H. E. HARBAUGH.

SHEET FEEDING MECHANISM.

APPLICATION FILED JUNE 8, 1914.

1,127,991.

Patented Feb. 9, 1915.

3 SHEETS—SHEET 1.

Fig. 1.

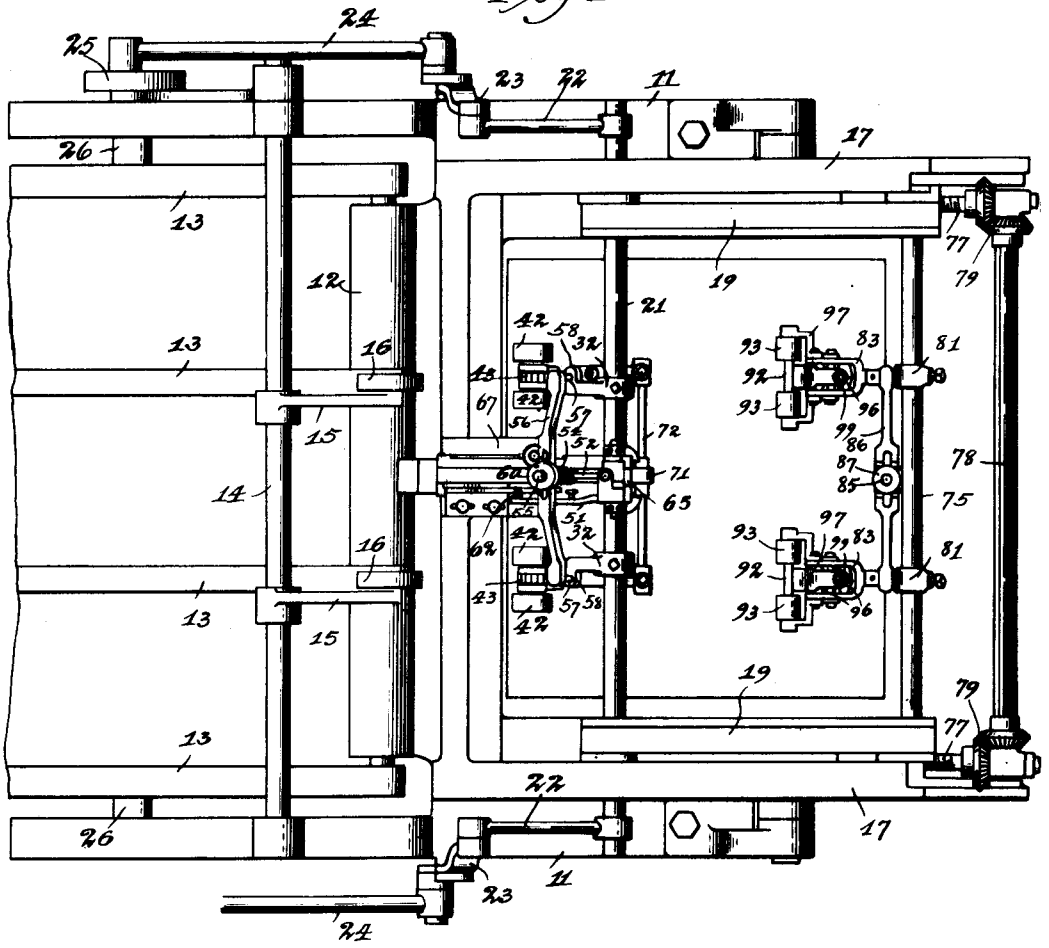


Fig. 2.

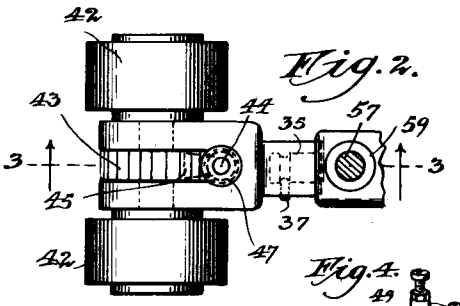


Fig. 3.

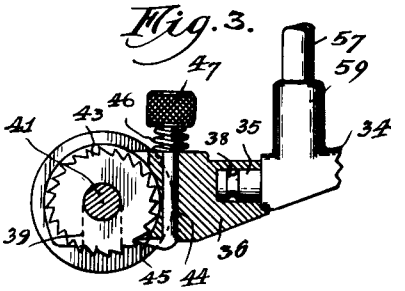
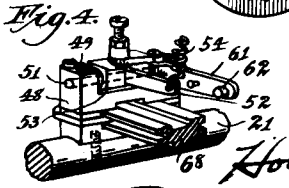


Fig. 4.



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3 SHEETS—SHEET 2.

Fig. 5.

