No. 747,862. PATENTED DEC. 22, 1903.

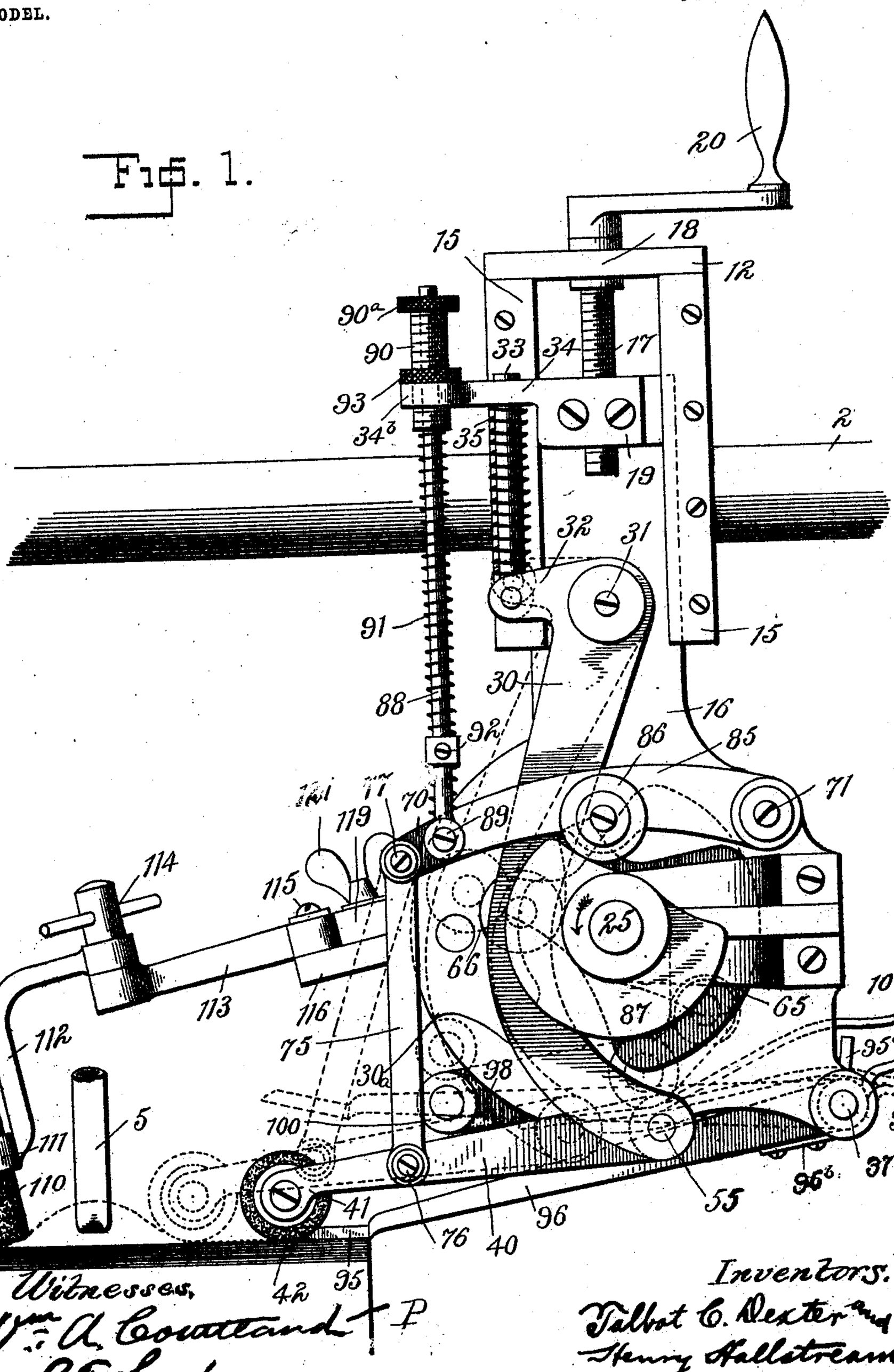
T. C. DEXTER & H. HALLSTREAM.

PAPER FEEDING MACHINE.

APPLICATION FILED APR. 7, 1902.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.



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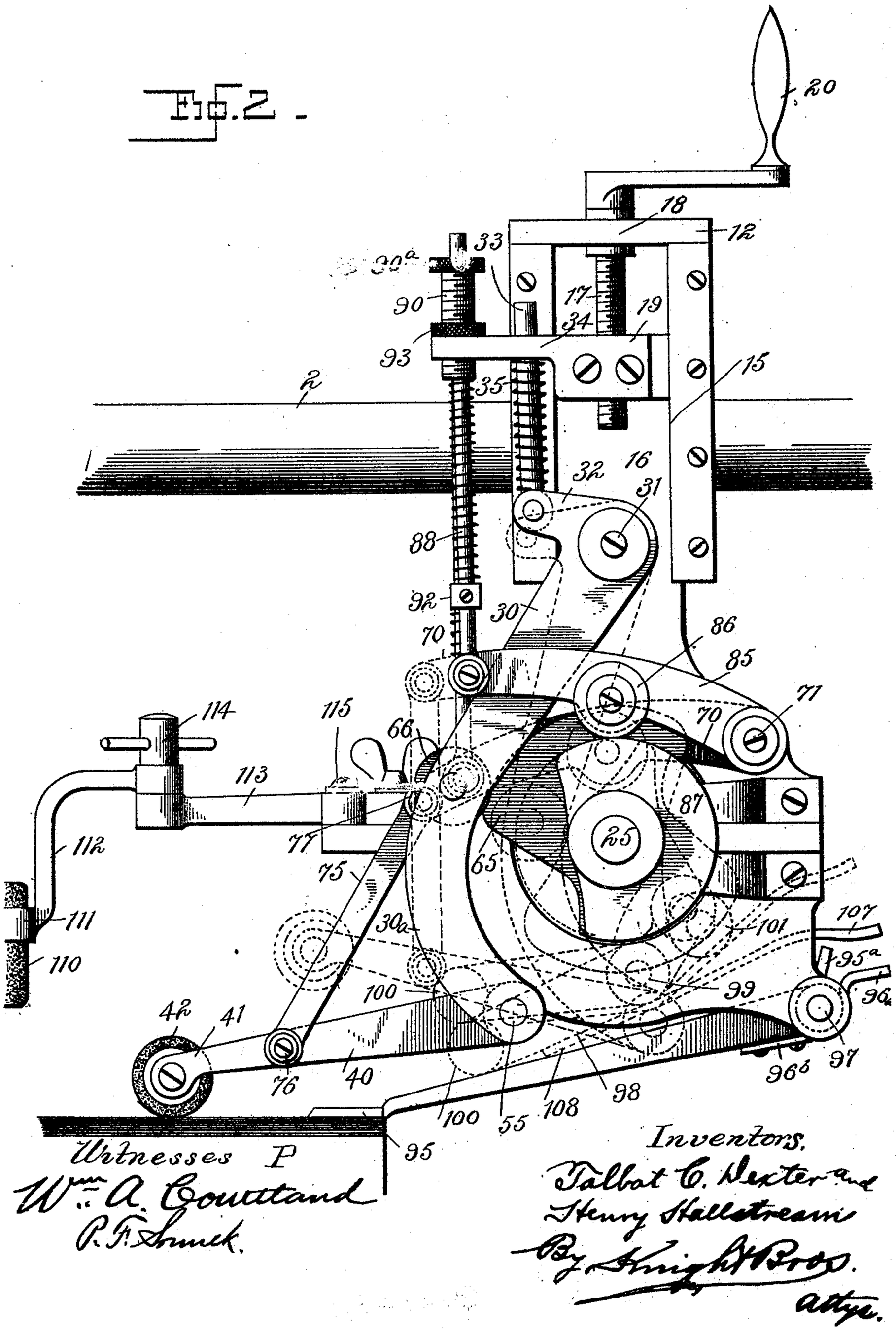
NO MODEL. 5 SHEETS—SHEET 2.

