No. 754,205. PATENTED MAR. 8, 1904.

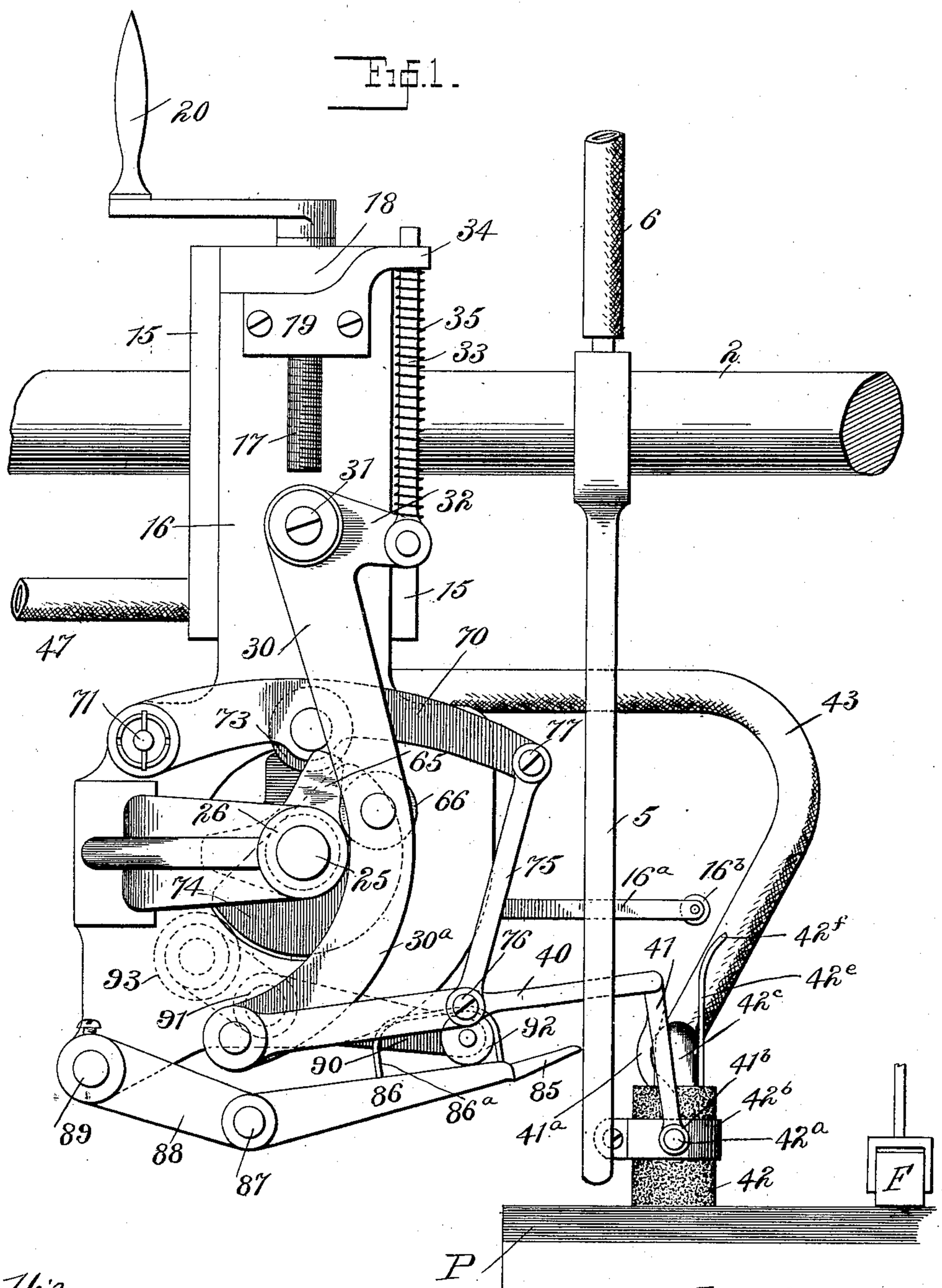
T. C. DEXTER.

PAPER FEEDING MACHINE.

APPLICATION FILED AUG. 10, 1901.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
Wm. A. Courtland
P. F. Smuck

Inventor
Talbot C. Dexter
By Knight Bros.
Attys.

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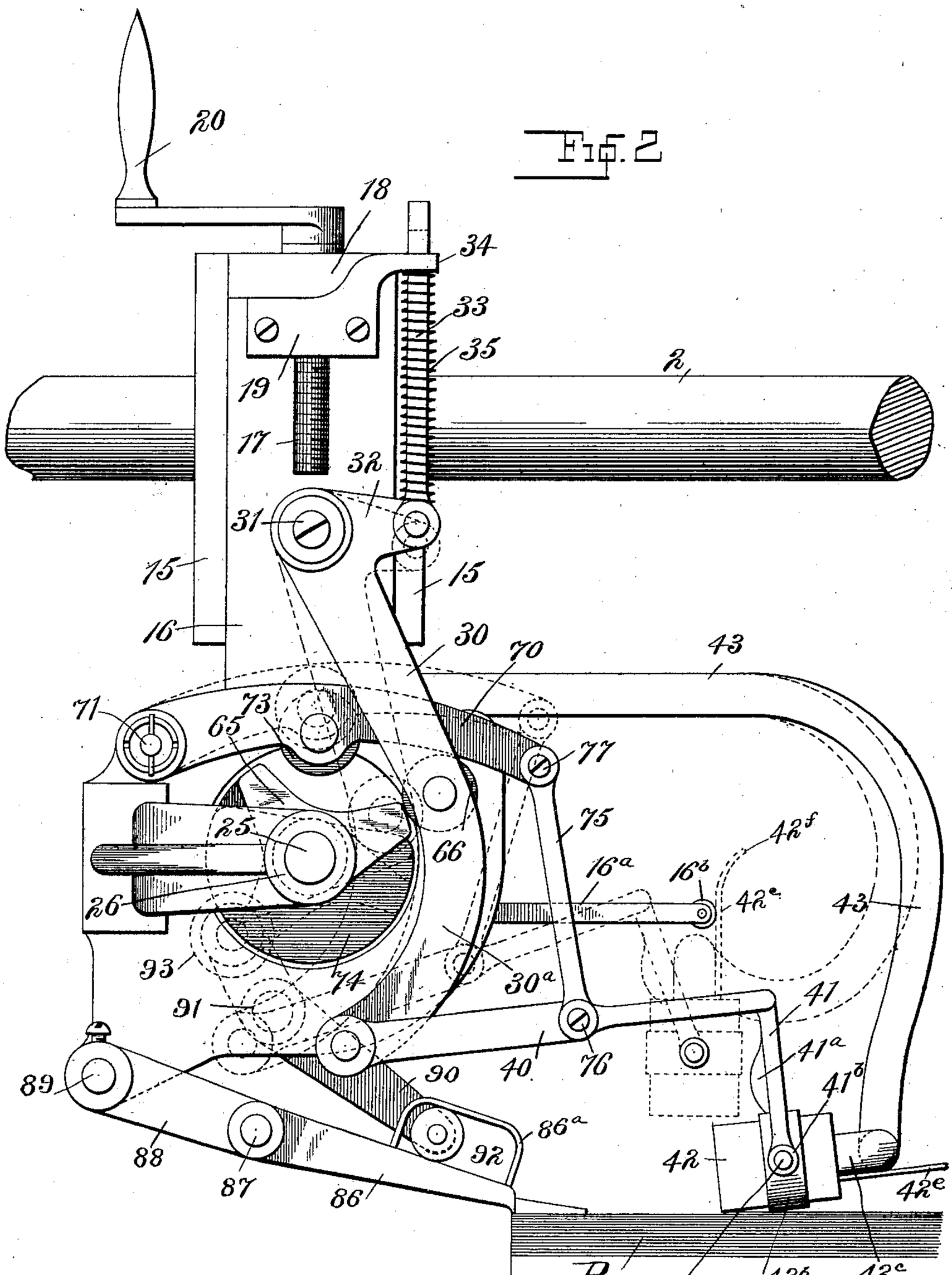
NO MODEL. 5 SHEETS—SHEET 2.

