

March 25, 1941.

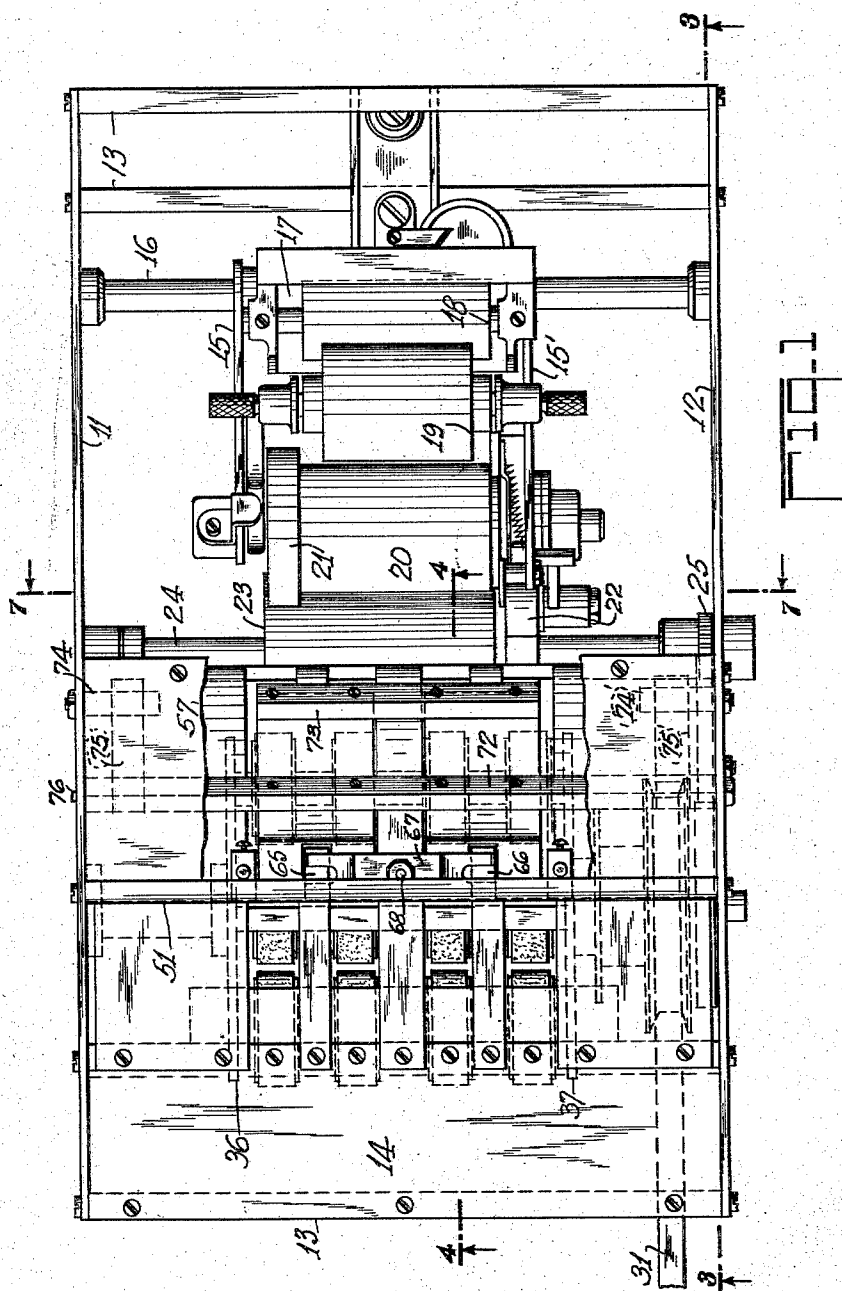
A. W. NELSON

2,235,844

SHEET FEEDING MACHINE

Filed April 21, 1939

6 Sheets-Sheet 1

