June 18, 1929. L. E. LA BOMBARD ET AL 1,717,695

FEEDER FOR SHEET MATERIAL

Filed Jan. 20, 1925 4 Sheets-Sheet 1

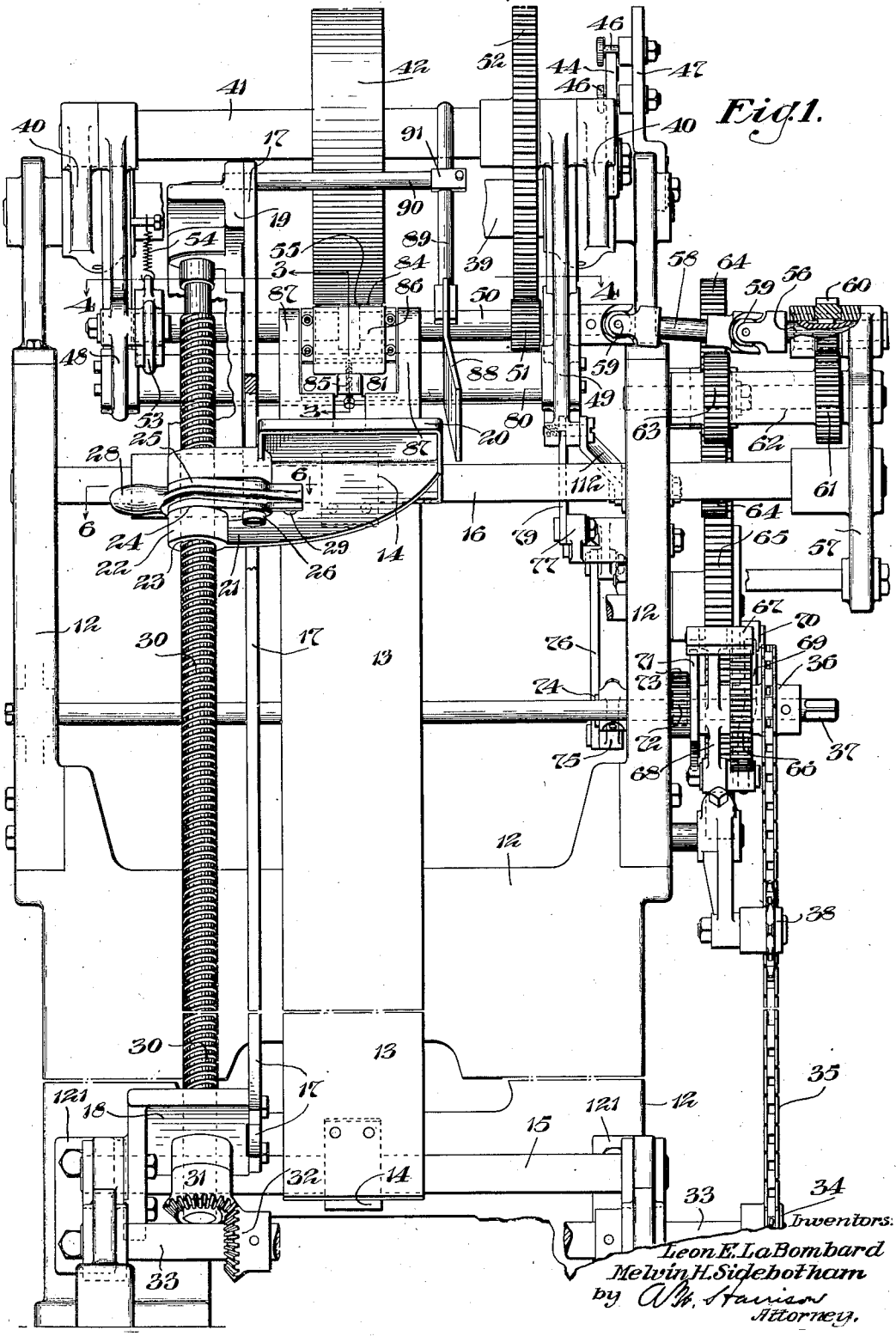


Fig.1.

