

No. 795,491.

PATENTED JULY 25, 1905.

A. B. DICK.
FOLDING MACHINE.

APPLICATION FILED NOV. 20, 1903.

6 SHEETS—SHEET 1.

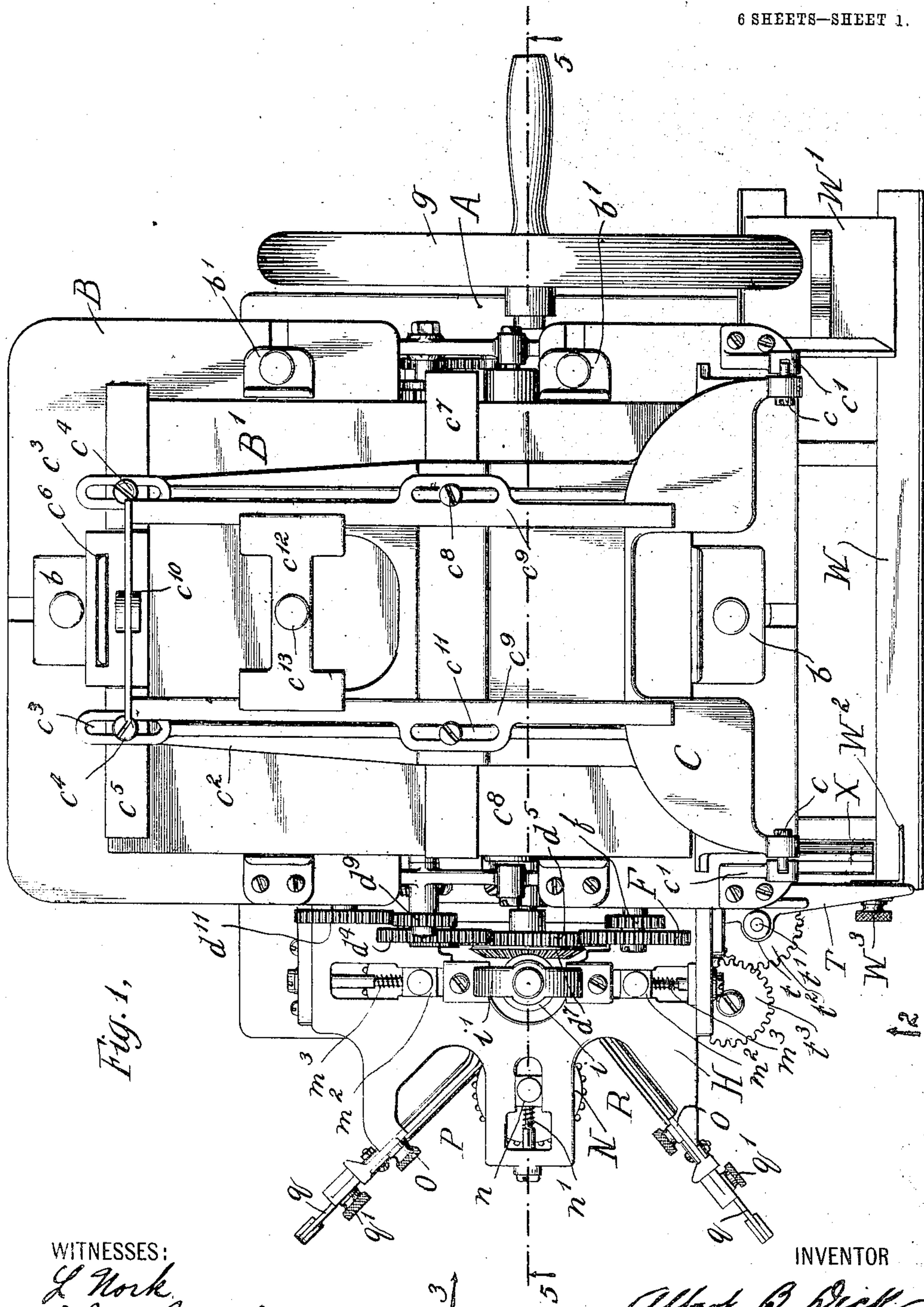


Fig. 1,

WITNESSES:

L. Hork
L. M. Lintoch

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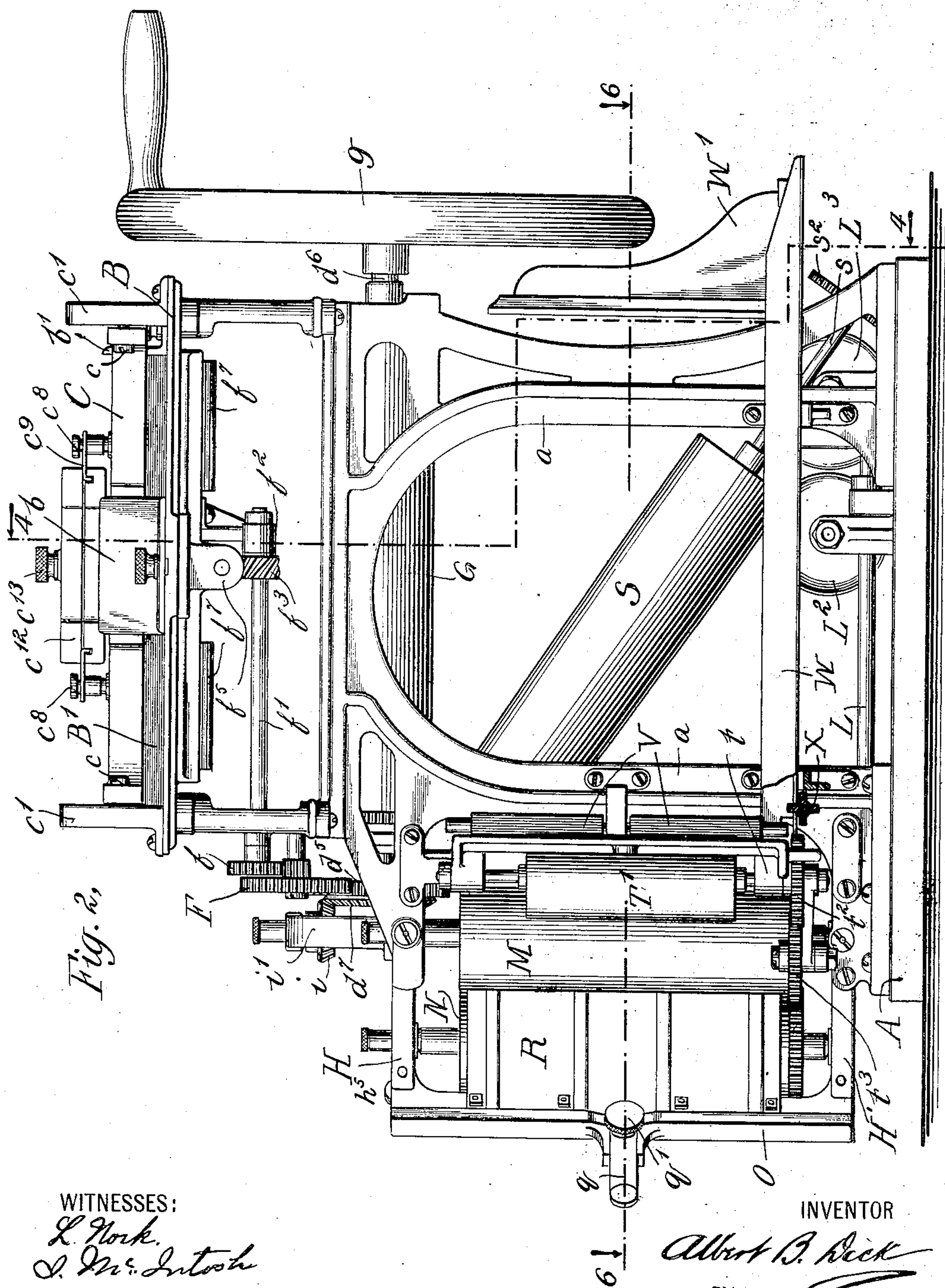


