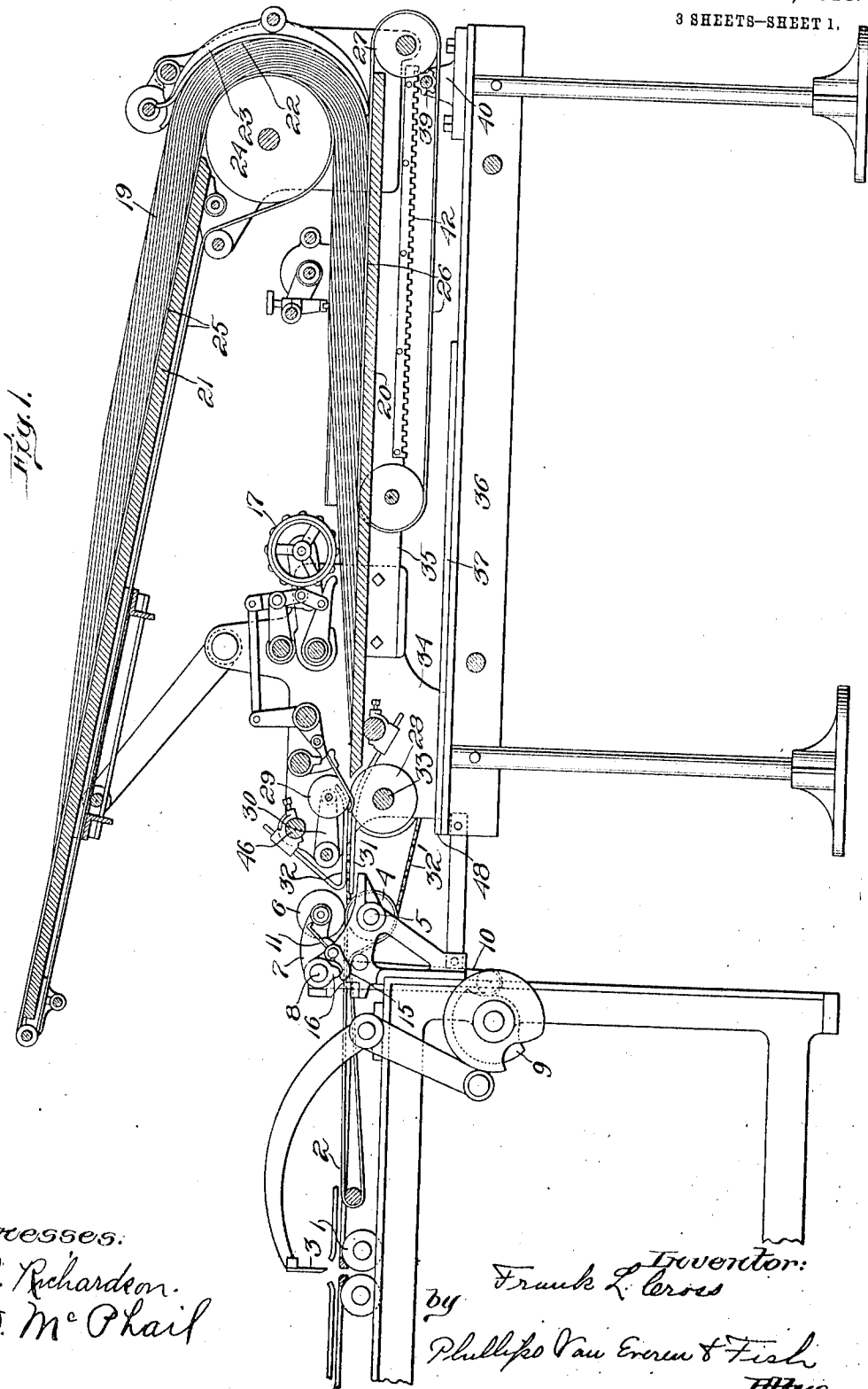


F. L. CROSS.
PAPER FOLDING MACHINE.
APPLICATION FILED JULY 18, 1908.

1,063,860.

Patented June 3, 1913.