Fig. 2.



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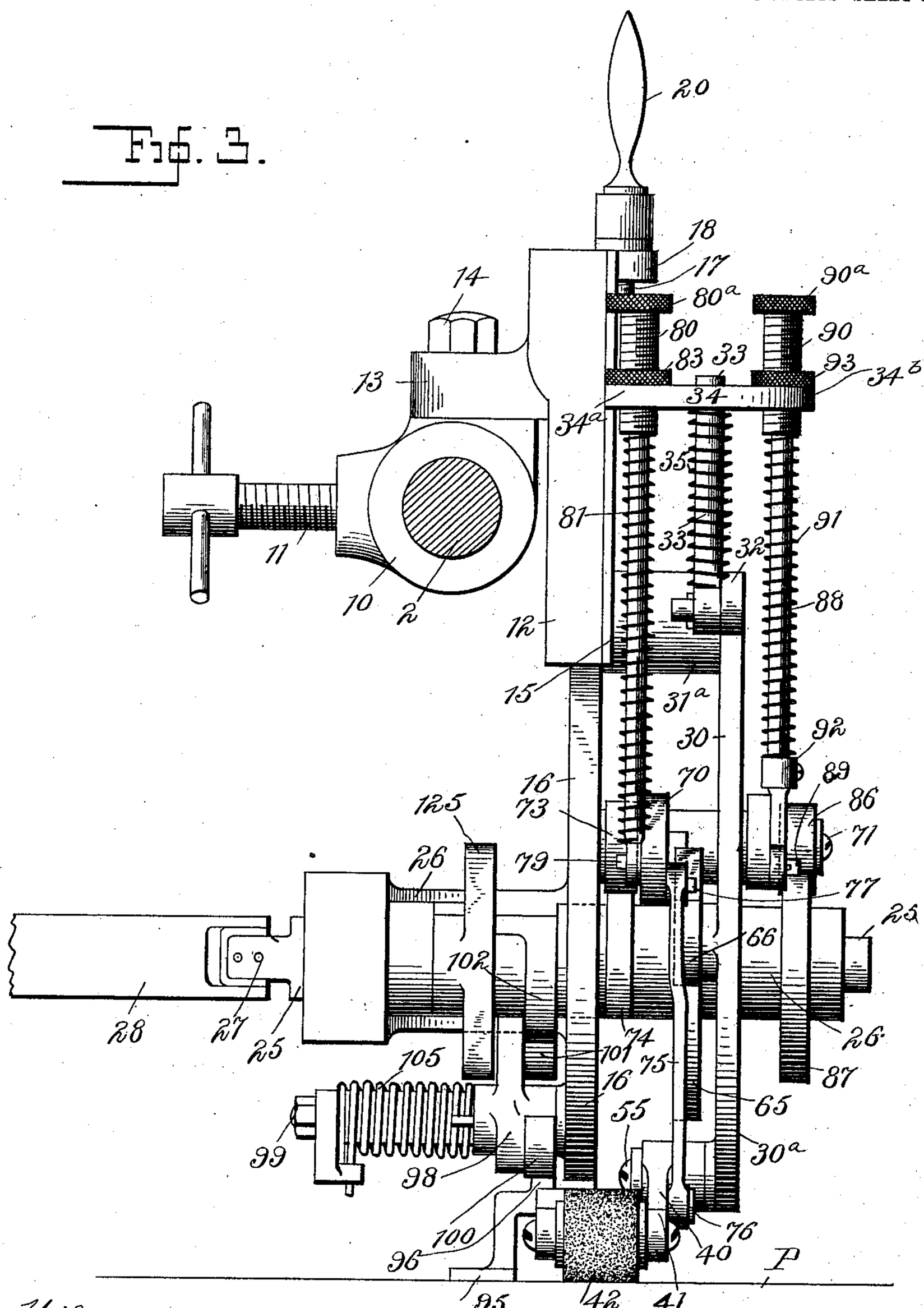
NO MODEL. 5 SHEETS—SHEET 3.

Fig. 3.



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NO MODEL. 5 SHEETS—SHEET 4.

Fig. 4.

