferring the remains of the first mentioned pile of sheets onto the top of the second mentioned pile of sheets so that the composite pile of sheets thus formed may be raised by the primary raising means.

9. A sheet feeder comprising a pile support, primary raising means for raising the pile support from the bottom of its vertical travel to near the top of its vertical travel, secondary raising means for raising the pile support at the upper portion of its vertical travel, sensing means sensing the height of the top of a pile of sheets atop the pile support as sheets are fed from the top of the pile of sheets and means selectively operatively connecting the sensing means to the primary and secondary raising means to actuate the raising means to which the sensing means are connected to raise the pile support when the top of the pile of sheets atop the pile support falls below a predetermined height.

10. A sheet feeder comprising a pile support, primary raising means for raising the pile support from the bottom of its vertical travel to near the top of its vertical travel, secondary raising means for raising the pile support at the upper portion of its vertical travel, sensing means sensing the height of the top of a pile of sheets atop the pile support as sheets are fed from the top of the pile of sheets, driving means and means controlled by the sensing means selectively operatively connecting the driving means to the primary and secondary raising means to actuate the raising means to which the driving means are connected to raise the pile support when the top of the pile of sheets atop the pile support falls below a predetermined height.

11. A sheet feeder comprising a pile support, primary raising means for raising the pile support from the bottom of its vertical travel to near the top of its vertical travel, secondary raising means for raising the pile support at the upper portion of its vertical travel, sensing means sensing the height of the top of a pile of sheets atop the pile support as sheets are fed from the top of the pile of sheets, driving means, first connections capable of being rendered operative and inoperative between the driving means and the primary raising means whereby the driving means may operate the primary raising means to raise the pile support, second connections capable of being rendered operative and inoperative between the driving means and the secondary raising means whereby the driving means may operate the secondary raising means to raise the pile support and means controlled by the sensing means selectively rendering operative the first connections and the second connections to raise the pile support when the top of the pile of sheets atop the pile support falls below a predetermined height.

12. A sheet feeder comprising a pile support, primary raising means for raising the pile support from the bottom of its vertical travel to near the top of its vertical travel, secondary raising means for raising the pile support at the upper portion of its vertical travel, sensing means sensing the height of the top of a pile of sheets atop the pile support as sheets are fed from the top of the pile of sheets, oscillatable means, detent means normally preventing operative oscillation of the oscillatable means, means operated by the sensing means when the top of the pile of sheets atop the pile support falls below a predetermined height rendering the detent means inoperative whereupon the oscillatable means partake of operative oscillation, first connections between the oscillatable means and the primary raising means for operating the primary raising means upon operative oscillation of the oscillatable means to raise the pile support, second connections between the oscillatable means and the secondary raising means for operating the secondary raising means upon operative oscillation of the oscillatable means to raise the pile support and shiftable means for selectively rendering operative the first connections and the second connections.

13. A sheet feeder comprising a pile support, primary raising means for raising the pile support from the bottom of its vertical travel to near the top of its vertical travel, secondary raising means for raising the pile support at the upper portion of its vertical travel, sensing means sensing

the height of the top of a pile of sheets atop the pile support as sheets are fed from the top of the pile of sheets, continuously rotatable cam means, oscillatable means having follower means resiliently urged toward the cam means so that as the cam means rotate with the follower means against the cam means the cam means cause oscillation of the oscillatable means, detent means normally holding the oscillatable means against the action of the means resiliently urging the follower means toward the cam means so that the follower means do not follow the cam means throughout the entire cycle of the cam means whereby the oscillatable means are prevented from partaking of operative oscillation, means operated by the sensing means when the top of the pile of sheets atop the pile support falls below a predetermined height rendering the detent means inoperative whereupon the oscillatable means partake of operative oscillation, first connections between the oscillatable means and the primary raising means for operating the primary raising means upon operative oscillation of the oscillatable means to raise the pile support, second connections between the oscillatable means and the secondary raising means for operating the secondary raising means upon operative oscillation of the oscillatable means to raise the pile support and shiftable means for selectively rendering operative the first connections and the second connections.