3 SHEETS—SHEET 1.



Witnesses:

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Inventor:
by Frank L. Cross

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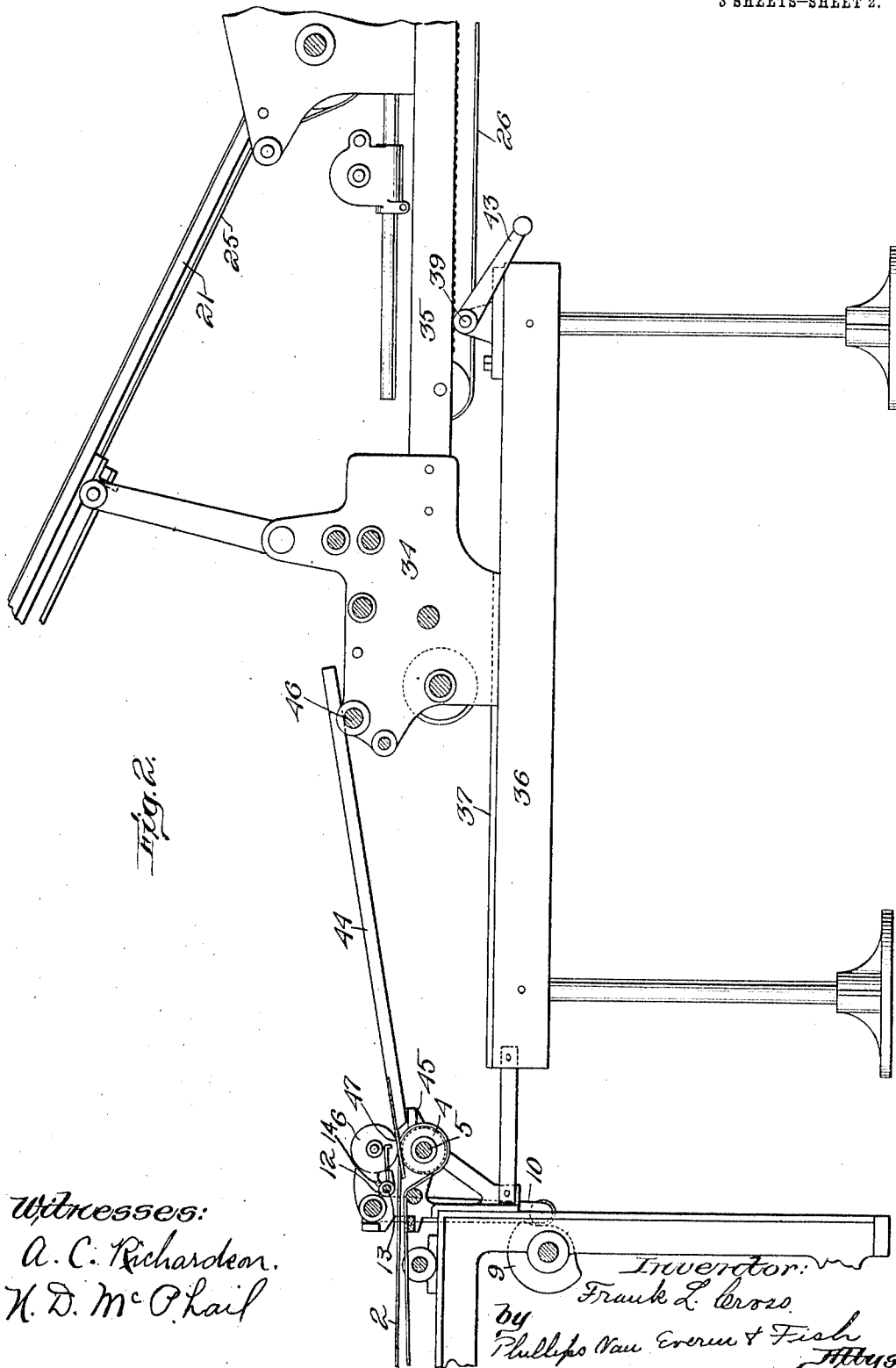


Fig. 2.