Fig. 2.

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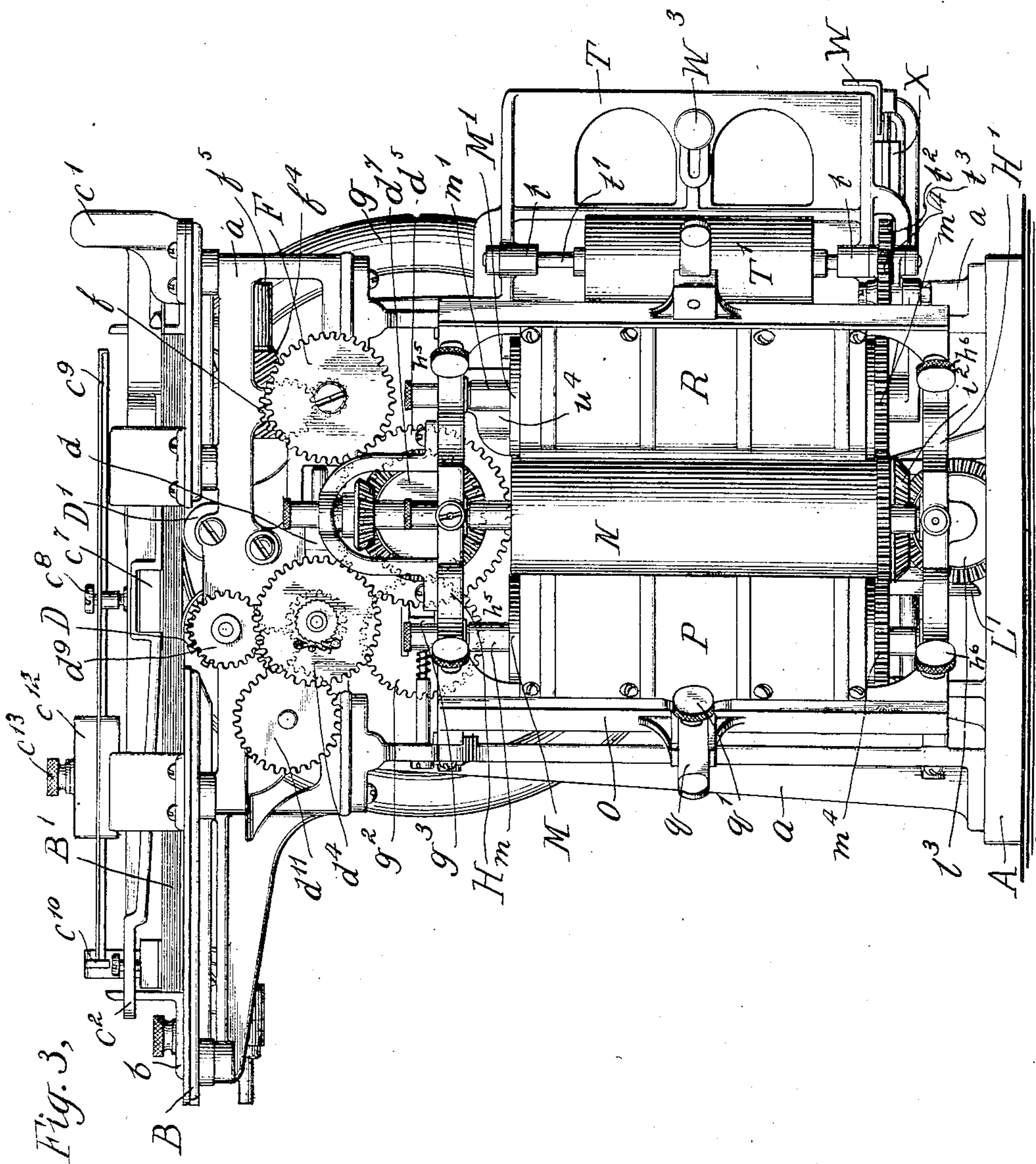
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6 SHEETS—SHEET 4.