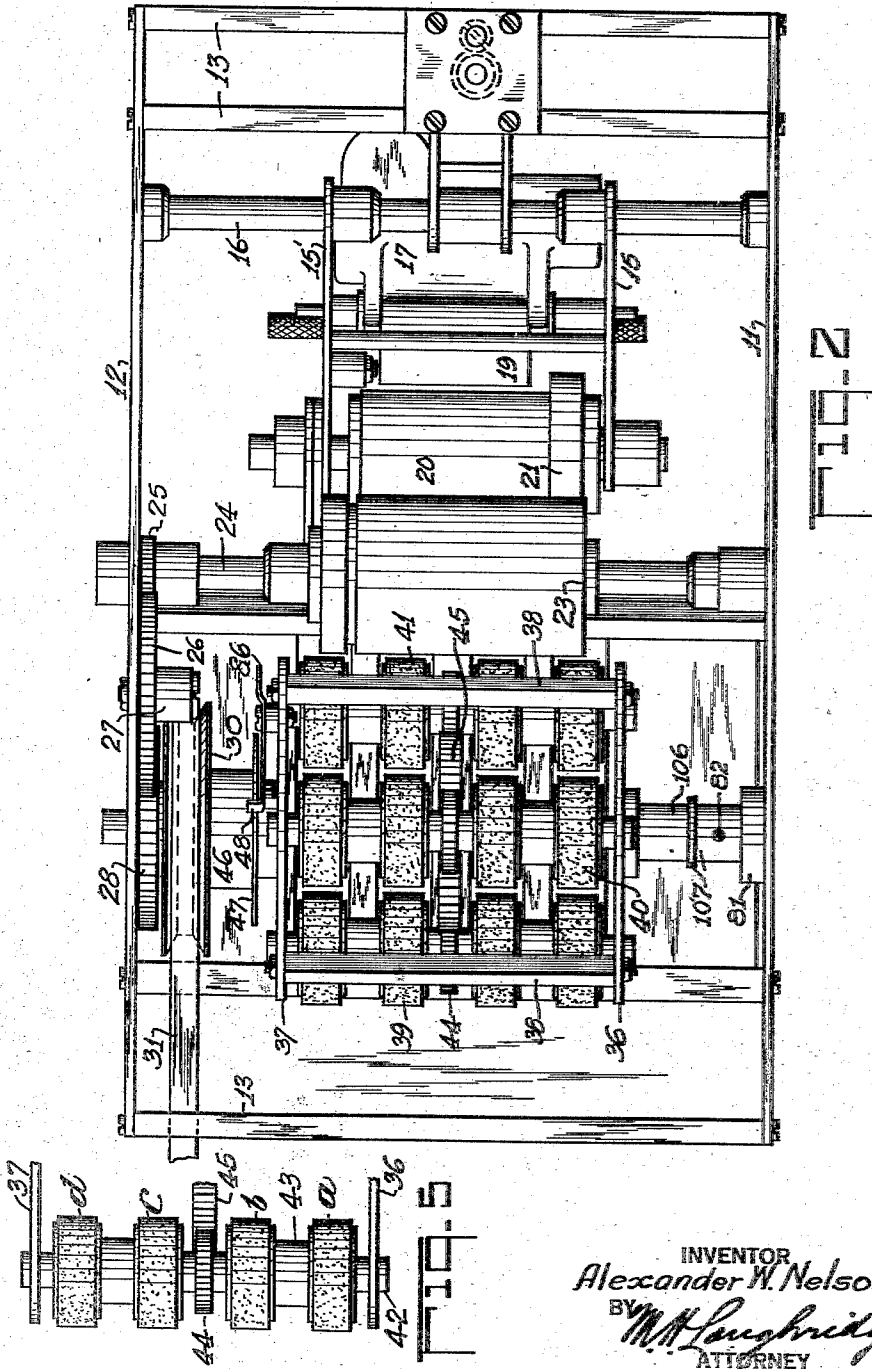


INVENTOR
Alexander W. Nelson.
BY *M. Leachridge*
ATTORNEY

2,235,844

Filed April 21, 1939

6 Sheets-Sheet 2



March 25, 1941.