Witnesses:

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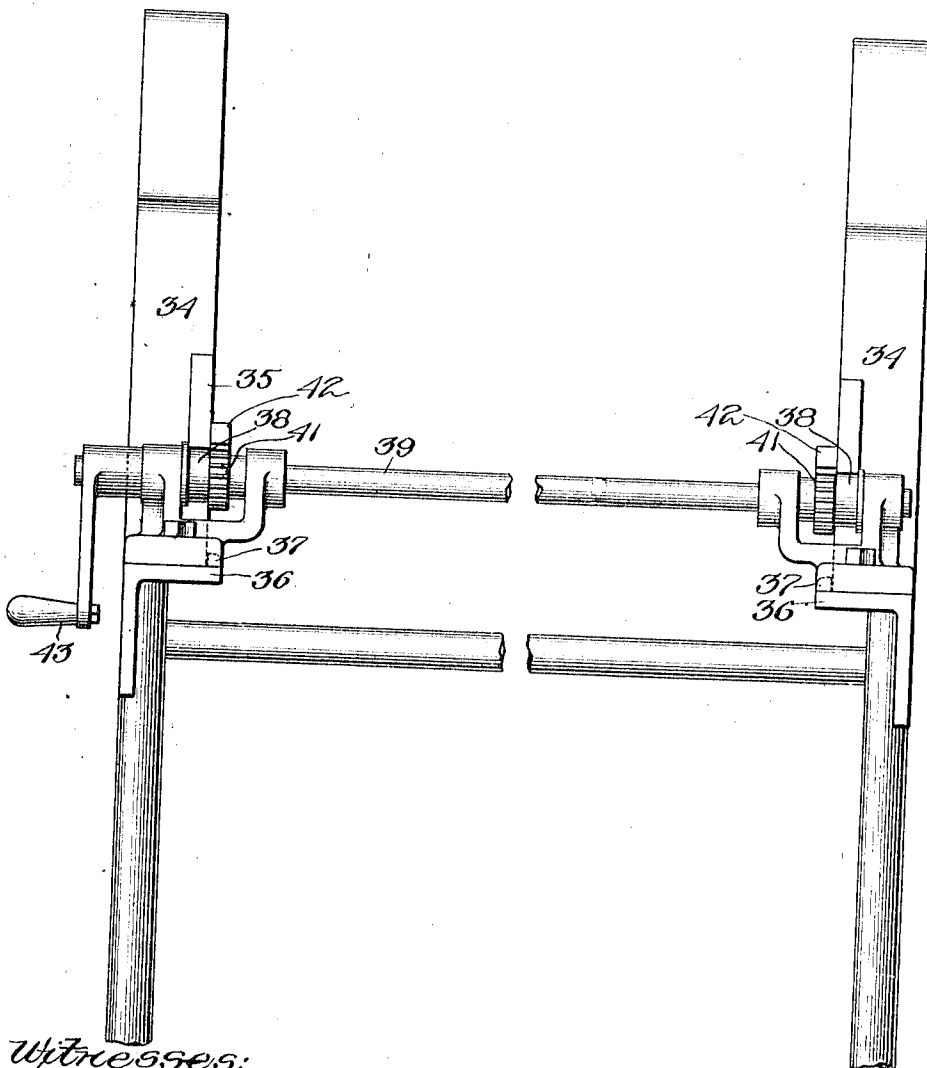
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3 SHEETS-SHEET 3.

Fig. 3



Witnesses:

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UNITED STATES PATENT OFFICE.

FRANK L. CROSS, OF WOLLASTON, MASSACHUSETTS, ASSIGNOR TO CROSS PAPER FEEDER COMPANY, A CORPORATION OF MAINE.

PAPER-FOLDING MACHINE.

1,063,860.

Specification of Letters Patent.

Patented June 3, 1913.

Application filed July 18, 1908. Serial No. 444,154.

To all whom it may concern:

Be it known that I, FRANK L. CROSS, citizen of the United States, residing at Wollaston, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Paper-Folding 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 sheet feeding mechanism adapted for feeding sheets of paper to folding or other machines.

The object of the invention is to provide novel and improved mechanism whereby the sheets may be separated and presented either automatically or by hand to the devices for forwarding them to the folding or other mechanism which is to act upon them.