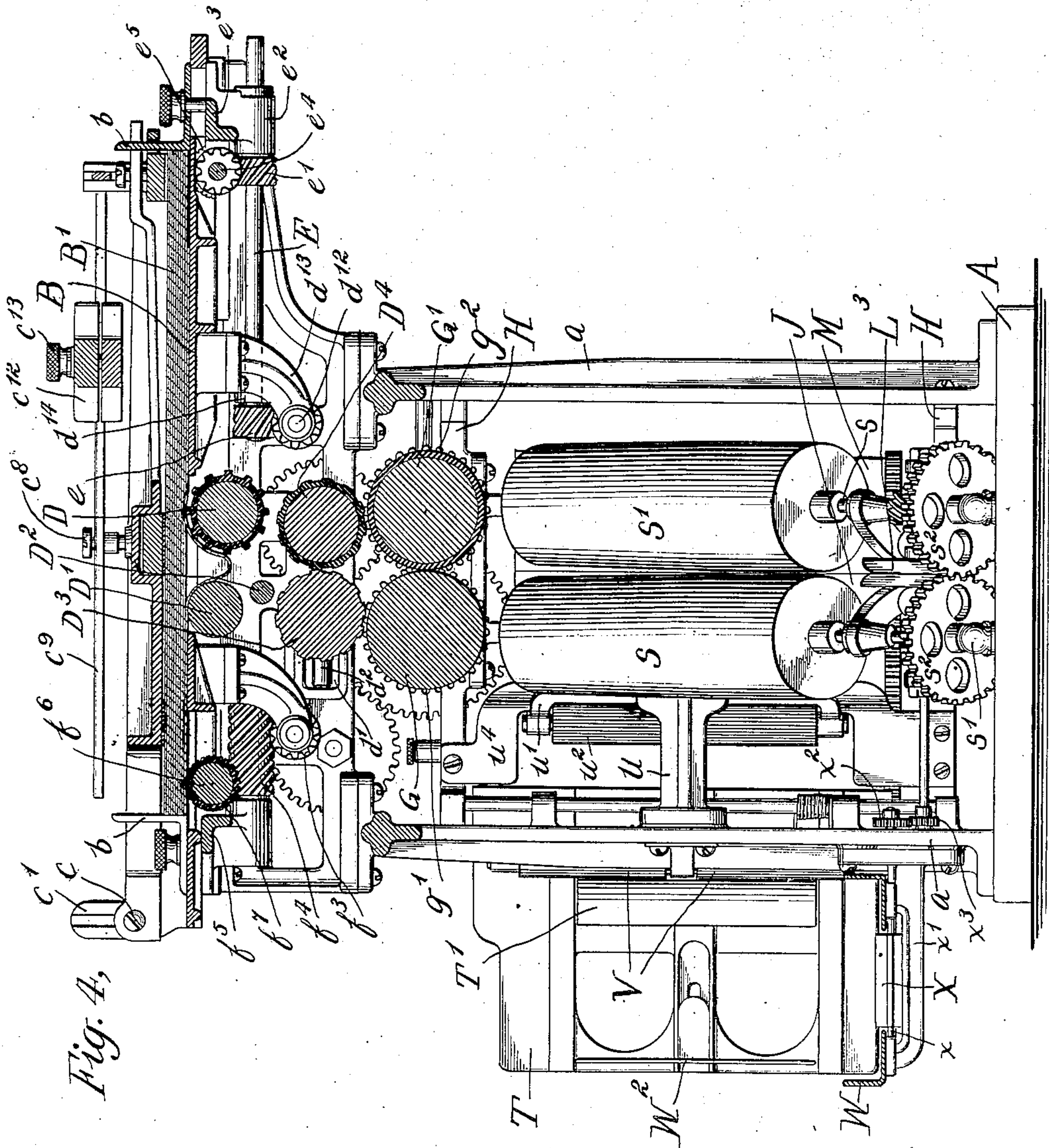


Fig. 4,

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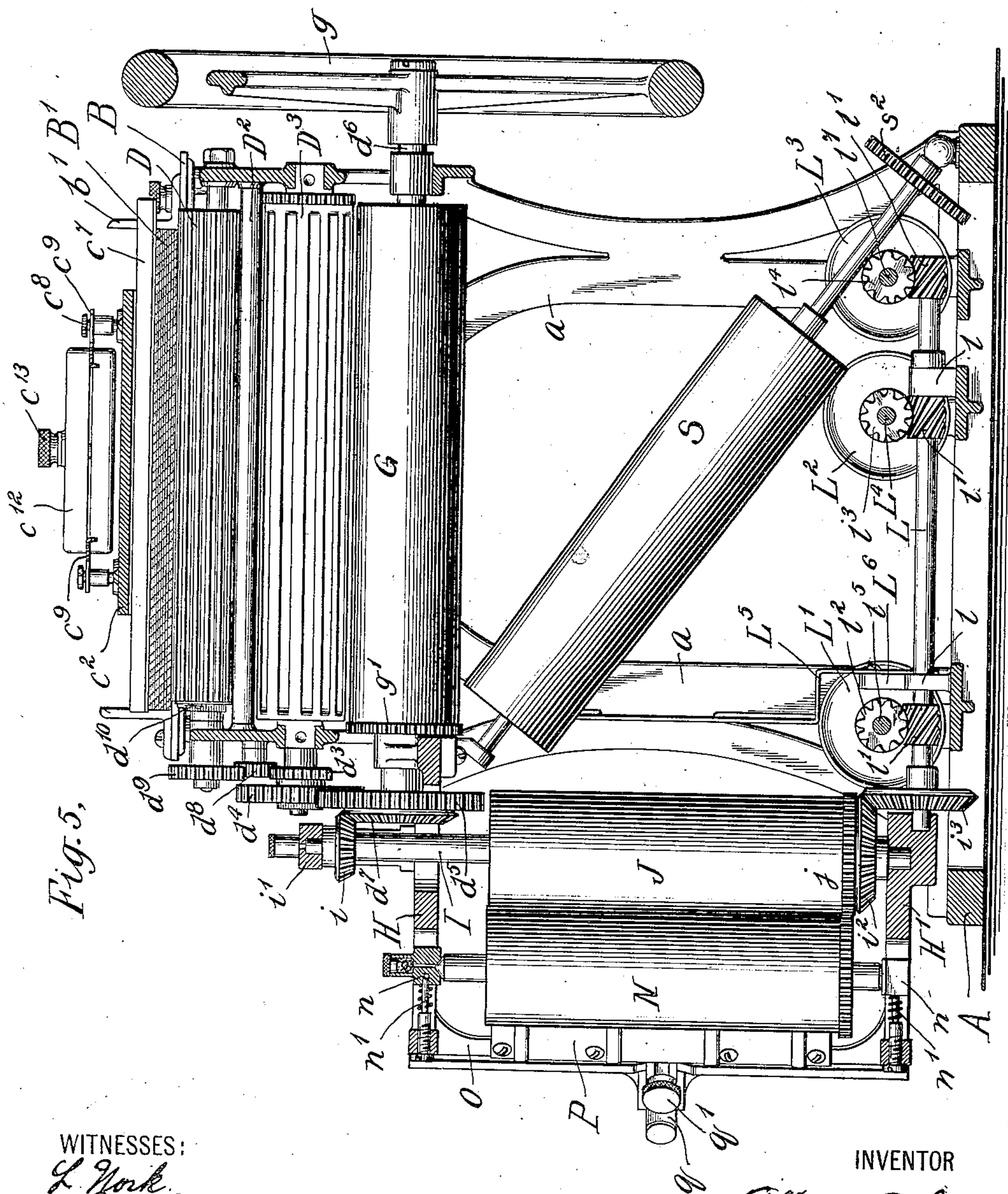
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A. B. DICK.