A. W. NELSON

2,235,844

SHEET FEEDING MACHINE

Filed April 21, 1939

6 Sheets-Sheet 3

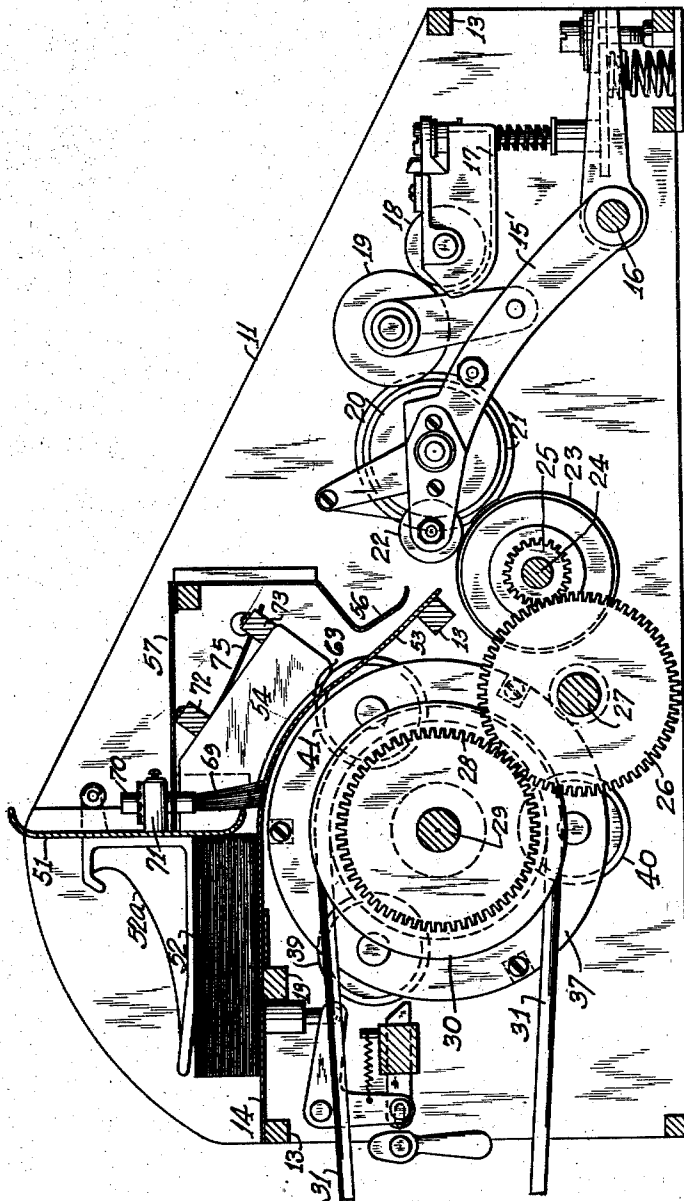


Fig. 3

INVENTOR
Alexander W. Nelson,
BY
M. A. Loughridge
ATTORNEY

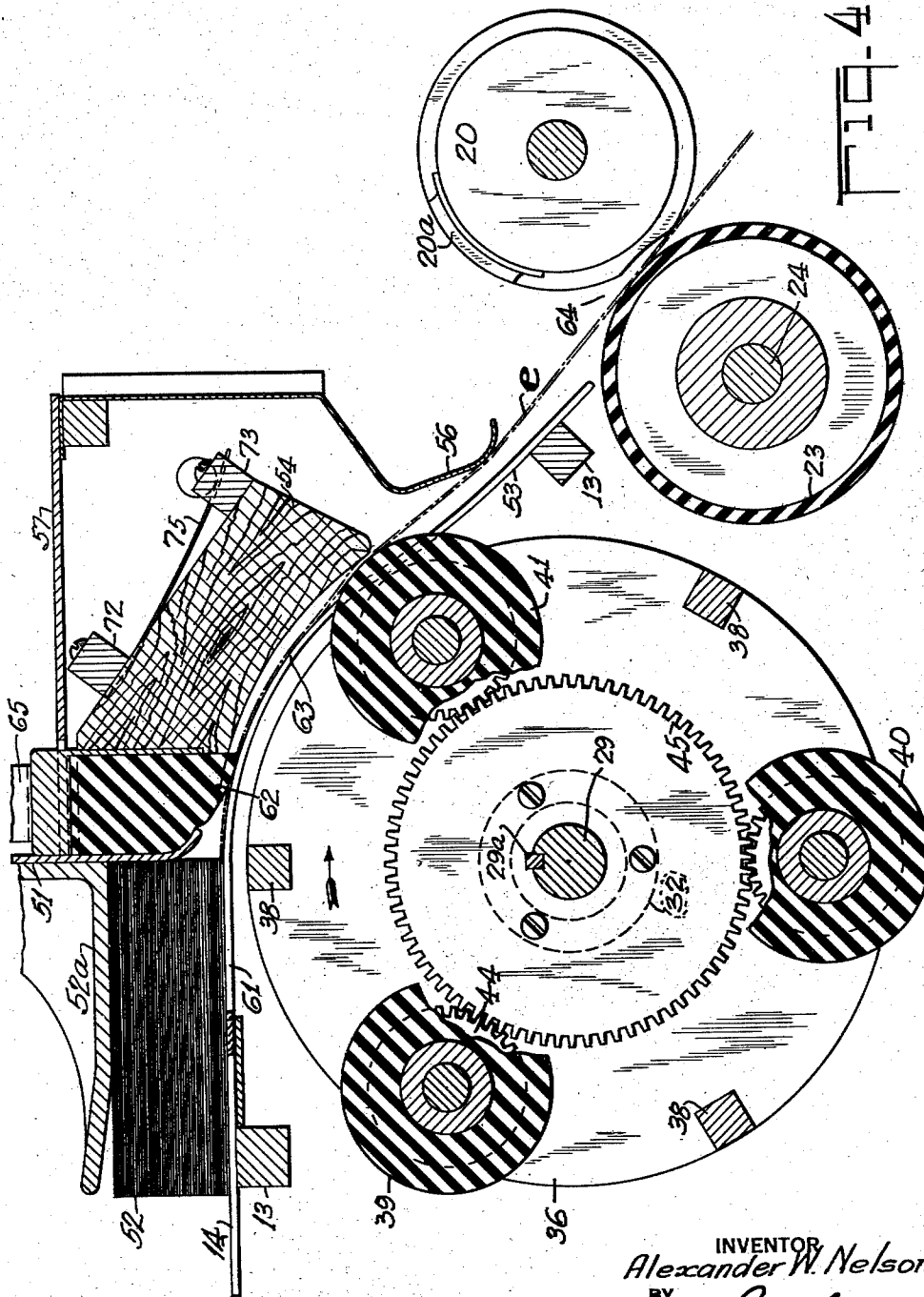
March 25, 1941.