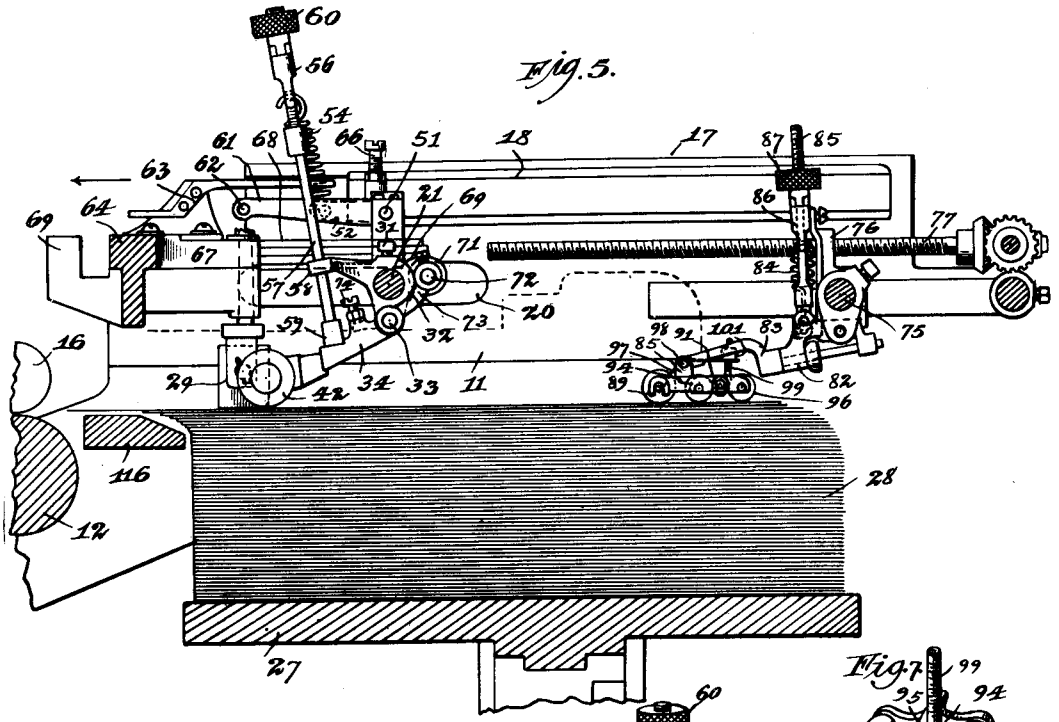


Fig. 7.

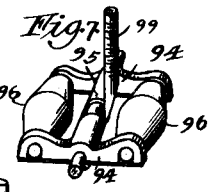


Fig. 6.

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3 SHEETS—SHEET 3.

Fig. 8.

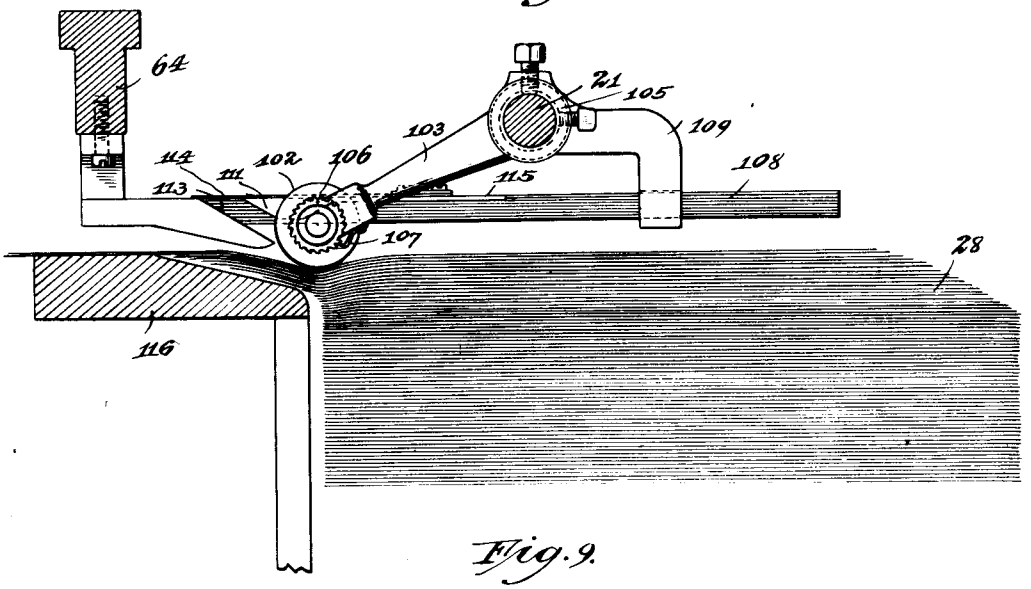
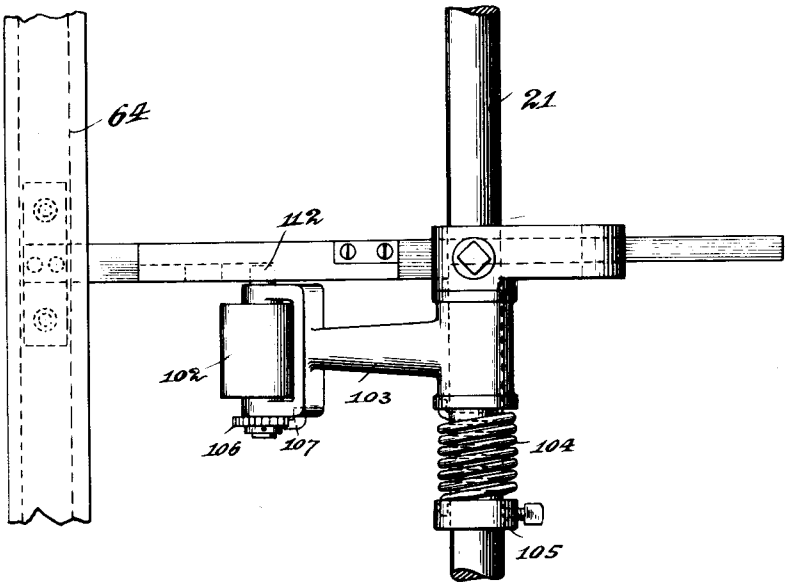


