No. 609,968. Patented Aug. 30, 1898.

E. LARSON.

SHEET SEPARATOR.

(Application filed Dec. 3, 1897.)

(No Model.) 3 Sheets—Sheet 1.

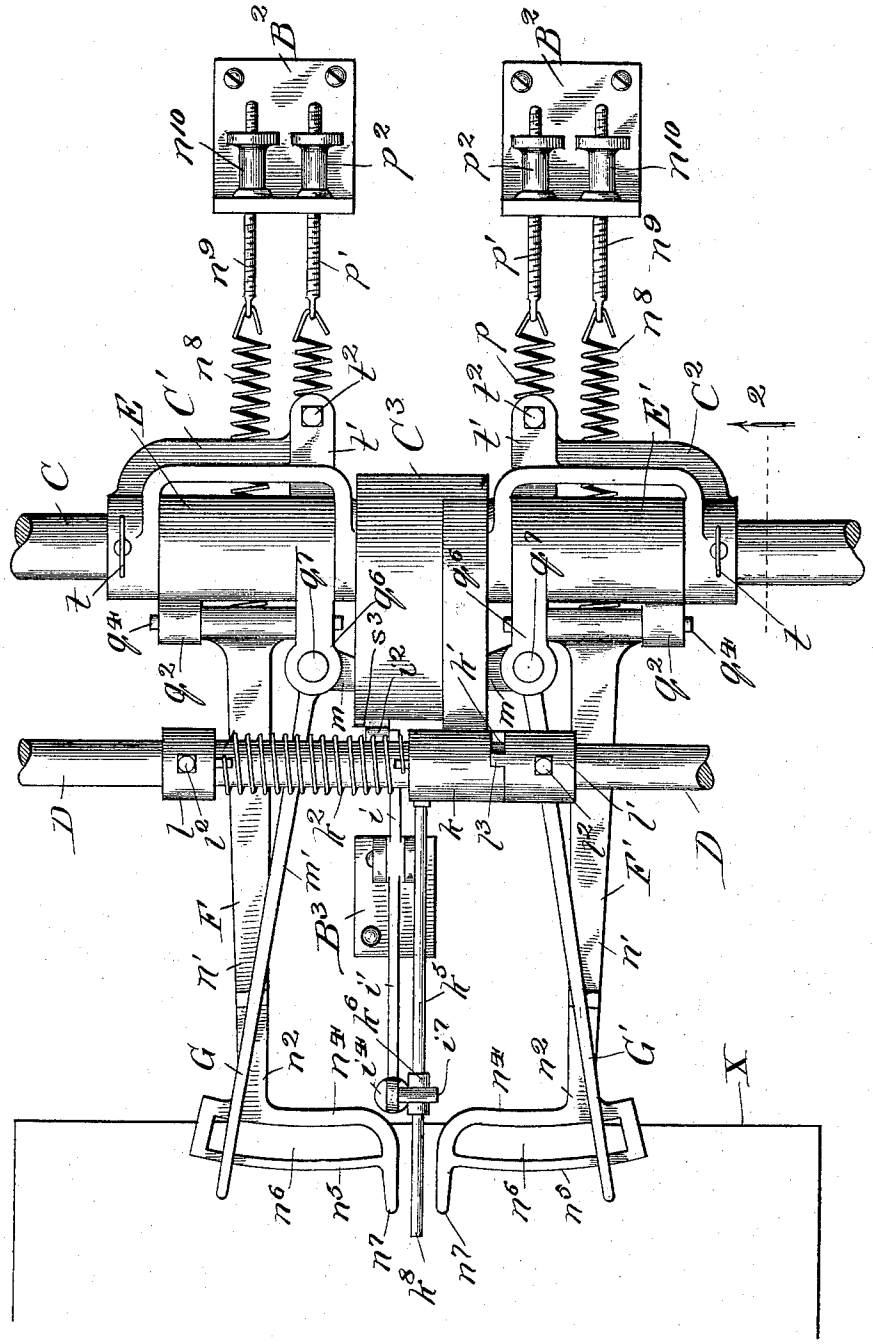

Fig. 1.

Witnesses:
Chas. E. Gaylord.
Peter B. Mellen

Inventor:
Emil Larson,
By Dyrenforth & Dyrenforth,
Attys.