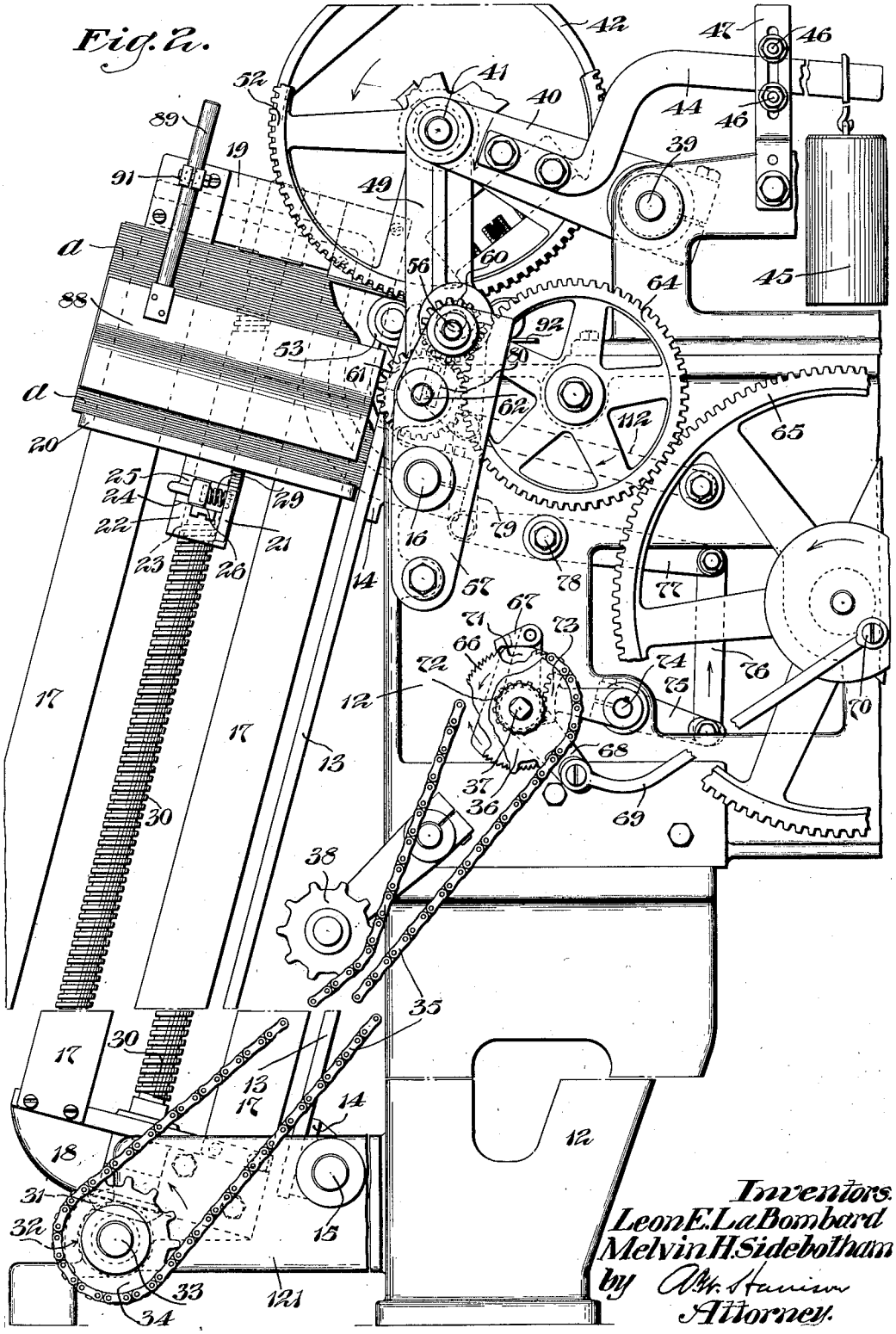
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FEEDER FOR SHEET MATERIAL

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Fig. 2.



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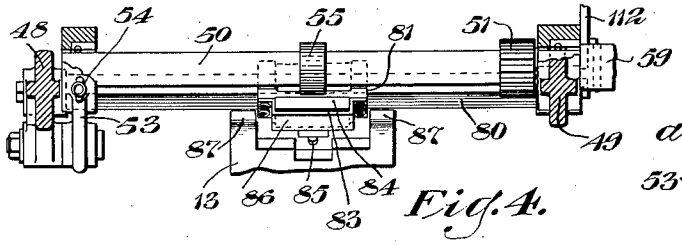


Fig. 4.

