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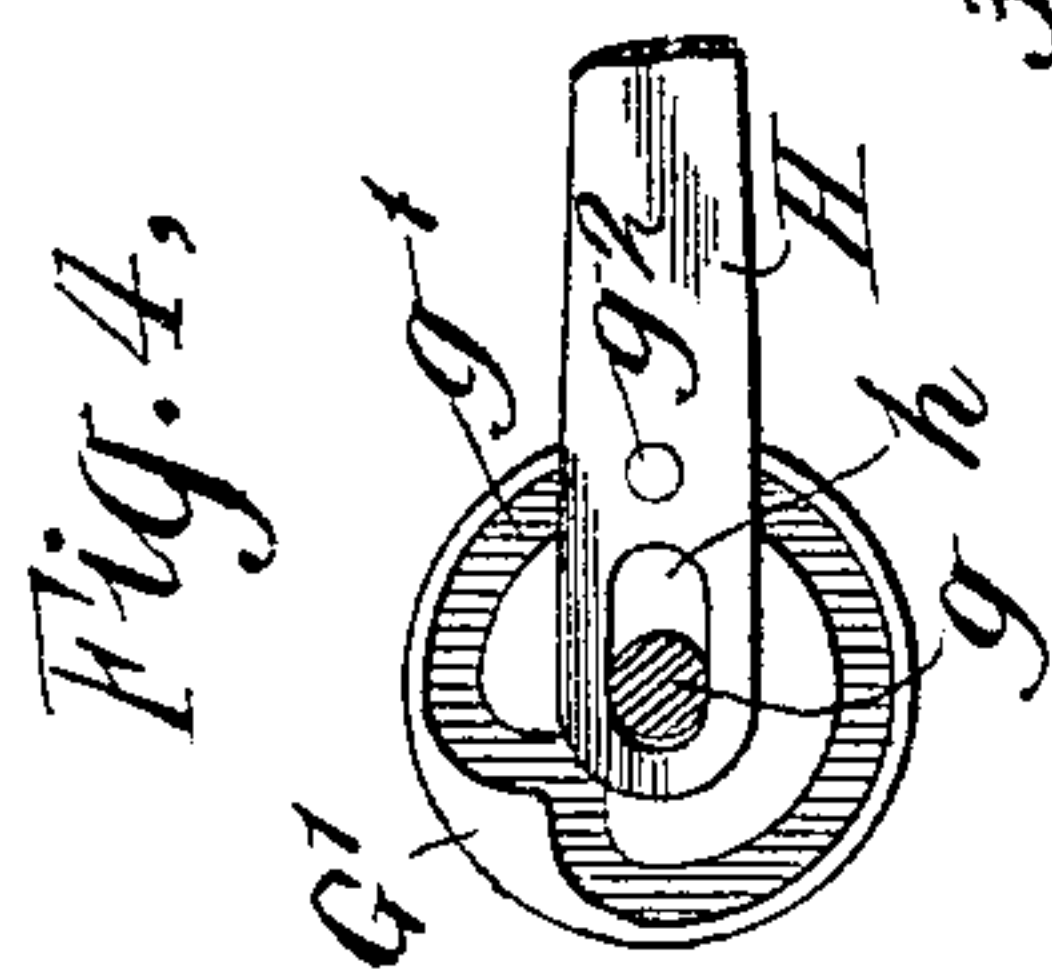