No. 609,968. Patented Aug. 30, 1898.

E. LARSON.

SHEET SEPARATOR.

(Application filed Dec. 3, 1897.)

(No Model.) 3 Sheets—Sheet 2.

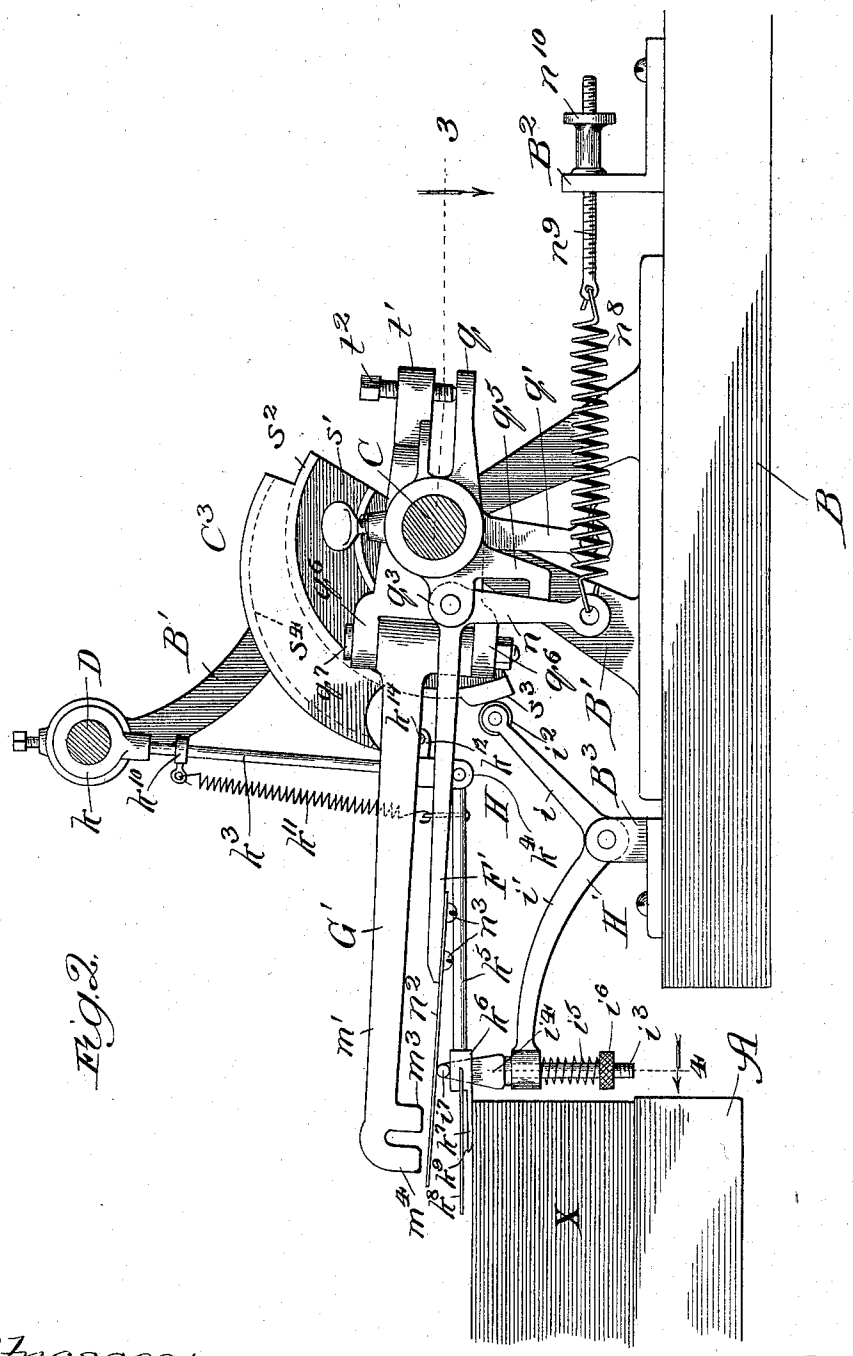

Fig. 2.

