F. L. CROSS.

SHEET FEEDING MACHINE.

APPLICATION FILED DEC. 12, 1912.

1,182,837.

Patented May 9, 1916.

4 SHEETS—SHEET 1.

Fig. 1.

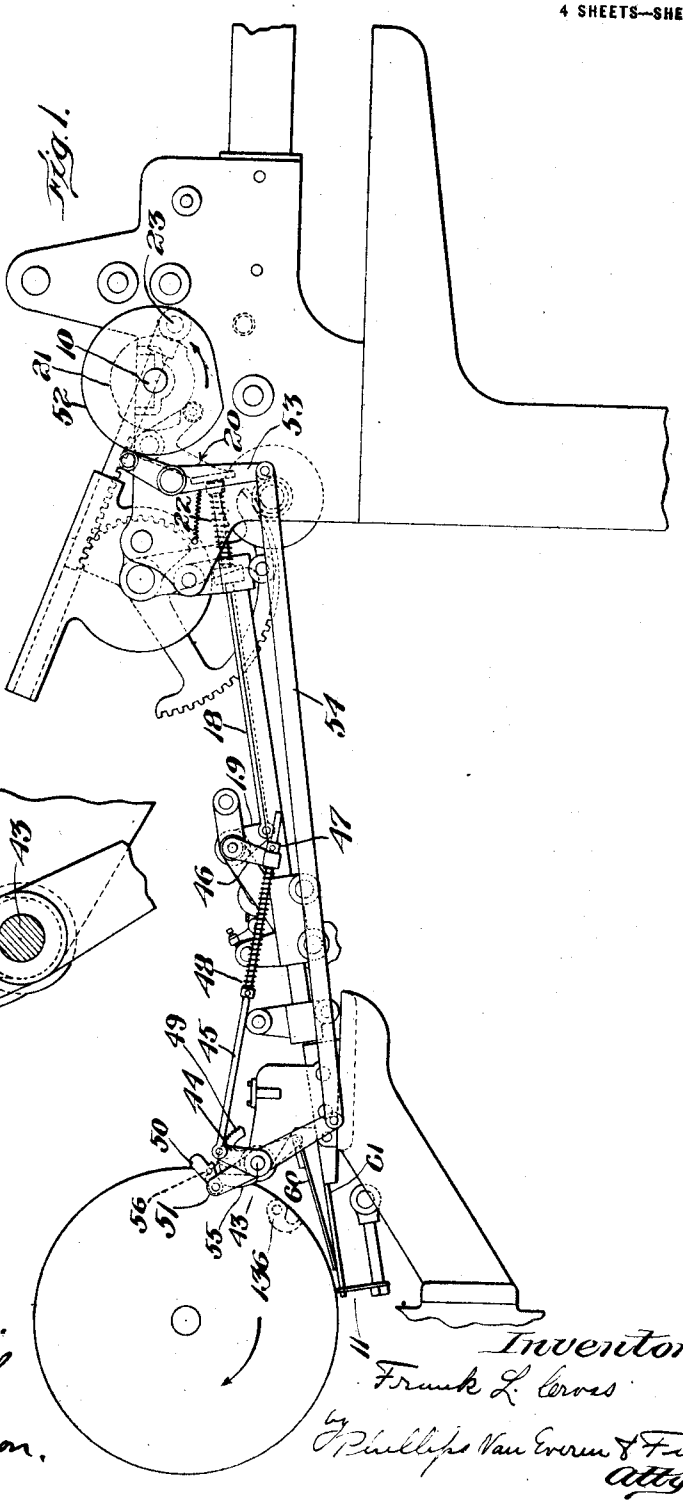
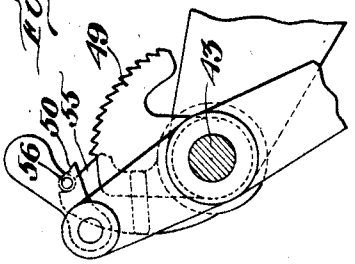


Fig. 2.