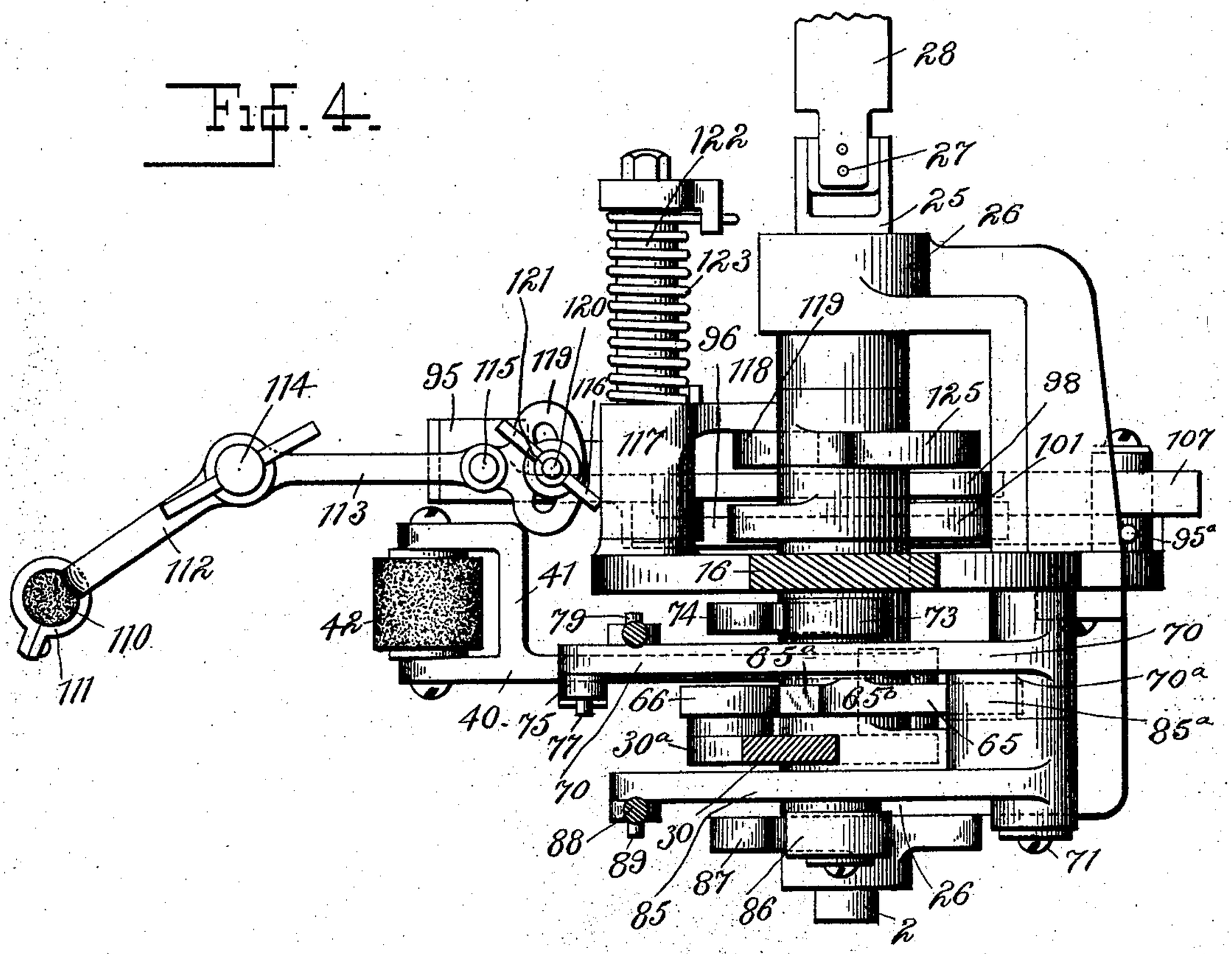
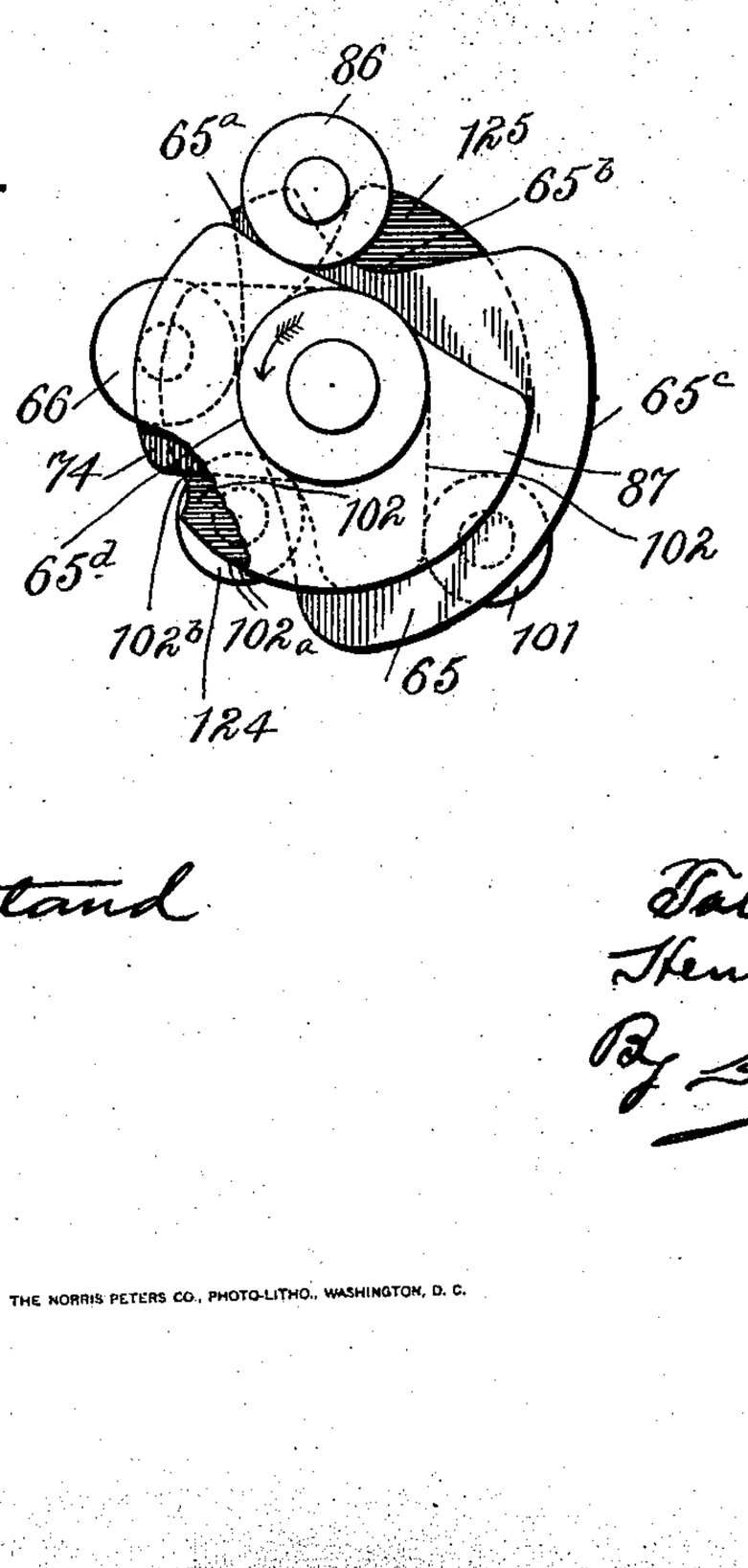


Fig. 5.