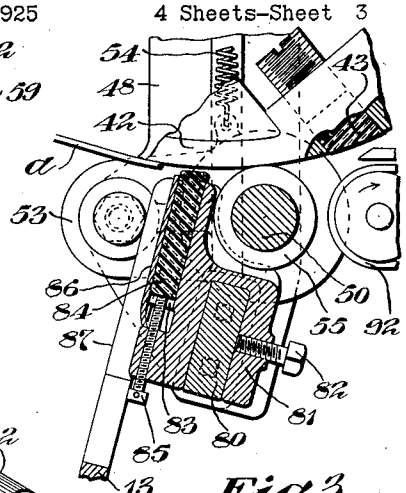


Fig. 3.

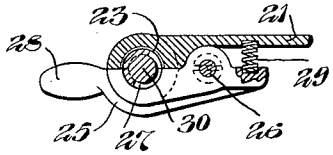


Fig. 6.

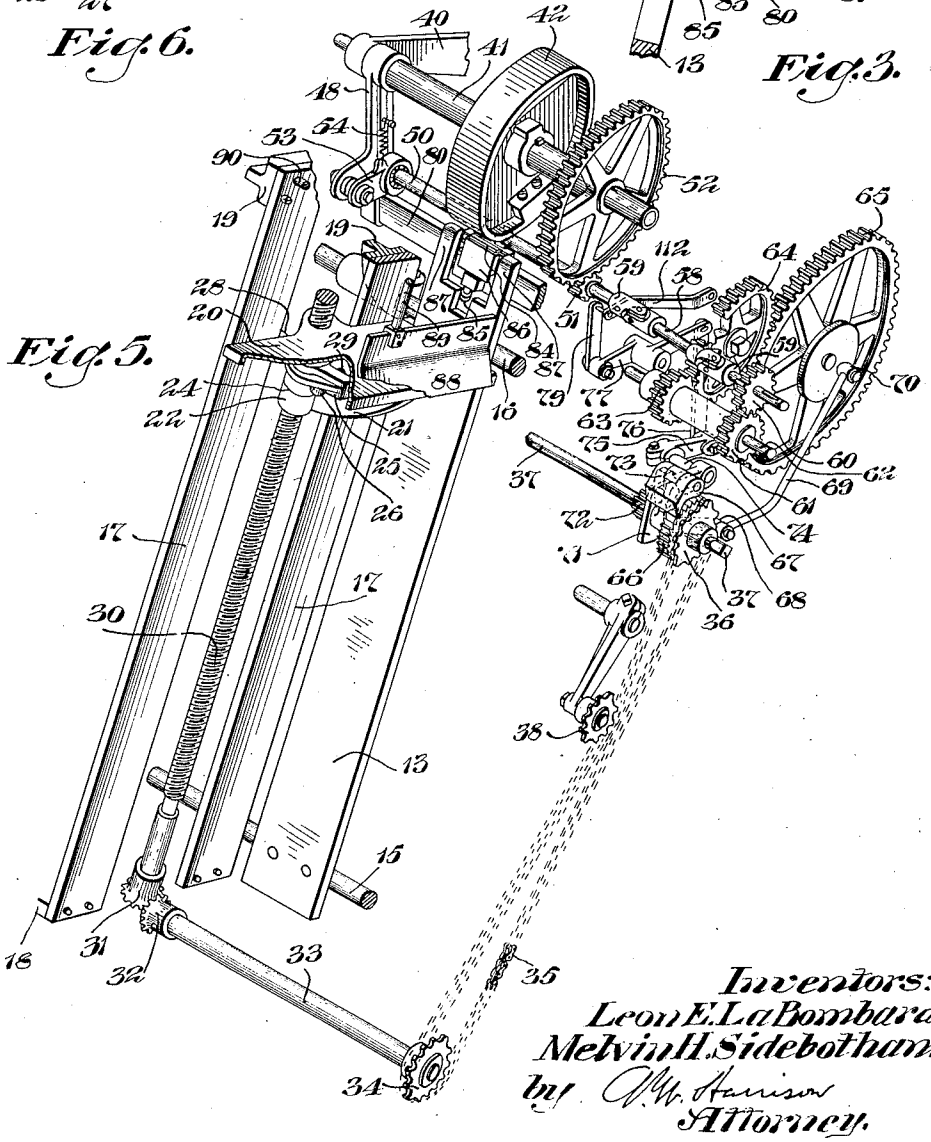


Fig. 5.

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Fig. 8.