A. W. NELSON
SHEET FEEDING MACHINE

Filed April 21, 1939

2,235,844

6 Sheets-Sheet 4



INVENTOR
Alexander W. Nelson.
BY *M. A. Loughbridge*
ATTORNEY

March 25, 1941.

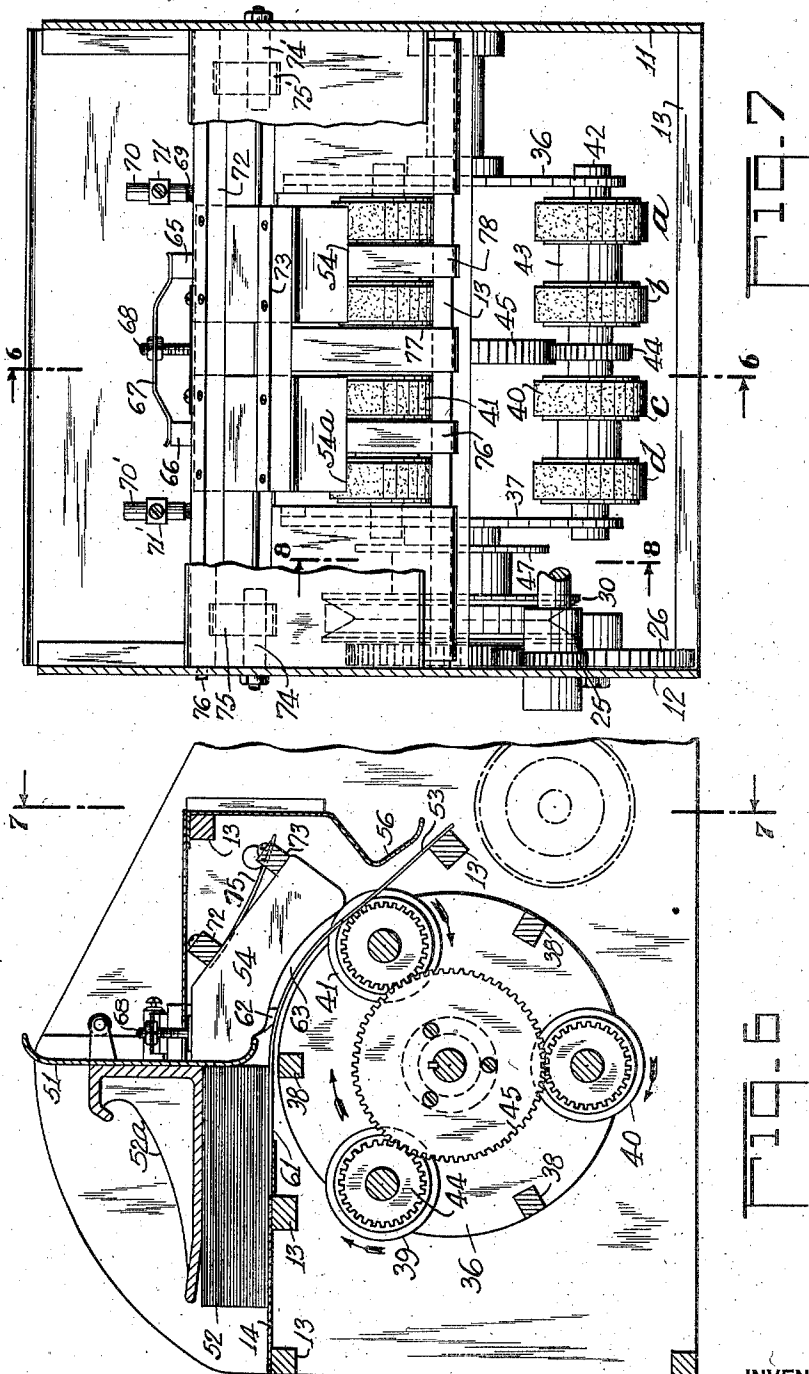
A. W. NELSON

2,235,844

SHEET FEEDING MACHINE

Filed April 21, 1939

6 Sheets-Sheet 5



INVENTOR
Alexander W. Nelson.
BY *M. A. Laughridge*
ATTORNEY

March 25, 1941.