Fig. 9.



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UNITED STATES PATENT OFFICE.

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SHEET-FEEDING MECHANISM.

1,127,991. Specification of Letters Patent. Patented Feb. 9, 1915.

Application filed June 8, 1914. Serial No. 843,677.

To all whom it may concern:

Be it known that I, HOWARD E. HARBAUGH, a citizen of the United States, residing at Kenosha, in the county of Kenosha and State of Wisconsin, have invented certain new and useful Improvements in Sheet-Feeding Mechanisms, of which the following is a specification.

This invention pertains in general to sheet feeding mechanisms and has more particular reference to a paper feeding mechanism adapted to be attached to or used in conjunction with printing presses and the like, my present invention constituting an improvement upon the mechanism disclosed in my application, No. 691,058, filed April 15, 1912.

In this general type of feeding mechanisms, of which that disclosed in my aforementioned application is an illustration, a plurality of feeding rollers are employed which reciprocate across the top of a stack of sheets to be fed and separate and feed forward the topmost sheet from the stack. Hold-back rollers are also employed to hold back or retard the sheets of paper beneath the topmost sheet which is being fed, these hold-back rollers being positioned nearer the rear edge of the pile than the feed rollers and in most instances being immovable with respect to the frame, that is, they do not reciprocate longitudinally of the frame as the feed rollers do.

Considerable difficulty has been experienced prior to my invention with feeding mechanisms of this type for the reason that it has been impossible to separate one and only one sheet from the stack at each stroke of the feeding roller. The feed rolls have been held, usually, by spring pressure in contact with the uppermost sheet. If the pressure is too light no combing of the underlying sheets will be produced as the upper sheet is removed. If the pressure is too great the sheets will separate, not immediately beneath the top sheet, but some little distance in the pile, with the result that a bunch or at least several sheets will be fed from the stack at once. Furthermore, the different grades of paper require different pressures, and the general result has been that unless the pressure is adjusted with the utmost accuracy for each particular grade of paper the sheets will not be combed out upon the top of the stack evenly; the topmost sheet will not be fed singly from the stack at each operation of the feed rolls, and the hold-back rollers will not be given an opportunity to retard or hold back the next-to-the-top sheet of the pile.

The primary purpose of my present invention is to provide a sheet feeding mechanism of this general type which will feed with accuracy a single sheet from the top of the stack at each operation of the mechanism.

One of the important novel features of this invention, which contributes to the successful accomplishment of this purpose, is the provision of means for increasing the pressure of the feed rolls upon the stack as the rolls approach and pass the forward edge of the stack. So far as I am aware feed rolls heretofore employed have engaged the stack of sheets with a uniform pressure throughout the operative stroke of the mechanism, and my invention broadly, therefore, resides in increasing this pressure at a predetermined point in the travel of the rollers. The result of this increased pressure of the feed rollers at and adjacent to the forward edge of the stack causes the upper sheets to be flexed over the forward edge of the stack thereby advancing their rear edges successively and uniformly combing the sheets out upon the top of the stack.

Since, as has been previously stated, different grades of paper require different pressures of the feed rollers in order to secure the best results I have devised an adjustment by means of which the increased pressure of the feed rollers, as they approach the end of their feeding stroke, may be regulated to suit the requirements of the particular paper being fed.