FOLDING MACHINE.

APPLICATION FILED NOV. 20, 1903.

6 SHEETS—SHEET 5.



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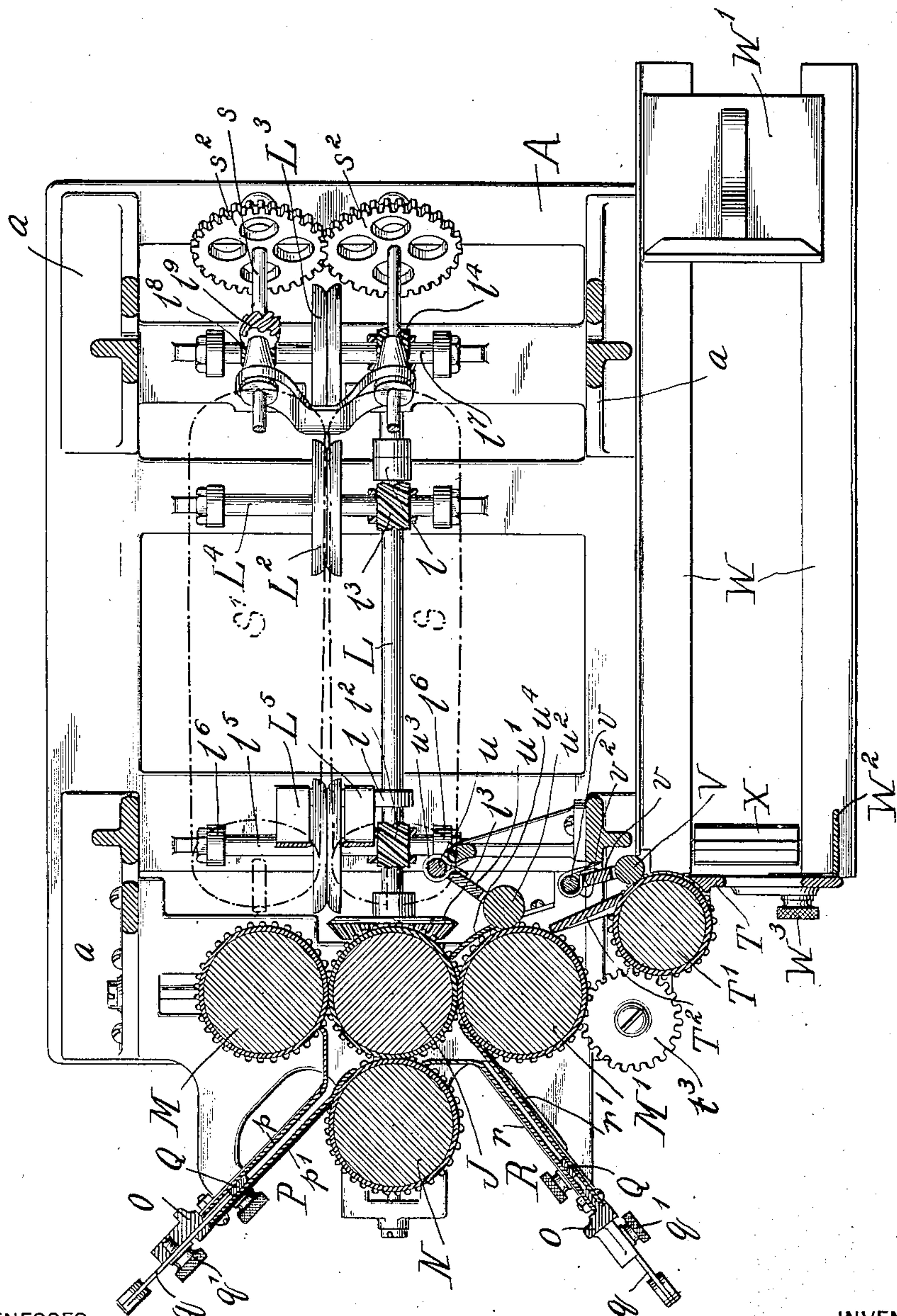
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FOLDING MACHINE.
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6 SHEETS—SHEET 6.

Fig. 6,



WITNESSES:
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S. McIntosh

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UNITED STATES PATENT OFFICE.

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

FOLDING-MACHINE.

No. 795,491.

Specification of Letters Patent.

Patented July 25, 1905.

Application filed November 20, 1903. Serial No. 181,897.

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 Folding-Machines, of which the following is a description.

The object of the present invention is to provide a machine for folding and delivering sheets of paper or other material.

In main essentials the invention comprises means for separating one sheet at a time from a pile, roller systems whereby the sheets so separated from the pile may be folded, and delivery mechanism whereby the folded sheets may be delivered in folded condition uniformly and substantially continuously.

For the purposes of this application I shall disclose a preferred form in which the invention may be embodied for the purpose of thrice folding each sheet from the pile—once through the center of such sheet and twice across the sheet thus folded in halves. Such preferred form is illustrated in the drawings, in which—

Figure 1 is a top plan view; Fig. 2, a front end elevation looking in the direction of the arrow 2, Fig. 1; Fig. 3, a rear side elevation looking in the direction of the arrow 3, Fig. 1; Fig. 4, a vertical section on the line 4 4, Fig. 2; Fig. 5, a vertical section taken at about the line 5 5, Fig. 1, certain of the internal parts being shown in outline; and Fig. 6, a horizontal section on the line 6 6, Fig. 2.

Referring to the drawings, in which similar letters denote corresponding parts, the entire mechanism is here shown as mounted upon a base A, carrying a frame comprising four posts or standards *a*, suitably connected at their upper ends for the support of the feeding mechanism presently to be described.

B designates the bed, upon which is laid the paper pile B'. Adjustably secured to this bed are end guides *b* and side guides *b'* for determining the proper position of the pile.