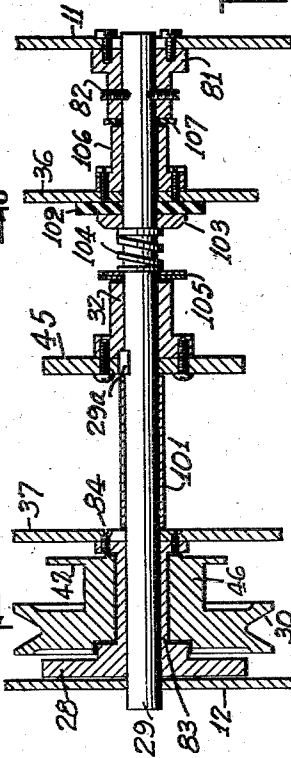
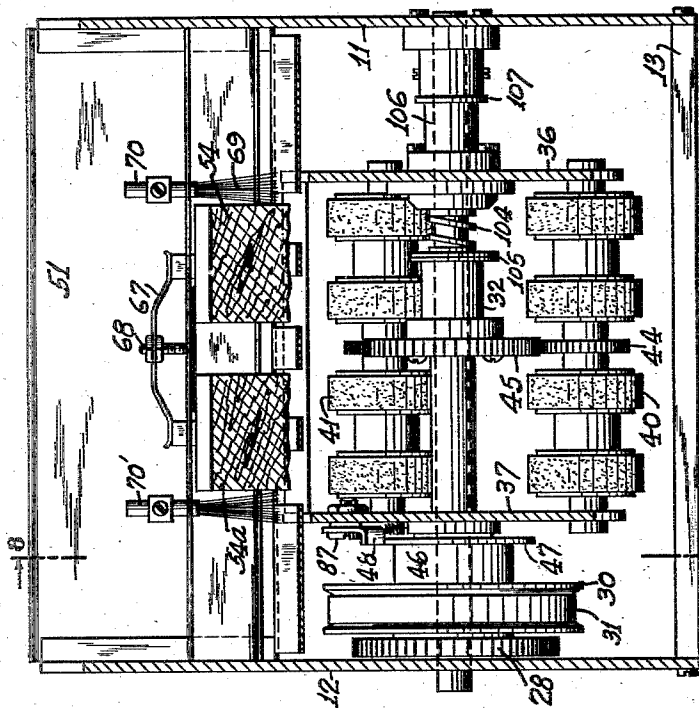
A. W. NELSON

2,235,844

SHEET FEEDING MACHINE

Filed April 21, 1939

6 Sheets-Sheet 6



INVENTOR

Alexander W. Nelson,

BY *M. H. Longbridge*
ATTORNEY

ATTORNEY

UNITED STATES PATENT OFFICE

2,235,844

SHEET FEEDING MACHINE

Alexander W. Nelson, Belleville, N. J., assignor to
Robert F. Darby, Newark, N. J.

Application April 21, 1939, Serial No. 269,181

14 Claims. (Cl. 271-41)

This invention relates to an automatic paper feeding machine in which paper sheets or cards are taken up from a stack and fed, one at a time, into a mechanism for photographing or other processing of each sheet.

An object of the invention is to provide a paper feeding mechanism that will feed paper from a stack, one sheet at a time, and at a fairly high rate of speed; also an object is to feed paper sheets, or similar articles, from a stack, one at a time, that are not uniform in size and shape and that may have been worn in use, such as bank checks.

These and other objects of the invention will be more particularly understood from the following specification and the accompanying drawings, in which:

Fig. 1 is a top plan view of the sheet feeding mechanism and endorsing mechanism;

Fig. 2 is a bottom plan view of the sheet feeding mechanism and the endorsing mechanism;

Fig. 3 is a side elevation on line 3-3 of Fig. 1 with the side plate removed, showing the operating mechanism;

Fig. 4 is an enlarged view taken on line 4-4 of Fig. 1 of the sheet feeding mechanism;

Fig. 5 is a detail view of one set of rollers used in the sheet feeding mechanism;

Fig. 6 is a sectional elevation on line 6-6 of Fig. 7, showing the sheet feeding mechanism and paper guide;

Fig. 7 is a sectional elevation on line 7-7 of Figs. 1 and 6;

Fig. 8 is a sectional elevation on 8-8 of Fig. 9, showing the control of the driving clutch;

Fig. 9 is a sectional elevation on line 9-9 of Fig. 8, and

Fig. 10 is a sectional view of the driving shaft and the frictional damper for the paper feed taken on line 10-10 of Fig. 8.

Sheet feeding mechanism

The documents or sheets are placed in a stack upon a table and are suitably held under pressure by a weight or follower. Below the table a spider revolves carrying three spaced rollers thereon which rollers are provided with rubber tired sections that engage the lowest sheet of the stack as the spider revolves. A planetary mechanism is provided for rotating these take-up rollers as the spider revolves at a much higher surface speed than the speed of the spider, so that the take-up rollers engage the bottom sheet of the stack, rotating at a fairly high speed, and, at the same time, moving forward in the direction of

the paper feed. This has the effect of snapping the bottom sheet from below the stack without producing any great tendency to move more than one sheet from the stack at a time. If the surface engagement between the take-up rollers and the bottom sheet were operated at a lower speed the tendency for one or more sheets above the bottom sheet to follow the bottom sheet into the feeder would be materially increased.