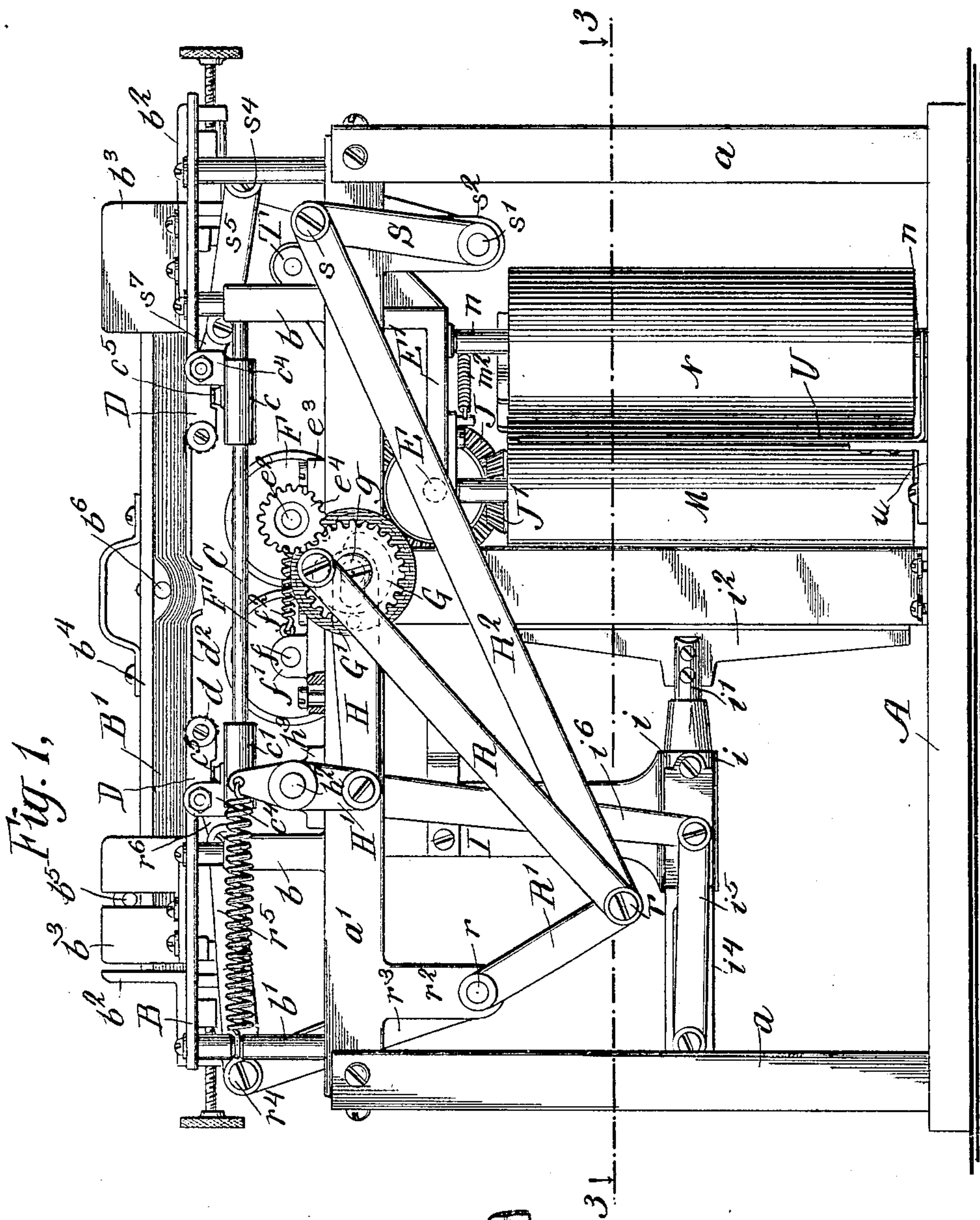
PATENTED JULY 25, 1905.