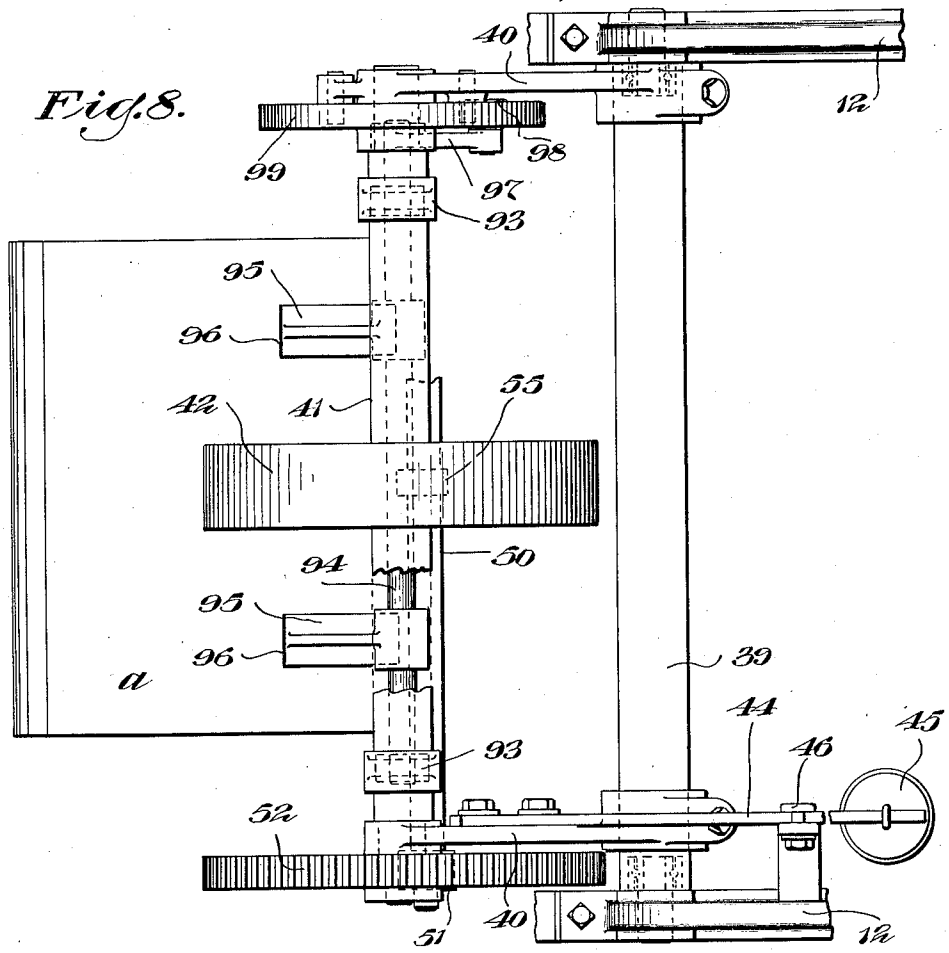
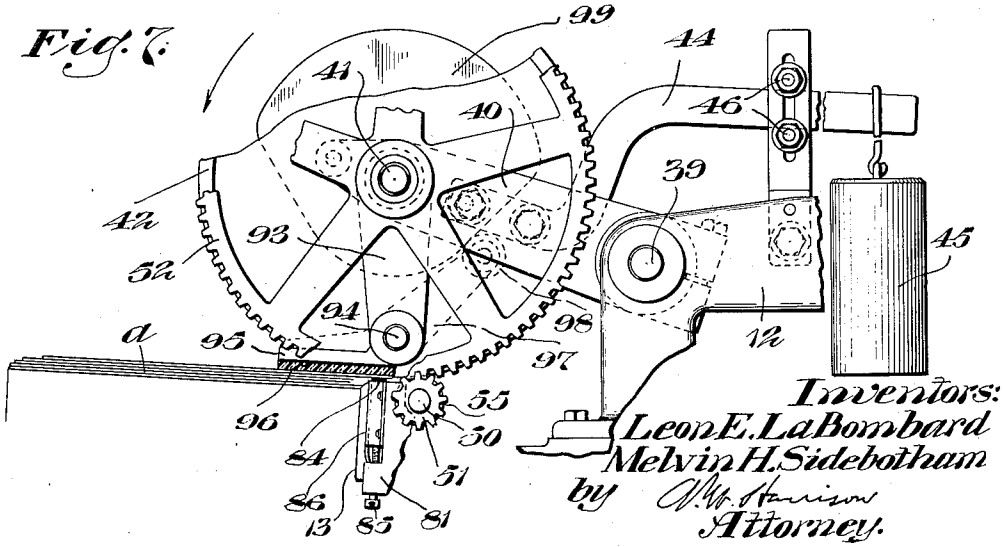


Fig. 7.