A further object of the invention is to provide a mechanism of this type which is well adapted for feeding sheets to folding machines such as are used for folding sheets of paper in binderies and similar establishments, and the invention will be described as applied to such machine.

Such folding machines have heretofore been of two classes with respect to the devices employed for supporting the sheet supply and presenting the sheets in succession to the devices for feeding them to the folding mechanism. In one class of machines the sheet supply is supported upon a feed table arranged in front of the feeding devices, and the individual sheets are manually separated from the supply and presented to the feeding devices. In the other class of machines the sheet supply is presented to mechanism which acts to automatically separate the individual sheets from the supply and present them to the devices by which they are fed to the folding mechanism. The hand feed machines are of general utility and adaptability, and may be employed in doing all the various classes of work upon which the folding mechanism of the machine is designed to operate. For this reason, this form of machine is the more generally used, and is exclusively used in those establishments in which a general class of work is done, and in which only one or two folding machines are required to take care of the work. Machines which are provided with mechanism for automatically

separating the sheets from the sheet supply are especially adapted for use upon long runs involving the folding of a large number of sheets, and this class of work may be done upon these machines with greater economy and in less time than upon the hand feed machines. The automatic feed machines are not adapted, however, to operate upon the smaller sizes of sheets which it may be necessary to fold, or to operate economically upon short runs. The limited range of work which may be done with economy upon the automatic feed machines has practically prohibited their use in the smaller establishments doing a general class of work, although much of the work done on the hand feed machines with which these establishments are equipped could be done with greater economy upon automatic feed machines. The installation of automatic feed machines has therefore been confined heretofore to those establishments doing special work, or doing work of such character or amount as to warrant the employment of both hand feed and automatic feed folding machines.

The present invention overcomes the objections to the automatic feed machines above outlined, and provides a machine which may be utilized to do all classes of work in the most economical and advantageous manner.

The invention contemplates the provision in a machine having sheet folding mechanism and devices for feeding sheets to the folding mechanism, of mechanism for automatically separating the sheets from a sheet supply, and means for moving the separating mechanism into position for delivering sheets to the feeding devices, or into position to allow the presenting of sheets to the feeding devices by hand. With the automatic sheet separating mechanism thus constructed and arranged, this mechanism may be adjusted to active position whenever work is to be folded which can be most economically done by automatically separating the sheets from the sheet supply, and when work is to be done which is not adapted for automatic separation of the sheets, the sheet separating mechanism may be readily moved out of active position, and a feed board be placed or brought into position so that the sheets may be manually separated from the sheet supply on the

board and presented to the feeding devices of the machine. Thus the machine is rendered of general utility and adaptability, and may be utilized to fold all classes of work in the most advantageous and economical manner.

In accordance with the broader features of the invention, any suitable form of mechanism acting to automatically separate individual sheets from a sheet supply and present them to the feeding devices by which they are fed to the folding or other mechanism, may be employed, and the devices for enabling the mechanism to be moved into and out of active position may be of any suitable construction and arrangement. The devices for enabling the sheets to be presented manually to the feeding devices may also be of any suitable construction and arrangement, and may be brought into proper relation with the feeding devices by the movement of the automatic separating mechanism out of active position, or may be placed in position after the automatic separating mechanism has been withdrawn from active position. In the preferred embodiment of the invention, mechanism is provided for presenting the sheet supply to the mechanism which acts to automatically separate individual sheets from the supply, and these mechanisms are mounted upon a frame which is so supported that it may be moved into and out of active relation with the devices for feeding the sheets to the folding or other mechanism, and means is provided for supporting a feed board in position for presenting the sheets to the feeding devices by hand when the frame is moved to bring the separating mechanism into inactive position.

The various features of the invention will be readily understood from an inspection of the accompanying drawings, in which—

Figure 1 is a sectional elevation illustrating a folding machine embodying the various features of the invention in their preferred forms, the automatic sheet separating mechanism being shown in active relation to the devices for feeding the sheets to the folding mechanism; Fig. 2 is a similar view illustrating the position of the parts when the sheets are to be manually presented to the feeding devices; and Fig. 3 is a rear elevation showing the means for withdrawing and advancing the frame which carries the automatically acting sheet separating devices and the mechanism for presenting a sheet supply thereto.