C designates a presser-plate (here shown in the form of a casting of some weight) hinged by means of screws *c* in vertical grooves formed in the internal faces of ears *c'*, secured to and projecting upwardly from the bed B. This presser-plate is provided with bifurcate extensions *c''*, having slotted ends *c'''*, through which project screws *c''''*, carrying presser-bar *c'''''*, said bar being adjustable longitudinally of the machine. A slot *c''''''* is formed in said

presser-bar *c'''''* to receive the upwardly-extending end guide *b*. The presser-plate is also provided intermediate of its ends (at the point where the sheets are buckled preliminarily to the folding operation) with a second presser-bar *c''''''*, and the under faces of both these presser-bars are preferably surfaced with rubber. The presser-bar *c''''''* is loosely mounted in a recess in the under side of the presser-plate, being held in position by screws *c''''''''*.

c'''''''' designate ways supported at their rearward end upon an ear *c''''''''''*, carried by the presser-bar *c'''''*, and forward of this by the screws *c''''''''''*, said ways being provided with slots *c''''''''''''*, through which such screws extend. Operating upon these ways is an adjustable weight *c''''''''''''''*, here shown as made in two parts united (and clamped to the ways *c''''''''''*) by means of a screw *c''''''''''''''*. By means of this adjustable weight *c''''''''''''''* the pressure upon the paper pile may be regulated at will. If desired, the under face of the presser-plate C near its hinged end and where it comes in contact with the paper pile is surfaced with rubber.

Intermediate of its ends and nearer to the forward end than to the rearward end is an opening in the bed B, and in this opening are located the separating-roll D and idler-roll D'. Both of these rolls are mounted in the side members of the frame of the machine and the separating-roll is preferably provided with a fluted-rubber periphery for reliable contact with the lowermost sheet of the paper pile. The peripheries of these rolls are about level with the surface of the bed B, and the separating-roll is so positioned as to lie almost directly under (but slightly rearward of) the presser-bar *c'''''*. Lying below the idler-roll D' is a tie rod D'', whereby the side members of the frame are secured together. Below the separating-roll D and idler-roll D' is a pair of feeding-rolls D''' D'', the surfaces of both being longitudinally fluted and roll D''' being of rubber or rubber-covered. One of these rolls, in the present instance the roll D''', is journaled in blocks *d*, held in recesses *d'* in the side frames and spring-pressed (toward the roll D') by means of spring barrel and pin *d''*. The rearward end of the shaft of feed-roll D''' projects through the frame and is provided with a small pinion *d'''* and a larger pinion *d''''*. The former meshes with the pinion *d''''* on the main shaft *d''''''* of the machine, to the outer surface of which pinion *d''''* is secured miter-gear *d''''''*. The small pinion *d'''* meshes with an idler-

pinion d^8 , and with the latter engages a pinion d^9 , keyed to the shaft of the separating-roll D. Said roll D is preferably provided with a clutch d^{10} , permitting said roll to rotate only in one (operative) direction. Meshing also with the idler-pinion d^8 is a pinion d^{11} on a shaft d^{12} , mounted at one end in the side member of the frame and at the other end sustained by an ear d^{13} , secured to the under side of the bed B. Carried by the shaft d^{12} is a worm and a bearing d^{14} for a worm-shaft E, provided with a worm e in operative relation to the worm on the shaft d^{12} and to another worm e' near the rearward end of said shaft E. The rearward end of said shaft is journaled in an ear e^2 , carried by a cross-bar e^3 , secured to the under side of the bed B. Mounted in the angular ends of the cross-bar e^3 is a shaft e^4 , carrying retarding-roll e^5 , here shown as made in two sections, the periphery of each extending through an opening in the bed B. The shaft e^4 of the retarding-roll is provided with a worm coacting with the worm e' on the shaft E.

The forward end of the machine is provided with a retarding-roll and operating mechanism substantially the same as that above described as being located at the rearward end, this mechanism comprising the pinion F, driven by the gear d^5 on the main shaft d^6 of the machine and transmitting motion to the gear f on shaft f' , mounted near one end in the frame of the machine and at the other end in an ear f^2 , depending from the under side of the bed B. The shaft f' is provided with a worm f^3 , meshing with a worm f^4 , carried by a cross-bar f^5 , secured to the under side of the bed B, and with the worm f^4 coacts a similar worm upon the shaft f^6 of a retarding-roll f^7 , similar to the roll e^5 and projecting through openings in the bed B in like manner. It will thus be seen that power being applied to the main shaft d^6 this is transmitted, by means of the pinions heretofore described, to the separating-roll D, the feed-rolls D^3 D^4 , and the retarding-rolls e^5 and f^7 . It will also be seen that by reason of this connecting mechanism the direction of travel of the separating-roll D is forward, that of the retarding-roll f^7 is also forward, that of the retarding-roll e^5 is rearward, and that of the feed-rolls D^3 D^4 is toward each other. In other words, the direction of travel of the retarding-rolls e^5 f^7 is from each other.

A pair of pressing and passing rolls G G' directly underlies the feed-rolls D^3 D^4 . The roll G is mounted upon the main shaft d^6 of the machine and is preferably of metal or provided with a metal periphery. Near that end distant from the hand-wheel g , but inside the framework of the machine, the roll G is provided with the gear g' , which meshes with a corresponding gear g^2 upon the other pressing and passing roll G', this roll preferably being of rubber or having a rubbered periph-

ery. The shaft of the roll G' is preferably mounted in the same manner as that of the feed-roll D^3 —i. e., in horizontally-adjustable spring-pressed blocks g^3 . In both cases the spring-pressed blocks in which the rolls D^3 and G' are mounted tend to press said rolls toward their companion rolls.

The main frame of the machine is provided with two shelf-like extensions H H', preferably upon that side of the machine distant from the hand-wheel g , and mounted between these is a system of vertical folding and passing rolls now to be described.

The miter-gear d^7 on the main shaft d^6 of the machine meshes with a similar gear i , carried by a vertical shaft I, supported at its upper end in a yoke i' , carried by the upper member H of the extension-frame. At its lower end the shaft I is stepped in the lower extension H' of the frame and here provided with miter-gear i^2 , meshing with a similar gear i^3 upon the shaft L, the purpose whereof will presently be explained. Mounted upon the shaft I is a roll J, provided near its lower end and just above the miter-gear i^3 with a pinion j .