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Patented June 18, 1929. 1,717,695

UNITED STATES PATENT OFFICE.

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FEEDER FOR SHEET MATERIAL.

Application filed January 20, 1925. Serial No. 3,567.

This invention relates to mechanism for automatically supplying pieces of sheet material such as box blanks or sheets of paper, singly and successively, to other machines such as folding machines or printing presses.

One of the objects of the invention is to provide a feeder so constructed as to successfully continue to operate on blanks or sheets stacked in a pile of maximum height, whereby fresh supplies need to be given at such long intervals that one attendant can supply a much greater number of machines than heretofore. We attain this object of maximum capacity by providing a structure which successively feeds sheets from the top of a pile the height of which is only restricted by the distance between its feeding throat and the floor on which the machine that is to be fed rests.

Another object is to provide a feeder of the combing wheel type in which the pressure of the combing wheel on the upper sheet of the pile will always be the same whether there are many or few sheets in the pile.

Another object is to provide a feeder having a combing wheel and also one or more members which, as the wheel rotates, will bear on the top sheet of a pile and move far enough in a substantially horizontal direction to pull that sheet away from the next one and start it in the direction of feed.

With the above and other objects hereinafter explained in view, the invention consists in the construction and combination of parts substantially as hereinafter described and claimed.

Of the accompanying drawings, in which similar reference characters indicate similar parts in all of the views:

Figure 1 is an elevation looking from the left of Figure 2.

Figure 2 is a side elevation, the lower portion of the figure being off-set to accommodate the size of the sheet.

Figures 3 and 4 represent sections on lines 3—3 and 4—4 of Figure 1 respectively.

Figure 5 is a skeletonized perspective view.

Figure 6 represents a section on line 6—6 of Figure 1.

Figure 7 is a view similar to the upper portion of Figure 2, but illustrating the preferred combing structure.

Figure 8 is a plan view of the Figure 7 structure.

A suitably formed and constructed frame is indicated at 12. The guiding walls of the hopper for the blanks, which walls are inclined from the vertical for a purpose explained hereinafter, comprise a front strip 13 having ears 14 (Fig. 2) mounted on tie rods 15 16, and a pair of side strips 17 secured to upper and lower frame brackets 18 19.

A vertically movable shelf or plate 20, two of the edges of which extend close to the wall strips 13 17, supports the pile of blanks *a*, and coacts with said wall strips in forming a hopper for an extremely large quantity of blanks. This is due to the fact that said shelf or plate may, and usually is at the beginning of operation on a pile, lowered as hereinafter described, close to the floor or base of the machine, to enable a fresh supply of blanks to be quickly located in position for the feeding operation. Said shelf has a bracket or integral extension 21 (Figs. 1, 2, 5 and 6) passing laterally through the space between the two side wall strips 17 and terminating in an ear 22 having a smooth-bored hole 23 and a slot or opening 24 in one side. A lever 25 pivoted at 26 has a semi-circular recess 27 which has one or more teeth to act as a thread or threads cooperating with the screw-threaded shaft 30 which extends through the hole 23. The lever 25 has a finger piece 28 and is normally held in the position illustrated in Figure 6 by a spring 29. An attendant can, at any time, actuate the lever to release its teeth from the screw shaft 30, when it is desired to lower or raise the pile-supporting shelf.

This structure enables the said shelf 20 to be quickly adjusted to any position down or up, to accommodate a fresh supply of blanks with the top of the pile at the proper point of elevation for feeding.

The lower end of the screw shaft 30 has a bevel pinion 31 (Fig. 1) meshing with a bevel pinion 32 of a shaft 33 which, at the other end, extends through a frame bracket 121 and has a sprocket 34. A chain 35 connects said sprocket with a sprocket 36 (Fig. 2) carried by an upper shaft 37 which is intermittently actuated as hereinafter described. A chain tightener is indicated at 38.

We will now describe the balancing support for the feed or combing wheel and certain other important members connected therewith, so as to rise and fall with said

combing wheel and coact therewith in providing a throat through which the blanks are fed. A rock shaft 39 has arms 40 (Fig. 2) which have bearings for the shaft 41 carrying the combing wheel 42 (Figs. 1, 2 and 5). The latter may have one or more friction plugs such as illustrated at 43 in Figure 3, but is preferably combined with one or more outwardly and inwardly movable friction members to bear quite flat on the top blank of the pile in the hopper and start it with a pulling action. Said preferable structure will be described hereinafter.