A further object of my invention is the provision of novel mounting for the feed rollers and a device acting in conjunction therewith to normally prevent reverse rotation of the rollers and also retain the rollers in their open bearings, this device being capable of movement to inoperative position to permit the ready removal of the rollers when occasion requires.

Still another object is the provision of improved hold-back means for holding back the underlying sheets as the topmost sheet is fed from the stack and also to provide novel means for producing the required frictional resistance to the rotation of the hold back rollers, which means also acts to retain the

hold back rollers and the smooth rollers in their respective bearings.

Other objects and many of the attendant advantages of this invention will be apparent to those skilled in the art as the same becomes better understood by reference to the following description when considered in connection with the accompanying drawings, throughout the various views of which like reference characters refer to similar parts. Referring to the drawings—

Figure 1 is a plan view of a sheet feeding mechanism embodying my invention; Fig. 2 is an enlarged fragmentary plan view of one set of feed rollers; Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 2; Fig. 4 is a perspective view showing a portion of the mechanism for regulating pressure of the feed rollers; Fig. 5 is a longitudinal sectional view through the mechanism shown in Fig. 1; Fig. 6 is a transverse sectional view taken just in front of the feed rollers shown in Figs. 1 and 5; Fig. 7 is a detail perspective view of the smooth and tripping rollers embodied in the hold-back device; Fig. 8 is a view similar to Fig. 5 showing another form of mechanism for controlling the feed rollers, and Fig. 9 is a plan view of the structure shown in Fig. 8.

Referring to the drawings, and more particularly to Fig. 1 thereof, reference character 11 designates the side bars of a frame at the far end of which is mounted a rotatable roller 12 adapted to be driven by the endless belts or tapes 13 which carry the sheets of paper or other similar material to the machine in which they are to be operated upon. A shaft 14 disposed above the tapes is provided with a plurality of arms 15 carrying at their extremities presser rollers 16 which overlie the roller 12 and cause the sheets to be fed by the roller 16 and the tapes.

The side bars 11 of the frame are formed to provide upstanding guideways or members 17, each provided on its inner face with a track or guideway 18 in which the bars 19 are adapted to reciprocate toward and from the roller 12. The bars 19 are rigidly secured to a cross rod 21, the ends of which project through slots 20 formed in the side members of the frame. The outer ends of the rod are connected by links 22 to the upper ends of levers 23 pivoted on the sides of the frame, the lower ends of these levers being connected by links 24 with a crank member 25 mounted upon a shaft 26 driven from any convenient source of power. It will be obvious that upon rotation of the shaft 26 the rod 21 will be reciprocated back and forth and will be guided in its movements by the guides or bars 19 traveling in their respective guideways 18.

Beneath the frame I have provided a table or support 27, of any well known or preferred construction, adapted to carry a stack of sheets 28 to be fed. Any well known or preferred means (not shown) may be employed to gradually elevate the table as the sheets are removed therefrom so that the topmost sheet will always be positioned in the same plane, which is determined by a stop or abutment 29 mounted in the main frame and adapted to be actuated by well known mechanism to release the top sheet at each feeding operation.

Upon the rod 21 I have fixedly secured by set screws 31 a pair of bracket members 32 connected beneath the rod 21 by a rod 33 upon which is pivotally mounted a pair of supporting arms 34, each equipped at its forward end with a pivot pin 35 (Figs. 2 and 3) upon which a bearing member 36 is pivoted to swing about a horizontal axis. Each bearing member is secured to its respective pivot pin by a screw 37 engaging in a peripheral groove 38 formed in the pin, as shown in Figs. 2 and 3. Each bearing member is forked at its forward extremity and each fork is provided with an open-ended downwardly opening slotted bearing 39 adapted to receive a pintle 41 carrying at its outer ends rubber feed rollers 42 fixed on the pintle and intermediate its ends a ratchet wheel 43 also fixed on the pintle and disposed between the forks of the bearing member as shown in Fig. 2. The feed rollers are held in engagement with the topmost sheet of the stack by means which will be hereafter described more in detail, and in order to insure the best results it is preferable to hold the rollers against rotation during their forward or feeding stroke, so that the friction between the peripheries of the rubber rollers and the topmost sheet will carry this sheet forwardly on the pile to the roller 12. The rollers are held against reverse rotation, that is, counter-clockwise rotation, during the feeding movement by means of a pawl 44 disposed in a bearing formed in each bearing member 36, the lower end of each pawl being bent laterally as indicated at 45 to engage with the teeth of the ratchet wheel 43, an expansion spring 46 disposed between the bearing member 36 and a knob 47 on the pawl being adapted to yieldingly hold the end 45 in coöperative relation with the ratchet wheel. It will be obvious that this construction prevents reverse rotation of the roller but permits the roller to rotate freely in a clockwise direction upon the return or inoperative stroke of the mechanism. The pawl also performs another function, that is, it serves to hold the pintle in its bearings and prevents the same from dropping out when the bearing member is elevated above the stack. If it should be desirable at any time to remove the