M M' designate rolls similar to the roll J, mounted upon shafts m m' , each of which is journaled at each end in blocks m^2 , spring-pressed at m^3 toward the central roll J. These rolls M M' are provided near their lower ends with pinions m^4 , which engage with the pinion j , mounted upon the shaft I, or the roll J upon that shaft.

N designates a roll similar to the rolls J, M, and M' and also like said rolls, mounted in blocks n , spring-pressed at n' toward the roll J. Also like the rolls M M' said roll N is provided with a pinion meshing with the pinion j upon the shaft I or upon the roll J upon that shaft. It will therefore be seen that the rolls J, M, M', and N are all geared together and driven by the main shaft d^6 of the machine.

Carried by the extensions H H' of the frame are the (detachable) guide-supports O, carrying the guides P and R, the free ends whereof terminate in close proximity to but not in contact with the rolls above described. The guide P comprises the two members p p' , and the guide R the two members r r' . Each of these pairs of guide members is secured at its outer end to an inwardly-extending web formed upon one of the guide-supports O, and each of said guide-supports is secured to the extensions H H' at two points, above and below, by means preferably of set-screws h^5 h^6 , as clearly shown in Fig. 2. By the removal of these screws the guides and their supports may readily be detached from the extensions H H' of the frame for repair, &c. Should actual removal of a guide be unnecessary and mere access to the interior thereof sufficient, one of the screws—as, for instance, h^5 —may be removed, whereupon such guide and its

support may be swung backward away from the folding-rolls and such access to the interior of said guide be easily had. With respect to both the guide P and the guide R it will be noted that the respective members thereof are parallel throughout a considerable portion of their length. The inner end of the guide member p , however, is turned at an angle and terminates in proximity to the roll M. The inner end of the guide member p' terminates in proximity to the roll N. The inner end of the guide member r is turned at an angle and also terminates in proximity to the roll N. The inner end of the guide member r' terminates in close proximity to the roll M'. Each of the guides P and R is provided with a stop Q, the office whereof is to determine the extent of movement of the paper into either of said guides. In each case the stop Q is provided with an adjusting-arm q and set-screw q' , whereby after the stop has been properly located it may be rigidly secured in position.

SS' designate two passing-rolls, here shown as mounted at an angle intermediate of the axes of the rolls G G' and the rolls J, M, M', and N. These rolls S S' are carried by shafts s , each journaled at its upper end in an ear depending from the under side of the extension member H of the frame and at its lower end in a bearing s' , carried by the base-plate A. As here shown, the rolls S S' are not strictly parallel, their upper ends being somewhat farther apart than their lower ends. The shafts s are geared together by means of pinions s^2 and driven by means of the shaft L, heretofore referred to.

The shaft L is supported in bearings l , carried by the base-plate A, and is driven, as above stated, through the gears i^2 and i^3 . It is provided with three worms l' , which mesh with corresponding worms l^2 l^3 l^4 . The worm l^2 is mounted upon a shaft l^5 , carried by ears l^6 , extending upwardly from the base-plate A. Said shaft carries one of three passing-pulleys L^1 , L^2 , and L^3 , each of which is provided with a centrally-grooved periphery, as clearly shown in Fig. 4. The worm l^3 and passing-pulley L^2 are mounted upon a shaft L^4 , carried by ears extending upwardly from the base-plate A. The worm l^4 and passing-pulley L^3 are carried by a shaft l^7 , supported in similar manner. Said shaft l^7 carries, in addition to the worm l^4 and passing-pulley L^3 , a worm l^8 , which meshes with a corresponding worm l^9 upon the shaft s of one of the angular passing-rolls S S', and the shafts of both these passing-rolls being geared together by means of the pinions s^2 movement is thereby transmitted to such rolls.

The mechanism thus far described provides for the folding of a sheet not only in half, but also the halves so folded together into thirds. Turning now to the means for passing the sheets so folded from the machine,

T designates a wing of the main supporting-frame, provided with ears t , in which is journaled the vertical shaft t' of a roller T'. Below the lower ear t the shaft t' is provided with a pinion t^2 , meshing with a pinion t^3 , which in turn meshes with the pinion m^4 of the roll M'. The inner end T² of the wing T terminates in close proximity to the roll M' to receive the folded sheets passed from said roll.

U designates an arm secured to one of the standards u of the frame of the machine, in the bifurcated inner end of which is mounted a shaft u , upon which is pivoted the swinging bracket u' , carrying a milled roll u^2 , held in engagement with the periphery of the roll M' by the stress of a spring u^3 , carried by said shaft and bearing against said bracket u' . This roll operates through the cut-away portion of a guard u^4 adjacent to said roll M', as clearly shown in Fig. 6.

V designates a milled roll similar to the roll u^2 , carried by a bracket v , pivoted upon a rod v' , supported at its ends in ears formed upon the frame of the machine. A spring v^2 , coiled about said rod v' and bearing against said bracket v , serves to maintain said roll V in contact with the periphery of the roller T'.

The wing T forms one end of a delivery-tray, which comprises the ways W, angular in cross-section, and the sliding block W', operating on said ways. Said wing is provided with a gage or stop W², adjustable by means of set-screw W³, against which the folded sheets are thrown as they pass out of the machine between the roller T' and roll V. Lying below these ways W is a shaft x , supported in arm x' , secured to one of the standards u of the frame, said shaft projecting through said standard and being provided on the other side thereof with a pinion x^2 , which meshes with a pinion x^3 on the shaft l^5 . Said shaft x carries a roll X, preferably of rubber and having a fluted periphery.