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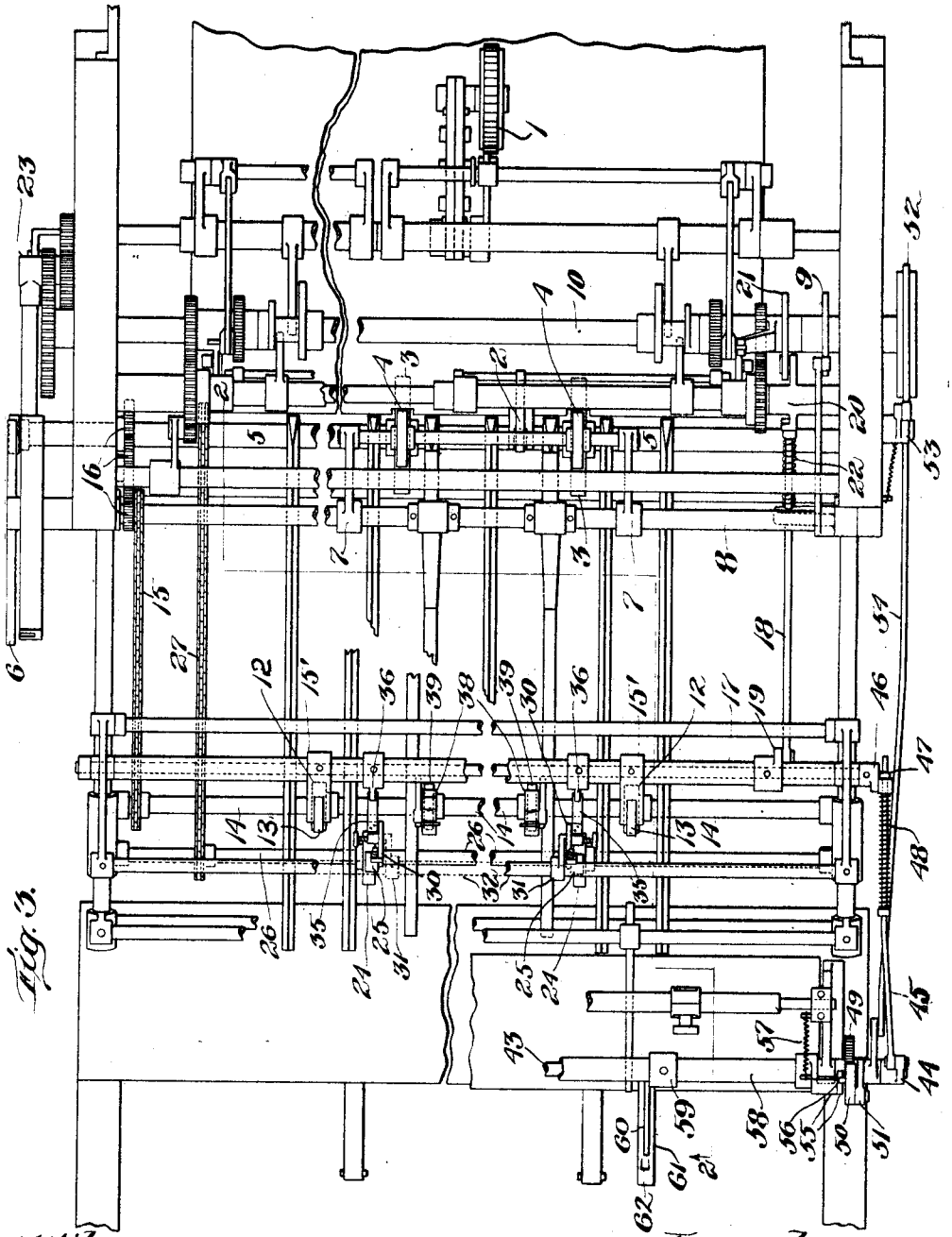


Fig. 3.