W. LANG & W. ZANDER.

FOLDING MACHINE.

APPLICATION FILED NOV. 20, 1903.

3 SHEETS—SHEET 1.



WITNESSES:
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J. M. Intosh

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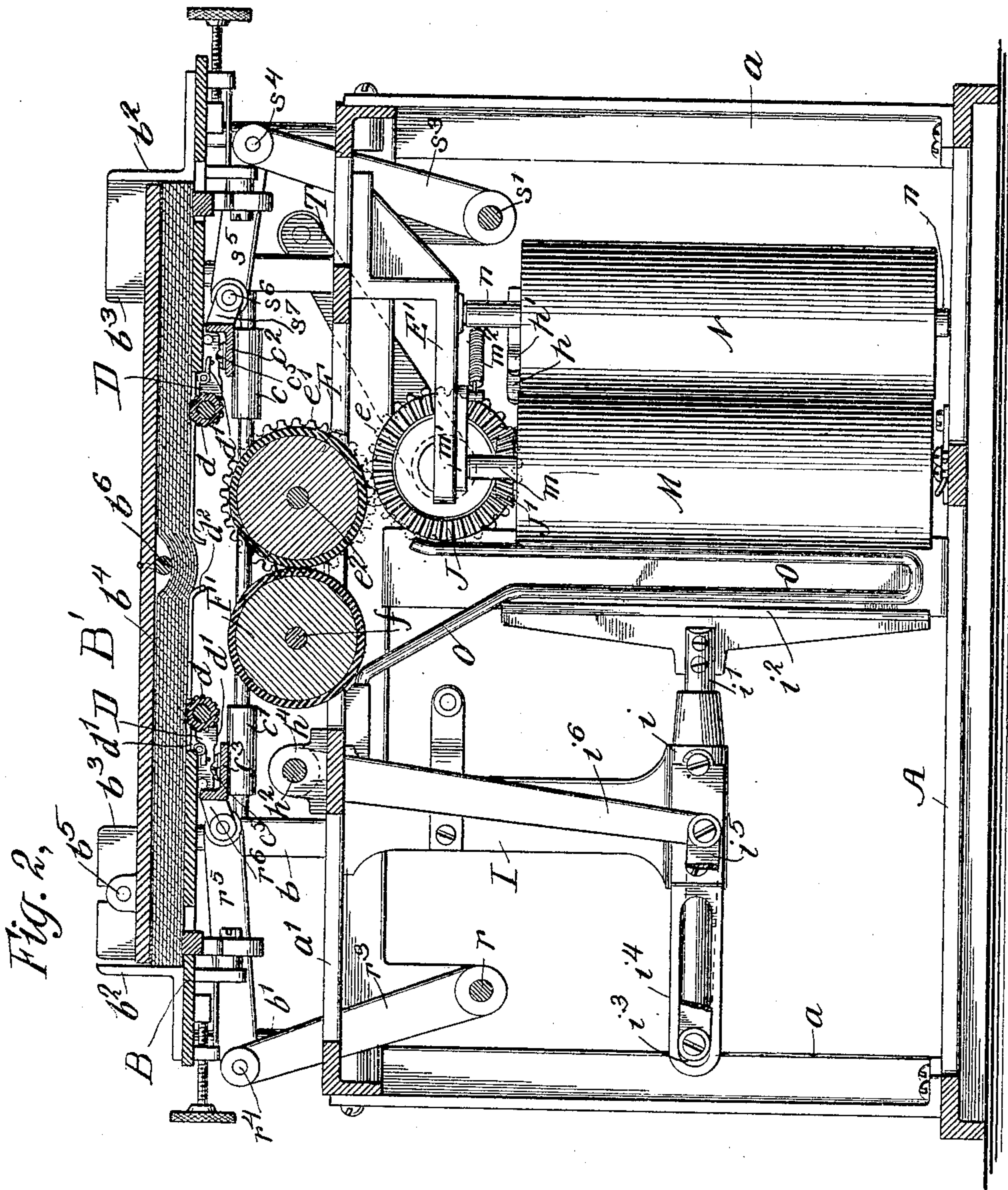
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3 SHEETS—SHEET 2.



