No. 823,935. PATENTED JUNE 19, 1906.

A. B. DICK.

SHEET SEPARATING APPARATUS.

APPLICATION FILED MAY 10, 1904.

3 SHEETS—SHEET 1.

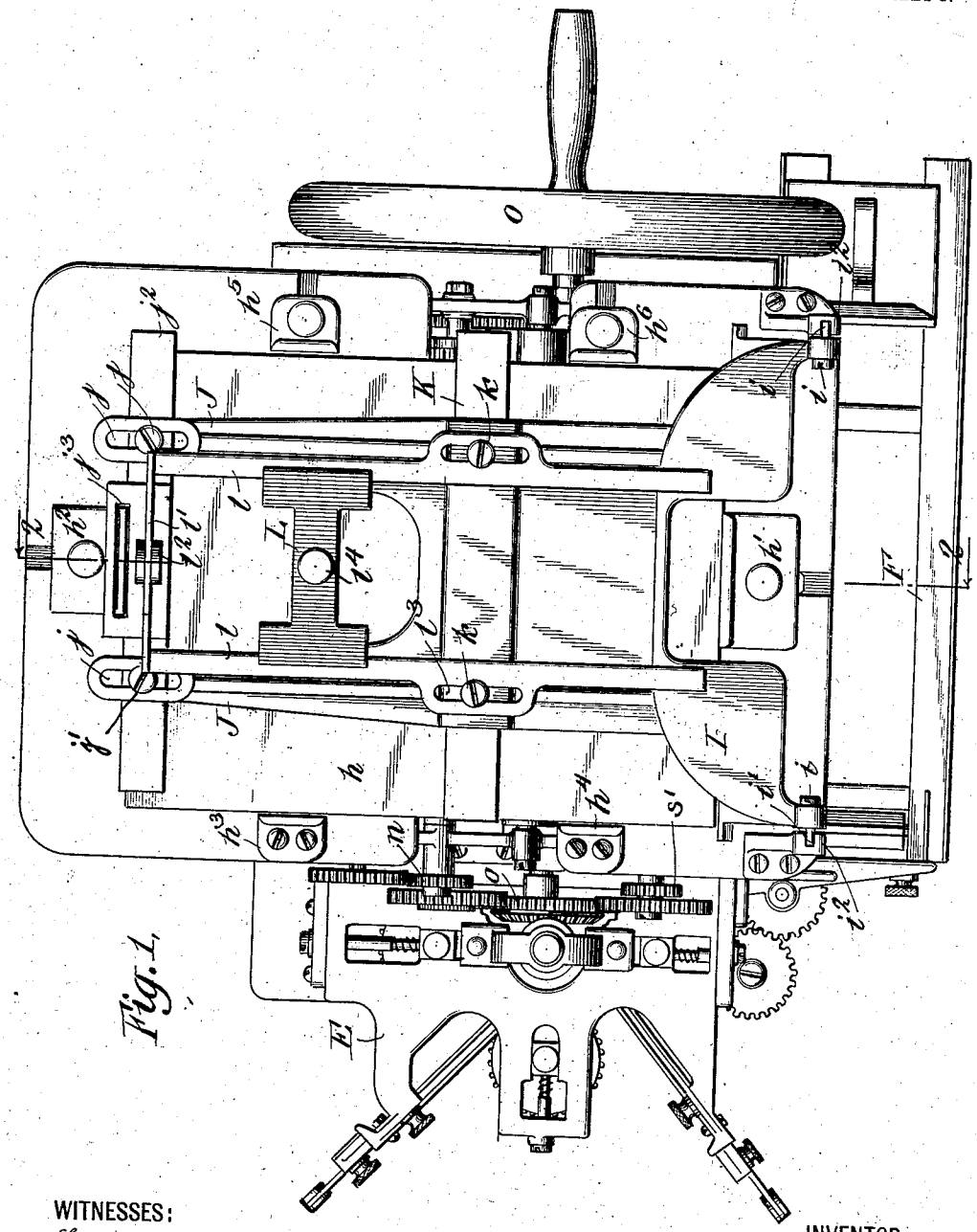

Fig. 1.

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3 SHEETS—SHEET 2.