14. A sheet feeder comprising a pile support, primary raising means for raising the pile support from the bottom of its vertical travel to near the top of its vertical travel, a first shaft for operating the primary raising means, secondary raising means for raising the pile support at the upper portion of its vertical travel, a second shaft for operating the secondary raising means, sensing means sensing the height of the top of a pile of sheets atop the pile support as sheets are fed from the top of the pile of sheets, continuously rotatable cam means, oscillatable means having follower means resiliently urged toward the cam means so that as the cam means rotate with the follower means against the cam means the cam means cause oscillation of the oscillatable means, detent means normally holding the oscillatable means against the action of the means resiliently urging the follower means toward the cam means so that the follower means do not follow the cam means throughout the entire cycle of the cam means whereby the oscillatable means are prevented from partaking of operative oscillation, each of the first shaft and the second shaft having a ratchet fixed thereto, the oscillatable means having two pawls, one adapted to cooperate with each ratchet, means operated by the sensing means when the top of the pile of sheets atop the pile support falls below a predetermined height rendering the detent means inoperative whereupon the oscillatable means partake of operative oscillation and shiftable means for selectively rendering operative the pawls cooperating with the respective ratchets whereby upon operative oscillation of the oscillatable means a desired one of the first and second shafts is turned by the corresponding pawl and ratchet resulting in operation of the corresponding raising means to raise the pile support.

15. A sheet feeder comprising a pile support, primary raising means for raising the pile support from the bottom of its vertical travel to near the top of its vertical travel, a first shaft for operating the primary raising means, secondary raising means for raising the pile support at the upper portion of its vertical travel, a second shaft for operating the secondary raising means, sensing means sensing the height of the top of a pile of sheets atop the pile support as sheets are fed from the top of the pile of sheets, continuously rotatable cam means, two oscillatable members, one disposed to oscillate coaxially with the first shaft and the other disposed to oscillate coaxially with the second shaft, connections between the two oscillatable members insuring oscillation thereof in synchronism, one of the oscillatable members having follower means resiliently urged toward the cam means so that as the cam means rotate with the follower means against the cam means the cam means cause oscillation of the oscillatable members, detent means normally holding the oscillatable members against the action of the means resiliently urging the follower means toward the cam means so that the follower means do not follow the cam means throughout the entire cycle of the cam means whereby the oscillatable members are prevented from partaking of operative oscillation, each of the first shaft and the second shaft having a ratchet fixed thereto, each of the oscillatable members having a pawl adapted to cooperative with the ratchet fixed to the corresponding shaft, means operated by the sensing means when the top of the pile of sheets atop the pile support falls below a predetermined height rendering the detent means inoperative whereupon the oscillatable members partake of operative oscillation and shiftable means for selectively rendering operative the pawls carried by the respective oscillatable members to cooperate with the corresponding ratchets whereby upon operative oscillation of the oscillatable members a desired one of the first and second shafts is turned by the corresponding pawl and ratchet resulting in operation of the corresponding raising means to raise the pile support.

16. A sheet feeder comprising a pile support, primary raising means for raising the pile support from the bottom of its vertical travel to near the top of its vertical travel, a first shaft for operating the primary raising means, secondary raising means for raising the pile support at the upper portion of its vertical travel, a second shaft for operating the secondary raising means, sensing means sensing the height of the top of a pile of sheets atop the pile support as sheets are fed from the top of the pile of sheets, continuously rotatable cam means, two oscillatable members, one disposed to oscillate coaxially with the first shaft and the other disposed to oscillate coaxially with the second shaft, connections between the two oscillatable members insuring oscillation thereof in synchronism, one of the oscillatable members having follower means resiliently urged toward the cam means so that as the cam means rotate with the follower means against the cam means the cam means cause to oscillation of the oscillatable members, detent means normally holding the oscillatable members against the action of the means resiliently urging the follower means toward the cam means so that the follower means do not follow the cam means throughout the entire cycle of the cam means whereby the oscillatable members are prevented from partaking of operative oscillation, each of the first shaft and the second shaft having a ratchet fixed thereto, each of the oscillatable members having a pawl adapted to cooperate with the ratchet fixed to the corresponding shaft, means operated by the sensing means when the top of the pile of sheets atop the pile support falls below a predetermined height rendering the detent means inoperative whereupon the oscillatable members partake of operative oscillation, two retracting members, one for retracting each pawl from cooperative relationship with the corresponding ratchet and shiftable means for selectively rendering the retracting members operative to retract the pawls away from cooperative relationship with the corresponding ratchets whereby upon operative oscillation of the oscillatable members a desired one of the first and second shafts is turned by the corresponding pawl and ratchet resulting in operation of the corresponding raising means to raise the pile support.