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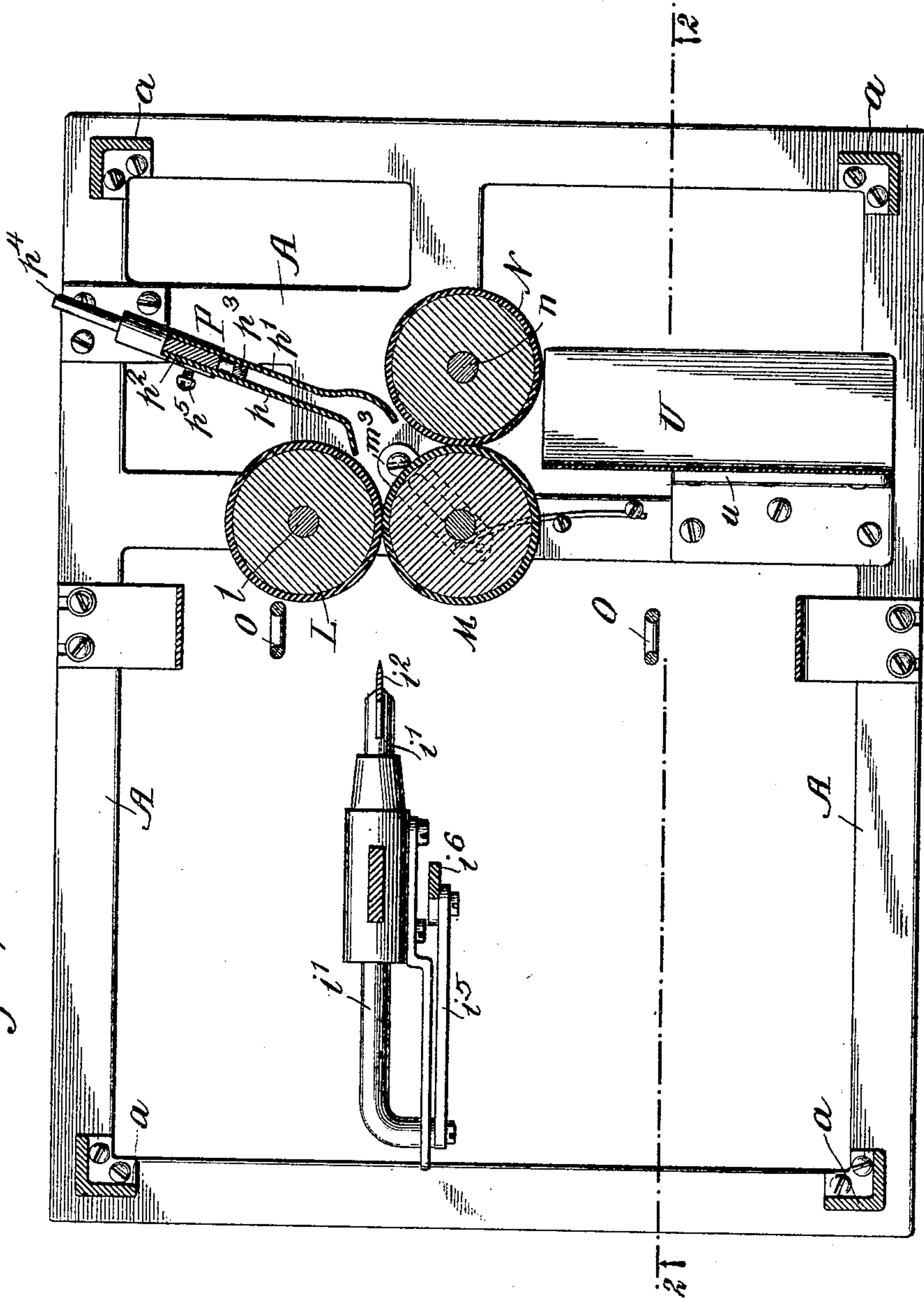
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3 SHEETS—SHEET 3.

Fig. 3,



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UNITED STATES PATENT OFFICE.

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OF ILLINOIS.

FOLDING-MACHINE.

No. 795,519.

Specification of Letters Patent.

Patented July 25, 1905.

Application filed November 20, 1903. Serial No. 181,915.

To all whom it may concern:

Be it known that we, WILLIAM LANG and WILLIAM ZANDER, citizens of the United States, and residents of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Folding-Machines, of which the following is a specification.

The object of the present invention is to provide mechanism for rapidly separating sheets successively from a pile and folding the same for insertion in envelopes. In a preferred form of the invention the operating parts of the device are located below a paper pile and means are employed for successively separating from such pile the lowermost sheet, which is thereupon passed between rolls serving to press one fold in such sheet and pass the same to a position below such rolls, where by means of a suitable device the once-folded sheet is passed to other rolls, by means whereof the sheets is folded one or more times in a line or lines at an angle to the fold first made.

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

Figure 1 is a side elevation; Fig. 2, a vertical section on the line 2 2, Fig. 3; Fig. 3, a horizontal section on the line 3 3, Fig. 1; and Fig. 4, a detail view illustrating a preferred device for actuating a folding-plunger, where such a device is employed, for passing the once-folded sheets to the rolls by which they are again folded.

Referring to the drawings, it will be seen that the mechanism is mounted in a suitable framework, here shown as comprising the base A, having four uprights *a* and the top member *a'*. Above this is a supplementary frame, comprising the bed B, upon which the paper pile B' is placed, said bed being supported by upwardly-extending arms *b* and posts *b'*, there being two of such arms and two of such posts on each side of the machine. The upper surface of the bed is provided with adjustable guides *b*², coacting with the ends of the paper pile, and similar guides *b*³, coacting with the sides of such pile.