Witnesses:
Chas. E. Gaylord,
Fitch S. Fitch

Inventor:
Emil Larson,
By Dyrenforth & Dyrenforth,
Attys.

No. 609,968. Patented Aug. 30, 1898.

E. LARSON.

SHEET SEPARATOR.

(Application filed Dec. 3, 1897.)

(No Model.) 3 Sheets—Sheet 3.

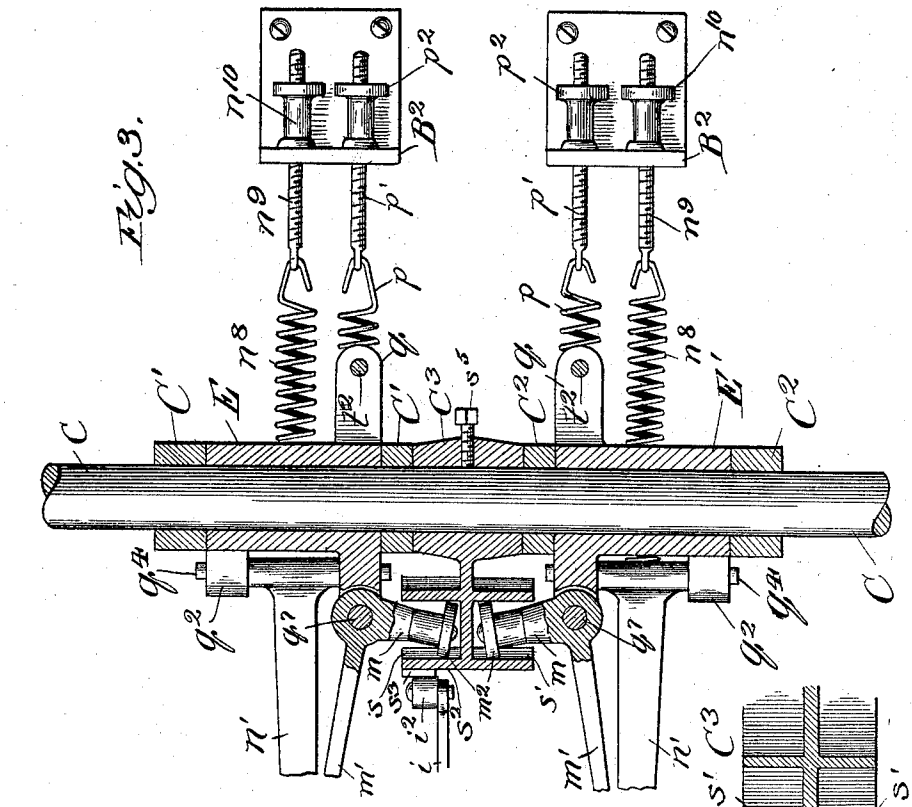

Fig. 3.

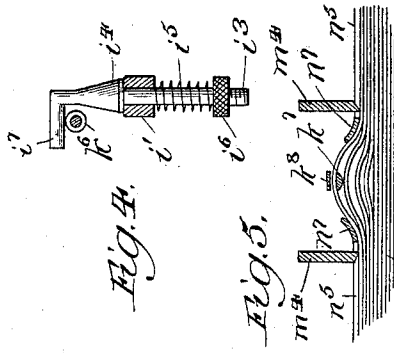

Fig. 4.

Fig. 5.

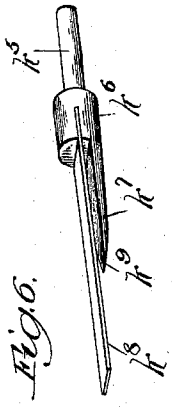

Fig. 6.

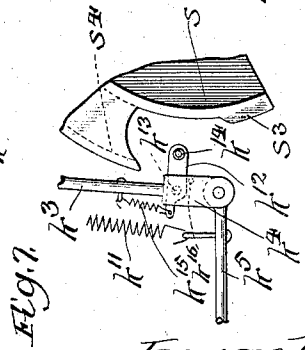

Fig. 7.

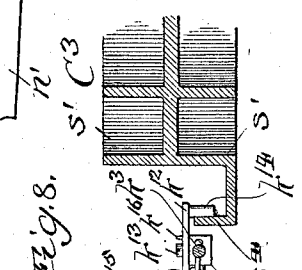

Fig. 8.