To insure that only one sheet may be fed forward for operation at a time, a hold-back mechanism is provided at the entrance to the paper guide which comprises one or more spring-pressed rubber shoes which engage the back of the document as it leaves the paper stack, with less friction, however, than the friction of the take-up rollers, so that the bottom sheet of the stack is carried forward while any sheets that might follow the bottom sheet are retarded and held back by the hold-back mechanism.

In the drawings 11 and 12 are the side plates of the mechanism which are suitably spaced by spacer bars indicated at 13. The paper table for the stack of documents is indicated at 14 and the frame of the endorsing mechanism 15, 15' is mounted on shaft 16 and comprises the inkwell 17, the inking rollers 18, 19 and the endorsing roller 20, which is provided with a collar 21 which engages the roller 23, mounted on shaft 24 and driven by the pinion gear 25, the idler gear 26, mounted on arbor 27 and engaging spur gear 28, mounted on shaft 29, and connected with the belt wheel 30, driven by belt 31.

The shaft 29 is stationary and has a collar 37, Figs. 4 and 10 secured thereon by the key 29a and to this collar the planetary gear 45 is fastened. A spider, comprising the discs 36 and 37, spaced by the bars 38, is mounted by the bearing 106 on the shaft 29, so that the spider rotates freely on the fixed shaft 29 and is held in position by the sleeve 101. The spider comprises three sets of take-up rollers as indicated in Fig. 5, a, b, c and d and as indicated in Fig. 4 at 39, 40 and 41. These rollers are each mounted on a shaft 42, rotating freely in the end plates 36 and 37 of the spider and each shaft is provided with a spur gear 44, which engages the planetary gear 45, fixed on shaft 29.

The spider is driven from the belt wheel 30, through the collar 46 and the ratchet disc 47 engaged by the latch 48, Fig. 2 and Fig. 8, mounted on the end plate 37 of the spider, so that the spider is rotated by the movement of the belt as long as latch 48 remains engaged. The movement of the spider in the direction of the arrow

in Fig. 6 by the belt 31, rotates each of the take-up sets of rollers 39, 40 and 41 in the direction indicated by the arrows, that is, in the direction in which the spider is moving but the surface velocity of these take-up rollers, which are provided with soft rubber tires, is much higher than the surface velocity of the spider discs.

The stack of paper sheets 52 is placed on the table 14 against the vertical guide 51 and on top of this stack the weighted follower 52a is placed to hold the sheets compressed together. The table 14 develops into guide fingers indicated at 53, Figs. 3, 4 and 8 and at 76, 77 and 78 in Fig. 7. Above the fingers 53 the guide blocks 54 and 54a are located and are secured to the crossbar 72 which is pivotally mounted at 76, Fig. 7, in the side plates of the mechanism. A flat spring 75 extends from the crossbar 72 and below the stud 74 which gives a bias to the blocks 54 which provide a pressure on the upper side of the sheet, passing through the slot 63 of the paper guide, as this sheet is engaged by the take-up rollers. An upper fixed member is provided at 56 to guide the paper stock *e* into the slot 64, between the rollers 20 and 23, Fig. 4. The blocks 54 are preferably protected by a cover 57 and are connected at the lower end by the bar 73.

The table 14 is provided with slots at 61 below the paper stack and between the fingers 76, 77 and 78, and in these slots the take-up rollers *a*, *b*, *c* and *d* project, as indicated in Fig. 4 so that they clamp the paper sheet taken up from the bottom of the stack between the rollers and the guide blocks 54, 54a. The hold-back shoe 62 is mounted in a head 65 which slides vertically and engages the back of the bottom sheet as it leaves the paper stack and enters the paper guide. In practice, a pair of hold-back shoes are provided with the heads 65 and 66, Fig. 7 pressed downwardly by the flat spring 67, which is secured by the stud bolt 68. In addition to the hold-back shoes, brushes are provided on each side of the intake mechanism to prevent loose sheets from entering the paper guide on the skew. These brushes are indicated at 69 with a brush holder 70 secured to the arm 71. The brush on the opposite side of the machine is indicated by corresponding characters with a prime mark.

In the operation of the feeding spider each set of take-up rollers takes up and feeds forward one sheet from the bottom of the stack, that is, three sheets are fed for each rotation of the spider. A control is provided whereby the drive mechanism is disconnected when the last sheet from the paper stack has been taken up and it may also be disconnected manually. For this purpose, the driving pulley 30 is provided with a collar 46 upon which the flange 47 is mounted. This flange is made in the form of a ratchet having a tooth corresponding to the position of each of the three take-up rollers. The ratchet is latched to the disc 37 by the lever 48, pivoted at 87 to 37 and having the arm extending from 86 into the path of the dog 89 which slides in the guide 90 and is connected with the crank 91 and the plunger 93, operating in guide 94, through an aperture in the table 14 and in line with the aperture 95 in the follower 52a. As long as any paper sheets remain in the stack the plunger 93 is held depressed against spring 92, but when the last sheet is taken up this plunger enters the aperture 95 and permits the dog 89 to engage the tail lever 86 as the disc 37 rotates, thereby disconnecting the drive by un-

latching at 48. The crank 91 connects to 89 by a slotted connection and the handle 98 may be operated to bring the cam 99 into engagement with the end of 89 and thereby permanently unlatch the lever 48.