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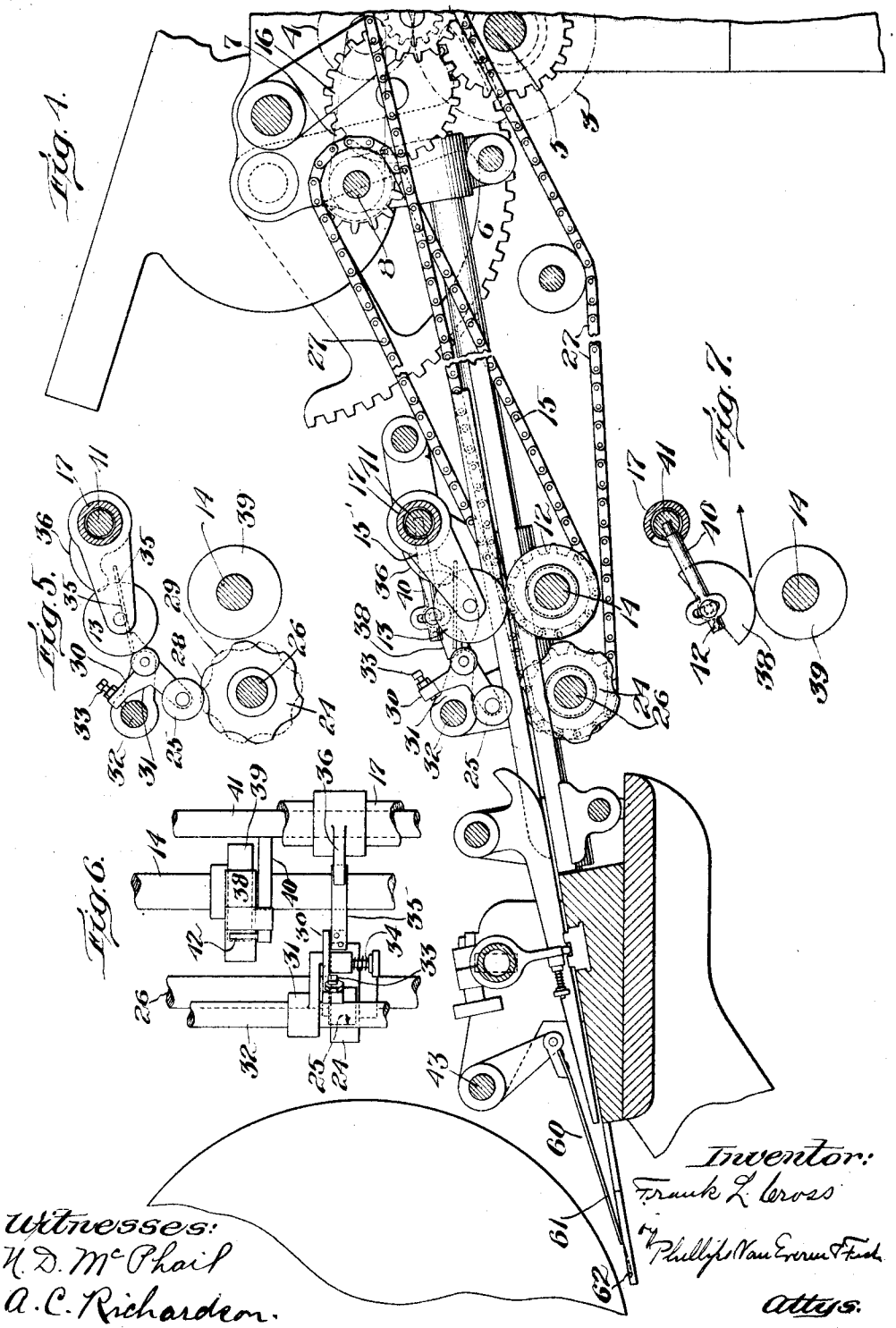
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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