Witnesses:
Chas. E. Gaylord,
Luke B. Miller.

Inventor:
Emil Larson,
By Dyrenforth & Dyrenforth,
Att'ys.

UNITED STATES PATENT OFFICE.

EMIL LARSON, OF CHICAGO, ILLINOIS.

SHEET-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 609,968, dated August 30, 1898.

Application filed December 3, 1897. Serial No. 660,629. (No model.)

To all whom it may concern:

Be it known that I, EMIL LARSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Sheet-Separators, of which the following is a specification.

My invention relates to an improved attachment for sheet-feeders which feed sheets of paper or the like to printing, ruling, or folding machines, the attachment operating as a sheet-separator to hold all but the top sheet of a pack, and thus prevent more than one sheet at a time from being removed from the pack by the feeding mechanism.

My object is to provide sheet-separating mechanism to be employed as an attachment to sheet-feeding devices of any style and which shall be of simple and durable construction and particularly effective in its operation.

In the drawings, Figure 1 is a broken top plan view of my improved sheet-separating device mounted adjacent to the feed-table of a sheet-feeder; Fig. 2, a sectional side elevation of the device and end portion of the feed-table, the section being taken on line 2 of Fig. 1; Fig. 3, a broken plan section taken on line 3 of Fig. 2; Fig. 4, a sectional detail view of presser-finger mechanism forming part of the construction; Fig. 5, a broken view showing a pack of sheets to be fed one at a time and illustrating a stage in the operation of my improved separating mechanism; Fig. 6, an enlarged broken perspective view of a separating-finger detail of the construction, and Figs. 7 and 8 broken and broken sectional detail views of parts of the separator mechanism.

A is the table or platform of a sheet-feeding machine or device. This feeding-machine may be of any suitable construction and requires no illustration in the present connection. It will suffice to say that the table A rises intermittingly a distance approximating the thickness of one of the sheets X to be fed when the friction-rollers or other sheet-engaging means employed remove a sheet from the pack.

B is a table or support upon which are mounted toward opposite sides similar standards B′, of which only one is shown in Fig. 2. Journaled in the standards in the position shown is a rock-shaft C, which in practice is suitably geared to the feeding-machine to rock intermittingly. Mounted in the upper ends of the standards B′ is a stationary rod or shaft D. On the shaft C are two yoke-pieces C′ C^2, of like construction, which are adjustably secured to the shaft by means of thumb-screws t t, whereby they rock with the shaft. On the shaft C is a cam device C^3, formed with two cam-recesses s s' on opposite sides, as illustrated in Fig. 3, an outer cam-surface s^2, provided at one end with a cam projection s^3, and an inner cam-surface s^4 beyond the cam-surface s^2. The cam device C^3 is rigidly but adjustably secured to the shaft C by means of a set-screw s^5. Loosely surrounding the rock-shaft C in the yoke-pieces C′ C^2 are sleeves E E′. On each yoke-piece is a backward-extending arm t', having a threaded opening through it to receive an adjusting-screw t^2, and on each sleeve E E′ is a backward-extending arm q in position to be engaged by the end of the adjusting-screw. Also, on each sleeve is a downward-extending arm q', to which is connected one end of a coiled spring p, which at its opposite ends connects with a tensioning-screw p', working in a bracket B^2 on the table B in the position shown. On each of the screws p', as shown, is a tensioning-nut p^2. Each of the sleeves E E′ is provided with an outer lug q^2 and an inner lug q^3, forming bearings for horizontal pins q^4 q^4.

F F′ are presser devices, each comprising a bell-crank lever having the downward-extending arm n, backward horizontally-disposed arm n', and plate or frame n^2, secured, as by means of screws n^3, to the arm n', as shown in Fig. 2. Each frame n^2 consists of a thin flat plate of more or less springy metal, having the segmental cross-pieces n^4 n^5, with a segmental recess n^6 between them, and the toe or projection n^7. Connected with the lower ends of the arms n are coiled springs n^8, connected at their opposite ends to adjacent screws n^9, working in the brackets B^2 and provided with tensioning-nuts n^{10}, as shown. The sleeves E E′ are provided with downward-extending arms q^5, forming stops, against which the arms n of the presser devices are caused normally to bear by the springs n^8.