Secured to one of the arms 40 and extending rearwardly therefrom is a lever arm 44 from which a weight 45 is adjustably suspended to counter-balance the shaft 41 and the parts carried thereby. The lever arm 44 extends between stop pins 46 adjustably mounted in slotted uprights 47 to limit the amount of swing permitted for the said weight-carrying arm and the parts counterbalanced thereby.

Depending from the feed-wheel-carrying shaft 41 are two arms 48 49. A shaft 50 is mounted at one end in the arm 49 (Figs. 1, 2 and 4) and has a pinion 51 meshing with a gear 52 carried by the shaft 41. The other end of the shaft 50 is mounted in a small arm 53 pivoted to the arm 48 (Fig. 5), a spring 54 being connected to the small arm 53. The shaft 50 carries a small roll 55 (Figs. 2 and 3) which is held yieldingly against the combing wheel 42 owing to the action of the spring 54 which exerts an upward tension on that end of the shaft 50. The mounting of the other end of the shaft in the arm 49 is sufficiently loose to permit the slight yield required to permit a blank to pass between the small roll 55 and the combing wheel.

Since the combing wheel and the shaft 50 and the feed-throat-forming associated parts are counter-balanced, and are to be permitted to shift vertically, the connection for driving the shaft 50 and its small roll 55 is preferably flexible. Such will now be described.

A stud shaft 56 (Figs. 1 and 2) is mounted in a bracket 57 supported by the tie rod 16 and other frame connections, and is connected with one end of the shaft 50 by a short coupling shaft 58 having knuckle or universal joints 59 (see also Fig. 5). The stud shaft 56 carries a pinion 60 meshing with and driven by a pinion 61 carried by a shaft 62, the latter having a pinion 63 meshing with the gear 64 which, in turn, meshes with and is driven by a gear 65, the latter being constantly driven by any suitable motor and mechanism not necessary to illustrate.

The shaft 37 has a ratchet 66 (Figs. 2 and 5) which is engaged by an actuating pawl 67 carried by one end of a lever 68 the other end of which is connected by a link 69 with a crank pin 70 of the gear wheel 65. If the pawl 67 were allowed to act every stroke, there would be a continuous step-by-step lifting of the pile of blanks on the shelf 20, through the connection already described. To prevent such continuous operation, so that the feed may be controlled by preventing too rapid upward movement of the pile of blanks, and to compensate for different thicknesses or qualities of the material of the blanks or sheets in the pile, the pawl is permitted to act only when several blanks or sheets have been removed successively from the top of the pile and the combing wheel has about reached its lower limit of swing. To effect this control a pawl shield 71 is mounted on the shaft 37 (Figs. 1, 2 and 5), said shield having a pinion 72 combined with its hub, said pinion being engaged by a toothed segment 73 of an arm carred by a short rock shaft 74 mounted in one side of the frame 12. Said rock shaft has an arm 75 connected by a link 76 with one end of a lever 77 pivoted at 78, the other end of said lever being connected by a link 79 with the arm 49 which depends from the combing-wheel shaft. Consequently, as the combing wheel swings up or down, the pawl shield is rocked. The shape of the pawl shield 71, and the described connections for actuating it, are such that when rotation of the screw shaft 30 has continued long enough to cause the upward movement of the pile to act through the top-most blank to lift the combing wheel and its associated parts a predetermined distance, the higher portion of the pawl shield moves under the pawl and lifts it away from the ratchet. Upward movement of the pile of blanks then ceases until the successive removal of blanks from the top of the pile permits the combing wheel and its associated parts to descend far enough to cause the pawl shield to rock and permit the pawl to resume actuation of the ratchet. It is to be understood, of course, that the counter-balance weight 45 is so adjusted along the lever 44 as to cause the combing wheel to always bear with some pressure on the pile of blanks, which pressure may be varied to best suit the size or quality of the blanks.