Fig. 2



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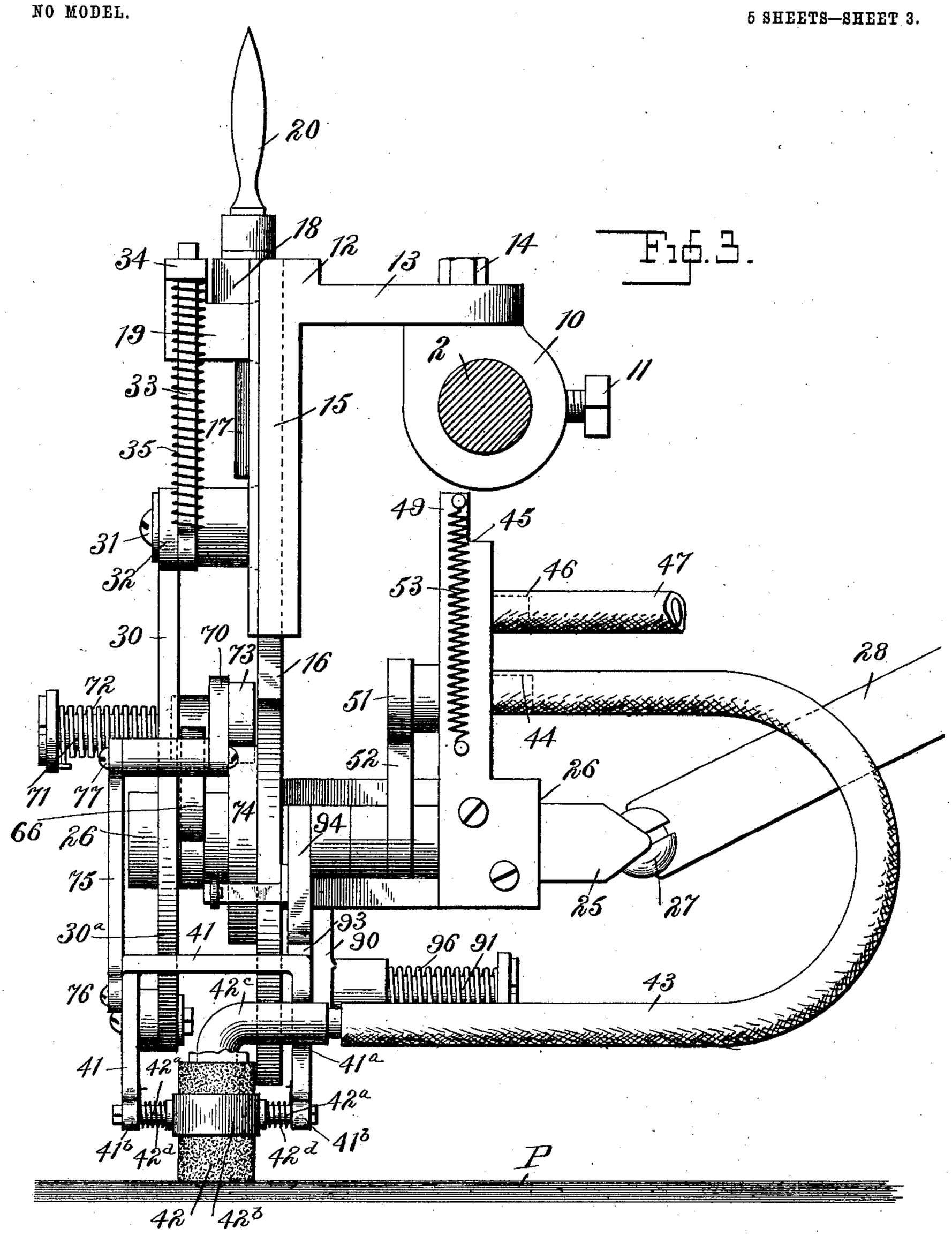
NO MODEL. 5 SHEETS—SHEET 3.

Fig. 3.



Witnesses.
Wm. A. Coutland
P. F. Sonnek

Inventor.
Talbot C. Dexter
By Knight Bros.
Attys.

No. 754,205. PATENTED MAR. 8, 1904.

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NO MODEL. 5 SHEETS—SHEET 4.

Fig. 5.

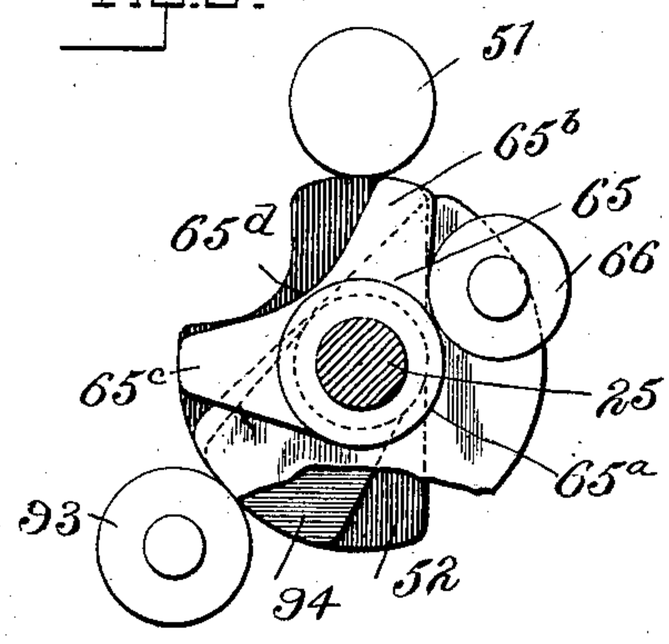


Fig. 6.