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NO MODEL. 5 SHEETS—SHEET 5.

Fig. 6.

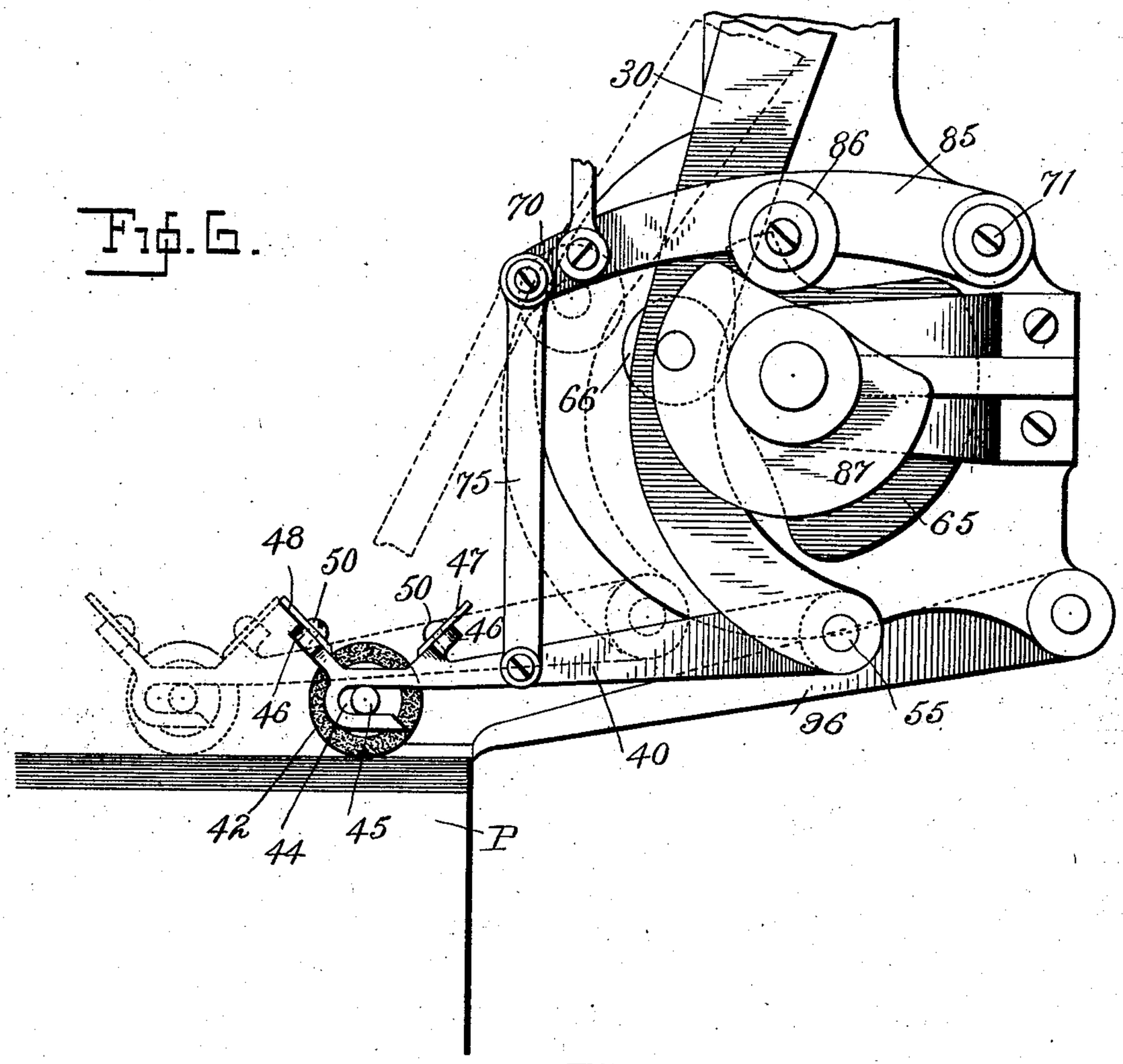
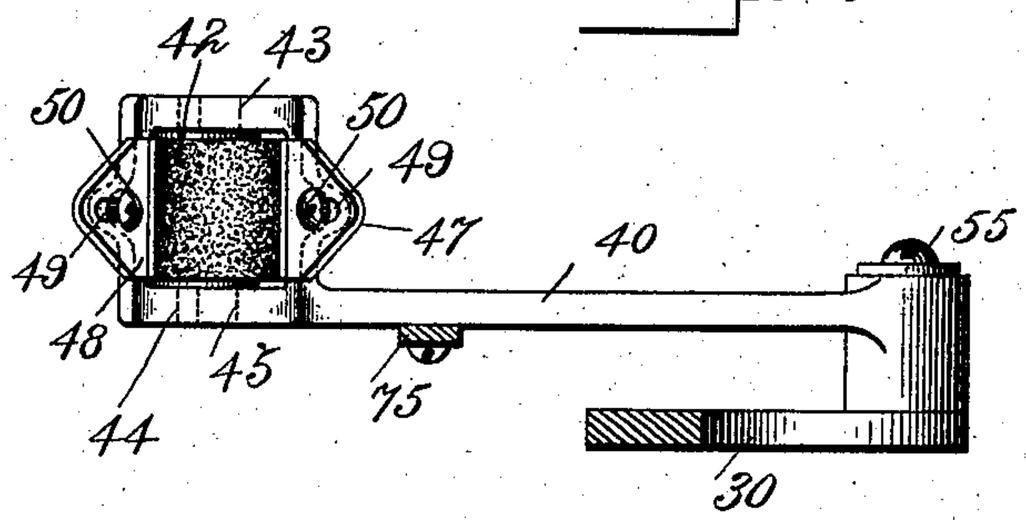


Fig. 7.



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No. 747,862. Patented December 22, 1903.

UNITED STATES PATENT OFFICE.

TALBOT C. DEXTER AND HENRY HALLSTREAM, OF PEARL RIVER, NEW YORK; SAID HALLSTREAM ASSIGNOR TO SAID DEXTER.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 747,862, dated December 22, 1903.