In the construction illustrated in Fig. 1 the first set of folding rolls of the folding mechanism is indicated at 1, it being understood that the folding mechanism may be of any usual and well known construction. The individual sheets are fed into position over the folding rolls 1 by means of tapes

2, as is usual in the type of folding machine illustrated, and are acted upon by the folding blade 3 which coöperates with the rolls 1 in forming the first fold in the sheets. The feeding tapes 2 pass around a drum or series of rolls 4 secured to a shaft 5 which is driven through mechanism not shown. Drop rolls 6 coöperate with the rolls 4 and the tapes 2 in feeding the sheets into position to be acted upon by the folding mechanism. The drop rolls 6 are carried in arms 7 which are secured to a rock shaft 8, and these rolls are raised and lowered at proper intervals by a cam 9 arranged to engage the lower end of an arm 10 which is secured to the rock shaft 8. The machine is also provided with a series of front gages 11 carried by sleeves 12 which are adjustably secured upon a rock shaft 13 by means of set screws 14. An operating arm 15 is secured to the end of the rock shaft 13, and is arranged to be engaged and operated by a cam 16 secured on the end of the rock shaft 8. The arrangement of the cam and operating arm is such that the rock shaft 13 is rocked in a direction to lower the front gages when the drop rolls 6 are raised, and to raise the front gages when the drop rolls are lowered. When sheets are being automatically presented to the feeding devices, the front gages are so adjusted upon the rock shaft 13 that they do not move down into the path of the sheets when the drop rolls are raised. When sheets are to be presented manually to the feeding devices, the front gages are so adjusted upon the shaft that they will move down across the path of the sheet when the drop rolls 6 are raised, and will be raised out of the path of the sheets when the drop rolls are lowered into engagement with the rolls 4.

The mechanism shown for automatically separating sheets from a sheet supply and presenting them to the feeding rolls and tapes is substantially the same in construction and mode of operation as the sheet separating mechanism shown and described in my Patent No. 812,260, dated February 13, 1906. This sheet separating mechanism comprises combing rolls, one of which is indicated at 17, and sheet operated trips for controlling the action of the combing rolls, one of these being indicated at 18. The feathered bank of sheets 19 forming the sheet supply is supported upon a table 20 in position to be acted upon by the combing rolls, and is delivered on to the table 20 from a supply table 21 through a curved throat 22. One side of the curved throat is formed by a series of curved guides 23, and the other side is formed by a drum 24 over which the tapes 25 pass. The bank of sheets upon the table 20 rests upon a series of feed tapes 26, and is intermittently advanced to properly present the front end of the bank

to the combing devices, by mechanism (not shown) which acts to intermittently rotate the drum 24 and the pulleys 27 over which the tapes 26 pass. This mechanism corresponds in construction and mode of operation to the mechanism shown in the patent above referred to for controlling the feeding movement of the bank of sheets in the machine of said patent.

By the action of the combing wheels, the sheets are successively advanced into position between the rolls 28 and 29 by which they are delivered between the rolls 4 and the drop rolls 6. The rolls 29 are mounted in arms 30, and are raised and lowered at proper intervals by mechanism such as is shown in the patent referred to. The sheets as they pass from the rolls 28 and 29 to the rolls 6 and 4, are supported and guided by guiding rods 31 and 32 arranged below and above the path of the sheets, as indicated in Fig. 1.

The mechanism for automatically separating the sheets from the sheet supply, and the mechanism for automatically presenting the sheet supply to the separating mechanism, is driven through a sprocket chain 32' which passes over a sprocket wheel secured to the shaft 5, and over a sprocket wheel secured to the shaft 33 which carries the delivery rolls 28. The mechanisms for automatically separating the sheets and for presenting the sheet supply to the separating mechanism are mounted in a frame provided with side plates 34 and side bars 35. The side plates 34 are supported upon base plates 36, and are guided on these plates by ribs 37 which engage the inner sides of the plates. The side bars 35 are supported and guided upon rolls 38 mounted or secured upon a transverse shaft 39. The shaft 39 is mounted in bearings 40 on the base plates 36, and is provided with pinions 41 which engage racks 42 secured to the side bars 35.