The shaft 29, Fig. 10, is rigidly secured by the studs 82 to the collar 81 which is screwed to the side plate 11. On this shaft the drive pulley 30 is freely mounted and is latched to the side plate 37 of the spider as described. The spider 37 is connected at 84 with the sleeve 83 of the gear 28, which, in turn, through pinion 25 drives the roller 23 and the associated mechanism.

The collar 32 is rigidly mounted on shaft 29 and to this collar the planetary gear 45 is secured, as previously described. The end plates 36 and 37, forming part of the frame of the spider rotate together and at the speed of the drive pulley 30. In order to prevent the spider from over-running its position when the drive is unlatched, a damping mechanism is provided in the drive comprising the fibre plate 102 engaging the end plate 36 by a spring engagement obtained through coil spring 104 and collar 103 and this spring is opposed by a pair of washers 105 which engage the collar 32. The thrust of the spring 104 is taken up through collar 106 and the fibre washer 107 engaging the fixed collar 84. Normally, when the spider is driven a slippage occurs in this friction drive between the washers at 105. When the drive is unlatched with the spider rotating at speed the friction washer 102 operates to secure a quick stopping of the spider with the tail lever 86 in engagement with 89 so that thereafter the pulley 30 runs idle and the mechanism is disconnected. A sleeve is provided at 101 on shaft 29 to hold the end plate 37 in place.

In the operation of this paper feeding mechanism a stack of paper sheets, such as bank checks or the like, are placed on the table 14 and the mechanism is started, being usually driven by an electric motor, not shown in the drawings. This rotates the spider frame 37 in the direction in which the paper sheets are fed into the paper guide, and each set of take-up rollers project from the frame of the spider like a rubber covered cam to engage the bottom sheet of the paper stack. The take-up rollers rotate with the spider frame at the same speed as the spider frame, but in addition to this they rotate on their own shafts, driven by the planetary gear so that their peripheral velocity is much greater than the peripheral velocity of the spider frame. This results in a snap action which releases and moves forward the lower sheet of the stack without producing any great tendency for the sheet immediately on top of the bottom sheet to follow it into the paper guide.

In order to further guard against feeding more than one sheet at a time the hold-back shoes are provided to engage the back of the document that is carried forward by the feed rollers. These shoes are regulated by spring pressure and do not engage the sheet with the same friction as the feed rollers do so that the sheet is carried forward in the paper guide, while any following sheets are engaged by these shoes and they are held from moving forward into the paper guide. The hold-back shoes are preferably applied to the paper sheets between the take-up rollers so that there is no contact and no frictional wear between these shoes and the take-up rollers.

This mechanism is capable of feeding paper sheets that may be irregular in size and of different thickness and that may be fed to any kind

of mechanism for processing or other purposes. In the drawings selected to illustrate the invention the paper sheets are fed to an endorsing mechanism at 64 between the rollers 20 and 23 in which roller 20 is provided at 20a with a marking plate so that each revolution of the roller provides the required mark on the document. The sheet is fed forward between roller 22 and roller 23 and unlatches the mechanism for a rotation of roller 20. The endorsing mechanism here shown is typical of a commercial mechanism used for this purpose and of itself is no part of the present invention.

This application relates to the same subject as application Serial No. 175,253, filed November 18, 1937 now Patent 2,186,986, January 16, 1940.

The paper feeding mechanism, it will be noted, has a pair of spaced take-up rollers, which are rotating as they engage the bottom sheet of the stack. The pressure on the sheets produced by the follower is substantially uniform. The bottom sheet is snapped from the stack by the rollers engaging the sheet at an equal distance from the centre so that it is fed equally on both sides and in alignment with the apparatus that processes the sheet.

Having thus described my invention, I claim:

1. A paper feeding mechanism comprising a table for a stack of paper sheets, a rotating spider, a take-up roller on said spider arranged to engage the bottom sheet of the stack as the spider rotates, driving means for rotating said spider and said take-up roller and means for disconnecting said driving means and for damping the rotation of the spider.

2. A paper feeding mechanism comprising a table for a stack of paper sheets, a paper guide, feed rollers engaging the outside sheet of the stack, a spider rotating about a fixed centre for said feed rollers moving in the direction of the feed, means operated by the rotation of said spider for rotating said rollers to remove a sheet from the stack and feed it into the paper guide and a spring controlled clamping member forming part of the paper guide for clamping the sheet against the rollers.