The operation of the machine has been indicated to some extent in the foregoing description. The paper pile having been laid upon the bed and the guides on such bed having been adjusted to hold such pile against displacement, power may be applied either by means of the hand-wheel or a suitable motor. It will be noted that the separating-roll D is somewhat nearer to the forward end of the machine than to the rearward end. Said roll therefore presses the under sheet forwardly; but since forward movement is precluded by the end guides said sheet is buckled between said separating-roll and the idler-roll D' and passed downwardly between the same until it is grasped by the feed-rolls D³ D⁴. Due to the relation of the separating-roll to the ends of the pile the fold will be made in the sheet at the center thereof. The separating from the pile of more than one sheet at a time is precluded by the retarding-rolls e^5 f^7 , which, as

above stated, operate in opposite directions away from the center of the pile. The moment the ends of the lowermost sheet are pulled toward the opening between the separating-roll D and idler-roll D' said retarding-rolls, operating upon the next sheet on the under side of the pile, tend to keep that sheet straight and prevent it from following by frictional contact the lowermost sheet which is being passed through the machine. From the feed-rolls D³ D⁴ the sheet passes between the pressing and passing rolls G G', where the transverse fold is pressed, and which rolls pass the folded sheet downwardly between the oblique rolls S S' until the folded edge of the sheet is received on the grooved peripheries of the passing-pulleys L', L², and L³. In order to prevent disarrangement of that end of the sheet nearest the folding system of rollers, I provide two vertical guards L⁵, mounted upon ears L⁶, carried by the frame of the machine, said guards being located on either side of the passing-pulley L' and extending upwardly almost to the rolls S S'. As the sheet falls upon the passing-pulleys their rotation toward the folding system passes the forward edge of the folded sheet between the rolls J and M. (See Fig. 6.) Such forward edge enters the guide P until its movement is arrested by the stop Q therein, when the sheet is buckled sufficiently to be caught by the rolls J and N, whereupon the second fold is made in the sheet and the whole fed between the rolls last named until the exterior of such fold strikes the member r' of the guide R, whereupon the sheet is fed into said guide R until its movement therein is arrested by the stop in said guide. This arrest of movement again causes the sheet to buckle at a point coincident with the unfolded lateral edge, and the sheet is then again grasped by and passed between the rolls J and M', thereby making the third fold in the sheet. As the thrice-folded sheet passes between the rolls last named it is fed out of the machine against the guard u⁴, between the roll M' and roll u², past the extension T² of the wing T, between the roller T' and the roll V, and thence into the receiving-tray, where it is at once acted upon by fluted roll X to pass it along in said tray, and thereby make room for the succeeding sheet. As the folded sheets are delivered to said tray the block W' therein is moved outwardly, whereby said folded sheets are kept under sufficient pressure to prevent disarrangement.

The operation is continuous from start to finish. The moment the edge of a sheet leaves the separating-roll that roll acts upon the sheet next below it, and the other rolls, from the separating-roll on, having higher surface speed than the separating-roll the ends of the sheet already separated are speedily withdrawn in order to clear the feeding and other rolls for the receipt of the next sheet.

Having now described my invention, what

I claim as new therein, and desire to secure by Letters Patent, is as follows:

1. In a folding-machine, the combination with a sheet-separating device including a rotary sheet-buckling roll, of rolls mounted in planes parallel with that of said buckling-roll, rolls mounted at an angle thereto, and intermediate sheet-passing rolls, substantially as set forth.

2. In a folding-machine, the combination with a rotary sheet-buckling roll and subjacent rolls mounted in planes substantially parallel with each other and with said buckling-roll, of a series of rolls mounted at an angle thereto, another roll mounted parallel but not in line with the rolls of said series, and a sheet-guide on each side of said roll and coacting therewith and with the other rolls of said series, substantially as set forth.

3. In a folding-machine, the combination with a separating-roll operating in a substantially fixed position and a pair of rolls adapted to receive a sheet therefrom, of other rolls arranged at an angle to said pair of rolls, intermediate sheet-passing mechanism, and sheet-guides coacting with the last-named rolls, substantially as set forth.

4. In a folding-machine, the combination with a sheet-separating device including a rotary sheet-buckling roll operating in a substantially fixed position and horizontal rolls adapted to receive a sheet therefrom, of intermediate sheet-passing mechanism, vertical rolls adapted to receive sheets passed thereby, and two sheet-guides coacting with said vertical rolls, substantially as set forth.

5. In a folding-machine, the combination with a bed, of a rotary sheet-separating device operating in a substantially fixed position, a pair of subjacent feed-rolls, and folding mechanism below said feed-rolls and adapted to coact with a sheet fed thereby, substantially as set forth.

6. In a folding-machine, the combination with a bed, of a sheet-separating device, a pair of subjacent feed-rolls having fluted peripheries, and folding mechanism below said feed-rolls and adapted to coact with a sheet fed thereby, substantially as set forth.

7. In a folding-machine, the combination with a sheet-separating device, of a pair of subjacent feed-rolls having fluted peripheries, the projections upon the periphery of one roll coacting with those upon the periphery of the other roll, and folding mechanism below said feed-rolls and adapted to coact with a sheet fed thereby, substantially as set forth.

8. In a folding-machine, the combination with a bed, of a sheet-separating device, a pair of subjacent feed-rolls, the periphery of one of said rolls being metallic and that of the other being of rubber or other elastic material, and folding mechanism below said feed-rolls and adapted to coact with a sheet fed thereby, substantially as set forth.

9. In a folding-machine, the combination with a bed, of a separating device including a buckling-roll operating in a substantially fixed position, a pair of subjacent feed-rolls, and a pair of pressing and passing rolls below said feed-rolls, substantially as set forth.

10. In a folding-machine, the combination with a bed, of a separating device, a pair of subjacent feed-rolls, and a pair of pressing and passing rolls below said feed-rolls, the periphery of one of said pressing and passing rolls being metallic and that of the other being of rubber or other elastic material, substantially as set forth.

11. In a folding-machine, the combination with a bed, of a separating-roll, a pair of feed-rolls, a pair of pressing and passing rolls, a main shaft and means for applying power thereto, and connections between said main shaft and said pressing and passing rolls, said feed-rolls and said separating-roll, substantially as set forth.

12. In a folding-machine, the combination with a bed, of a separating-roll, a retarding roll or rolls, a pair of feed-rolls and a pair of pressing and passing rolls, a main shaft and means for applying power thereto, and connections between said main shaft, said pressing and passing rolls, said feed-rolls, said retarding roll or rolls and said separating-roll, substantially as set forth.

13. In a folding-machine, the combination with a bed adapted to receive a pile of sheets, of a weight above said bed adapted to coact with said pile, a separating device and a sheet-retarding device coacting with said pile, a pair of feed-rolls and a pair of pressing and passing rolls, and a common source of power for said pressing and passing rolls, said feed-rolls and said separating and retarding devices, substantially as set forth.

14. In a folding-machine, the combination with a bed, of a rotary separating device in proximity thereto and operating in a substantially fixed position, horizontal rolls below said separating device, and sheet-passing mechanism below said horizontal rolls, substantially as set forth.