It is to be understood that when the parts are in the position shown in the figures the rock-shaft C is turned to the limit of its movement in the direction from left to right, which has caused the set-screws t^2, carried by the yokes, to impinge against and bear down upon the arms q of the sleeves, turning the latter to press the stops q^5 against the arms n and lift the presser devices F F′ against the resistance of the springs n^8 to raise the presser devices from the surface of the pack X, as illustrated in Fig. 2.

On each sleeve E E′ is a pair of lugs q^6, one above the other, forming bearings for vertically-disposed pins q^7.

G G′ are buckling devices, each in the form of a bell-crank lever, having a short arm m and a long arm m'. Journaled on the short arm m of the buckler G is a roller m^2, projecting into the adjacent cam-recess s, and on the arm m' of the buckler G′ is a roller m^2, projecting into the cam-recess s'. The bucklers are pivoted to the pins q^7 to swing in the horizontal plane toward and away from each other at their free end portions. On the said free end portions of the bucklers are downward-extending scraper-blades m^3 m^4, adapted to straddle the segmental bars n^5 of the presser devices, whereby the blade m^3 moves in the recess or slot n^6 and the blade m^4 beyond the bar n^5.

H is the separator mechanism. Fastened upon the fixed shaft or rod D in the positions shown are collars l l', held in place by means of set-screws l^2. On the collar l' is a stop projection l^3. Loose upon the shaft D is a sleeve k, provided in its end adjacent to the collar l' with an elongated recess k', into which the stop l^3 projects. Surrounding the shaft and connected at opposite ends, respectively, with the collar l and sleeve k is a spring k^2, which tends normally to press the sleeve at one end of its recess k' against the stop l^3. Fastened against the under side of the sleeve to form a substantially integral part thereof is a downward-extending rod k^3, provided at its lower end with a head or block k^4. Pivoted at one end to the block k^4 is a rod or stem k^5, provided at its free end with a head k^6, (see Fig. 6,) from which extend a pointed separating finger or prong k^7 and a prong or strip k^8, preferably of thin springy metal to be yielding. The strip k^8 is above and longer than the finger k^7, and they are separated by a space or recess k^9, which in practice is, say, about one-sixteenth of an inch in height. On the rod k^3 is a collar k^{10}, and k^{11} is a counterbalancing-spring fastened at one end to the collar k^{10} and at its opposite end to the rod k^5.

H′ is a presser or clamping device comprising a bell-crank lever of the shape shown most clearly in Fig. 2, having the arms i i' and fulcrumed upon a bearing or bracket B^3, fastened to the table B. On the free end of the arm i is a roller i^2, which rides upon the cam-surface s^2 and cam projection s^3. Extending through a vertical opening in the free end of the arm i' is a loose pin i^3, having a head i^4, which rests normally against the upper surface of the arm i', being held down by a spring i^5, surrounding the pin and confined between the lower surface of the arm and a nut i^6 on the pin. On the upper end of the head i^4 is a laterally-extending finger i^7, which extends over the head k^6. On the side of the block k^4, at the lower end portion of the rod k^3, is a swinging arm k^{12}, pivoted to the block at k^{13} and carrying a laterally-extending antifriction-roller k^{14} in the path of the cam-surface s^4. The arm k^{12} is held normally against a stop k^{16} on the side of the head by means of a light spring k^{15}.