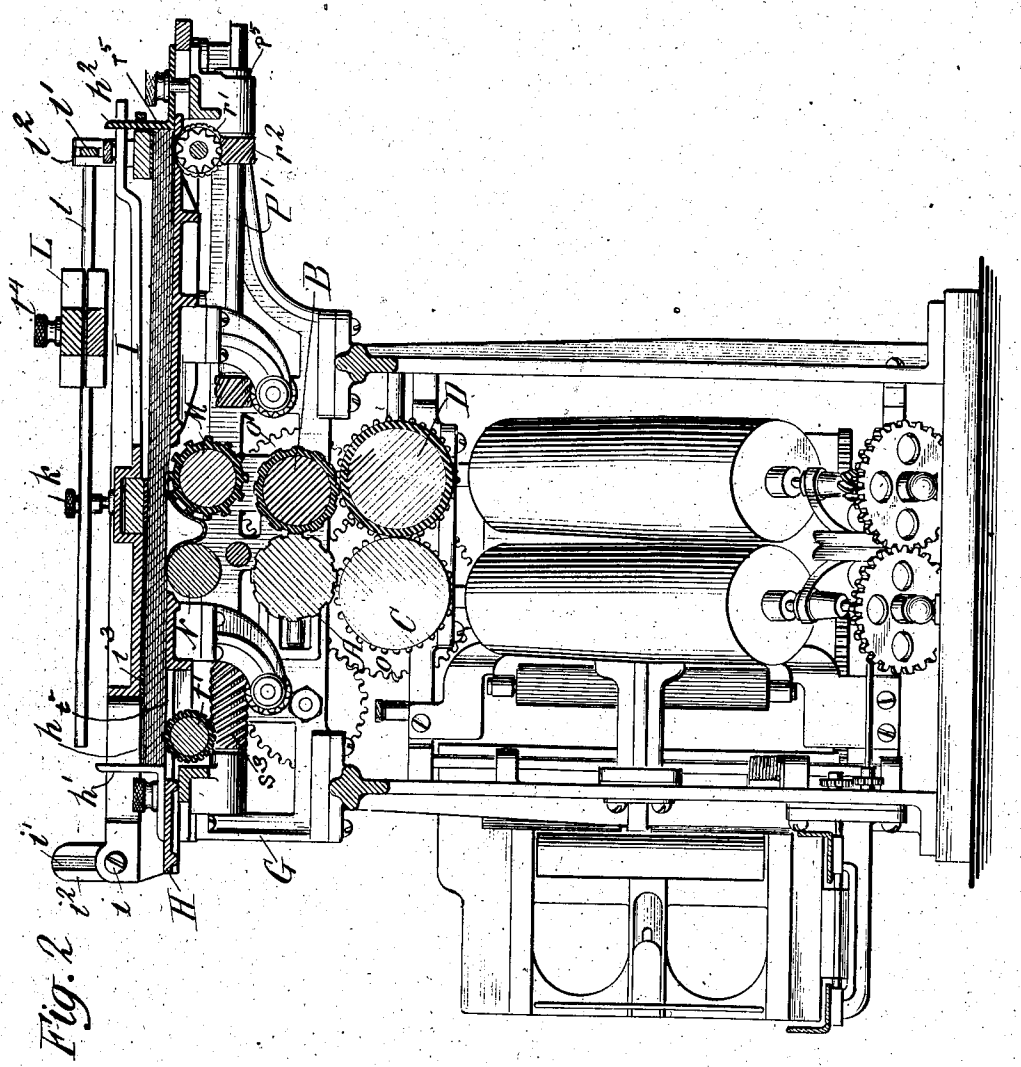

Fig. 2

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3 SHEETS—SHEET 3.