rollers for purposes of repair or for any other reason the pawl is depressed below a slight notch in which the end 45 normally rests whereupon it may be rotated manually through the knob 47 to disengage the end 45 from the ratchet wheel thereby permitting the pintle, and rollers carried thereby, out of their bearings. Midway between the brackets 32 there is secured upon the rod 21 by bolts or otherwise an upwardly extending bracket or supporting member 48 (Fig. 4) having upwardly projecting ears 49 at each end which carry a pin or shaft 51. A lever 52, pivoted on this shaft, is formed at its pivot end in the shape of a tapered block, the rear end of which engages with the upper face of the underlying bracket 48 to limit the upward movement of the free end of the lever. The forward end of the block portion is rounded off as indicated at 53 so that a limited downward movement of the lever is permitted. The free end of lever 52 is connected by a spring 54 with a bolt or pin 55 passed through a yoke 56 and provided at its upper end with an adjusting nut 60, by means of which the tension of spring 54 may be adjusted. The outer ends of the yoke 56 are connected with rods 57 which extend downwardly through guides 58 formed on the brackets 32 into sockets 59 formed on the arms 34. It will be manifest that since the outer end of lever 52 is held against upward movement the spring 54 will pull downwardly upon the yoke 56 and that this downward pressure will be transmitted through the rods 57 to the feed rollers 42. The feed rollers are forced downwardly against the top of the stack under a constant pressure exerted by spring 54 during the initial operative stroke of the rollers, and for the purpose of increasing the pressure of the rollers on the stack as the rollers approach the forward edge of the stack I have provided mechanism which will now be described.

Upon the pin 51 adjacent to the lever 52 I have pivoted an arm 61 which is longer than the lever 52 and is equipped at its outer end with a pin or roller 62 projecting laterally therefrom in position to engage with a stationary cam 63 upon forward movement of the rollers, the cam being fixedly mounted upon the transversely extending portion 64 of the main frame. The arm 61 is provided just in front of its pivot with a laterally projecting lug or ear 65, equipped with an abutment 66 in the form of a set screw extending through the ear 65 directly above the lever 52 so that when the outer end of arm 61 is depressed the lower end of the screw will engage the lever 52 and depress said lever on its pivot thereby increasing the tension on spring 54. The extent of movement of the lever 52 under the influence of arm 61 may be regulated by adjustment of the set screw 66 so that the amount that the pressure of the feed rollers upon the stack will be increased may be regulated at will. The cam 63 is so positioned and the cooperating parts are so proportioned that the increased pressure of the feed rollers will be begun just before the rollers reach the forward edge of the stack, and this increased pressure will be continued approximately to the end of the feeding stroke. The effect of this increased pressure at this point is to flex the upper sheets over the forward edge of the stack thereby pulling a number of the upper sheets forwardly varying amounts so that they will be initially fed or combed out upon the stack as shown in Figs. 5 and 8. This flexing of the sheets causes, therefore, a relative movement between each of the upper sheets so that they are partially separated and loosened, one from the other, and are in position to be fed singly from the stack without danger of feeding a number of them together in a bunch as they have been fed by mechanisms employed prior to my invention.

For the purpose of relieving the pressure of the rolls on the stack after they have reached the end of their feeding stroke in order that the sheet then gripped between the rollers 12 and 16 may be withdrawn from the stack without opposition by the feed rollers I have provided mechanism for positively elevating the rollers at this point against the force of the presser spring 54. This means consists of a cam and a roller cooperating therewith and acting upon the feed rollers, as will now be described. The cross piece 64 of the main frame is equipped with a guide 67 in which a floating bar 68 is adapted to travel, the forward movement of the bar being limited by a stop 69 at the front of the frame. The rear end of bar 68 slides in the block or bearing member 48 as shown in Fig. 6 and at its rear end on its under side it is provided with a cam surface 69 (Fig. 5) adapted to be engaged by a roller 71 carried on a shaft 72 connecting a pair of arms 73 pivoted on the pins 33, the forward ends of the arms 73 being disposed beneath abutment screws 74 carried by the arms 34 so that when the rear ends of arms 73 are depressed their forward ends, engaging with the abutment screw 74 will elevate the arms 34 and the feed rolls carried thereby out of contact with the stack of sheets. During the forward feeding movement of the feed rollers the floating bar 68 slides in the guide 67 until its forward movement is arrested by the stop 69 whereupon further forward movement of the feed rolls will cause the roller 71 to be depressed by the cam surface 69 to elevate the rollers in the manner described.