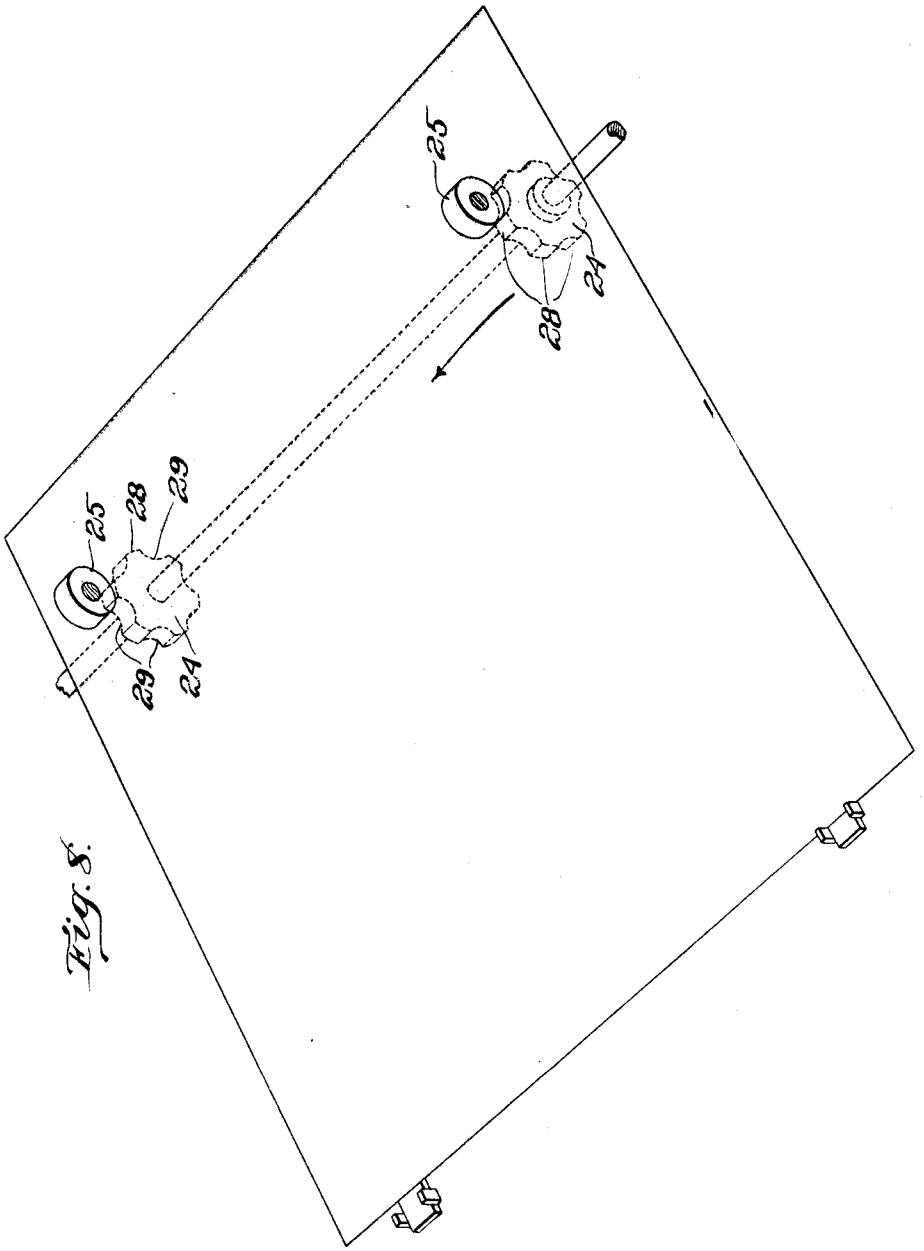


Fig. 8.

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UNITED STATES PATENT OFFICE.

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SHEET-FEEDING MACHINE.

1,182,837. Specification of Letters Patent. Patented May 9, 1916.

Application filed December 12, 1912. Serial No. 736,345.

To all whom it may concern:

Be it known that I, FRANK L. CROSS, a citizen of the United States, residing at Port Washington, in the county of Queens and State of New York, have invented certain new and useful Improvements in Sheet-Feeding Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to paper feeding machines, and more particularly to mechanism for securing the front registry of the sheets, and for preventing further carrying forward of the sheet in case it is not in proper register.

One object of the invention is to provide novel and improved sheet registering devices by which the edge of the sheet may be brought positively and accurately against the gages by which its position and alinement is determined. A further object of the invention is to provide means for preventing the taking of the sheet by the devices to which the sheets are being fed, in case the sheet is not properly positioned at the front gages.

To these ends the invention comprises the features of construction and combinations of parts hereinafter described and referred to in the claims.

The various features of the invention will be readily understood from an inspection of the accompanying drawings and the following detailed description of the mechanism illustrated therein.

In the drawings, Figure 1 is a side elevation showing so much of a paper feeding machine as is necessary to illustrate the application of the present invention thereto; Fig. 2 is a detail view showing parts of the mechanism for withdrawing sheets from the front gages; Fig. 3 is a partial plan view of the machine; Fig. 4 is a vertical sectional view on line 2—2, Fig. 3; Fig. 5 is a detail side elevation of the sheet registering devices; Fig. 6 is a plan view of the devices shown in Fig. 5; Fig. 7 is a detail plan view of the devices for withdrawing the sheet from the front gages; and Fig. 8 is a perspective view illustrating the mode of operation of the sheet registering devices.