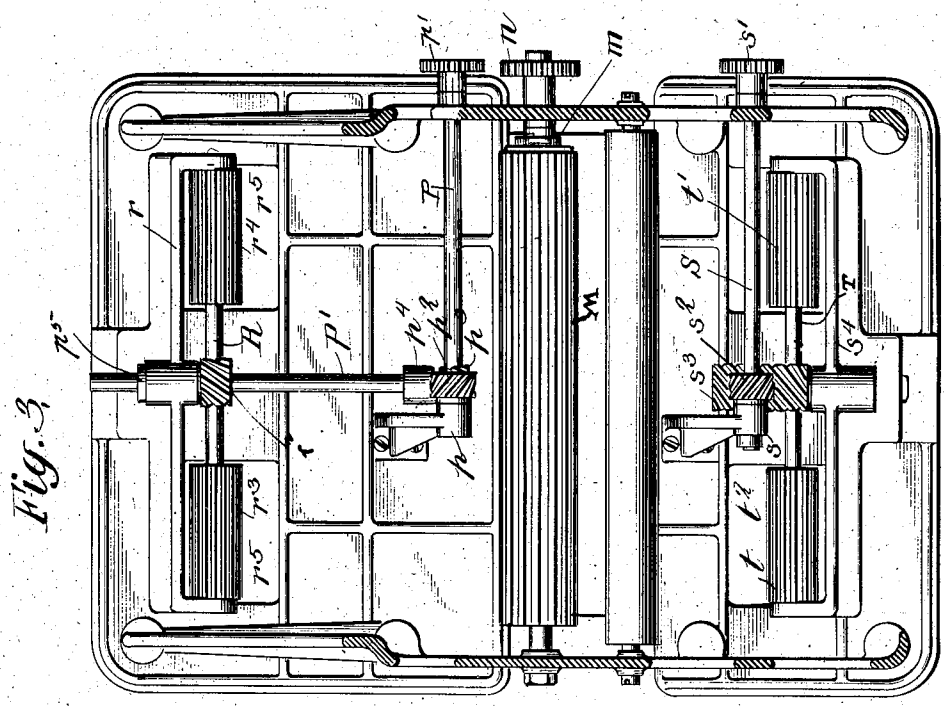

Fig. 3.

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ALBERT B. DICK, OF CHICAGO, ILLINOIS, ASSIGNOR TO A. B. DICK COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SHEET-SEPARATING APPARATUS.

No. 823,935. Specification of Letters Patent. Patented June 19, 1906.

Application filed May 10, 1904. Serial No. 207,285.

To all whom it may concern:

Be it known that I, ALBERT B. DICK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Sheet-Separating Apparatus, of which the following is a specification.

The object of the present invention is to provide an efficient apparatus for separating successive sheets from a pile and feeding or delivering the same to any desired form of mechanism, such as a folding-machine, a printing-press, &c.

In a preferred form of the invention the sheets are separated or fed or both separated and fed from the under side of a pile which may be supported upon a suitable bed in juxtaposition to the separating devices. Also in such a preferred form—as, for instance, that form in which the apparatus is peculiarly adapted for use in conjunction with a folding-machine—the sheet may be buckled at a point intermediate of its ends and thus fed to the connected apparatus after being separated by the mechanism herein described from the pile.

Broadly, the invention comprehends the use of a bed or other support for the sheet pile, a rotating separator-roll adapted to coact successively with the lowermost sheets of the pile, and a retarding roll or rolls, also coacting successively with the lowermost sheets of the pile and opposing any tendency there may be toward the separation of more than one sheet at a time by the separator-roll.

The invention further includes, however, various devices and combinations of devices in addition to the broad subject-matter herein stated, which will be described in detail, and pointed out in the claims.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a top plan view illustrating the invention. Fig. 2 is a vertical section on the line 2 2, Fig. 1; and Fig. 3 is an inverted plan view of the sheet-pile-supporting bed and a portion of the mechanism coacting therewith.

In the drawings, as will be seen, I have for the purpose of a complete disclosure of an approved form in which the invention may be embodied, illustrated the improved sheet-separating apparatus in conjunction with a folding-machine; but since the latter does not form part of the invention designed to be covered by the present application the same will not be described in detail beyond reference to the fact that the same is here shown as including feed-rolls A B, pressing and passing rolls C D, vertical folding-rolls and guideways carried by the brackets E, and a delivery stack or way F, into which the sheets are fed after being folded.