As before stated, the rock-shaft C is operatively connected with the driving mechanism of the feeding-machine, to which the separating device is applied, and the shaft is oscillated upon its axis about one-third of a revolution with each operation. The drawings show the parts in the position they occupy just after a sheet has been removed by the feeding mechanism from the pack X. The buckling devices G G′ and presser devices F F′ are raised from the pack, and the separator H is pressed down upon the pack by the pressure of the cam s^3 against the roller i^2, which has swung the bell-crank lever to cause the pin or finger i^7 to bear down upon the head k^6 and cause the latter to clamp the pack. In the next movement of the rock-shaft C the cam device is swung in the downward direction, (to the left in Fig. 2,) causing the cam s^3 to release the roller i^2 and the latter to ride upon the cam-surface s^2. The spring k^{11} nearly, but not quite, balances the weight of the rod k^5 with its head k^6 and the weight of the arm r' and attendant parts, so that when the pressure of the finger i^7 is taken off the head k^6 the separating prong or finger k^7 will rest very lightly upon the pack and be raised by the buckling of the top sheet. In the initial turning of the rock-shaft and yokes C′ C², carried thereby, the arms t' and set-screws t^2 are lifted away from the arms q, carried by the sleeves E E′, whereby the said sleeves are swung by the springs p to lower the bucklers G G′ upon the upper surface of the pack, where they are held yieldingly by the springs p. At the same time the stop projections or arms q^5 on the sleeves are moved away from the arms n of the presser devices, whereby the springs n^8 operate to swing the presser devices down and hold them yieldingly upon the upper surface of the pack. At the same time the cams s s' swing the arms m of the buckling devices in the direction of the shaft C, whereby the arms m' are swung in the direction of each other—that is to say, toward the toes n^7 of the presser devices. The blades m^3 m^4 of the bucklers are pressed by the tension of the springs p upon the top sheet of the pack at opposite sides of the bars n^5, and in the movement of the bucklers toward each other they slide with slight contact upon the upper sheet, the pressure they

exert being sufficient to buckle one or more of the upper sheets between the toes n^7, as indicated in Fig. 5, and cause the top sheet in buckling to raise the separator. To insure proper operation of the blades without injury, however, to the top sheet of the pack, they are sharpened slightly from one side, as indicated in Fig. 5, and rounded off at the corners. The toe portions n^7 of the presser devices are curved upward, as indicated in Fig. 5, to afford guides which insure the proper buckling of the top sheet. The operation of the bucklers, owing to the presser devices, is such that the top sheet of the pack will always and without fail be separated at its edge from the sheet next below it a distance greater than the height of the recess or socket k^9 of the separating device. In the further movement of the cam device C^3 the cam s^4 engages the roller k^{14} on the separator and swings the lower end of the rod k^3 in the direction of the shaft C against the resistance of the spring k^2 on the shaft D. This drives the rod k^5 and attendant parts in the direction of the shaft C until the point of the prong or finger k^7 passes the edge of the pack, when the rod k^5 and attendant parts drop upon its pivot, causing the strip or prong k^8 to rest lightly on the top of the buckled upper sheet. The cam device moves in the direction stated until the cam s^4 wipes past and releases the roller k^{14}, permitting the spring k^2 to recoil and move the rods k^3 k^5 in the direction away from the shaft C to the position shown in Fig. 2. In this movement the strip or prong k^8 moves along the upper surface of the top sheet, upon which it rests, and the prong or finger k^7 moves beneath the said top sheet, as indicated in Fig. 5. When the cam s^4 has released the roller k^{14}, as described, the shaft reaches the limit of its movement in the direction described and starts upon the return movement to move the cam device to the position indicated in the figures. In this movement the bucklers G G′ slide away from each other to the position indicated in Fig. 1. As the cam moves to the position shown in the figures the roller k^{14} slides on the outer surface of the cam s^4, the pivotal arm k^{12} yielding against the resistance of the spring k^{15}. When the cam passes up beyond the roller k^{14} and releases it, the arm k^{12} is turned to the stop k^{16} by the spring, moving the roller k^{14} to normal position. When the shaft has nearly completed its movement to the position indicated, the yokes C′ C^2 at their set-screws t^2 engage and swing the sleeves to raise the presser and buckling devices, as before described. At about the same time the cam s^3 engages the roller i^2 on the clamping device H′, causing the pin i^7 to bear down upon the separator and clamp all but the top sheet of the pack, leaving said sheet loose and free to be moved from the pack by the feeding device.

When the paper to be fed is very thin, the toes n^7 of the presser devices G G′ should be close to each other, as indicated in Fig. 5, to insure the proper buckling of the paper. When the paper is heavier, the distance between the toes n^7 should be increased to insure perfect operation. This increase of distance may be effected by moving and adjusting the yokes C′ C^2, and consequently the sleeves E E′ and attendant parts, in the direction away from each other on the shaft C.