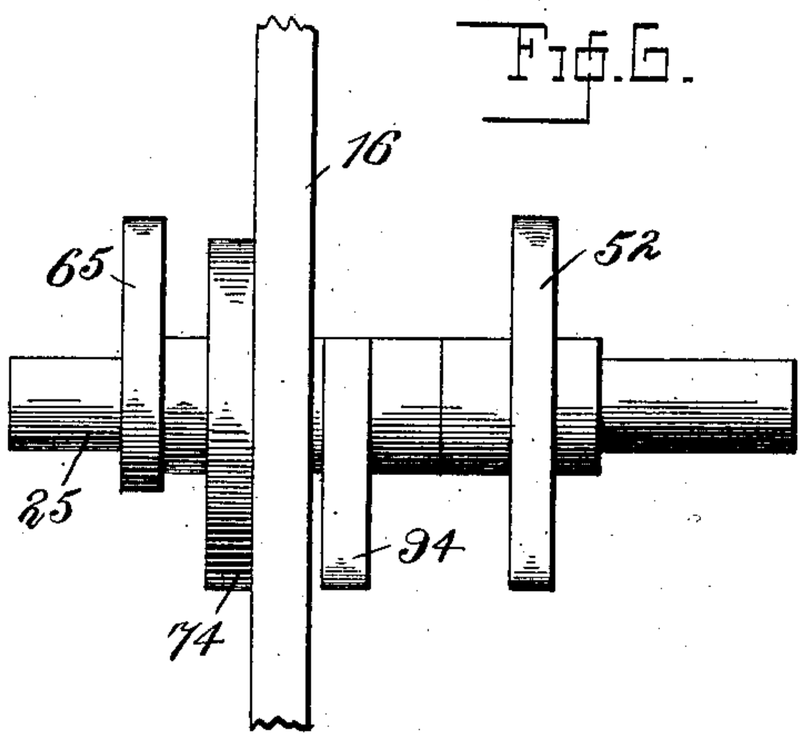


Fig. 7.

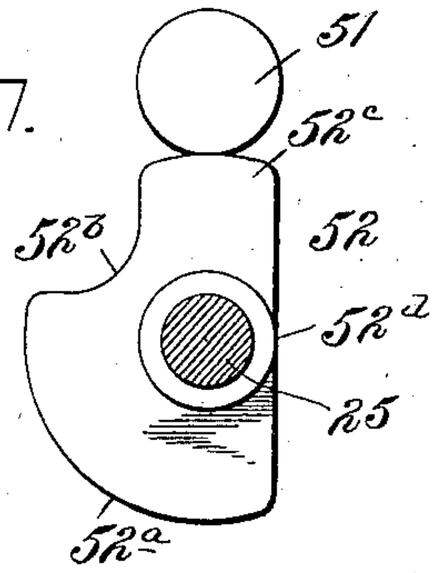


Fig. 8.

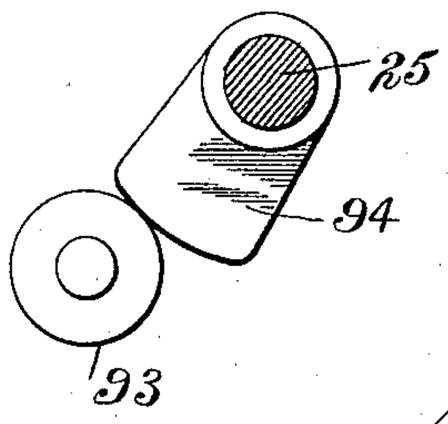
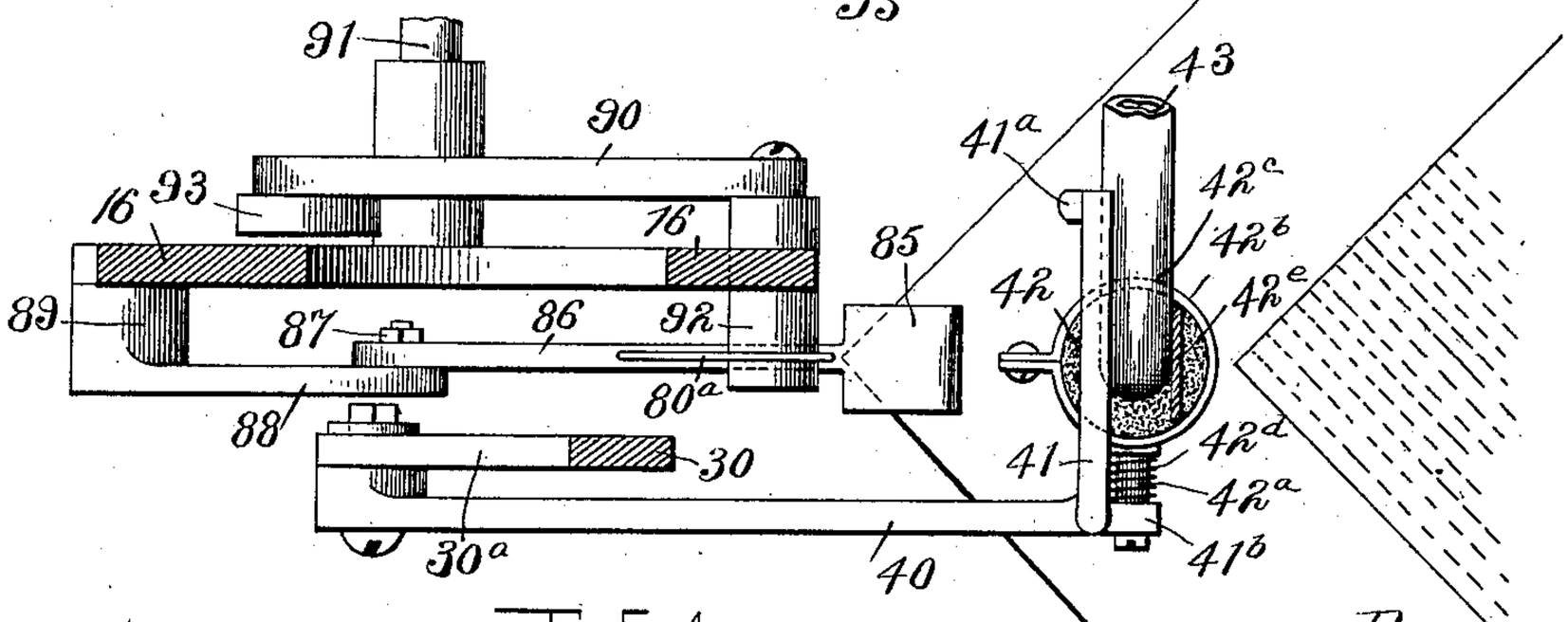


Fig. 4.



Witnesses.
Wm. A. Coulland
C. F. Sonnek

Inventor.
Talbot C. Dexter,
By Knight Bros.
Attys.

No. 754,205. PATENTED MAR. 8, 1904.

T. C. DEXTER.

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APPLICATION FILED AUG. 10, 1901.

NO MODEL. 5 SHEETS—SHEET 5.