Referring now more in detail to the sheet-separating apparatus, this is here shown as mounted upon a frame G, which may be conveniently located over the folding or printing mechanism to which it is designed that the sheets shall be fed. H designates the bed upon which the sheet pile h may be laid. Adjustably secured upon this bed are end guides h' h^2 and side guides h^3 h^4 h^5 h^6. All of said side guides may, if desired, be adjustable, as are the end guides h' h^2, or but two of said side guides (as, for instance, the guides h^5 h^6) may be adjustable. The function of these guides is to determine the proper position of the sheet pile. I designates a presser-plate, here shown in the form of a casting of some weight, hinged by means of the screws i in vertical grooves i', formed in the internal faces of ears i^2, secured to and projecting upwardly from the bed H. Said presser-plate is provided with bifurcate extensions J J', having slots j formed in the ends thereof, through which slots project screws j', carrying presser-bar j^2, said bar being therefore adjustable longitudinally of the machine. A slot j^3 is formed in said presser-bar j^2 to receive the upwardly-extending end guide h^2. The presser-plate I is also provided intermediate its ends (at a point where in the particular embodiment of the invention which is here described the sheets are buckled preliminary to the folding operation) with a second presser-bar K, and, if desired, the under faces of both the presser-bars j^2 and K may be surfaced with rubber. Said bar K is loosely mounted in a recess (see Fig. 2) in the under side of the presser-plate I, being held in position by screws k. l l designate guideways supported and guided by cross-bar l' and ear l^2, carried by the presser-bar j^2 and the screws k k, said ways being provided with slots l^3, through which such screws extend. Operating upon said ways l l is an adjustable weight L, here shown as made

in two parts, united and clamped to said ways by means of a screw l^4. By means of this adjustable weight the pressure upon the sheet pile may be regulated at will. If desired, the under surface of the presser-plate I, near its hinged end and where it comes in contact with the sheet pile, may be surfaced, as at i^3, with rubber. The bed H, intermediate of its ends and in the present instance nearer to the forward end than to the rearward end, is provided with an opening in which are located a separator-roll M and an idler-roll N, both mounted in the frame G, and said separator-roll receiving power from any suitable source—as, for instance, by means of a connection through the pinion n with a source of power utilized in the mechanism in conjunction with which the separating apparatus is employed. For example, in the present instance, power is transmitted by the hand-wheel O to the shaft of the pressing and passing roll C, said shaft being proovided with a pinion o, meshing with a pinion o', driving the feed-roll B, the shaft of said pinion o' driving an idler-pinion, (not shown,) with which meshes said pinion n on the shaft of the separator-roll M. Said separator-roll M is preferably provided with a jacket or cover of rubber or other suitable material fluted longitudinally to assure reliable contact with the sheet pile. The peripheries of the separator-roll M and idler-roll N are about level with the surface of the bed H, and said separator-roll is preferably so positioned as to lie almost directly under (but slightly rearward of) the presser-bar K. Said separator-roll is preferably provided with a clutch m, permitting said roll to rotate only in one (operative) direction. P designates a shaft the inner end whereof is journaled in an ear p depending from the under side of the bed H, its outer end being journaled in the frame G and provided outside such frame with a pinion p' driven in any suitable manner coincidently with the pinion of the separator-roll. A convenient means of accomplishing this is to permit the pinion p' to mesh with the idler-pinion, (not shown,) through which power is transmitted to the pinion n of said separator-roll. Carried by said shaft P is a worm p^2, which meshes with a worm p^3, carried by a shaft P′, the latter being supported in a bearing-lug p^4, adjacent to the ear p, and a similar bearing-lug p^5, both said lugs depending from the under side of the bed H. R designates a cross-shaft supported at its ends in the bracket r, depending from the under side of the bed H and provided with a worm r', meshing with the worm r^2, carried by said shaft P′. Upon said shaft R is mounted a retarding-roll which coacts with the under side of the sheet pile, the movement of said roll being such as to exert a tendency to draw the lowermost sheet of such pile away from the separator-roll M. Such roll may be continuous from end to end or sectional, as desired. In the present instance I have shown the latter form, the roll comprising sections r^3 r^4, having fluted peripheries (preferably of rubber) and operating through openings r^5 in the bed H. The retarding mechanism just described at the rearward end of the separating apparatus is substantially reproduced at the forward end thereof, save that the retarding-roll (or rolls) at such forward end operates in a direction directly opposed to that of the retarding-roll at the rearward end. S designates a shaft underlying the forward end of the bed H, supported at its inner end by the ear s, depending from the under side of said bed and at its outer end by a bearing in the frame G. Such outer end of the shaft may also be provided with pinion s', to which power may be transmitted coincidently with that transmitted to the pinion n of the separator-roll M by suitable intermediate pinions, which for clearness are omitted from the drawings. Said shaft S carries a worm s^2, which meshes with a worm s^3, carried by a stub-shaft mounted in a bearing formed in the bracket s^4, secured to the under side of the bed H. T designates a cross-shaft similar to the cross-shaft R, the same being provided with a worm whereby rotary movement is transmitted to said cross-shaft from the worms s^3 and s^2 and the shaft S. Like the cross-shaft R, the cross-shaft T is here shown as provided with sectional rolls t t', the fluted rubber-covered peripheries whereof operate through openings t^2 in the bed H. It will thus be seen that by means of suitable gear connections with a common source of power—as, for instance, the main pinion o—the separator-roll M and the retarding-rolls on either side thereof are simultaneously operated, the direction of rotation of the said roll M being toward the idler-roll N, that of the roll or rolls upon the cross-shaft T being in the same direction, and that of the roll or rolls upon the cross-shaft R being in the opposite direction. Said retarding-rolls, therefore, exert at all times a tendency to maintain the lowermost sheet of the pile in a truly horizontal plane, resisting such tendency as there may be upon the separation of the lowermost sheet to take with it in its separation from the under side of the pile the sheet lying next above the same.