Application filed April 7, 1902. Serial No. 101,776. (No model.)

To all whom it may concern:

Be it known that we, TALBOT C. DEXTER and HENRY HALLSTREAM, citizens 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.

This invention relates to improvements in paper-feeding machines of the buckler type, in which the successive sheets of an adjustably-supported pile are first buckled at the corners to partially loosen the sheets and afterward fed from the pile by suitable feeding-off mechanism. In this type of machines the sheet-buckling devices are usually constructed to have a single buckling movement inwardly and outwardly over the rear corners of the pile of sheets. Such a buckling movement is usually effective in producing the preliminary separation of sheets; but in operating upon certain kinds of paper and upon piles of sheets which have become very compact we have found that this simple movement of the buckler will not always produce the desired effect.

In buckling sheets of paper the main difficulty encountered is at the beginning of the operation—*i. e.*, the starting of the separation of the corners of the top sheet from the pile. After the corners begin to separate and air gets between the top sheet and the pile the remainder of the buckling operation is readily accomplished, and after the top sheet has been buckled and partially separated it is a simple matter to feed the sheet off from the pile to the machine which is to operate upon it.

The object of the present invention is to provide a sheet-buckling mechanism for paper-feeding machines which will have more power for separating the sheets at the beginning of the operation, where the greatest difficulty is encountered, and less power for the remainder of the operation after the separation has started. In accomplishing this result we provide a sheet-buckling mechanism having a double buckling movement or impulse and differential spring mechanism constructed and arranged to apply a heavy pressure upon the buckling-finger during the initial or first part of the buckling movement and a lighter spring-pressure during the second part or remainder of the buckling movement.

In order that our invention may be fully understood, we will first describe the same with reference to the accompanying drawings and afterward point out the novelty more particularly in the annexed claims.

In said drawings, Figure 1 is a rear elevation of one of a pair of the improved sheet-buckling mechanisms, representing two positions assumed by the operating parts during the initial buckling movement. Fig. 2 is a similar view representing two other positions assumed by the operating parts at the completion of the second part of the buckling movement and at the return of the parts in elevated position. Fig. 3 is an inside edge elevation of the buckling mechanism as seen when looking from the center of the pile of sheets, the buckler-stop being omitted. Fig. 4 is a detail sectional plan view of the same. Fig. 5 is a detail view illustrating the relative initial positions of the several operating-cams upon the cam-shaft. Fig. 6 is a detail view similar to Fig. 1, showing the preferred form of sheet-buckling finger and parts of the operating mechanism. Fig. 7 is a detail plan view of the same form of the buckling-finger.

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, which may be mounted and operated in the usual manner. The side frames of the feeding-machine to which our 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-buckling separating mechanisms are adjustably mounted. We 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 any-sized sheets which are 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 transversely of the pile.

5 represents one of the ordinary air-blast tubes adjustably mounted upon the supporting-bar 2 and having air-pipe connections 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.

We will now describe the improved sheet-buckling separating mechanism, of which two sets are designed to be arranged at opposite sides above the rear edge of the pile.

Both sheet-buckling mechanisms are of the same construction, and a description of one will be sufficient for both.

We have shown only one of the buckling mechanisms in the accompanying drawings.

10 is a suitable bracket adjustably mounted upon the supporting-bar 2 and secured in the desired adjusted position by a set-screw 11.

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 position. The bracket 12 is formed in its rear vertical face with guide-flanges 15, between which is mounted the vertically-adjustable buckler-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 buckler-frame 16. This adjusting-screw 17 has a crank-handle 20 for operating it. By operating the screw 17 the buckler mechanism can be adjusted vertically with relation to the pile of sheets.

25 is the buckler-operating shaft, which is journaled in suitable bearings 26, formed upon the lower bracket portion of buckler-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 buckling-finger proper. This lever 30 is journaled at 31 upon a boss 31^a, projecting outwardly from the face of the buckler-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 buckler-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 right of Figs. 1 and 2.

40 is the buckler-finger proper, which is journaled loosely at its rear end upon a pin 55, mounted in the lower end 30^a of the lever 30.

In Figs. 1, 2, 3, and 4 of the drawings we have shown the common form of buckling-finger, in which a roll or block 42 of soft rubber is securely clamped in the yoked forward end 41 of the finger 40. This common form of buckling finger may be used with the present invention; but we prefer to use the form of buckling-finger illustrated in Figs. 6 and 7 of the drawings, in which the finger 40 has formed integral with its free end a closed yoke 43, the side arms or plates of which are formed with horizontally-extending open-ended slots 44, in which are supported the journal ends 45 of the soft-rubber roll 42. Bracket-arms 46 are formed integral with the yoke 43 and project therefrom at an angle of approximately forty-five degrees.

47 and 48 are knife-blades, each of which is formed with an elongated slot 49, through which passes a set-screw 50, threaded into one of the bracket-arms 46 of the yoke 43. These knife-blades 47 and 48 extend approximately radially with relation to the rubber roll 42, and their sharp edges are presented toward the cylindrical surface of the roll. The knife-blades are adjusted upon their supporting-brackets to leave sufficient space between them to allow the rubber roll 42 to move freely back and forth in its support between the knife-blades, each of the blades being, however, sufficiently close to the roll to engage it when the roll is pressed toward it. The purpose of this construction of the buckling-finger is to allow a sufficient movement of the frictional roll to continually change the frictional surface, which is presented toward the sheets, and at the same time provide means for holding the roll against movement on the finger during its working strokes, whether the finger is moving inwardly or outwardly with relation to the pile.

Keyed to the operating-shaft 25 is a cam 65, formed with an auxiliary high portion 65^a and auxiliary low portion 65^b, a main high portion 65^c, and a main low portion 65^d. This cam 65 operates upon an antifriction-roller 66, journaled in the buckler supporting and operating lever 30, and by the rotation of the cam 65 the buckling-finger 40 is moved inwardly and outwardly a double stroke or impulse over the pile of sheets—that is, the buckling-finger while in lowered position is first moved inwardly a short distance by reason of the engagement of auxiliary high por-

tion 65[a] with the lever 30, then returned to its initial position by reason of the auxiliary cut-out portion 65[b], and then moved inwardly a second time for a greater distance by reason of the engagement of the main high portion 65[c] with the lever 30, and finally (as it is raised by other mechanism) returned to its initial position for a second operation by reason of the main cut-out portion 65[b].