When sheets are to be automatically separated from the sheet supply and fed to the folding mechanism, the parts are in the position indicated in Fig. 1. When in this position, the sheets will be automatically separated from the sheet supply by the combing devices and delivery rolls, and will be fed into position to be acted upon by the folding mechanism by the feeding rolls and tapes. In case it is desired to present the sheets manually to the feeding devices, the sprocket chain 32' is removed from the sprocket wheel, and the frame carrying the sheet separating mechanism is retracted into the position indicated in Fig. 2, the movement of the frame into this position being readily accomplished by turning the shaft 39 by means of a crank 43. After the frame has been run back, a feed board is placed in position with its front end resting upon a cross-rod 46 or other part of the frame

which carries the automatic sheet separating mechanism. The front gages 11 are also adjusted so that they will be moved into position against the fingers 47 which project from the front of the feed board when the drop rolls 6 are raised. A sheet supply may now be supported upon the feed board 44, and the sheets manually separated from the sheet supply and presented in position against the front gages, so that they will be fed to the folding mechanism when the drop rolls 6 are lowered and the front gages raised. When the automatic sheet separating mechanism is to be again rendered active, the feed board 44 is removed, the front gages adjusted into position where they will not be moved across the path of the sheet, and the frame carrying the sheet separating mechanism is advanced until the side plates 34 bring up against the stops 48. This brings the sheet separating mechanism into position to properly present the sheets to the feeding devices, and the driving mechanism for the automatic guiding devices is thrown into action by replacing the sprocket chain 32' on the sprocket wheels.

Having explained the nature and object of the invention, and specifically described one embodiment thereof, what I claim is:—

1. A paper folding machine, having, in combination, sheet folding devices, feed rolls and tapes for feeding sheets to the folding devices, mechanism for separating sheets from a bank and delivering them in succession between the feed rolls, and means for moving the separating mechanism into position for delivering sheets between the feed rolls or into position to permit a feed board to be positioned at the feed rolls for feeding the sheets by hand, and a feed board positioned at the feed rolls when the separating mechanism is out of position and removed from position at the feed rolls when the separating mechanism is in position, substantially as described.

2. A paper folding machine, having, in combination, sheet folding mechanism, devices for feeding sheets to the folding mechanism, mechanism for separating sheets from a sheet supply and delivering them in succession to the feeding devices, means for moving the separating mechanism into or out of position for delivering sheets to the feeding devices, and means for supporting a feed table in position for the presenting of sheets to the feeding devices by hand when the separating mechanism is out of active position and a feed table which is removed from position for presenting sheets to the feeding devices when the separating mechanism is in position, substantially as described.

3. A paper folding machine, having, in combination, sheet folding mechanism, devices for feeding sheets to the folding mech-

anism, mechanism for separating sheets from a sheet supply and delivering them in succession to the feeding devices, mechanism for presenting a sheet supply to the sheet separating mechanism, a frame carrying the supply presenting and sheet separating mechanisms, and means for retracting the frame to permit a feed board to be placed in position for feeding sheets to the sheet feeding devices by hand, and for advancing it into position for the automatic delivery of sheets to the sheet feeding devices when the feed board is removed, substantially as described.

4. A paper folding machine, having, in combination, sheet folding mechanism, devices for feeding sheets to the folding mechanism, a feed table, a supply table arranged above the feed table, means for feeding a feathered bank of sheets from the supply table on to the feed table, devices for separating individual sheets from the sheet supply on the feed table and delivering them in succession to the feeding devices, a frame carrying the feed and supply tables and sheet separating mechanism, means for retracting the frame to permit sheets to be delivered manually to the sheet feeding devices and for advancing it into position for the automatic delivery of sheets to the sheet feeding devices and a feed board positioned at the feeding devices when the frame is retracted and removed from position at the feeding devices when the frame is advanced for delivering sheets automatically to the feeding devices, substantially as described.