While I have shown and described in the present instance the spring 54 as being con-

nected to the lever 52, which is actuated through the intermediary of the adjustable abutment screw 66 from the arm 61, I have found that with some grades of paper the adjustment afforded by the screw 66 is unnecessary. I have therefore provided the arm 61 with a laterally extending pin 50 (Fig. 6) to which the lower end of the spring 54 may be directly attached if desired, thereby eliminating the use of the lever 52 and connecting the bolt 55 directly with the arm 61. It will be manifest that downward movement of arm 61, under the influence of the cam 63, will increase the pressure on the feed rolls at the required time without the employment of the lever 50 but that the auxiliary adjustment and regulation of the increased pressure, which may be effected by the adjustable abutment screw 66, will be sacrificed.

The hold-back mechanism in the present instance comprises a transverse rod 75 provided at each end with upstanding members 76 screw-threaded onto longitudinal rods 77 connected to rotate in unison by means of a shaft 78 and intermeshing beveled gears 79. Manual rotation of the shaft 78 will cause both ends of rod 75 to travel forwardly or rearwardly an equal amount to the desired adjusted position. A pair of brackets 81, fixed to the rod 75, have pivoted thereto a bearing member 82 which carries a supporting member 83 capable of swinging movement about its axis. A spring 84, attached at its lower end to a finger fixed to the rod 75 and at its upper end to a bolt 85 passed through a yoke 86 and adjustable therein by means of a nut 87, serves to press downwardly upon the bearing member 82 and exert the required pressure upon the hold-back rolls in a manner similar to the action exerted by spring 54. The construction of the hold-back mechanism thus far described is substantially identical with that disclosed in my prior application aforementioned. The supporting members 83 are forked as shown in Fig. 1 and have pivoted thereto at their outer ends a frame 88 provided with a plurality of pairs of downwardly opening bearings 89 and 91 respectively. A spindle or shaft 92 provided with a pair of rubber hold-back rollers 93 is journaled in each bearing 89. A truck comprising side members 94, a central pin or shaft 95, and a pair of oval rollers 96, as best shown in Fig. 7, has the ends of shaft 95 journaled in the bearing 91 of the frame 88. The hold-back rollers 93 and the oval rollers 96 are yieldingly held in engagement with the stack of sheets by the spring 84 under any desired pressure, and in order that the underlying sheets may be held back by the rollers when the uppermost sheet is withdrawn I have provided means for frictionally engaging and retarding the rotation of the shaft 92 which presses a leaf spring 97 bent over the pivot pin 98, connecting the frame 88 with the supporting member 83, the forward end of said spring being engaged beneath the shaft 92 and the rear end being connected with the pin 95 of the truck by a screw 99 having its lower end hooked beneath the pin 95 and its upper end equipped with a nut 101 disposed above the rear end of the spring 97. By screwing down upon the nut 101 the tension of spring 97 may be increased to exert the required frictional resistance upon the shaft 92. It will be observed that the spring 97 not only serves as a brake to the shaft 92 but also serves to hold the shaft 92 and the truck in position in their respective bearings 89 and 91. During the operation of the machine the oval rollers 96, which are arranged in tandem, press downwardly upon the paper and serve to crease it to a certain extent, thereby tending to hold back the sheets and the rubber rollers 93, rotation of which is retarded by the spring 97, hold back the underlying sheets after the topmost sheet has been withdrawn from beneath them. It will be manifest therefore that my hold back mechanism, comprising two sets of spring-pressed rollers, is adapted to hold back the sheets and prevent more than one from being fed at a time from the stack.

In Figs. 8 and 9 I have shown a modified form of mechanism for controlling the feed rollers. In this form the feed rollers 102 are carried directly upon arms 103 pivoted on the cross rod 21 and a coiled spring 104, engaging at one end with an arm and at its other end with a collar 105 fixed on the rod 21, serves to yieldingly hold the rollers in engagement with the underlying sheets. Each roller may be equipped, if desired, with a ratchet wheel 106 and a spring pawl 107 to prevent reverse rotation of the roller.

In order to secure the increased pressure of the feeding roller at the end of the feeding stroke I have secured to the cross portion 64 of the main frame a rearwardly extending member 108, the rear end of which is supported by an arm 109 fixed on the cross rod 21. Upon the member 108 I have formed a cam 111 adapted to engage a roller 112 carried by the axle of each feed roller so that as the feed roller approaches the forward edge of the stack of sheets it is depressed by the cam 111 thereby giving the desired increased pressure. For the purpose of freeing the roll from the stack upon its return movement I have for this form of invention provided a track 113, up which the roller 112 travels as the forward stroke of the feed roll is completed, and a spring switch 114 disposed over the upper end of the track 113 serves to prevent return movement of the roller down the track and causes

it to travel back upon a guide 115 carried by the member 108. In other words, when the feed roller completes its forward movement it is passed up the track 113 out from beneath the spring switch 114 which then snaps back over the track 113. The roller 112 is then supported by the switch and the guide 115 until it travels off the rear end of the guide whereupon the roller is depressed by the spring 104 into coöperative relation with the stack. In both forms of my invention I preferably employ a guide bore 116 disposed in front of the stack to assist in guiding the sheets to the roller 112 as they are fed from the stack.