*b*⁴ designates a presser-plate, here shown as provided with lugs *b*⁵, which coact with vertical slots formed in the guides *b*³ or certain of them. The under side of the plate *b*⁴, about midway of its ends, is provided with a trans-

verse projection *b*⁶, bearing upon the paper pile and tending to depress that portion of the pile for the purpose hereinafter described.

C designates a rod on each side of the machine, the ends whereof are carried by the arms *b*. On this rod are mounted sleeves *c c'*, the sleeves *c* on either side of the machine being connected by a cross-bar *c*² and the sleeves *c'* on either side of the machine being connected by a cross-bar *c*³. Journaled in ears *c*⁴, formed upon each of the sleeves *c c c' c'*, are reciprocating sheet-separators D, comprising pivotally-mounted arms, in whose adjacent ends are pivoted separating-rolls *d*, the peripheries whereof are preferably corrugated or fluted. At one end each of said rolls is provided with a ratchet and a coacting pawl *d'*, by means whereof said separating-rolls are permitted to revolve when said rolls are moving from each other, but held against revolving when said rolls are moved toward each other, as hereinafter described. Carried by the cross-bars *c*^{2 c} are leaf-springs *c*⁵, exerting upward pressure against the arms which carry the separating-rolls *d*.

*d*² designates guide-fingers carried by the bed B and extending toward the center of the machine, their free ends being downturned, as shown in Figs. 1 and 2. The peripheries of the rolls *d* are recessed directly under these guide-fingers in order that the upper surface of the latter may be in substantially the same plane as the peripheries of said rolls. The sheet-separating devices are oscillated toward and from each other upon the rods C by means of connections with a source of power hereinafter described.

E designates the main shaft of the machine, to which power may be applied either by hand or motor. This shaft is journaled in an ear depending from the top member *a'* of the frame, its inner end being received in a bearing carried by an arm E', secured to the under side of said top member *a'* and within the framework of the machine. Outside the frame (in the present case) said shaft is provided with a pinion *e*, which meshes with a similar pinion *e'*, carried by a shaft *e*², journaled in ears *e*³, secured upon the top member *a'* of the frame. Carried by said shaft *e*² is a roll F, having, preferably, a rubbered periphery. Said roll coacts with a similar roll

F', also having a rubbered periphery and carried by a shaft f , journaled in ears f' , carried by the top member a' of the frame, said ears being adjustable relatively to the ears e^3 , as clearly shown in Fig. 1. Preferably said ears are connected by suitable means—as, for instance, coil-springs f^2 , exerting a tendency to draw said rolls together. As clearly shown in Figs. 1 and 2, the meeting-point of the rolls F F' directly underlies the opening between the guide-fingers d^2 , so that the sheets separated by the separating device above described from the under side of the pile may readily be fed downward until grasped by said rolls and passed between the same.

The rear end of the shaft e^2 is provided with a pinion e^4 , meshing with a pinion G, mounted on a stub-shaft g , carried by the top member a' of the frame. Also mounted upon the stub-shaft g and secured to the pinion G is a box-cam G', (the inner surface whereof is clearly illustrated in Fig. 4.) This is provided with the eccentric groove g' , with which coacts a pin g^2 , carried by the arm H, whose end is provided with a slot h to receive the stub-shaft g . The other end of said arm H is pivoted to a lever H', secured between its ends upon a shaft h^2 , journaled near said lever in an ear h^3 , carried by the top member a' of the frame, and at its other end at about the center of the machine in another ear h^4 , also carried by said top member. I designates an arm secured to and depending from the under side of the top member a' of the frame, its end terminating in a sleeve i , within which operates a plunger i' , provided at its forward end with a folding-bar i^2 . The rear end of said plunger i' is turned at substantially right angles, passing through a slot i^3 in a guide-arm i^4 , secured to the sleeve i . The end of said plunger is connected, by means of connecting-bars i^5 , with an arm i^6 , whose upper end is secured to the shaft h^2 . It will therefore be seen that as the lever H' is operated by the box-cam G' this movement is transmitted to the plunger and folding-bar $i' i^2$ to rapidly oscillate the same toward and from the system of vertical folding-rolls now to be described.