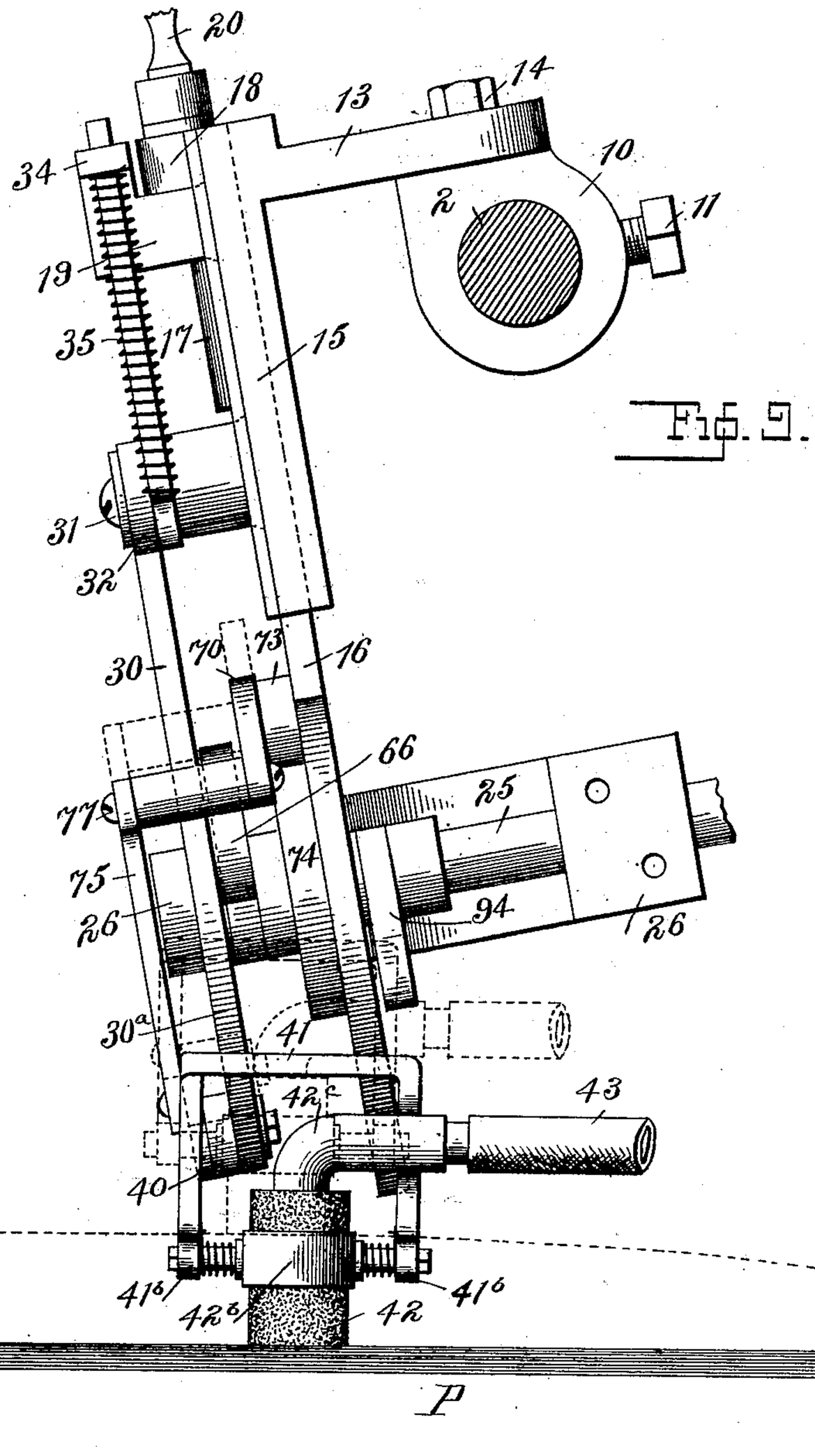

Fig. 9.

Witnesses.
Wm. A. Countland
P. G. Lomick

Inventor
Talbot C. Dexter
By J. Knight & Bro.
Attys

No. 754,205. Patented March 8, 1904.

UNITED STATES PATENT OFFICE.

TALBOT C. DEXTER, OF PEARL RIVER, NEW YORK.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 754,205, dated March 8, 1904.

Application filed August 10, 1901. Serial No. 71,573. (No model.)

To all whom it may concern:

Be it known that I, TALBOT C. DEXTER, a citizen of the United States, residing at Pearl River, in the county of Rockland and State of New York, have invented certain new and useful Improvements in Paper-Feeding Machines, of which the following is a specification.

The object of my present invention is to provide a simple and effective mechanism for separating the successive sheets of a pile preparatory to feeding the sheets from the pile to a folding-machine, ruling-machine, printing-press, or other machine which is to operate upon the sheets.

One of the main difficulties encountered in the operation of paper-separating mechanism as heretofore constructed is the tendency of the upper two or three sheets of the pile to separate from the pile at once under the operation of the separating mechanism; and it is the purpose of my invention to provide a mechanism which will be more effective in separating the top sheet from the underlying sheets, so as to avoid the possibility of feeding more than one sheet from the pile at the same time.

To this end the main feature of my invention consists, broadly, of means for abruptly turning up or bending at a sharp angle the opposite corners at one edge of the top sheet of the pile, then raising the edge of the sheet from the pile by its corners, and blowing air beneath the raised edge of the sheet. I prefer to employ pneumatic or suctional sheet-engaging devices for turning up the corners of a sheet, as such devices are less liable to turn up the corners of more than one sheet at a time. For causing the corners of the sheet to be bent or turned up I mount suctional sheet-engaging devices upon suitable supports in such a manner that they can engage the corners of one edge of a sheet and rock or tip over one or more times upon the pile of sheets and then move up away from the pile, carrying the edge of the sheet by the corners.

In the preferred arrangement of the mechanism the sheet-engaging devices are caused to first engage the corners of the sheet, then rock or tip over, causing the sheet-corners to be bent upwardly at a sharp angle, then release the corners of the sheet to allow them to spring back nearly to their normal position, then rock back to their initial position and again engage the corners of the sheet, then tip over again to bend the sheet-corners upwardly a second time, and finally move upwardly away from the pile of sheets to lift the edge of the sheet away from the pile for the purpose of separating it and at the same time allowing blasts of air to be blown under the top sheet to assist in the separating operation. The bending over of the corners of the sheet a plurality of times and the release of the corners between the bending operations insures absolutely against the possibility of the next underlying sheet being raised with the top sheet. By arranging the separating devices to engage the sheets at the corners in the margins I avoid the danger of injuring the printing upon the sheets.

Another important feature of my present invention is the arrangement of the separating devices for bodily shifting the partially-separated sheet upon the pile to complete the separating operation.