It is customary to employ what is known as a retard in connection with a friction feeding wheel. Such a retard is illustrated at 84 in Figures 1, 3, 4 and 5. To support it so that it will always occupy a proper position relatively to the vertically movable combing wheel, we employ a cross bar 80 having its ends connected with the arms 48 49 which, as hereinbefore described, depend from the combing-wheel shaft 41, and a casting or bracket 81 is mounted on said bar and retained in proper adjusted position longitudinally of the bar by a set screw 82 (Fig. 3). The casting 81 has a recess 83 for a block 84 of retarding material such as rubber. A suitable cover plate 86 is provided for the block, and said block is adjustable vertically in the recess 83 by means of a screw 85. The

upper end of the hopper strip 13 is recessed to form two arms 87 which extend up parallel with the plate 86 for the purpose of providing a recess within which the retard-carrying member can move vertically when the retard and the combing wheel move vertically.

It will now be understood that the retard 84, as well as the roll 55, which effect the separation of each top blank from the next one and ensure passage of single blanks successively, are so associated with the feed wheel 42 as to rise and fall with the latter. In other words, although the feed wheel which is counterbalanced rises and falls, the parts which are associated therewith to provide the feeding throat also rise and fall to maintain their relationship to said feed or combing wheel.

Owing to the inclination of the hopper substantially as illustrated by Figure 2, the blanks have a natural tendency to present their front edges in contact with the hopper strip 13. To ensure squaring up of the blanks if any are askew, especially those approaching the top to be fed, we employ a guide plate 88 (Figs. 1, 2 and 5) opposite and parallel with the upper portion of the hopper side strips 17. The lower edge of the plate 88 is flaring so that if any blank is askew it will be straightened out and pushed over against the strips 17 as the pile moves upwardly. To hold said plate in proper position, and adjustably so in order to provide for blanks of different widths, the plate is supported by means of its vertical stem or stud 89 which is connected to an arm 90 extending horizontally from the bracket 19 by means of a clamp 91 which will permit the stem 89 to be secured in adjusted position vertically or laterally.

Each blank fed from the top of the pile passes to a carrier belt 92 (Fig. 3) to be delivered to the machine which is to fold, print, or otherwise treat it.

To prevent the arms 48 49 which are secured to and depend from the shaft 41 and support the retard 84 and roll 55 from having any material swinging movement a steadying link 112 (Figs. 1 and 2) is pivotally connected at one end to the arm 49 and at the other end of a suitable part of the frame.

The material of some blanks or sheets, especially when said material is heavy or the blanks large, is such that ordinary friction plugs such as illustrated at 43 in Figure 3, are not sufficient to properly start the feed. In Figures 7 and 8 we illustrate means for starting the feed by members which, after first bearing on the top blank, then move for a short distance in a path to pull that blank in feeding direction. Secured to the shaft 41 so as to rotate therewith are two arms 93 in the ends of which are bearings for a rock shaft 94, the latter having secured to it one or more plates 95 provided with friction material 96 on their under surfaces. At one end the rock shaft 94 has an arm 97 provided with a roll 98 which rides over and around a cam 99 which is mounted stationarily as by being secured to one of the arms 40.

The stationary cam 99 is so shaped that as the shaft 41 and combing wheel 42 revolve, the auxiliary pads 95 96 are caused by centrifugal force to swing out as they approach the top blank of the pile and press on that blank as illustrated by Figure 7 (and of course a spring may be employed to aid such pressure), and to then be swung inward relatively to shaft 41 so that, for a short distance, the friction surfaces of the pads continue to bear substantially flat on said top blank and pull it in feed-starting direction.

While we show two of the auxiliary pads located adjacent opposite sides of the combing wheel, we do not limit ourselves thereto as a greater number might be employed or a single one combined with the combing wheel.

Where reference is made hereinbefore or hereinafter to blanks or sheets, it is to be understood that the employment of either of said terms alone is for the sake of brevity of description and not of limitation, as the mechanism is capable of feeding blanks to box folding machines or envelope machines, or sheets of thin paper to printing presses, and either one may be considered a blank or a sheet.

The operation is as follows:—

Assuming that the hopper is empty or nearly so, and the machine idle, the attendant, by means of the finger piece 28 (Fig. 6), pulls the lever 25 to remove its threaded recess from the screw shaft 30 and lowers the shelf 20 to the bottom of the hopper strips and releases said lever back into engagement with said screw shaft. Then a very high pile of blanks can be placed on the shelf, several thousands if the blanks are thin, the height of the pile being such that the counter-balanced combing wheel exerts pressure on the top-most blank due to said wheel being held lifted by the pile of blanks. When the connection of the lowered shelf to the screw shaft is made as just described, such connection is easily made or effected at any portion of the length of said shaft according to the quantity of blanks piled on the shelf, in order that the top blank of the pile will be in the proper plane of elevation for separation and feeding through the feed throat all members of which, including the combing wheel, rise and fall in accordance with the intermittently varying height of the pile as hereinbefore described. Each rotation of the wheel and auxiliary pads effects removal of the top-most blank and starts it through the throat between said wheel and the retard 84 and small roll 55, on its way to the machine which is to operate on the fed