The operation of the separator-roll M overcoming the pressure exerted by the retarding roll or rolls upon the shaft R draws the lowermost sheet from the pile and buckling the same between it and the idler-roll N passes the same downwardly until it is gripped by such other mechanism as may be employed below said separator-roll—as, for instance, the feed-rolls A B. When the buckled portion of the lowermost sheet has been passed downwardly sufficiently far to be so gripped, the sheet is drawn entirely free from the pile

and passed to the mechanism, by means whereof it is to be further acted upon, the retarding-rolls during this operation maintaining the remaining sheets of the pile in a truly horizontal plane and resisting the tendency toward multiple separation above referred to until said lowermost sheet has been separated, whereupon the roll M immediately coacts with the next lowermost sheet, operating upon the same in the manner just described.

The separating operation is practically continuous and capable of high speed. Additionally great reliability in the separating operation is assured, not only through the action of the retarding mechanism described, but also through the presser-plate and the means for varying the point at which pressure is brought to bear upon the pile, thus providing for widely-differing sorts and sizes of paper or other material.

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

1. In sheet-separating apparatus, the combination with a bed adapted to receive and support a pile of sheets in a substantially horizontal plane, of an opening in said bed, a sheet-separating device located in operative relation to said opening and coacting with the under side of said pile to buckle a sheet and feed the same downwardly therefrom, the buckled portion in advance, and a retarding roll or rolls on one side of said device, substantially as set forth.

2. In sheet-separating apparatus, the combination with a bed adapted to receive and support a pile of sheets in substantially the same plane, of an opening in said bed nearer to one end thereof than to the other, a sheet-separating device located in operative relation to said opening and coacting with the under side of said pile to buckle a sheet and feed the same downwardly therefrom, the buckled portion in advance, and a retarding roll or rolls on one side of said sheet-separating device, substantially as set forth.

3. In sheet-separating apparatus, the combination with a bed adapted to receive a pile of sheets, of an opening in said bed, a sheet-separating device located in operative relation to said opening, and a retarding roll or rolls on one side of said device and operating in openings in said bed, substantially as set forth.

4. In sheet-separating apparatus, the combination with a bed adapted to receive a pile of sheets, of an opening in said bed, a rotary sheet-separating device located in operative relation to said opening, and a retarding roll or rolls on one side of said device and operating in openings in said bed, substantially as set forth.

5. In sheet-separating apparatus, the combination with a bed adapted to receive a pile of sheets and provided with an opening nearer to one end of said bed than to the other, of a sheet-separating device located in operative relation to said opening, and a rotary retarding roll or rolls on one side of said device and operating in openings in said bed, substantially as set forth.

6. In sheet-separating apparatus, the combination with a bed adapted to receive a pile of sheets and provided with an opening, of a sheet-separating device located in operative relation to said opening, and a retarding roll or rolls on both sides of said device, substantially as set forth.

7. In sheet-separating apparatus, the combination with a bed adapted to receive a pile of sheets and provided with an opening, of a rotary sheet-separating device located in operative relation to said opening, and a retarding roll or rolls on both sides of said device, substantially as set forth.

8. In sheet-separating apparatus, the combination with a bed adapted to receive a pile of sheets and provided with an opening, of a sheet-separating device located in operative relation to said opening, and a retarding roll or rolls on both sides of said device and operating in openings in said bed, substantially as set forth.

9. In sheet-separating apparatus, the combination with a bed adapted to receive a pile of sheets and provided with an opening, of a rotary sheet-separating device located in operative relation to said opening, and a retarding roll or rolls on both sides of said device and operating in openings in said bed, substantially as set forth.