In my application, Serial No. 68,749, filed by me July 16, 1901, for the reissue of my original patent, No. 659,510, dated October 9, 1900, I have covered a sheet-buckling separating mechanism for paper-feeding machines comprising a pair of suctional buckling devices arranged to operate over one edge of a pile of sheets and adapted to buckle a sheet at its corners, raise the buckled edge of the sheet from the pile, shift the sheet bodily upon the pile, hold the raised edge in elevated position while air is blown under the partially-separated sheet, and finally release the buckled raised edge of the sheet in elevated position immediately after the feed devices engage the sheet to feed it from the pile.

In another application, filed by me on the 31st day of July, 1901, Serial No. 70,329, I have covered another improvement in sheet-separating mechanism for paper-feeding machines which is adapted to shift a sheet bodily upon the pile and stretch or straighten out the raised edge of a sheet above the pile.

In my present invention I shift the sheet

bodily upon the pile by so arranging and mounting the sheet-lifting separating instruments that each instrument will move toward and away from the surface of the pile in a plane inclined from the vertical (at the point of contact of the instrument with the pile) toward the edge of the sheet which is to be raised. With this arrangement it will be clear that when the separating instrument takes a positive hold upon the top sheet near its edge and moves upwardly away from the pile with the engaged edge of the sheet the instrument will at the same time move toward the vertical plane of the edge of the pile adjacent to which the top sheet was engaged, and this will shift the sheet bodily upon the pile, causing it to completely separate at every point throughout its area. The sheet-separating instruments are preferably arranged to operate above the rear edge of a pile, in which case they will move toward and away from the pile in planes inclined from the vertical toward the rear edge, and when the rear edge of the top sheet is raised from the pile the top sheet will be shifted bodily upon the pile toward the rear edge of the pile.

In order to facilitate the bending up of the corners of the sheet, I prefer to arrange the separating instruments at an angle to the corners of the pile, so that the axis upon which the suction sheet-engaging devices rock will extend across the corners of the sheet.

My invention also includes other features of novelty, and in order that my invention may be fully understood I will first describe the same with reference to the accompanying drawings and afterward point out the novelty with more particularity in the annexed claims.

In said drawings, Figure 1 is a detail rear elevation of one of a pair of my improved sheet-separating devices arranged above the pile of sheets, the parts being in the position assumed at the moment of starting the operation of separating a sheet. Fig. 2 is a similar view showing in full lines an intermediate position of the parts and in dotted lines the raised position of the parts, these positions being successive steps in the operation of separating sheets. Fig. 3 is an end elevation of the mechanism, the parts being in the position shown in Fig. 1. Fig. 4 is a detail sectional plan view representing the deflected angular position of one of the mechanisms with relation to the corner of a pile of sheets. Fig. 5 is a diagrammatic face view representing the relative arrangement of the cams which actuate the several parts of the mechanism. Fig. 6 is a detail plan view of the same. Fig. 7 is a face view of the cam which controls the pneumatic valve of the sheet-engaging device. Fig. 8 is a detail face view of the cam which operates the holding-down foot or clamp. Fig. 9 is a view similar to Fig. 3, representing the preferred adjusted position of one of the mechanisms with relation to the pile that is in a plane inclined to the perpendicular of the pile.

The pile of paper P to be fed to the folder, printing-press, or other machine is mounted upon an automatically-adjustable platform or table, (not shown,) which may be mounted and operated in the usual manner. The side frames of the feeding-machine to which my improvements are applied are not illustrated in the drawings. Suitably supported from the ordinary side frames above the pile-supporting table is a suitable frame, upon which the sheet-separating mechanisms are supported. I have shown only the rear transverse bar 2 of this supporting-frame. This bar 2 is adapted to be adjusted longitudinally of the feeding-machine, so as to support the sheet-separating mechanisms and the air-blast devices in proper position above the rear edge of a pile of sheets which is to be fed from the table or platform. The two sets of sheet-separating mechanism are adjustably mounted upon this rear supporting-bar 2, so as to be capable of adjustment vertically, horizontally, and transversely of the pile.

5 represents the ordinary air-blast tubes, adjustably mounted upon the supporting-bar 2 and having air-pipe connections 6 with any suitable blower. (Not shown.) There may be any desired number of these air-blast pipes 5, the number and disposition of them depending upon the size of the sheets to be operated upon and the nature of the paper and of the printing upon the paper, if the sheets have been previously printed.

I will now describe my improved sheet-separating mechanism, of which there are two sets arranged at opposite sides above the rear corners of the pile. Both sheet-separating mechanisms are of the same construction, and a description of one will be sufficient for both.

10 is a suitable bracket adjustably mounted upon the supporting-bar 2 and secured in the desired adjusted position by a set-screw 11. The bracket 10 can be adjusted longitudinally of the bar 2 (transversely of the pile) or circumferentially of bar 2 to support the separating mechanism in the desired inclined plane above the pile.

12 is a vertically-extending guide-bracket formed with a horizontal ear 13, through which passes a vertical set-screw 14 for securing the bracket 12 to the bracket 10 in the desired adjusted angular position. The bracket 12 is formed in its rear vertical face with guide-flanges 15, between which is mounted the vertically-adjustable separator-frame 16, formed with an upper oblong portion which fits between and slides in the guide-flanges 15 of bracket 12, and a lower bracket portion of suitable shape to properly support the operative parts of the mechanism hereinafter referred to. An adjusting-screw 17 is journaled in a lug 18 on bracket 12 and threaded through a nut 19, secured to the vertically-sliding sep-

arator-frame 16. This adjusting-screw 17 has a crank-handle 20 for operating it. By operating the screw 17 the separating mechanism can be adjusted vertically with relation to the pile of sheets.

25 is the separator operating-shaft, which is journaled in suitable bearings 26, formed upon the lower bracket portion of supporting-frame 16. This short shaft 25 has universal-joint connection 27 with an operating-shaft 28, which is adapted to be driven from the main shaft of the feeding-machine in any suitable manner. (Not shown.) Mounted upon the shaft 25 between its supporting-bearings are several cams, which operate the different parts of the sheet-separating mechanism. These cams will be referred to in connection with the said parts of the mechanism.

30 is the supporting and operating lever of the separating-finger proper. This lever 30 is journaled at 31 to the face of the supporting-frame 16 and has a heel or lug 32 projecting from it adjacent to its journal, to which lug 32 is journaled a vertically-extending rod 33, which passes up through a guide-bracket 34, which is secured to the outer face of the nut 19 of the supporting-frame. A spiral spring 35 surrounds the rod 33 and is confined between the bracket 34 and the lower end of the rod 33. The spring 35 tends to move the lower curved end 30^a of the lever 30 outwardly, or to the left of Figs. 1 and 2.

40 is an arm or lever journaled upon the lower end 30^a of the lever 30 and formed with a downwardly-extending fork or yoke 41, the inner leg 41^a of which is curved out slightly for the purpose hereinafter explained. Journaled in the bearings 41^b at the lower ends of the legs of yoke 41 are the trunnions 42^a on a collar 42^b, which surrounds and carries the tubular rubber block 42, which constitutes the suctional sheet engaging and raising device. Leading from the upper end of the tubular rubber block 42 is an angular tube 42^c, which in the normal position of the device, as shown in Fig. 1, rests in the curved portion of the leg 41^a of yoke 41 and forms a limiting-stop for determining the vertical position of the sheet-engaging device 42 when it is down in engagement with the pile. Springs 42^d surround the trunnions 42^a for holding the suctional sheet-engaging block 42 in its normal vertical position.