The gist of my invention lies more especially in the construction and operation of the separating mechanism H, in combination with means for buckling the top sheet, and while I prefer to construct my improvements throughout as shown and described they may be variously modified without departing from the spirit of my invention as defined by the claims.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a sheet-separator for sheet-feeding devices, the combination of a buckler, and a separator, coöperating with said buckler, having a separating projection supported to be raised by the buckling of the top sheet moving means operating to move the separator at its said projection past the edge then under the top sheet to be separated and means for clamping the under sheets down, substantially as and for the purpose set forth.

2. In a sheet-separator for sheet-feeding devices, the combination of a buckler having sheet-engagers and operating means for causing the sheet-engagers to approach and recede with relation to each other, and a separator, between and coöperating with the sheet-engagers, having a separating projection supported to be raised by the buckling of the top sheet, moving means for the separator operating to move the separator at its said projection past the edge then under the top sheet to be separated and means for clamping the under sheets down, substantially as and for purpose set forth.

3. In a sheet-separator for sheet-feeding devices, the combination of a buckler having sheet-engagers and operating means for causing the sheet-engagers to approach and recede with relation to each other, presser devices across which the sheet-engagers move, and a separator, between and coöperating with the sheet-engagers and presser devices, having a separating projection supported to be raised by the buckling of the top sheet moving means for the separator operating to move it at its said projection past the edge then under the top sheet to be separated, and means for clamping the under sheets down, substantially as and for the purpose set forth.

4. In a sheet-separator for sheet-feeding devices, the combination of a buckler having sheet-engagers and operating means for causing the sheet-engagers to approach and recede with relation to each other, presser devices, across which the sheet-engagers move, having adjacent upturned guide portions, and a separator between and coöperating with

the sheet-engagers, having a separating projection, moving means operating to move the separator at its said projection past the edge then under the top sheet to be separated and means for clamping the under sheets down, substantially as and for the purpose set forth.

5. In a sheet-separator for sheet-feeding devices, the combination of a buckler, and a separator coöperating with said buckler comprising a nearly-counterbalanced bar to rest lightly at its free end portion upon the buckled sheet to be raised thereby and there having an upper prong and a shorter lower prong, and reciprocating and clamping means operating to move the separator at its lower prong past the edge of the buckled top sheet whereby it drops to cause the upper prong to rest upon said sheet, and then move the lower prong under the sheet to be separated and clamp the under sheets down, substantially as and for the purpose set forth.

6. In a sheet-separator for sheet-feeding devices, the combination of a buckler having sheet-engaging surface portions, means for raising and lowering the buckler at said sheet-engaging portions and for moving them to approach and recede with relation to each other, a presser device for guiding the sheet as it is buckled, means for raising and lowering said presser device, and a separator cooperating with the buckler and presser device resting lightly upon the sheet to be separated and having a separating projection, and reciprocating and clamping means operating to move the separator at its said projection past the edge then under the sheet to be separated and clamp the under sheets down, substantially as and for the purpose set forth.

7. In a sheet-separator for sheet-feeding devices, the combination of a buckler having sheet-engaging arms and means for causing said arms to move toward and away from each other, presser mechanism at each of said arms having upturned sheet-guiding edge portions, raising and lowering mechanisms for the said buckling-arms and presser mechanism, a sheet-separator resting at one end portion lightly upon the sheet to be separated between the presser mechanisms and there provided with an upper prong k^8 and a lower shorter prong k^7 separated by an opening k^9, means for reciprocating the separator to move it at its lower prong past the edge then under the sheet to be separated, and clamping mechanism for the separator, all arranged to operate substantially as and for the purpose set forth.

8. In a sheet-separator for sheet-feeding devices, the combination of a buckler, and a separator coöperating with said buckler comprising a nearly-counterbalanced bar to rest lightly at its free end portion upon the buckled sheet to be raised thereby and there having an upper yielding prong and a shorter lower prong, and reciprocating and clamping means operating to move the separator at its lower prong past the edge of the buckled top sheet whereby it drops to cause the upper yielding prong to rest upon said sheet, and then move the lower prong under the sheet to be separated and clamp the under sheets down, substantially as and for the purpose set forth.

EMIL LARSON.

In presence of—
M. J. FROST,
R. T. SPENCER.