Mounted upon the main shaft E of the machine is a bevel-gear J, meshing with a gear J' of the same pitch, but preferably of smaller size mounted upon a vertical shaft l , journaled at its lower end in the base A of the frame and at its upper end in the arm E', depending from the top member a' of the frame. Said shaft carries a roll L having a rubbered periphery. Coacting with said roll L and in line with it transversely of the machine is a similar roll M, having rubbered periphery and carried by a shaft m , the lower end whereof is mounted in an arm m^3 , pivoted to the base A of the frame and spring-pressed toward said

roll L, the upper end of said shaft m being mounted in a similar arm m' , carried by the under side of the arm E' and also spring-pressed (by means of coil-spring m^2) toward said roll L.

N designates a roll similar to the rolls L and M and having rubbered periphery, this roll being mounted upon a shaft n , the lower end whereof is mounted in the base A of the frame, the upper end being mounted in the arm E'. As shown most clearly in Fig. 3, the rolls L and M are in line transversely of the machine, while the rolls M and N are in line longitudinally of the machine, the meeting-point of the rolls L and M being directly in line with the plunger and folding-bar $i' i^2$. It will also be seen that the roll M is spring-pressed into engagement with both the roll L and the roll N.

O O designate sheet-guards each supported at its upper end in the under side of the top member a' of the frame, the main operative portion, comprising two parallel members, of each being arranged adjacent to the rolls L and M. As clearly shown in Fig. 2, the opening between the two parallel portions of each sheet-guard directly underlies the meeting-point of the rolls F F'. Preferably the ends of each guard will be inclined, as also shown in said figure, in order to assure proper coaction with the sheets, even should they not pass directly downward from said rolls.

P designates a sheet-guide, here shown as comprising two approximately parallel members $p p'$, secured upon an upright bracket p^2 , carried by the base A of the frame. The member p is turned at an angle at its free end and terminates in proximity to the roll L. The member p' is also preferably curved at its free end and terminates in proximity to the roll M. Within the sheet-guide formed by these two members is an adjustable bar p^3 , operated by means of rod p^4 and set-screw p^5 , whereby the extent of traverse of the folded sheet within said guide may be determined.

Pivoted to the pinion G and operated thereby is an arm R, the distant end of which is pivoted at r to two similar arms R' R². That end of the arm R' distant from the pivotal point r is secured to the rock-shaft r' , carried by ears r^2 , depending from the top member a' of the frame. Keyed or otherwise secured to this rock-shaft r' are two arms r^3 , to whose upper ends are pivoted at r^4 the arms r^5 , whose other ends are pivoted to ears r^6 , forming part of the cross-bar c^3 , connecting the sleeves c' of the sheet-separating mechanism. That end of the arm R² distant from the pivotal point r is pivoted at s to the arm S, keyed or otherwise secured to a shaft s' , carried by ears s^2 , depending from the top member a' of the frame. Also keyed or otherwise secured upon

the rock-shaft s' are two arms s^3 , pivoted at s^4 to the ends of two similar arms s^5 , their other ends being pivoted at s^6 to ears s^7 , forming part of the cross-bar c^2 connecting the sleeves c .

The operation of the device has to some extent been explained in connection with the description of the mechanism. The paper pile is laid upon the bed and the presser-plate placed thereon. Power being applied—as, for instance, by means of the crank T—the moving parts are set in operation, the separator-rolls d of the sheet-separating mechanism being rapidly oscillated toward and from each other. The lowermost sheet of the pile is thereby buckled at a point about midway of its ends and passed downwardly over the fingers d^2 until seized by the rolls F F'. In the present instance instead of having two rolls to feed and two other rolls to press and pass the sheet downwardly we have shown but two rolls to perform both functions. After the sheet passes said rolls F F' it is dropped, once folded, into the sheet-guards O, whereupon the reciprocating plunger $i' i^2$, operating in this instance nearer to one edge of the once-folded sheet than to the other, presses said sheet into engagement with the rolls L M. On passing through these rolls the sheet is given a fold at right angles to the fold first made and fed, the folded edge first, through said rolls L M and into the sheet-guide P. When it reaches the adjustable stop p^3 in said guide, the paper is buckled until seized by the rolls M N, whereupon a third fold, also at right angles to the fold first made, is given to the sheet, the once-folded sheet being thereby folded into three substantially equal sections and fed outwardly between said rolls M and N. Preferably a delivery apparatus will be employed to receive the thrice-folded sheets; but this forming no part of the present invention is not illustrated in detail herein. We have shown merely a delivery-plate U, carried by an angular bracket u , secured to the base A of the frame, and upon which plate the thrice-folded sheets are fed from the rolls M N.