blanks. A number of blanks (varying according to the thickness thereof) will be successively fed before anything occurs to lift the pile, the combing wheel, and the associated small roll 55, their shafts, the retard, and other described parts gradually descending so that the combing wheel and the auxiliary pads will bear with just as much pressure on each of a series of successively fed blanks as on the first one. During the descent of the said parts, the shield 71 holds the pawl 67 out of engagement with the ratchet 66 and no actuation of the pile-elevating screw 30 occurs. The shield-controlling connections however, are such that just before the combing wheel and the associated parts which swing therewith reach the lowermost operative position (which position is determined by the upper adjustable stop pin 46) the shield 71 releases the pawl 67 so that the latter, which has been and is continuously actuated by the crank pin 70, now actuates the ratchet and, through the gearing illustrated and described, rotates the pile-elevating screw 30. The pile is elevated faster than the combing wheel and the auxiliary pads remove successive blanks and consequently the feeding throat, comprising the wheel 42 and the associated small wheel 55 and the retard 84, and the other parts connected therewith, are swung up by the topmost blank pushing the combing wheel up, until the pawl shield is returned to pawl disengaging position to effect stoppage of further rotation of the pile elevating screw until said feeding-throat members are again lowered by the diminishing height of the pile of blanks.

This provision of a feeding throat, all members of which are movable relatively to the plane of the top of a pile of blanks, ensures proper feeding of the blanks whether they are thick or thin. And the employment therewith of means for gradually elevating the pile ensures uniform pressure on the topmost blanks whether there be few or many blanks in the pile. And by adjustably counter-balancing the throat members, including the friction feeder, the amount of the said uniform pressure can be regulated according to the requirements of the material to be fed.

Having now described our invention, we claim:

1. A blank feeder having a rotary combing wheel feeder, and a blank hopper below it, said hopper comprising inclined walls and a shelf mounted to move in a direction parallel with said walls, means being provided for automatically elevating said shelf, and means for permitting the shelf to be lowered independently of said elevating means.

2. A feeder having a support for a pile of blanks, a combing wheel for removing blanks successively from the top of said pile, and a shaft having a roll to coact with said wheel in forwarding the blanks, said shaft being mounted to permit its roll to permanently bear yieldingly against the combing wheel.

3. A feeder having a support for a pile of blanks, a combing wheel for removing blanks successively from the top of said pile, and a shaft yieldingly mounted at one end and carrying a roll to coact with said wheel in forwarding blanks.

4. A feeder having a support for a pile of blanks, a pair of shafts geared together and carrying a combing wheel and coacting roll, said shafts and the parts carried thereby being counter-balanced and movable relatively to the plane of the top of the pile of blanks, and a flexible driving connection for the roll-carrying shaft.

5. A feeder having an upwardly movable support for a pile of blanks, a screw shaft for elevating the support, a counter-balanced combing wheel movable relatively to the plane of the top of the pile, means including a pawl and ratchet for actuating said screw shaft, a pawl shield for alternately permitting and preventing the actuation of the ratchet by the pawl, and connections for varying the position of the pawl shield according to the vertical position of the combing wheel.

6. A blank feeder having a combing wheel, a support for a pile of blanks below the wheel, means for automatically elevating said support, and a guide shaped to ensure squaring up of the blanks as they approach the wheel.

7. In mechanism of the character described, a pair of pivoted arms, a shaft supported by said arms and carrying a feed wheel, a bar connected to one of said arms and having a weight movably mounted thereon, means supported by said arms and coacting with said feed wheel to form a throat for the passage of blanks, and means for supporting a pile of blanks in position to be successively fed through said throat by said wheel, adjustable stops being provided to limit the extent of movement of the weight-carrying bar.

8. In a feeder of the character described, a hopper for a pile of blanks, means for gradually elevating the pile, and a counter-balanced combing wheel and coacting retard movable relatively to the plane of the top of said pile, the said hopper having front wall portions which extend up past the retard and close to the combing wheel.

In testimony whereof we have affixed our signatures.

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