In the drawings the invention is illustrated as embodied in a paper feeding machine known as the Cross paper feeder. In this machine a bank of sheets is acted upon by two independently controlled combing wheels, one of which is indicated at 1 in Fig. 3. The combing wheels are engaged with the bank of sheets at regular intervals, and each wheel is disengaged from the sheet by devices controlled by a trip finger 2 arranged to be engaged by the front edge of the top sheet when the sheet has been advanced into position to be acted upon by the delivery rolls 3 and 4. The devices for controlling and operating the combing wheels are the same in construction and mode of operation as the corresponding devices fully shown and described in the patent to Cross, No. 812,260, February 13, 1906. The lower delivery rolls 3 are secured to a shaft 5 which is actuated by an oscillating segment 6, and the upper rolls 4 are mounted upon a shaft which is carried by arms 7 secured to a rock shaft 8. The rock shaft is oscillated to raise and lower the upper rolls at proper intervals by a cam 9 on the cam shaft 10, as in the machine of the patent referred to. The sheets advanced by the delivery rolls are forwarded to the front gages 11 of the press or other machine to which the sheets are being fed by forwarding rolls 12 and 13. The lower forwarding rolls 12 are secured to a shaft 14, and are driven in unison with the delivery rolls 3 through chains 15 and gearing 16. The upper forwarding rolls 13 are carried in arms 15′ secured to a rock sleeve 17 which is oscillated at proper intervals to raise and lower the rolls through a link 18, one end of which is connected to an arm 19 on the rock sleeve, and the other end of which is arranged to be engaged by one arm of a lever 20, the other arm of which carries a roll engaging a cam 21 on the cam shaft 10. The link is forced against the lever by a spring 22. The segment 6 is oscillated from a crank 23 on the cam shaft 10, so that the delivery and forwarding rolls are accelerated and then retarded during the forwarding of the sheet to the front gages. After the sheet has been thus forwarded, the upper delivery and forwarding rolls are raised, and the lower rolls are rotated idly in a reverse direction, as in the machine of the patent referred to.

After the sheet has been advanced to or nearly to the front gages by the forwarding

rolls, it is acted upon by registering devices which act in alternating succession upon the sheet to position it with its front edge in accurate alinement against the front gages. The registering devices are spaced apart transversely of the sheet, and since they are constructed and arranged to operate in alternating succession, each device acts upon the sheet while the sheet is free to move with relation to the other device, either in the line of feed or transversely to the line of feed. The front edge of the sheet will therefore be brought into accurate alinement against the front gages, in case its front edge is out of transverse alinement when advanced by the sheet delivery and forwarding devices. The registering devices may be of any suitable construction, and may be actuated in any suitable manner to act upon the sheet in alternating succession, so that each acts between the succeeding actions of the other. In the construction shown, the registering devices comprise two sets of rolls, each set comprising an under roll 24 and an upper roll 25. The under rolls are secured to a shaft 26 which is continuously driven through a chain 27 connected by gearing with the cam shaft 10. Each of the rolls is notched to provide a series of sheet engaging surfaces 28 separated by depressions or notches 29. The rolls are so secured to the shaft that the sheet engaging surfaces 28 on one roll are in line with the depressions on the other roll. The coöperating upper rolls 25 are carried in bell crank levers 30 pivotally supported upon arms 31 secured to a transverse rod 32. The levers 30 are provided with stop screws 33 for determining the lower positions of the rolls 25, and are forced in a direction to press the rolls 25 toward the rolls 24 by springs 34. The levers 30 are also provided with rearwardly projecting fingers 35 arranged to be engaged by arms 36 secured to the rock sleeve 17 which carries the upper forwarding rolls. When the upper forwarding rolls are raised, as indicated in Fig. 5, the upper registering rolls 25 are in position to engage the sheet and press it against the sheet engaging surfaces 28 of the lower rolls 24. When the two sets of registering rolls are in this position the sheet engaging surfaces 28 on the lower rolls act in alternating succession to engage and feed forward the sheet and bring its front edge positively into engagement with the front gages. If the front edge of the sheet should be out of transverse alinement, as indicated in Fig. 8, the edge of the sheet in advance of one set of registering rolls will engage the corresponding front gage before the edge of the sheet in front of the other set of registering rolls engages the corresponding front gage.