10. In sheet-separating apparatus, the combination with a bed adapted to receive a sheet pile, of a separating device, and a hinged presser-plate coacting with said sheet-pile, the hinge thereof being vertically adjustable, substantially as set forth.

11. In sheet-separating apparatus, the combination with a bed adapted to receive a sheet pile and to support the same immovably as a whole, of a sheet-separating device operating in a fixed position relatively to said bed, a presser-plate, and an adjustable weight carried by said presser-plate and having a clamping device, said presser-plate and weight coacting with the upper surface of said sheet pile, substantially as set forth.

12. In sheet-separating apparatus, the combination with a bed adapted to support a sheet pile in a substantially horizontal plane, a sheet-separating device adapted to buckle and pass a sheet downwardly from said pile, the buckled portion in advance, and sheet-retarding mechanism operating in substantially the same plane as said device, of means for applying pressure upon said sheet pile, substantially as set forth.

13. In sheet-separating apparatus, the combination with a bed adapted to support a sheet pile in a substantially horizontal plane,

a sheet-separating device adapted to buckle and pass a sheet downwardly from said pile, and sheet-retarding mechanism operating in substantially the same plane as said device, of means for applying variable pressure upon said sheet pile, substantially as set forth.

14. In sheet-separating apparatus, the combination of a bed adapted to support a sheet pile, a sheet-separating device underlying a pile on said support and adapted to successively buckle the sheets of said pile and pass them therefrom, and sheet-retarding mechanism also underlying said pile and coacting by frictional contact first with the lowermost sheet of said pile as the same is acted upon by said sheet-separating device and then with the next adjacent sheet while the movement of the sheet first named is being completed by said device, substantially as set forth.

15. In sheet-separating apparatus, the combination with a bed, of a sheet-separating device, retarding-rolls on either side thereof and means for operating the same in a direction away from said separating device, and means for exerting downward pressure upon a sheet pile placed on said bed, substantially as set forth.

16. In sheet-separating apparatus, the combination with a bed, of a sheet-separating device, retarding-rolls on either side thereof and means for operating the same in a direction away from said separating device, a pressure device mounted above said bed and adapted to coact with the sheet pile thereon, and means for varying the degree of pressure of said device, substantially as set forth.

17. In sheet-separating apparatus, the combination with a stationary bed, of guides thereon for centering a sheet pile placed on said bed, and a separating device operating in a substantially fixed position and constantly in the same direction and located nearer to one end of said bed than to the other, said separating device coacting with the under side of said sheet pile to buckle and separate a sheet therefrom and to feed such sheet, the buckled portion thereof in advance, substantially as set forth.

18. In sheet-separating apparatus, the combination with a stationary bed, of guides thereon, and a separator-roll operating in a substantially fixed position and in one direction only through an opening in said bed and coacting with the under side of a sheet pile upon said bed to buckle and separate a sheet therefrom and to feed the same, the buckled portion in advance, substantially as set forth.

19. In sheet-separating apparatus, the combination with a bed provided with guides and having an opening, of a separator-roll and an idler-roll operating through said opening and coacting with a sheet pile arranged on said bed to buckle and separate a sheet therefrom and to feed the same, the buckled portion in advance, substantially as set forth.

20. In sheet-separating apparatus, the combination with a bed adapted to support a sheet pile in a plane parallel with said bed, of a rotary sheet-separating device operating in one direction only and in a substantially fixed position to buckle the lowermost sheets of said pile successively, and means subjacent to said device for coaction with the buckled portion of sheets passed to said means by said device, substantially as set forth.

21. In sheet-separating apparatus, the combination with a bed adapted to support a sheet pile and provided with an opening, of a separator-roll in operative relation to said opening, and movable sheet-retarding mechanism coacting with the under side of said pile and operating in unison with said separator-roll, substantially as set forth.

22. In sheet-separating apparatus, the combination with a bed adapted to support a sheet pile, of a separator-roll coacting with the under side of said sheet pile, and movable sheet-retarding mechanism operating in unison with said separator-roll, said mechanism and said roll underlying said pile and coacting with the under side thereof through openings in said bed, substantially as set forth.

This specification signed and witnessed this 3d day of May, 1904.

ALBERT B. DICK.

Witnesses:
S. O. EDMONDS,
W. G. ARNOLD.