3. A paper feeding mechanism comprising a table for a stack of paper sheets, feed rollers engaging the outside sheet of the stack, a carrier for said feed rollers moving in the direction of the feed, means operated by the movement of the carrier for rotating said rollers to remove a sheet from the stack, a drive for said carrier and means controlled by said paper stack controlling said drive.

4. A paper feeding mechanism as in claim 3 with a drive for the carrier, means connecting said drive with the carrier, manually operated means and also means controlled by the paper stack controlling said connecting means.

5. A paper feeding mechanism comprising a table for a stack of paper sheets, feed rollers engaging the outside sheet of the stack, a carrier for said feed rollers moving in the direction of the feed, means operating by the movement of the carrier for rotating said rollers to remove a sheet from the stack, a paper guide, a pair of friction shoes aligning with said paper guide and engaging the back of the sheet fed by said rollers and a spring applying tension to said shoes.

6. A paper feeding mechanism comprising a table for a stack of paper sheets, feed rollers engaging the outside sheet of the stack, a carrier for said feed rollers moving in the direction of the feed, means operated by the movement of the

carrier for rotating said rollers to remove a sheet from the stack, a paper guide for the sheet and a pair of spring friction shoes engaging the opposite face of the sheet to the face engaged by said rollers and staggered in said guide with relation to said rollers.

7. A paper feeding mechanism comprising a table for a stack of paper sheets, a shaft fixed with relation to said table, a spider comprising a pair of spaced plates rotating on said shaft, a second shaft rotatably mounted on said plates having a pair of spaced friction rollers engaging the outside sheet of said stack as said spider is rotated, a spur gear rigidly secured to said fixed shaft and a pinion gear on said second shaft engaging said fixed gear to rotate said friction rollers as the spider rotates and as the rollers engage the sheet of the stack.

8. A paper feeding machine comprising a table for a stack of paper sheets, a rotating spider below said table, a plurality of shafts rotatably mounted on said spider, each shaft having at least two spaced take-up rollers arranged to engage the bottom sheet of the stack as the spider is rotated, means for driving said shafts by said spider as the rollers engage the stack, driving means for rotating said spider, a clutch connecting said driving means with said spider and means controlled by the paper stack for clutching the drive.

9. A paper feeding machine comprising a table for a stack of paper sheets, a first shaft fixed with relation to the paper table, a rotating spider on said shaft, a planetary gear rigidly mounted on said shaft, a second shaft rotatably mounted on said spider and having a gear engaging said planetary gear for continuously driving said shaft, and rollers spaced on said second shaft and arranged to engage the bottom sheet of the stack substantially an equal distance from the centre of the sheet to withdraw the sheet from the stack.

10. A paper feeding machine comprising a table for a stack of paper sheets, a rotating spider, a drive shaft for said spider, a plurality of shafts radially spaced and rotatably mounted on said spider, a pair of spaced rollers on each shaft arranged to engage the bottom sheet of the stack substantially at equal distances from the centre of the sheet as the spider rotates, means for continuously rotating said rollers by the rotation of the spider and a clutch connecting said drive shaft with said spider and having an engagement corresponding to each of said radially spaced shafts.

11. A paper feeding mechanism comprising a table for a stack of paper sheets, a rotating spider, a plurality of spaced rollers on said spider arranged to engage the bottom sheet of the stack in spaced positions as the spider rotates, a pair of spaced friction hold-back shoes, means for rotating said rollers with a greater peripheral speed than the peripheral speed of said spider for moving the bottom sheet forward from the stack and said shoes engaging the back of said sheet to hold back following sheets.

12. A paper feeding mechanism comprising a table for a stack of paper sheets, a fixed shaft with a rotating spider thereon, a plurality of spaced rollers on said spider arranged to simultaneously engage the bottom sheet of the stack as the spider rotates, means for rotating said rollers by the rotation of said spider and a paper guide for the sheet taken up by said rollers, said

guide holding said sheet in engagement with said rollers until it is removed from the stack.

13. A paper feeding mechanism comprising a table for a stack of paper sheets, a fixed shaft with a rotating spider thereon, means for rotating said spider, a roller on said spider arranged to engage the bottom sheet of said stack as the spider rotates, means for driving said roller at a higher peripheral speed than the peripheral speed of said spider and a paper guide for the sheet taken up by the roller arranged to hold said sheet in engagement with the roller until it is removed from the stack.

14. A paper feeding machine comprising a table for a stack of paper sheets, a rotating spider, a paper guide, a take up roller mounted on said spider of smaller diameter than said spider, said take up roller arranged to engage the end sheet of said stack as said spider is rotated, and means for rotating said spider and for rotating said roller at a higher peripheral speed than said spider to move the sheet from the stack, said sheet being free to move in said paper guide at a higher speed than the peripheral speed of said spider.

ALEXANDER W. NELSON.