42^e is a spring-arm attached to tube 42^c and projecting up from the top of cup 42 and formed with a curved upper end 42^f. An arm 16^a extends horizontally from the separator-frame and has journaled in its end an antifriction-roller 16^b. When the suction-cup is raised from the pile, spring-arm 42^e engages antifriction-roller 16^b and maintains the cup 42 in vertical position with relation to the pile, so as to hold the raised edge of the sheet as nearly horizontal as possible and facilitate the injection of the air-blast beneath the sheet.

Extending from the tube 42^c is a flexible air-tube 43, which leads to the lower tubular projection 44, formed on the forward face of the valve-casing 45, which is mounted upon the lower bracket portion of the supporting-frame 16. This valve-casing 45 also has an upper tubular projection 46, from which extends a flexible tube 47, which leads to any suitable air-pump or other device for exhausting the air from the cups 42 of the separating devices.

In the valve block or casing 45 is mounted a vertically-sliding valve-plate 49, which is adapted to open and close communication between tubes 43 and 47 for creating and breaking the suction in the swiveled cup 42. The valve-plate 49 carries an antifriction-roller 51, which rests in the same vertical plane as the operating-cam 52, which is mounted upon the shaft 25. A spring 53 tends to move valve-plate 49 in one direction and causes roller 51 to closely follow the cam 52, allowing the cam to move the valve-plate in the opposite direction.

The cam 52 is formed with a main high portion 52^a, an intermediate low portion 52^b, an auxiliary high portion 52^c, and a main low portion 52^d. The purpose of this shape of cam 52 will be hereinafter explained.

Keyed to the operating-shaft 25 is a cam 65, formed with a main low portion 65^a, two high portions 65^b and 65^c, and an intermediate low portion 65^d. This cam 65 operates upon an antifriction-roller 66, journaled upon the supporting and operating lever 30, and by the rotation of cam 65 the separator-finger 40 is caused to move inwardly and outwardly, with the result hereinafter explained.

70 is a lever journaled to the buckler-supporting frame upon a pin 71 and having a spring 72 for imparting to it a downward spring tendency. The lever 70 carries an antifriction-roller 73, which operates the periphery of a semicircular cam 74, keyed to the operating-shaft 25. Journaled at the inner end of the lever 70 upon a pivot-pin 77 is a link 75, which is in turn journaled at its lower end 76 to the buckling-finger 40.

85 is the holding-down foot or clamp formed upon the inner end of arm or lever 86, which is journaled at 87 upon an inwardly and downwardly projecting arm 88, which is adjustably secured at 89 to the separator-frame.

86^a is an elongated bail or loop secured to the upper face of lever 86.

90 is an arm or lever journaled at 91 upon the separator-frame and carrying in one end an elongated antifriction-roller 92, which engages in the loop 86^a of the holding-down foot 85 and causes the foot 85 to be clamped downwardly against the pile or raised away from the pile. Journaled in the other end of the lever 90 is an antifriction-roller 93, which travels upon the periphery of a semicircular cam 94, which is keyed to the operating-shaft

25. The tension-spring 96, mounted upon the extended journal 91 of the lever 90, holds the antifriction-roller 93 in engagement with the cam and tends to throw the foot 95 down into engagement with the pile P when it is released by the low portion of the cam 94 reaching the antifriction-roller 93. The tension of said spring 86 is thereby thrown upon the holding-down foot 85 for securely clamping the pile after the corner of the top sheet has been bent up from beneath the foot and while the separated sheet is being fed from the pile.

F represents diagrammatically in Fig. 1 of the drawings one of the feeding-off fingers, which may be of any suitable construction adapted to feed a separated sheet from the pile.

In some cases I find it desirable to stretch or straighten out the raised edge of the sheet above the pile, as set forth in my above-named application. In some of the adjusted positions of the separating mechanisms the engagement of the spring-arms 42^e of cups 42 with the arms 16^a of the supporting-frames will effect the stretching of the raised edge of the sheet. In cases where the buckling mechanisms are operating in planes inclined to the perpendicular to the pile and at extreme horizontal angles to the corners of the pile the mere retention of cups 42 perpendicularly to the pile as they are raised will not suffice to stretch or straighten out the raised edge of the sheets. In such cases the arms 16^a should be lengthened or the spring-arms 42^e bent slightly toward arms 16^a, so as to cause the suction-cups 42 to tip over farther in their supporting-yokes while they are raised, thereby throwing the engaged corners of the raised edge of the sheet farther apart, resulting in the stretching or straightening out of the raised edge of the sheet. This tipping over of the suction-cups to incline them with relation to the surfaces of the pile is also advantageous in tending to turn upwardly the side edges of the corners to further facilitate winding the sheets.

It will be clear to those familiar with the art that it is my intention to use two of the improved sheet-separating devices, one arranged above each of the rear corners of the pile of sheets. In operating my improved mechanism I prefer to adjust each separating mechanism horizontally on the pile by first loosening the bolts 14, which secure the brackets 12 to the brackets 10, and then placing each mechanism at an angle to the pile, as indicated in Fig. 4 of the drawings. I also prefer to adjust the mechanism into planes which are inclined from the vertical plane of the pile and rearwardly of the pile, as shown in Fig. 9 of the drawings. It will be clear by comparing Fig. 9 with Figs. 1, 2, 3, and 4 of the drawings that when the separating mechanism is adjusted to operate in the inclined plane shown in Fig. 9 it is necessary to twist or bend slightly the separator-arm 40 and the clamp-arm 86 to cause the suction-cup 42 and clamp 85 to engage the horizontal surface of the pile squarely. These arms are constructed to allow for this; but, if desired, they can be made in adjustable sections.