5. A paper folding machine, having, in combination, sheet folding mechanism, devices for feeding sheets to the folding mechanism, front gages for positioning sheets at the feed devices, mechanism for separating sheets from a bank of sheets and delivering them in succession to the feeding devices, means for moving the separating mechanism into or out of position for delivering sheets to the feeding devices, means for throwing the front gages out of action when the separating mechanism is in position for delivering sheets to the feeding devices, and throwing them into action when the separating mechanism is out of position for delivering sheets to the feeding devices, and means for removably supporting a feed table in position for the presenting of sheets to the front gages by hand when the separating mechanism is out of active position, substantially as described.

6. A paper folding machine, having, in combination, sheet folding mechanism, devices for feeding sheets to the folding mechanism, front gages for positioning sheets at the feeding devices, mechanism for separating sheets from a bank of sheets and delivering them in succession to the feeding devices, a frame carrying the sheet separat-

ing mechanism and bank of sheets, guides for supporting the sheets in front of the sheet separating mechanism, means for retracting the frame to withdraw the guides from the feeding devices and for advancing it to bring the guides into position to deliver sheets to the feeding devices, means for throwing the front gages into and out of operation and means for supporting a feed table in position for the presenting of sheets to the front gages by hand when the frame is retracted, substantially as described.

7. A paper folding machine, having, in combination, sheet folding devices, feed rolls and tapes for feeding sheets to the folding devices, front gages for positioning the sheets at the feed rolls when feeding by hand, mechanism for separating sheets from a bank of sheets and delivering them in succession to the feed rolls, means for moving the separating mechanism into or out of position for delivering sheets to the feed rolls, means for throwing the front gages out of action when the separating mechanism is in position for delivering sheets to the feed rolls and for throwing them into action when the separating mechanism is out of this position, and means for supporting a feed board in position for feeding sheets to the front gages by hand when the separating mechanism is out of active position, substantially as described.

8. A paper folding machine, having, in combination, sheet folding devices, devices for feeding sheets to the folding devices, mechanism for separating sheets from a bank of sheets and delivering them in succession to the feeding devices, a frame carrying the sheet separating mechanism and bank of sheets, guides for supporting the sheets in front of the sheet separating mechanism, means for moving the frame to bring the guides into or out of position to deliver sheets to the feeding devices, and means for supporting a feed table in position for feeding sheets to the feeding devices by hand when the guides are out of position for delivering sheets to the feeding devices, substantially as described.

9. A sheet feeding machine including in combination, sheet forwarding and registering means, automatic sheet separating means, said sheet separating means being movable into and out of position for delivering the separated sheets to said sheet forwarding means, said sheet separating means serving when out of delivering position, as a support for a hand feed board for delivering sheets to said sheet forwarding and registering means.

10. A sheet feeding machine including in combination, sheet forwarding and registering means, a feed board, automatic sheet separating means, said sheet separating means being movable into and out of posi-

tion for delivering the separated sheets to said sheet forwarding means, said sheet separating means serving, when out of delivering position, as a support for a hand feed board for delivering sheets to said sheet forwarding and registering means.

11. A sheet feeding machine including in combination, sheet forwarding means, automatic sheet separating means, a frame upon which said automatic sheet separating means is movable into and out of position for delivering separated sheets to said sheet forwarding means, and a hand feed board supported in position to deliver sheets to said forwarding means by said automatic sheet separating means when out of delivering position and by said frame jointly.

12. A sheet feeding machine including in combination, sheet forwarding and registering means, automatic sheet separating means, driving means for said separating means, said sheet separating means being movable into and out of position to deliver the separated sheets to said sheet forwarding means, a feed board and means for supporting said feed board in position to de-

liver sheets to said sheet forwarding and registering means when said automatic separating means is out of delivering position, and means for connecting and disconnecting said separating means from said driving means.

13. A sheet feeding machine including in combination, sheet forwarding means, automatic sheet separating means, comprising separating devices and a supporting structure therefor, a frame upon which said sheet separating means are movable into and out of position to deliver the separated sheets to said sheet forwarding means, and a hand feed board supported upon said supporting structure and upon said frame in position to deliver sheets to said sheet forwarding means when said automatic sheet separating means is out of its said delivering position.

In testimony whereof I affix my signature, in presence of two witnesses.

FRANK L. CROSS.

Witnesses:

IRA L. FISH,
N. D. McPHAIL.