15. In a folding-machine, the combination with a bed, of a separating device in proximity thereto, horizontal rolls below said separating device, and sheet-passing mechanism, including rolls and pulleys, below said horizontal rolls said rolls coacting with the sides of said sheets and said pulleys with the edges thereof, substantially as set forth.

16. In a folding-machine, the combination with a bed, of a separating device in proximity thereto, horizontal rolls below said separating device, and sheet-passing mechanism, including oblique divergent rolls, below said horizontal rolls, substantially as set forth.

17. In a folding-machine, the combination with a bed, of a separating device in proximity thereto, horizontal rolls below said separating

device, and sheet-passing mechanism below said horizontal rolls, said mechanism including oblique rolls which advance but do not fold the sheet and an underlying sheet-carrier, substantially as set forth.

18. In a folding-machine, the combination with a bed, of a separating device in proximity thereto, horizontal rolls below said separating device, and sheet-passing mechanism below said horizontal rolls, including oblique, divergent rolls and an underlying sheet-carrier, substantially as set forth.

19. In a folding-machine, the combination with a bed, of a separating device in proximity thereto, horizontal rolls below said separating device, and sheet-passing mechanism, including pulleys adapted to receive the lower edge of a sheet and to pass such sheet from said horizontal rolls, substantially as set forth.

20. In a folding-machine, the combination with a bed, of a separating device in proximity thereto, horizontal rolls below said separating device, and sheet-passing mechanism including pulleys having grooved peripheries adapted to receive the lower edge of a sheet and to pass such sheet from said horizontal rolls, substantially as set forth.

21. 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, rotary sheet-passing mechanism, including oblique rolls and underlying pulleys, the latter coacting with the lower edge of the sheet, and vertical rolls adapted to receive said sheet from said mechanism and fold the same transversely, substantially as set forth.

22. 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, rotary sheet-passing mechanism, including oblique rolls and underlying pulleys, the latter coacting with the lower edge of the sheet, and vertical rolls and guides 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.

23. In a folding-machine, the combination with a series of rolls, of a detachable guide coacting therewith, said guide being secured in position at two points permitting its release at one and pivotal movement at the other, and a stop adjustable within said guide to determine the traverse of a sheet therein, substantially as set forth.

24. In a folding-machine, the combination with rolls mounted side by side in a substantially straight series, and another roll mounted parallel with said rolls but not in line with the series thereof, of a two-part guide one of whose parts terminates in proximity to one of the rolls first named, its other part having an angular portion terminating in proximity to said parallel roll, and another two-part

guide one of whose parts terminates in proximity to said parallel roll, its other part having an angular portion terminating in proximity to one of the rolls first named, each of said guides being secured in position at two points, permitting its release at one and pivotal movement at the other, substantially as set forth.

25. In a folding-machine, the combination with rolls mounted vertically side by side in a substantially straight series and spring-pressed into contact with each other, and another vertical roll mounted parallel to said rolls but not in line with the series thereof and spring-pressed into contact with one of the rolls first named, of a two-part guide, one of whose parts terminates in proximity to one of the rolls first named, its other part having an angular portion terminating in proximity to said parallel roll, and another two-part guide one of whose parts terminates in proximity to said parallel roll, its other part having an angular portion terminating in proximity to one of the rolls first named, substantially as set forth.

26. In a folding-machine, the combination with three vertical rolls spring-pressed into engagement with each other and so mounted, side by side, that a straight line, at right angles to their axes, shall intercept the center of each of said rolls, of a fourth roll opposite the central roll, a detachable guide adapted to receive a sheet from between the central roll and one of the outer rolls of the series, to buckle and pass said sheet between said central roll and the roll opposite the same, a guide adapted to receive the sheets so passed, to buckle and pass the same between said central roll and the other outer roll, and means for determining the traverse of said sheets in said guides, substantially as set forth.

27. In a folding-machine, the combination with a series of rolls, of guides adapted to receive, buckle and pass sheets from certain of said rolls to others, and a guard and guide roll coacting with one of said rolls and between which and said roll the sheet is adapted to pass, substantially as set forth.

28. In a folding-machine, the combination with a bed adapted to receive a pile of sheets, a separating device, and subjacent rolls coacting with the sheets presented by said separating device, of sheet-passing mechanism, including pulleys and means for guiding said sheets from said rolls to said pulleys, substantially as set forth.

29. In a folding-machine, the combination with a bed adapted to receive a pile of sheets, a separating device, and subjacent rolls co-

acting with the sheets presented by said separating device, of sheet-passing mechanism, including oblique rolls, and pulleys, substantially as set forth.

30. In a folding-machine, the combination with a bed adapted to receive a pile of sheets, a separating device, and subjacent rolls coacting with the sheets presented by said separating device, of sheet-passing mechanism, including divergent oblique rolls, and pulleys, substantially as set forth.

31. In a folding-machine, the combination with a bed adapted to receive a pile of sheets, a separating device, and subjacent rolls coacting with the sheets presented by said separating device, of sheet-passing mechanism, including divergent rolls, pulleys and guards, substantially as set forth.

32. In a folding-machine, the combination with a bed adapted to receive a pile of sheets, of a weight adapted to bear upon said pile, a separating-roll and retarding-rolls coacting with the under side of said pile, feed-rolls and pressing and passing rolls, all said rolls being mounted in a substantially horizontal plane, oblique rolls below said pressing and passing rolls, pulleys below said oblique rolls, a series of vertical rolls having coacting guides, said guides being adapted to receive a sheet folded between its ends by said horizontal rolls, to buckle and fold such once-folded sheet in a direction at an angle to the fold first made, and means for delivering the sheet so folded, substantially as set forth.

33. In a folding-machine, the combination with a bed adapted to receive a pile of sheets, of a weight adapted to bear upon said pile, a separating-roll and retarding-rolls coacting with the under side of said pile, feed-rolls and pressing and passing rolls, all said rolls being mounted in a substantially horizontal plane, oblique rolls below said pressing and passing rolls, pulleys below said oblique rolls, a series of vertical rolls having coacting guides, said guides being adapted to receive a sheet folded between its ends by said horizontal rolls, to buckle and fold such once-folded sheet in a direction at an angle to the fold first made, all of said rolls and said pulleys being operated from a common source of power, and means for delivering the sheet so folded, substantially as set forth.

This specification signed and witnessed this 30th day of September, 1903.

ALBERT B. DICK.

Witnesses:

S. O. EDMONDS,
I. McINTOSH.