During the first short inward and outward stroke of the buckling-finger the finger is in engagement with the pile, and a heavy spring-pressure is maintained upon it, while during the second or long inward stroke of the buckling-finger it is in engagement with the pile and has only a light spring-pressure maintained upon it, and, finally, while the finger is being returned to its initial position for a second operation the finger is held in elevated position. The mechanism for accomplishing these results will now be explained.

70 is a lever journaled upon a pin 71 on the buckler-supporting frame 16. The lever 70 carries an antifriction-roller 73, which operates upon the periphery of an approximately quadrant-shaped cam 74, keyed to the operating-shaft 25. A link 75 is journaled to the free end of lever 70 upon a pin 77 and to the buckling-finger 40 upon a pin 76 to connect lever 70 with buckling-finger 40. The result of this connection is the raising and lowering of the buckling-finger by the cam 74. The connection between lever 70 and buckling-finger 40 also serves to transmit the spring-pressure from the tension devices, which will now be described. A rod 78 is journaled to lever 70 upon a pin 79, adjacent to the free end of the lever 70, and extends upwardly from said pin 79 and passes freely through an externally-threaded elongated nut 80, which is threaded into a suitable opening formed in the lateral extension 34[a] of bracket-arm 34. The nut 80 is formed with a milled head 80[a], by which it is operated. A spiral spring 81 surrounds the rod 78 and is confined between the enlarged lower end of said rod and the adjustable nut 80 at its upper end. By screwing the nut 80 downwardly or upwardly in its supporting-bracket 34[a] the tension of spring 81 can be regulated. A clamp-nut 83 is threaded upon the elongated nut 80 and is adapted to engage the bracket-arm extension 34[a] for clamping nut 80 in its adjusted position.

The spring 81 not only holds the buckler-elevating lever 70 into operative relation with the cam 74, but holds the buckling-finger down into operative engagement with the pile of sheets during its working strokes. This spring 81 constitutes the light spring of the differential spring mechanism and is effectively acting upon the buckling-finger during both parts of the double stroke of the buckler.

In addition to the spring device just described we provide a second spring device of greater strength, the pressure of which is periodically thrown onto the buckling-finger. This second spring device comprises a lever 85, journaled upon an extension of the pin 71 and carrying an antifriction-roller 86, which travels upon the periphery of a controlling-cam 87, which is about two-thirds of a circumference in extent. The cam 87 is keyed to shaft 25 outside the bearing 26. A spring-supporting rod 88 is journaled at 89 to the lever 85 and extends upwardly therefrom and passes loosely through an elongated nut 90, which is externally threaded and adjustably mounted in the extension 34[b] of the bracket-arm 34. The nut 90 is formed with a milled head 90[a], by which it is adjusted. A heavy spiral spring 91 surrounds the rod 88 and is confined between an adjustable collar 92 at its lower end and the adjustable nut 90 at its upper end, the collar 92 being mounted upon the rod 88. By screwing the nut 90 downwardly or upwardly in its support 34[b] the tension of the spring 91 can be regulated. The clamp-nut 93 is threaded upon the elongated nut 90 and is adapted to engage the bracket 34[b] for clamping the nut 90 in the desired adjusted position.

The lever 85 is formed with a laterally-projecting heel or lug 85[a] adjacent to its journal end, which heel or lug 85[a] rests over a shoulder 70[a], formed adjacent to the journal of the lever 70 of the light spring-tension device. The purpose of this engagement between the levers 85 and 70 is to connect up the heavy spring device with the light spring device, so that the pressure of both spring devices may be applied to the buckling-finger at the same time at the commencement of the buckling operation, and the heavy spring device may be disconnected at the completion of the first stroke or impulse of the buckling-finger to allow the second stroke or impulse to be carried out under the tension of the light spring alone. The controlling-cam 87 is so shaped and arranged upon the shaft 25 that this effect will be produced.

95 is the holding-down foot or clamp mounted upon the inner free end of an arm or lever 96, which is journaled upon a pin 97, supported in the buckler-frame. A pin 95[a] projects upwardly from the journal end of lever 96 in position to engage a part of the buckler-frame for the purpose of preventing the holding-down foot or clamp 95 falling when there is no pile in place to support it. 98 is an arm or lever journaled upon a pin 99, extending from the buckler-frame. The arm 98 carries at one end an antifriction-roller 100, which is adapted to be intermittently forced down into engagement with the arm 96 of the holding-clamp 95. Journaled upon the other end of the lever 98 is an antifriction-roller 101, which travels upon the periphery of a cam 102, keyed to the cam-shaft 25. This cam 102 is approximately one-third of a circumference in extent, and one-half of its surface 102[a] is a trifle higher than the other half 102[b]. This form of cam is for the purpose which will presently appear.

Mounted upon an extension of the pin 99 is a tension-spring 105, of usual construction, which spring is arranged to move lever 98 upon its journal, so as to cause antifriction-roller 101 to closely follow the controlling-cam 102 and to throw the antifriction-roller 100 into engagement with the arm 96 of the holding-clamp for applying the tension of spring 105 to the clamp when the lever 98 is released by the cam. The tension of spring 105 is thrown upon the holding-down foot or clamp 95 to securely clamp the pile immediately after the edge of the top sheet has been buckled from beneath the foot and while the separated sheet is being fed off from the pile by the feed mechanism.

In addition to the described construction of the holding-down clamp and its automatically-controlled spring mechanism we provide for the positive elevation of the clamp at a certain period of the buckling operation for the purpose which will presently appear.

The arm 96 of the holding-down clamp is provided with a laterally and outwardly projecting finger 96^a at its journal end, which finger is secured at 96^b. The controlling tension-lever 98 has a curved arm 107 secured to its lower face at 108 and projecting therefrom to a point above the finger 96^a of the holding-clamp.