In Fig. 8 the edge of the sheet at the right is shown in engagement with the right-hand front gage, while the edge of the sheet at the left has not yet reached the front gage. Under this condition the sheet engaging surfaces 28 of the left-hand registering roll 24 will act to advance the sheet while the surfaces 28 of the right-hand roll 24 are out of engagement with the sheet, so that the sheet is free to swing around the right-hand front gages, the surface of the sheet moving laterally between the right-hand registering rolls, as indicated by the arrow. The sheet is thus swung positively into position with its front edge properly alined against the front gages. After the edge of the sheet is brought against the front gages, the registering rolls will serve to maintain it in engagement with the gages so long as they act upon the sheet, the sheet engaging surfaces of the roll acting to feed the sheet forward slightly and then to release it, so that its edge will be continually forced against the front gages. The sheet will buckle slightly during the action of the sheet engaging surfaces of the rolls after its front edge has engaged the front gages, but will spring back immediately when the notches register with the upper rolls.

The lowering and raising of the upper registering rolls 25, to render the registering rolls active and inactive, is controlled by the cam 21 which raises and lowers the upper forwarding rolls 13. The cam is so shaped and timed that the forwarding rolls 13 are raised as the front edge of the sheet reaches the front gages, and this movement of the forwarding rolls lowers the registering rolls 25 into position to coöperate with the under registering rolls 24 in the manner above described. Before the front gages 11 are moved to free the sheet so that it may be taken away by the grippers 37 of the feed or impression cylinder to which the sheets are being fed, the cam 21 allows the sleeve 17 to rock sufficiently to raise the upper registering rolls 25. This movement of the rock sleeve is not sufficient, however, to engage the forwarding rolls 13 with the lower forwarding rolls 12, and the forwarding rolls remain out of action until the succeeding sheet has been advanced into position to be operated upon by them. The upper forwarding rolls are then lowered into engagement with the lower rolls, as indicated in Fig. 4. The movement of the sleeve 17 at this time raises the rolls 25 idly into their extreme upper position. The raising and lowering of the upper registering rolls may be so timed that the registering rolls remain in action until the front gages are about to be operated to free the sheet, in which case they will serve to maintain the front edge of the sheet against the front gages until the sheet is about to be seized by the grippers or other devices which take it away from the front gages. Under usual condi-

tions, however, it will be sufficient if the sheet registering rolls remain in action upon the sheet for only a sufficient interval to bring the front edge of the sheet against the front gages.

Automatic sheet feeding machines are usually provided with devices for stopping the machine, and the machine to which the sheets are being fed, in case a sheet is not properly positioned at the front gages. Under some conditions it is desirable to not only stop the machine, in case the sheet is not properly fed to the front gages, but to, also prevent the taking of the sheet by the grippers or other sheet carrying devices of the machine to which the sheets are being fed, so that the sheet will not be carried partially through the machine before its motion is arrested. The present invention accordingly includes means for accomplishing this result. This means, in the construction shown, comprises two segments 38 arranged to coöperate with rolls 39 secured to the forwarding roll shaft 14 to withdraw the sheet so that it is not in position to be seized by the grippers 36. The segments 38 are loosely mounted on studs secured in arms 40 which project from a rock shaft 41 passing through the rock sleeve 17. The weight of the segments 38 hold them normally in engagement with stop pins 42. The segments 38 are normally held out of engagement with the rolls 39, as indicated in Fig. 4. If the sheet is not properly positioned at the front gages, the segments 38 are lowered into engagement with the rolls 39 just before the grippers 36 come into position to take away a sheet, and while the shaft 14 is rotating in a reverse direction. When thus lowered, the segments press the sheet against the rolls 39, and coöperate with the rolls to draw the sheet backward until the sheet engaging face of the segment passes the point of contact between the segment and rolls. The devices for controlling the lowering of the segments comprise a rock shaft 43 provided with an arm 44 which is connected through a link 45 with an arm 46 secured to the rock shaft 41. The arm 46 is held yieldingly in engagement with a collar 47 on the link 45 by a spring 48. The rock shaft 43, which is also connected to the devices for stopping the machine, is provided with a ratchet segment 49 adapted to be engaged by a pawl 50 carried by a pawl carrying arm 51. The pawl carrying arm is actuated from a cam 52 secured to the cam shaft 10, and engaging a lever 53 which is connected by a link 54 with the pawl carrying lever. The pawl is normally held out of engagement with the segment 49 by a guard 55 held in engagement with a pin 56 on the pawl by a spring 57. The guard 55 is secured to a sleeve 58 mounted on the shaft 43, and provided with arms 59 carrying pivoted controller fingers 60. The controller fingers are arranged to travel along the upper surface of fingers 61 which are arranged to underlie the front part of the sheet, and are provided with stop notches 62. During the normal running of the machine the guard 55 oscillates back and forth with the pawl 50, and the controller finger 60 moves back and forth over the finger 61, the controller finger being guided over the notch 62 by the sheet when in position at the front gages. If the sheet is not properly positioned at the front gages, one of the fingers 60 will engage a notch 62, so that the movement of the guard 55 with the pawl 50 will be prevented. In such case the pawl will ride off of the guard, and will engage the ratchet segment 49, rocking the shaft 43 and through the connections described lowering the sheet withdrawing segments 38 into engagement with the rolls 39. The cam 52 is so timed that this takes place just before the grippers 36 come into position to seize the sheet, so that the sheet is withdrawn and the taking of the sheet by the grippers prevented.