In the foregoing description we have attempted to do no more than to describe a single form in which the invention hereof may be embodied. It will be obvious that many modifications may be made in this form—as, for instance, with respect to the sheet-separating device, the means for passing the sheets from the horizontal rolls to the vertical rolls, the connections between the source of power and the various moving parts, &c.—without departing essentially from the broad subject-matter of the invention as pointed out in the claims.

We claim—

1. In a folding-machine, the combination

with rolls and means for presenting a sheet thereto, of other rolls arranged at an angle to the rolls first named, intermediate sheet-passing mechanism, and a sheet-guide adapted to receive a sheet from and deliver the same to certain of said last-named rolls, substantially as set forth.

2. In a folding-machine, the combination with a sheet-separating device and rolls adapted to receive a sheet therefrom, of other rolls arranged at an angle to the rolls first named, intermediate sheet-passing mechanism, and a sheet-guide adapted to receive a sheet from and deliver the same to certain of the last-named rolls, substantially as set forth.

3. In a folding-machine, the combination with rolls mounted in substantially the same plane, of rolls mounted at an angle thereto in a line substantially parallel with the axes of the rolls first named, another roll coacting with one of said angularly-mounted rolls, and a sheet-guide adapted to receive, buckle and deliver a sheet, substantially as set forth.

4. In a folding-machine, the combination with a bed adapted to receive a sheet-pile, of a separating device in proximity thereto and adapted to coact with the under side of such pile, horizontal rolls below said separating device, sheet-passing mechanism below said horizontal rolls, rolls mounted at an angle to said horizontal rolls, a sheet-guide coacting therewith, and a common source of power for said rolls and said sheet-passing mechanism, substantially as set forth.

5. In a folding-machine, the combination with a bed, of a separating device, horizontal rolls below said separating device and adapted to fold a sheet between its ends, sheet-passing mechanism, and vertical rolls and a coacting paper-guide adapted to receive said sheet from said mechanism and fold the same on two lines at an angle to the fold first made, substantially as set forth.

6. In a folding-machine, the combination with horizontal rolls and means for presenting a sheet thereto to be folded transversely thereby, of a device underlying said rolls for advancing the once-folded sheet, a series of vertical rolls mounted side by side in a row, another roll parallel thereto but mounted at an angle to such row, and a guide coacting with said vertical rolls and having an adjustable stop therein to determine the traverse of a sheet in said guide, substantially as set forth.

7. In a folding-machine, the combination with rolls mounted in substantially the same plane, of rolls mounted at an angle thereto, intermediate sheet-passing mechanism, guides coacting with said rolls to receive, buckle and deliver a sheet, and means for determining the traverse of such sheet in said guides, substantially as set forth.

8. In a folding-machine, the combination

with rolls mounted in substantially the same plane, of rolls mounted at an angle thereto, intermediate sheet-passing mechanism, and guides whose ends terminate in proximity to said last-named rolls, said guides coacting with said rolls to receive, buckle and deliver a sheet fed thereto, substantially as set forth.

9. In a folding-machine, the combination with rolls mounted in substantially the same plane, of rolls mounted at an angle thereto, intermediate sheet-passing mechanism, guides whose ends terminate in proximity to said last-named rolls, and means for determining the traverse of a sheet in said guides and buckling said sheet at a certain point in its movement, substantially as set forth.

10. In a folding-machine, the combination with rolls mounted in substantially the same plane and rolls mounted at an angle thereto, of intermediate sheet-passing mechanism, and a two-part guide for receiving, buckling and delivering a sheet, one of whose parts terminates in proximity to one of the rolls last named, its other part terminating in proximity to another of the rolls last named, substantially as set forth.