When the high portion 102^a of the controlling-cam 102 relieves the holding-clamp from the pressure of spring 105, by rocking the lever 98 to its extreme position against the tendency of said spring the arm 107 will engage the finger 96^a and positively raise the clamp 95 from the surface of the pile. The clamp will be held in this elevated position while the antifriction-roller 101 is traveling over the extreme high portion 102^a of the cam, and during this time the buckling-finger is making its first or short buckling stroke or impulse inwardly and outwardly under the combined tension of the two springs 81 and 91. The clamp 95 is elevated from the pile during the first impulse of the buckling-finger to allow the buckled edge of the sheet to move out and return to a position beneath the clamp under the action of the buckling-finger. When the antifriction-roller 101 reaches the intermediate portion 102^b of the controlling-cam 102, the lever 98 will also assume its intermediate position, which frees the finger 96^a from engagement with the arm 107 and allows the clamp 95 to rest by gravity alone upon the surface of the pile. The clamp 95 is allowed to rest by gravity alone while the antifriction-roller 101 is passing the intermediate portion 102^b of the controlling-cam, and during this time the buckling-finger is performing its second stroke or impulse, which is twice the length of its first stroke or impulse, and is carried out under the tension of the light spring 81 alone. The holding-clamp 95, resting only by gravity upon the pile, will not interfere with the buckling of the edge of the sheet, and immediately following the completion of the second and longer buckling stroke of the buckling-finger the antifriction-roller 101 passes off of the intermediate portion 102^b of the controlling-cam and releases lever 98 to the full action of the tension-spring 105, which tension is immediately transferred to the arm 96 for firmly forcing the holding-clamp 95 downwardly into engagement with the pile. This action takes place after the edge of the sheet is buckled and drawn from beneath the clamp, so that the clamp will hold the pile securely in place while the sheet is being fed off.

110 is the buckler stop or foot, consisting of a block of rubber mounted in the socket 111, formed in the lower end of a bent arm 112, which is mounted upon the outer end of an arm or lever 113 by means of a vertical screw-bolt 114. The arm 113 is pivoted at 115 to a rock-arm 116, formed integral with a sleeve 117 and an oppositely-projecting arm 118. The rear end of arm 113 is formed with a laterally-extending slotted yoke 119, through the slot of which projects a bolt 120, extending up from arm 116. A nut 121, threaded on the bolt 120, clamps arm 116 in the desired adjusted position.

The joints between arms 112 and 113 and 113 and 116 allow the adjustment of buckler-stop 110 horizontally into any position with relation to the buckling-finger.

The sleeve 117 is freely journaled upon a pin 122, extending from the buckler-frame, and an adjustable tension-spring 123 is also mounted upon pin 122 and engages the sleeve 117 to throw stop 110 into engagement with the pile. The arm 118 carries an antifriction-roller 124, which runs upon the periphery of a controlling-cam 125, keyed to shaft 25. The rotation of the cam 125 causes the elevation of the buckler-stop 110 at the proper moment at the completion of each buckling operation to allow the sheets to be fed from the pile by the feeding-off devices.

Any suitable feeding devices may be employed for feeding the separated sheets from the pile. It will be clear that two of the improved sheet-buckling separating mechanisms are to be used on each feeding-machine, one arranged at each of the rear corners of the pile of sheets.

In the operation of a feeding-machine equipped with two of the improved sheet-buckling mechanisms the buckling-fingers and buckling-stops descend into engagement with the pile, and simultaneously the cams 87 throw the heavy springs 91 into action to subject the buckling-fingers to the combined pressure of springs 81 and 91. At this moment the holding-down clamps 95 are raised from the pile, and immediately after this the auxiliary high portions 65^a and low portions 65^b of cams 65 engage levers 30 and give the buckling-fingers 40 their short inward and outward impulses to buckle and return the corners of the top sheet. These short buckling movements loosen the corners of the top sheet and induce air beneath the sheet-corners to

insure a successful buckling by the second stroke of the buckling-fingers. At the completion of the short strokes of the buckling-fingers the cams 87 elevate levers 85 and relieve the buckling-fingers of the pressure of the heavy springs 91, so that the light springs 81 will remain in action. The holding-down clamps 95 are by this time dropped into engagement with the pile and rest thereon by gravity alone (the tension of spring 105 being restrained by intermediate portions 102^b of cams 102) when the main high portion 65^c of cams 65 engage levers 30 and force the buckling-fingers inwardly for the second stroke, which is about twice the extent and duration of the first stroke. As the buckling-fingers finish their second stroke under light spring-pressure, the buckler-stops are raised, air is blown under the buckled portions of the sheet by air-blast pipes 5, the pressure of springs 105 is thrown onto the holding-down clamps to securely clamp the pile beneath the top sheet, and the buckling-fingers are elevated and returned to their initial position, while the feeding devices are removing the top sheet from the pile.

In the operation of the mechanism equipped with the preferred form of buckling-finger (shown in Figs. 6 and 7 of the drawings) the buckling-finger descends upon the pile in the position shown in full lines in Fig. 6, with buckling-roll 42 resting against the inner or forward knife 48. The finger is started inwardly on its initial or short buckling stroke just prior to the effective operation of the combined spring devices, so that the roll 42 will not only move outwardly into engagement with knife 47, but will rotate a trifle before the spring mechanisms exert sufficient pressure to hold the roll. The short buckle is then accomplished with a slight lost motion at the changes in direction of movement, the knife 47 holding the roll on the inward stroke and the knife 48 holding the roll on the outward stroke. This is followed by the long inward stroke to the position shown in dotted lines in Fig. 6. The buckling-roll being free when the finger is raised for its return or outward stroke and there being a slight inward movement of the finger prior to the action of the spring mechanism on the initial stroke, the buckling-roll will be constantly shifted upon the finger between its strokes and a new part of the frictional surface of the roll will be brought into contact with the sheets for every stroke. We consider this buckling-finger of great importance in connection with our sheet-buckling mechanism, because it affords a structure which will operate both inwardly and outwardly and automatically shift its frictional surface. This double action is essential to the proper working of our buckling mechanism, because on the initial stroke it is necessary to return the buckled corner beneath the holding-clamp.

The main feature of novelty in our present invention is the double-acting sheet-buckling device having differential spring mechanism arranged and controlled in such a manner that the first stroke or impulse of the buckler will be performed under a heavy spring-pressure, while the second stroke or impulse will be performed under a light spring-pressure. The importance of this construction is due to the fact that the greatest difficulty in separating sheets of paper from the pile is to effectively start the separating action. With our construction the buckler is most effective during the most difficult part of its work. Another important feature is the buckling-finger, which is effective on both strokes and is capable of automatically shifting its frictional surface.

Having thus described our invention, the following is what we 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 horizontally-reciprocating vertically-movable sheet-buckling device, and operating means adapted to impart to the sheet-buckling device first a short forward and outward stroke in engagement with the top sheet of the pile, then a relatively longer inward stroke in engagement with the top sheet of the pile, and finally an outward stroke raised from the pile, substantially as set forth.

2. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling device, and operating and controlling means adapted to impart to the buckling device first a relatively short buckling stroke or impulse under a relatively heavy pressure, and second a longer buckling stroke or impulse under a lighter pressure, substantially as set forth.

3. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling device, operating means for the sheet-buckling device adapted to impart to it first a relatively short buckling stroke or impulse and second a relatively longer buckling stroke or impulse, and a spring device adapted to exert a relatively heavy pressure upon the buckling device during its first or short impulse and a lighter pressure during its second or long impulse, substantially as set forth.

4. In a paper-feeding machine, the combination of a support for a pile of sheets, with a horizontally-reciprocating vertically-movable sheet-buckling device, and operating means adapted to impart to the sheet-buckling device first a short forward and outward stroke in engagement with the top sheet of the pile under heavy pressure, then a relatively longer inward stroke in engagement with the top sheet of the pile under a lighter pressure, and finally an outward stroke raised from the pile, substantially as set forth.

5. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling device, and operating means adapted to cause the buckling-finger to first

be moved inwardly a short stroke, then outwardly to its starting position, then inwardly for a longer stroke and finally raise from the pile and return while raised to its starting position, substantially as set forth.

6. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling device, means for raising and lowering the sheet-buckling device, and operating means for moving the buckling device inwardly and outwardly over the pile, the said raising and lowering means and operating means being constructed and arranged to cause the buckling-finger to first have a short stroke or impulse inwardly and outwardly on the pile, then a longer stroke inwardly on the pile and finally a return stroke raised from the pile, as set forth.

7. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling device, means for imparting a double buckling stroke or impulse to said device, and differential spring mechanism having suitable operating and controlling means adapted to apply a different spring tension to said buckling device for each of its strokes or impulses, substantially as set forth.

8. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling device, means for imparting a double stroke or impulse to said device, means for applying a heavy spring-pressure to the buckling device during its first buckling stroke or impulse, and means for applying a lighter spring-pressure to the buckling device during its second buckling stroke or impulse, substantially as set forth.

9. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling device, means for imparting a double buckling stroke or impulse thereto, two spring tension devices, and tension-controlling means adapted to apply the pressure of one of said tension devices to the buckling device during one of its buckling strokes or impulses, and the pressure of both tension devices to the buckling device during its other buckling stroke or impulse, substantially as set forth.

10. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling device, operating means adapted to first move the buckling device inwardly and outwardly over the pile for a short stroke, and then inwardly over the pile for a longer stroke, and differential spring mechanism constructed and arranged to apply a relatively heavy spring-pressure to the buckling device during its short stroke, and a lighter spring-pressure during its long stroke, substantially as set forth.

11. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling device, operating means adapted to cause the buckling-finger to first be moved inwardly a short stroke, then outwardly to its starting position, then inwardly for a longer stroke and finally raise from the pile and return to its starting position, suitable spring mechanism, and controlling means constructed and arranged to apply a relatively heavy spring-pressure to the buckling-finger during its short stroke and a lighter spring-pressure during its long stroke, substantially as set forth.

12. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling device, means for raising and lowering the sheet-buckling device, operating means for moving the buckling device inwardly and outwardly over the pile, the said raising and lowering means and operating means being constructed and arranged to cause the buckling-finger to first have a short stroke or impulse inwardly and outwardly on the pile, then a longer stroke inwardly on the pile and finally a return stroke raised from the pile, suitable spring mechanism, and controlling means constructed and arranged to apply a relatively heavy spring-pressure to the buckling-finger during its short stroke and a lighter spring-pressure during its long stroke, substantially as set forth.

13. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling device, means for imparting a double stroke or impulse to said buckling device, a spring-actuated lever suitably connected with said buckling device, means for controlling the operation of said spring-actuated lever, a second spring device, and means for controlling said second spring device adapted to connect and disconnect it with said spring-actuated lever, substantially as set forth.

14. In a paper-feeding machine, the combination of a support for a pile of sheets, a sheet-buckling finger, means for imparting two buckling strokes or impulses to said finger, a spring tension device including a lever suitably connected with the buckling-finger, a cam controlling said tension-lever, a second tension device including a second lever, means of engagement between the first and second tension-levers, and a cam controlling said second tension-lever, substantially as set forth.

15. In a paper-feeding machine, the combination of a support for a pile of sheets, a horizontally-reciprocating vertically-moving sheet-buckling finger, means for imparting two buckling strokes or impulses to said finger, a combined lifting and tension lever suitably connected with the buckling-finger, a spring tension device engaging said lifting and tension lever, a cam controlling the operation of said tension and lifting lever, a second tension device including a second lever, means of engagement between said second tension-lever and the combined tension and lifting lever, and a cam controlling said second tension-lever, substantially as set forth.

16. In a paper-feeding machine, the combination of a support for a pile of sheets, a pivotally-mounted buckler-carrying arm, a buckling-finger journaled upon said arm, a rotary cam engaging said carrying-arm and adapted to impart two buckling strokes or impulses to it, a combined tension and lifting lever suitably connected with the buckling-finger, a tension device engaging said tension and lifting lever, a rotary cam controlling said tension and lifting lever, a second tension device including a second tension-lever, lugs or shoulders formed on the combined tension and lifting lever and on the second tension-lever, whereby said levers may be thrown into engagement, and a rotary cam controlling the operation of said second tension-lever, substantially as set forth.

17. In a paper-feeding machine, the combination of a support for a pile of sheets and suitable sheet-buckling devices, with a holding-ing-down foot or clamp mounted upon a pivotally-supported arm or lever, a finger projecting outwardly from the journal end of said arm or lever, a spring tension device including an oscillating lever, an arm projecting from said oscillating lever and adapted to engage the finger of the arm or lever of the holding-clamp, and a rotary controlling-cam operating upon the oscillating lever of the tension device, substantially as set forth.

18. In a paper-feeding machine, the combination of a support for a pile of sheets, with a sheet-buckling finger, operating means adapted to cause the buckling-finger to first move inwardly a short stroke in engagement with the pile, then outwardly in engagement with the pile, then inwardly for a longer stroke in engagement with the pile, and finally outwardly raised from the pile, a frictional sheet-engaging roll freely mounted upon the buckling-finger, and suitable stop devices carried by the finger and adapted to engage the frictional roll and hold it against movement on the buckling-finger while it is in engagement with the pile during both its inward and outward strokes, substantially as set forth.

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