17. A sheet feeder comprising pile supporting means, primary raising means for raising the pile supporting means as sheets are fed from the top of a pile of sheets thereon, the primary raising means being constructed and arranged to raise the pile supporting means to a position approaching the level at which sheets are taken from the top of the pile of sheets thereon, secondary raising means carried by the sheet feeder for further raising the pile supporting means as sheets are fed from the top of the

pile of sheets thereon, means for selectively operating the primary raising means and the secondary raising means to raise the pile supporting means including control means preventing simultaneous operation of the primary raising means and the secondary raising means to raise the pile supporting means, separate means for operating the primary raising means to raise and lower the same while the secondary raising means are raising the pile supporting means and supplemental control means rendering inoperative said separate means when the first mentioned operating means are operative for operating the primary raising means to raise the pile supporting means.

18. A sheet feeder comprising pile supporting means, primary raising means for raising the pile supporting means as sheets are fed from the top of a pile of sheets thereon, the primary raising means being constructed and arranged to raise the pile supporting means to a position approaching the level at which sheets are taken from the top of the pile of sheets thereon, secondary raising means carried by the sheet feeder for taking the pile supporting means from the primary raising means and further raising the same as sheets are fed from the top of the pile of sheets thereon, the secondary raising means being disposed out of the path of the pile supporting means until the pile supporting means have reached a predetermined height, and connections for positively moving the secondary raising means into position under the pile supporting means after the pile supporting means have been raised to said predetermined height whereafter the secondary raising means can take the pile supporting means from the primary raising means freeing the primary raising means so that such means can be lowered to receive other pile supporting means while the secondary raising means are raising the first mentioned pile supporting means.

19. A sheet feeder comprising pile supporting means, primary raising means for raising the pile supporting means as sheets are fed from the top of a pile of sheets thereon, the primary raising means being constructed and arranged to raise the pile supporting means to a position approaching the level at which sheets are taken from the top of the pile of sheets thereon, secondary raising means carried by the sheet feeder for taking the pile supporting means from the primary raising means and further raising the same as sheets are fed from the top of the pile of sheets thereon, the secondary raising means being disposed out of the path of the pile supporting means until the pile supporting means have reached a predetermined height, and manually operable means including connections for positively moving portions of the secondary raising means into position under the front and back portions of the pile supporting means after the pile supporting means have been raised to said predetermined height whereafter the secondary raising means can take the pile supporting means from the primary raising means freeing the primary raising means so that such means can be lowered to receive other pile supporting means while the secondary raising means are raising the first mentioned pile supporting means.

20. A sheet feeder comprising pile supporting means, primary raising means for raising the pile supporting means as sheets are fed from the top of a pile of sheets thereon, the primary raising means being constructed and arranged to raise the pile supporting means to a position approaching the level at which sheets are taken from the top of the pile of sheets thereon, secondary raising means for further raising the pile supporting means as sheets are fed from the top of the pile of sheets thereon, sensing means sensing the height of the top of the pile of sheets on the pile supporting means as sheets are fed from the top of the pile of sheets and means including a control member for selectively operatively connecting the sensing means to the primary and secondary raising means to raise the pile supporting means.

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