11. In a folding-machine, the combination with rolls mounted in substantially the same plane and rolls mounted at an angle thereto, of intermediate sheet-passing mechanism, a two-part guide one of whose parts terminates in proximity to one of the rolls last named, its other part terminating in proximity to another of the rolls last named, and means coacting with said guide for determining the traverse of a sheet therein, buckling and delivering the same, substantially as set forth.

12. In a folding-machine, the combination with rolls, and a bed adapted to receive a pile of sheets, of a sheet-separating device, comprising members adapted to oscillate toward and from each other, and subjacent rolls coacting with the sheet so separated from the pile, substantially as set forth.

13. In a folding-machine, the combination with a bed adapted to receive a pile of sheets, of a separating device, comprising rotary members adapted to oscillate toward and from each other, and subjacent rolls coacting with the sheet so separated from the pile, substantially as set forth.

14. In a folding-machine, the combination with a bed adapted to receive a pile of sheets, of a separating device, comprising members adapted to rotate in one direction only and to oscillate toward and from each other, and subjacent rolls coacting with the sheet so separated from the pile, substantially as set forth.

15. In a folding-machine, the combination with rolls mounted in substantially the same plane, of rolls mounted at an angle thereto, a

sheet-guide for receiving, buckling and delivering sheets acted upon by said angularly-mounted rolls, a sheet-passing device between said parallel rolls and said angularly-mounted rolls, and means for moving the same toward and from said last-named rolls, substantially as set forth.

16. In a folding-machine, the combination with means for supporting a sheet-pile, a separating device and subjacent horizontal rolls, of three vertical rolls, intermediate mechanism for passing a sheet from said horizontal rolls to said vertical rolls, and a sheet-guide coacting with said vertical rolls, substantially as set forth.

17. In a folding-machine, the combination with means for supporting a sheet-pile, a sheet-separating device and subjacent horizontal rolls, of three vertical rolls, intermediate mechanism for passing a sheet from said horizontal rolls to said vertical rolls, and a sheet-guide coacting with said vertical rolls to buckle a sheet fed thereto said sheet-guide having stops to determine the degree of traverse of a sheet therein, substantially as set forth.

18. In a folding-machine, the combination with a bed adapted to receive a pile of sheets, of a separating device, horizontal rolls underlying said bed and separating device, vertical rolls, sheet-passing mechanism intermediate of said horizontal rolls and said vertical rolls, a guide coacting with said vertical rolls to receive, buckle and deliver a sheet and a common source of power, substantially as set forth.

19. In a folding-machine, the combination with rolls and means for presenting a sheet to be folded thereby, of other rolls mounted at an angle to the rolls first named, a sheet-guide adjacent to said last-named rolls for receiving therefrom, buckling and delivering thereto a sheet and mechanism for passing the once-folded sheet to said angularly-mounted rolls for folding at an angle to the fold first made, substantially as set forth.

20. In a folding-machine, the combination with a bed, of a separating device, rolls below said bed and adapted to fold a sheet between its ends, sheet-passing mechanism, and rolls mounted at an angle to those first named and adapted to receive said sheet from said mechanism, pass the same to a sheet-guide and, in conjunction therewith, fold the same transversely and deliver said sheet, substantially as set forth.

21. In a folding-machine, the combination with horizontal rolls and means for presenting a sheet thereto to be folded transversely thereby, of an underlying device for advancing the once-folded sheet, a series of vertical rolls mounted side by side in a row, another vertical roll parallel thereto but mounted at an angle to such row, and a two-part sheet-guide

coacting with said vertical rolls, the ends of both parts being turned at an angle to the main portion thereof to facilitate the receipt, buckling and delivery of a sheet fed from and to said rolls, substantially as set forth.

22. In a folding-machine, the combination with a sheet buckling and feeding device and subjacent rolls mounted in substantially the same plane, of rolls mounted at an angle to the plane of said rolls, another roll mounted parallel with said last-named rolls but also at

an angle to said first-named rolls, and a sheet-guide coacting with said angularly-mounted rolls, substantially as set forth.

This specification signed and witnessed this 14th day of November, 1903.

WILLIAM LANG.
WILLIAM ZANDER.

Witnesses:

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M. H. BURKART.