It is believed that my invention and its mode of operation will be fully understood from the foregoing without further description and it will be obvious that various modifications of the structural details disclosed may be resorted to without departing from the essence of the invention as set forth in the following claims.

I claim:

1. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, a reciprocatory sheet-feeding device adapted to engage the topmost sheet and feed said sheet forwardly from the stack, and means for increasing the pressure of said device upon the stack during the feeding stroke of the device.

2. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, a reciprocatory sheet-feeding device adapted to engage the topmost sheet and feed said sheet forwardly from the stack, and means for automatically increasing the pressure of said device upon the stack during the feeding stroke of the device.

3. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, a reciprocatory sheet-feeding device adapted to contact with the uppermost sheet on said stack, and means for causing said device to exert an increased pressure upon the stack as the device approaches the forward edge of the stack on its feeding movement.

4. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, a sheet feeding device adapted to contact with the uppermost sheet on said stack, means for reciprocating said device, and means for automatically increasing the pressure of said device upon the stack to flex the upper sheets over the forward edge of the stack to facilitate the separation of said sheets.

5. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, a sheet-feeding device reciprocable with respect to said stack, and automatic means for causing said device to exert an increased pressure upon the stack sufficient to flex the upper sheets over the forward edge of the stack as the device approaches the end of its feeding stroke.

6. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, and automatic and variable pressure means for flexing the upper sheets of the stack over one edge of the stack to facilitate the separation of said sheets.

7. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, a reciprocatory device disposed above said stack, and means for causing said device to exert a pressure upon the stack as the device approaches and passes one edge of the stack whereby the upper sheets of said stack are flexed and combed out upon the stack.

8. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, a feeding roller disposed above said stack, means for moving said roller back and forth across the stack, means for urging said roller against the uppermost sheet upon the stack with a predetermined pressure, and means for automatically increasing the pressure of said roller upon the stack as the roller reaches a predetermined position in its operative stroke.

9. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, a sheet-feeding roller mounted above said stack, means for reciprocating the roller relatively to the stack, a spring normally urging said roller into contact with the topmost sheet, and means for automatically increasing the tension on said spring as the roller approaches the forward edge of the stack upon its feeding stroke whereby the upper sheets of the stack are flexed over said forward edge and combed out upon the stack.

10. In a sheet feeding mechanism, the combination of a frame, means for supporting a stack of paper beneath said frame, a feeding roller mounted in the frame, means for reciprocating said roller longitudinally of the frame, a pivoted arm, means for limiting the movement of said arm in one direction, connections including a spring between said arm and said roller whereby the roller is urged into contact with the uppermost sheet of said stack, and means including a stationary cam and an operating arm connected with said first mentioned arm and adapted to be actuated by said cam whereby the pressure of said roller upon the stack is automatically increased when the roller reaches a predetermined position in its feeding stroke.

11. In a sheet feeding mechanism, the combination of a frame, a feeding roller mounted to reciprocate longitudinally of said frame, means for normally urging said roller into engagement with the topmost

sheet on said stack under a predetermined pressure, and means including a cam for increasing the pressure of said roller on the stack when said roller reaches a predetermined position in its travel.

12. In a sheet feeding mechanism, the combination of a frame, a feeding roller mounted to move longitudinally of said frame, a lever, connections between said lever and said roller for urging said roller into engagment with said stack of sheets, an arm positioned adjacent to said lever, means for actuating said arm to increase the pressure of said roller on the stack, and an adjustable device connecting said arm with said lever whereby the pressure of said roller may be varied.

13. In a sheet feeding mechanism, the combination of a reciprocatory feeding device, means including a spring for urging said device into coöperative relation with a stack of paper beneath the device, and means for increasing the pressure of said device against the stack, said last mentioned means comprising a cam, a pivoted arm adapted to be actuated by said cam, and an adjustable abutment for transmitting the movement of said arm to said feeding device.

14. In a sheet feeding mechanism, the combination of a frame, a plurality of pairs of feeding rollers carried by said frame, means for reciprocating said rollers with respect to the frame, a pivotally mounted arm movable with said rollers, a stationary cam adapted to actuate said arm when the rollers have reached a predetermined point in their travel, and connections between said arm and said rollers whereby movement of the arm is transmitted to said rollers to increase the pressure of said rollers upon a stack of sheets disposed in proximity to the rollers.