The operation of my improved mechanism may be briefly described as follows: In starting to separate a sheet the parts of the two separating mechanisms are in the position shown in Figs. 1, 4, and 9 (or 3) of the drawings. The valves controlling the suction in cups 42 open up communication between the cups and the air-exhausting mechanism by reason of the auxiliary high portions 52^a of cams 52 engaging the antifriction-rollers 51. Immediately after the creation of suction in the cups 42 the high portions 65^b of cams 65 engage antifriction-rollers 66 and force levers 30 and the separator-fingers 40 inwardly. As the suction-cups 42 are journaled in the yoked ends of the separator-fingers 40 and have a firm suctional and frictional hold upon the corners of the sheet, the effect of moving the separator-fingers 40 inwardly will be to cause the suction-cups 42 to be tipped over or rocked on their angular corners upon the pile of sheets, turning up the corners of the top sheet abruptly from the pile. While this operation is taking place it will of course be clear that the pile-holding clamps 85 are raised away from the pile, as shown in Fig. 1. Immediately following the tipping over of the suction-cups 42, as just explained, the suction in the cups is broken by the low portions 52^b of cams 52 reaching antifriction-rollers 51 and allowing the pneumatic valves to close. The breaking of the suction in the cups 42 allows the bent-up corners of the sheet to spring back to positions just above their original position upon the pile. Immediately following this the low portions 65^d of the cams 65 reach antifriction-rollers 66 and allow springs 35 to force the separator-fingers 40 outwardly, the result of which will be the moving back into vertical position of the suctional cups 42 by reason of the engagement of cups 42 with the pile, assisted by the springs 42^d. The suction in cups 42 is then immediately started up again by the engagement of the main high portions 52^a of cams 52 with antifriction-rollers 51, which operate the pneumatic valves, and immediately following this the high portions 65^c of cams 65 again force the separator-fingers 40 inwardly to again rock or tip over the suction-cups 42. The suction in the cups is maintained after the second rocking or tipping over by reason of the length of the main high portions 52^a of the valve-operating cams, so that the cups will now maintain their hold upon the corners of the top sheet. The high portions of the cams 74 now come into operation upon the levers 70 to lift the separator-fingers 40 away from

the pile, and main low portions 65[a] of cams 65 allow fingers 40 to move outwardly over the pile at the same time, and as the suction is maintained in cups 42 the rear edge of the sheet will be raised from the pile by its corners.

If the separating mechanisms are supported in a vertical plane above the pile, as shown in Fig. 3 of the drawings, the edge of the sheet will be raised vertically from the pile and the sheet will be shifted bodily upon the pile, as explained in my above-named application for reissue, Serial No. 68,749. If the separating mechanisms are adjusted so as to operate in inclined planes, as shown in Fig. 9 of the drawings, each suction-cup will move away from the pile on an incline, which will cause it to move slightly toward the vertical plane of the rear edge of the pile. This will cause the sheet to be shifted bodily upon the pile to a greater degree.

As the suction-cups 42 move up away from the pile with the edge of the sheet the springs 42[a] tend to move the cups into upright position in the yoked ends of the separator-fingers, and the spring-arms 42[e] are thereby thrown into engagement with antifriction-rollers 16[d] of arms 16[a], with the result that the cups 42 will be maintained upright and at right angles to the surface of the pile or tilted, as the case may be.

During the first and second rocking operations of the suction-cups upon the corners of the pile of sheets blasts of air play upon the corners of the pile to assist in separating the corners of the top sheet from the under sheets. While the rear edge of the top sheet is being elevated and the sheet is being shifted bodily upon the pile blasts of air are blown under the top sheet to complete the separation throughout its entire area, and immediately following this the feeding-off fingers take the sheet and feed it from the pile, the suction in the cups 42 being finally broken to release the sheet (immediately after the feeding-off fingers engage the sheet and just prior to the return of the separating instruments to their initial position) by the arrival of the main low portions 52[d] of cams 52 at the antifriction-rollers 51 of the pneumatic valves. Immediately after the edge of the sheet is raised the clamping-feet 85 are forced down into engagement with the corners of the pile for holding the under sheets of the pile firmly in position.

As shown in Fig. 4 of the drawings, the separating devices engage the corners of the sheets in the margins outside of the printing matter, which I consider an advantage.

The effectiveness of my improved separating mechanism is largely due to the bending up of the corners of the sheets at a sharp angle, which action naturally causes the corners of the underlying sheet or sheets to move relatively to or slide upon and separate from the corners of the top sheet. By allowing the suctional sheet-engaging instruments to remain down in engagement with the pile while they are tipped over the corners of the top sheet adhering to the instruments will bend or break around the corners of the suction-cups, giving a strong tendency to repel the under sheets or at least making it extremely difficult for the under sheets to follow the top sheet. After this bending up of the corners of the top sheet the edge of the top sheet will be elevated by its bent-up corners and will easily separate from the pile with the assistance of the bodily shift of the sheet upon the pile and the air-blasts.

I am aware that sheet-separating mechanisms have heretofore been produced which raise the corners and edges of sheets to allow the injection of currents of air from blast devices, but I am not aware that any such mechanism has been produced which bends up the corners of a sheet at an abrupt angle, as hereinbefore described, nor such a mechanism which bends up the corners a plurality of times before raising the edge of the sheet, nor a mechanism constructed as illustrated and described in my present application.

I desire to claim, broadly, a sheet-separating mechanism comprising a rocking sheet-engaging device which is adapted to bend or turn up at a sharp angle the corners of a sheet upon a pile. I also desire to claim broadly, a rocking sheet-separating device adapted to first bend or turn up abruptly the corners of a sheet and then raise the edge of the sheet from the pile. I also desire to claim, broadly, a sheet-separating mechanism which is capable of engaging and raising an edge of a sheet from a pile and is mounted and operates in a plane inclined from the perpendicular to the pile toward one edge of the pile, whereby the lifting of the edge of a sheet will shift the sheet bodily upon the pile. Means for blowing air under the sheet are preferably employed with my improved sheet-separating devices.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-separating device adapted to bend abruptly upward a triangular portion or corner of a sheet, and raise a part of the sheet from the pile by its bent-up corner, substantially as set forth.

2. In a paper-feeding machine, the combination of a support for a pile of sheets, with independently-operating sheet-separating devices supported over the corners at one edge of a pile of sheets and adapted to bend the corners of the successive sheets abruptly upward into triangular portions, and raise part of the sheet from the pile by its bent-up corners, substantially as set forth.

3. In a paper-feeding machine, the combination of a support for a pile of sheets, with

sheet-separating mechanism including a pile-holding foot or clamp, and a separating device adapted to bend abruptly upward a triangular portion or corner of a sheet and raise a part of the sheet from the pile by its bent-up corner, substantially as set forth.

4. In a paper-feeding machine, the combination of a support for a pile of sheets, with sheet-separating mechanism adapted to first bend abruptly upward the corners of one edge of a sheet on lines extending approximately at right angles to the diagonals of the sheet, and then raise said edge of the sheet upwardly from the pile by its bent-up corners, substantially as set forth.

5. In a paper-feeding machine, the combination of a support for a pile of sheets, with sheet-separating mechanism including pile-holding clamps, and separating devices adapted to first bend abruptly upward the corners of one edge of a sheet on lines extending approximately at right angles to the diagonals of the sheet, and then raise said edge of the sheet upwardly from the pile by its bent-up corners, substantially as set forth.

6. In a paper-feeding machine, the combination of a support for a pile of sheets, with sheet-separating mechanism adapted to first bend abruptly upward the corners of one edge of a sheet on lines extending approximately at right angles to the diagonals of the sheet, and then raise said edge of the sheet upwardly from the pile by its bent-up corners, and means for feeding sheets from the pile, substantially as set forth.