While it is preferred to employ sheet registering rollers such as shown and described, and to provide for alternate and successive engagement of the sheet by the rollers by providing one of each set of rollers with alternating sheet engaging surfaces and depressions, it will be understood that other forms of registering devices may be employed, and that if rollers are employed, they may be otherwise constructed and actuated to engage and disengage the sheet in alternating succession. It will also be understood that the specific construction and arrangement of the devices for preventing the taking away of the sheet by the gripping devices of the machine to which the sheets are being fed, may be varied and modified without departing from the broader features of this part of the invention.

Having explained the nature and object of the invention, and specifically described one form of machine in which it may be embodied, what is claimed is:—

1. A sheet feeding machine, having, in combination, edge gages for positioning an edge of the sheet, and transversely spaced registering devices acting in alternating succession on the sheet to move it against the gages.

2. A sheet feeding machine, having, in combination, edge gages for positioning an edge of the sheet, transversely spaced registering devices, and means for actuating the devices to engage and free the sheet in alternating succession to move it against the gages.

3. A sheet feeding machine, having, in combination, edge gages for positioning

an edge of the sheet, two sets of transversely spaced rolls constructed and actuated to engage the sheet in alternating succession to move it against the gages.

4. A sheet feeding machine, having, in combination, edge gages, and two pairs of registering rolls, one roll of each pair being provided with alternating sheet engaging surfaces and depressions, the depressions in one roll being in time with the sheet engaging surfaces of the other.

5. A sheet feeding machine, having, in combination, edge gages, transversely spaced registering devices acting in alternate succession on the sheet, sheet forwarding devices, and means for rendering the registering devices inactive during the action of the forwarding devices and active as the forwarding devices are rendered inactive.

6. A sheet feeding machine, having, in combination, edge gages for positioning an edge of the sheet, transversely spaced registering devices acting in alternating succession on the sheet to move it against the gages, and means for rendering the registering devices inactive before the edge gages free the sheet.

7. A sheet feeding machine, having, in combination, edge gages, two sets of registering rolls, mechanism for actuating the rolls to act on the sheet in alternating succession, sheet forwarding rolls, mechanism for throwing the forwarding rolls out of action and the registering rolls into action as the sheet is forwarded to the gages, and mechanism for rendering the registering rolls inactive before the gages free the sheet.

8. A sheet feeding machine, having, in combination, edge gages, two registering rolls provided with series of sheet engaging surfaces and alternating depressions, the depressions in one roll being in line with the sheet engaging surfaces in the other, and rolls coöperating with the two registering rolls.

9. A sheet feeding machine, having, in combination, front gages, and two transversely spaced registering devices, each of which acts repeatedly upon the sheet and in alternation with the other to advance the sheet against the front gages.

10. A sheet feeding machine, having, in combination, front gages, and two transversely spaced sets of rolls, each set of which is constructed and actuated to repeatedly engage and release the sheet in rapid succession and in alternation with the other.

11. A sheet feeding machine, having, in combination, front registering devices, sheet gripping devices for taking the sheet, a sheet withdrawing roll, and means for pressing the sheet against the roll when not properly positioned at the front registering devices.

12. A sheet feeding machine, having, in combination, front registering devices, sheet gripping devices for taking the sheet, a sheet withdrawing roll, means for pressing the sheet against the roll, and means controlled by the sheet when in position at the registering devices for rendering the sheet pressing means inactive.

13. A sheet feeding machine, having, in combination, front gages, grippers for taking the sheet when in position at the front gages, a sheet withdrawing segment, a coöperating roll, and sheet controlled means for actuating the segment and roll to withdraw the sheet from the front gages.

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