15. In a sheet feeding mechanism, the combination of a feed roller provided with a ratchet wheel, a slotted bearing for said roller, and means for holding said roller in its bearing and preventing retrograde rotation of said roller.

16. In a sheet feeding mechanism, the combination of a slotted bearing, a feed roller journaled therein, a ratchet wheel fixed with respect to said roller, and means engaging with said ratchet wheel for preventing reverse rotation of the roller and for maintaining the roller against displacement from its bearing.

17. In a sheet feeding mechanism, the combination of a forked slotted bearing, a pintle journaled in said bearing, a pair of feed rolls and a ratchet wheel fixed on said pintle, and a spring-pressed pawl engaged with said ratchet wheel to hold the pintle in the bearing and at the same time prevent reverse rotation of the pintle, said pawl being movable against the force of its spring into inoperative position to permit removal of the pintle from its bearing.

18. In a sheet feeding mechanism, the combination of a forked bearing member, each fork of which is provided with an open-ended slotted bearing, a pintle journaled in said bearings, a pair of feed rollers and a ratchet wheel fixed on said pintle, and a spring-pressed pawl rotatable and longitudinally movable in said bearing member, said pawl when in operative position being disposed in engagement with said ratchet wheel to hold the pintle in said bearings and prevent reverse rotation thereof.

19. In a sheet feeding mechanism, the combination of a bearing block provided with an open-ended slotted bearing and a bore extending parallel therewith, a roller fixed on said pintle, a pawl positioned in said bore and having a laterally projecting end, a ratchet wheel mounted on said pintle, and a spring acting on said pawl to hold the laterally projecting end thereof in engagement with said ratchet wheel whereby reverse rotation of the pintle and displacement of the pintle from the bearing is prevented.

20. In a sheet feeding mechanism, the combination of a pivotally mounted bearing member, a frame pivotally carried thereby, a shaft journaled in said frame, a pair of rollers fixed on said shaft, a leaf spring frictionally engaging said shaft to retard the rotation of the rollers, and means for varying the tension of said spring.

21. In a sheet feeding mechanism, the combination of a support, a frame pivoted thereon and provided with a plurality of pairs of open-ended bearings, a shaft journaled in one pair of said bearings, a pair of rollers fixed on said shaft, a truck frame pivoted in the other pair of bearings, a pair of rollers journaled in said truck frame, and spring means frictionally engaging with said shaft and connected with said truck frame whereby said frame and shaft are maintained in said bearings.

22. In a sheet feeding mechanism, the combination of a supporting member, a frame pivoted thereon and provided with a plurality of pairs of open-ended bearings, a shaft journaled in one pair of bearings, a truck frame journaled in the other pair of bearings, a leaf-spring engaged at one end with said shaft, and means adjustably connecting the other end of said spring with said truck frame whereby said truck frame and shaft are held in their respective bearings, and a pair of oval rollers rotatably mounted in said truck frame.

23. In a sheet feeding mechanism, the combination of a pivotally mounted supporting member, a frame carried thereby, and a truck journaled in said frame, said

truck comprising side members and a plurality of oval rollers mounted in tandem between said side members.

24. In a paper feeding mechanism, the combination of a feeding device, and a holding device comprising a hold-back roller and a plurality of oval rollers disposed one ahead of the other.

25. In a sheet feeding mechanism, the combination of a feeding device, and a hold-back device comprising a plurality of oval rollers positioned one ahead of the other.

26. In a sheet feeding mechanism, the combination of a feeding device, and a hold-back device including an oval roller adapted to engage with the top sheet of a stack.

27. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, and means for exerting an increasing pressure upon the top of said stack adjacent to one edge thereof to bend the upper sheets over said edge of the stack whereby said sheets are combed out upon the stack.

28. In a sheet feeding mechanism, the combination of a sheet contacting device, mechanism for operating said device, means for causing said device to exert a pressure upon a stack of sheets, and independent means for increasing the pressure of said device as it approaches one edge of the stack to thereby flex the upper sheets of the stack over said edge.

29. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, a sheet feeding device, means for exerting a pressure upon the stack through said device, and independent means for increasing the pressure upon said stack at the forward edge thereof to flex the upper sheets over said edge of the stack.

30. In a sheet feeding mechanism, the combination of means for supporting a stack of sheets, a sheet-feeding device adapted to engage the topmost sheet of the stack, means for operating said device and means for exerting a pressure upon said stack at the forward edge thereof to flex the upper sheets and comb them out upon the stack.

HOWARD E. HARBAUGH.

Witnesses:
IRA J. WILSON,
A. G. LATIMER.