7. In a paper-feeding machine, the combination of a support for a pile of sheets, with sheet-separating mechanism adapted to abruptly bend up the corners of one edge of a sheet on lines extending approximately at right angles to the diagonals of the sheet, raise said edge of the sheet from the pile, and shift the sheet bodily upon the pile, substantially as set forth.

8. In a paper-feeding machine, the combination of a support for a pile of sheets, with sheet-separating mechanism adapted to abruptly bend up the corners of one edge of a sheet on lines extending approximately at right angles to the diagonals of the sheet, raise said edge of the sheet from the pile, shift the sheet bodily upon the pile, and stretch or straighten out the raised edge of the sheet above the pile, substantially as set forth.

9. In a paper-feeding machine, the combination of a support for pile of sheets, and a pile-holding foot or clamp, with sheet-separating mechanism including a rocking device having means for engaging a sheet and adapted to rock or tip over upon the pile and thereby bend up a triangular portion or corner of the top sheet, substantially as set forth.

10. In a paper-feeding machine, the combination of a support for pile of sheets, means for feeding sheets from the pile, and a pile-holding foot or clamp adapted to retain the pile in place, with sheet-separating mechanism including a rocking device having means for engaging a sheet and adapted to rock or tip over upon a pile and thereby bend up a triangular portion or corner of the top sheet, substantially as set forth.

11. In a paper-feeding machine, the combination of a support for a pile of sheets, with sheet-separating mechanism including a rocking or tipping sheet-engaging device, means for operating said sheet-engaging device adapted to cause it to move toward and away from the pile and rock or tip over upon the pile a plurality of times between its movements toward and away from the pile, and means controlling the engagement of said device with a sheet, substantially as set forth.

12. In a paper-feeding machine, the combination of a support for a pile of sheets, with sheet-separating mechanism including a rocking or tipping sheet-engaging device, means controlling the engagement of said device with a sheet, operating means adapted to cause said device to rock or tip over upon the pile a plurality of times between its movements toward and away from the pile, and means for raising and lowering said device with relation to the pile, substantially as set forth.

13. In a paper-feeding machine, the combination of a support for a pile of sheets, with sheet-separating mechanism including a rocking or tipping suctional sheet-engaging device, means for operating said sheet-engaging device adapted to cause it to rock or tip over upon the pile a plurality of times, and means controlling the suctional engagement of said device with a sheet, adapted to cause it to engage and release a sheet a plurality of times, said operating means and suction-controlling means being relatively timed to cause the sheet-engaging device to engage a sheet in upright position, hold onto it while it tips over, then release it in tipped-over position, and finally repeat the operation, substantially as set forth.

14. In a paper-feeding machine, the combination of a support for a pile of sheets, with a reciprocating support, and a sheet-engaging device journaled in said reciprocating support and adapted by its engagement with the pile to be rocked or tipped over upon the pile when its support is reciprocated, substantially as set forth.

15. In a paper-feeding machine, the combination of a support for a pile of sheets, with a reciprocating supporting-arm, and a corner-bending device journaled in the supporting-arm and having means for taking hold of a sheet, said corner-bending device being adapted to rock or tip over upon the pile by reason of its engagement with the pile when its supporting-arm is reciprocated, substantially as set forth.

16. In a paper-feeding machine, the combi-

nation of a support for a pile of sheets, with a horizontally-reciprocating supporting-arm capable of moving toward and away from the pile, a sheet-engaging device pivotally mounted in the free end of said supporting-arm, and adapted to rock or tip over upon the pile, said sheet-engaging device having means for raising a sheet, and yielding means holding said sheet-engaging device in upright position upon the supporting-arm, substantially as set forth.

17. In a paper-feeding machine, the combination of a support for a pile of sheets, with a horizontally-reciprocating supporting-arm capable of moving toward and away from the pile, a sheet-engaging device pivotally mounted in the free end of said supporting-arm, and adapted to rock or tip over upon the pile, said sheet-engaging device having means for raising a sheet, springs arranged to return said sheet-engaging device to upright position upon the supporting-arm, and a stop determining the normal upright position of said device, substantially as set forth.

18. In a paper-feeding machine, the combination of a support for a pile of sheets, with sheet-separating mechanism including a separator-arm, means for reciprocating and raising and lowering said arm, a sheet-engaging suction-cup journaled in the separator-arm and adapted to rock or tip over upon the pile, means controlling the exhaust of air in the suction-cup, and means for blowing air under a sheet, substantially as set forth.

19. In a paper-feeding machine, the combination of a support for a pile of sheets, with sheet-separating mechanism comprising a horizontally-swinging lever, means for operating said lever, a vertically-movable separator-arm journaled upon said lever, a vertically-swinging lever connected with the separator-arm, means for operating said vertically-swinging lever, a rocking separating device journaled in the free end of the separator-arm and provided with means for engaging and raising part of a sheet from the pile, substantially as set forth.

20. In a paper-feeding machine, the combination of a support for a pile of sheets, with a reciprocating vertically-movable supporting-arm having depending yoke-arms upon its free end, a pneumatic or suction cup journaled in the depending yoke-arms, a part attached to said cup adapted to engage one of the yoke-arms for determining the normal upright position of the suction-cup, a spring device adapted to return the suction-cup to upright position, means controlling the exhaust of air from the cup, and means for operating the supporting-arm, substantially as set forth.

21. In a paper-feeding machine, the combination of a support for a pile of sheets, with a separator-arm, a sheet-engaging device pivotally mounted in said arms, means for raising and lowering and reciprocating said arm for first moving the sheet-engaging device into contact with the pile, then causing it to tip over upon the pile to bend upward a part of the sheet and finally raise the said device with the sheet from the pile, and means for tilting said sheet-engaging device upon said arm when it is raised, substantially as set forth.

22. In a paper-feeding machine, the combination of a support for a pile of sheets, with a separator-arm, a sheet engaging and raising device journaled in said arm, means for raising and lowering said arm, a part projecting from said sheet-engaging device, and a stationary arm adapted to engage said part when the separator-arm is raised to cause the sheet-engaging device to be tilted upon the separator-arm, substantially as set forth.

23. In a paper-feeding machine, the combination of a support for a pile of sheets, with sheet-separating mechanism including two oppositely-arranged separator-arms, two sheet engaging and raising devices journaled in said arms to rock or tilt away from each other, means for raising and lowering said arms, means controlling the engagement of said devices with a sheet, and means for tilting said devices oppositely upon their supporting-arms to stretch or straighten out an edge of a sheet in raised position, substantially as set forth.

24. In a paper-feeding machine, the combination of a horizontal support for a pile of sheets, with a sheet-separating mechanism supported above the pile in a plane inclined from the vertical toward the vertical plane of one edge of the pile, said separating mechanism including a device having means for engaging and lifting a sheet and adapted to move up away from the pile toward the vertical plane of one edge of the pile, means for operating said sheet-engaging device, and means controlling its engagement with a sheet, substantially as set forth.

TALBOT C. DEXTER.

Witnesses:
WM. E. KNIGHT,
EUGENE J. BEALES.