(No Model.) 5 Sheets—Sheet 1.

W. LIDDELL.

MACHINE FOR MAKING SATCHEL BOTTOM OR SQUARE BOTTOM BAGS.

No. 370,548. Patented Sept. 27, 1887.

Fig. 1.

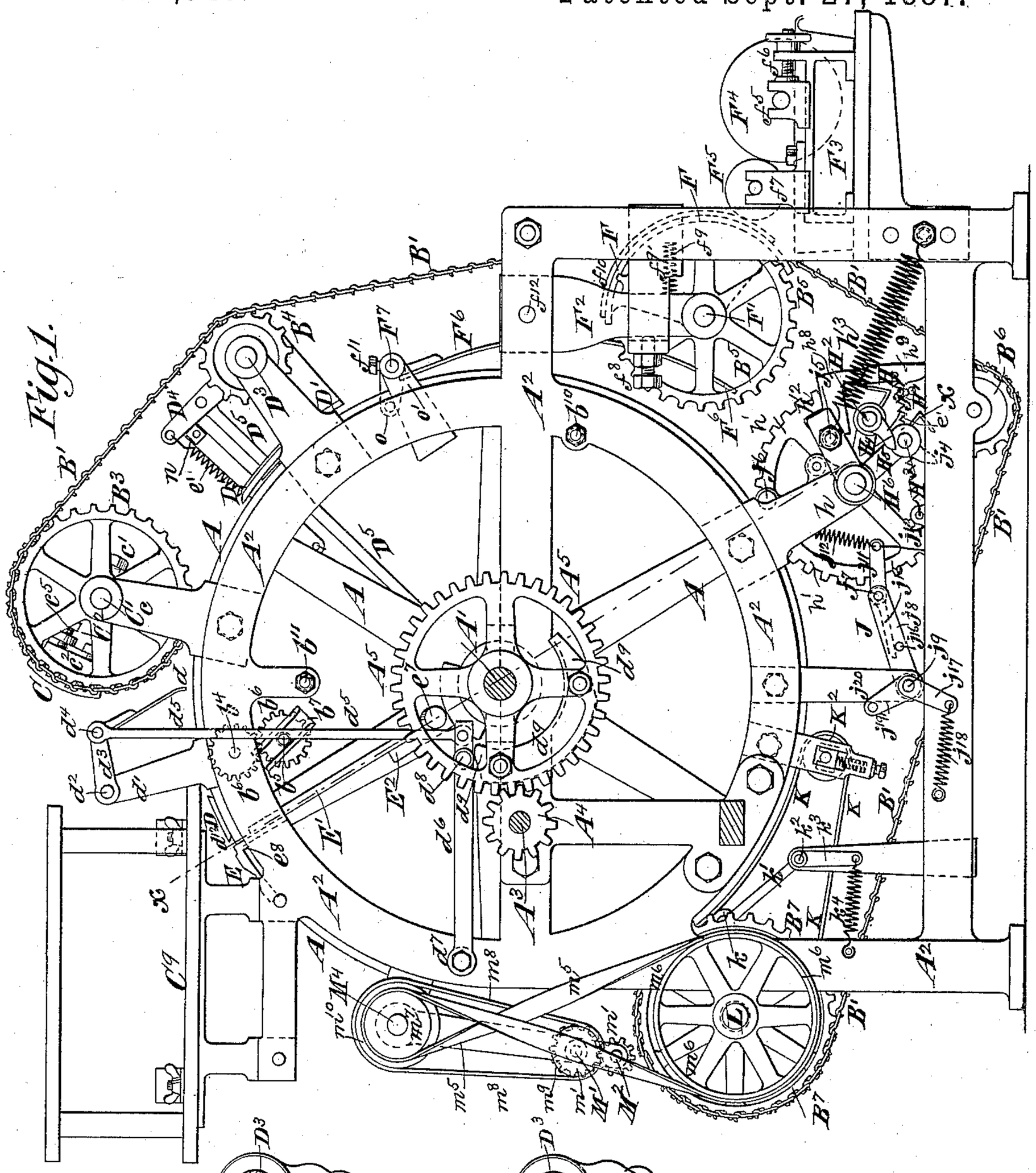


Fig. 9.

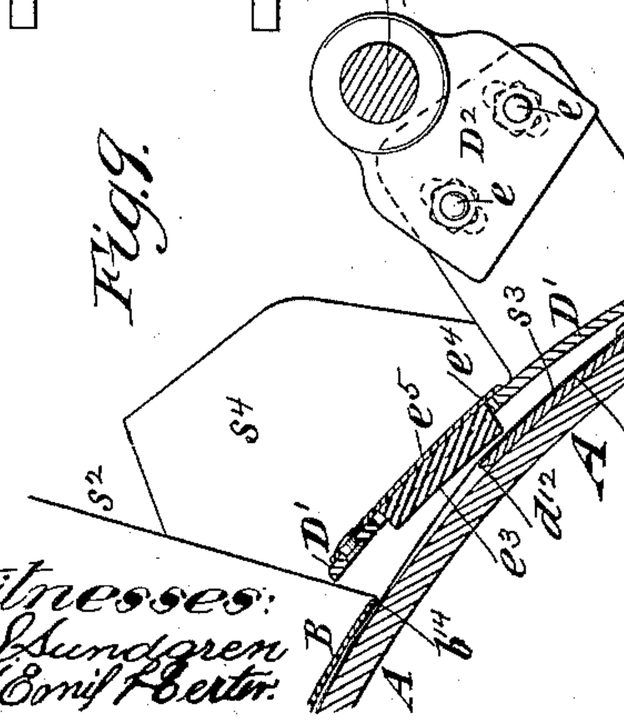
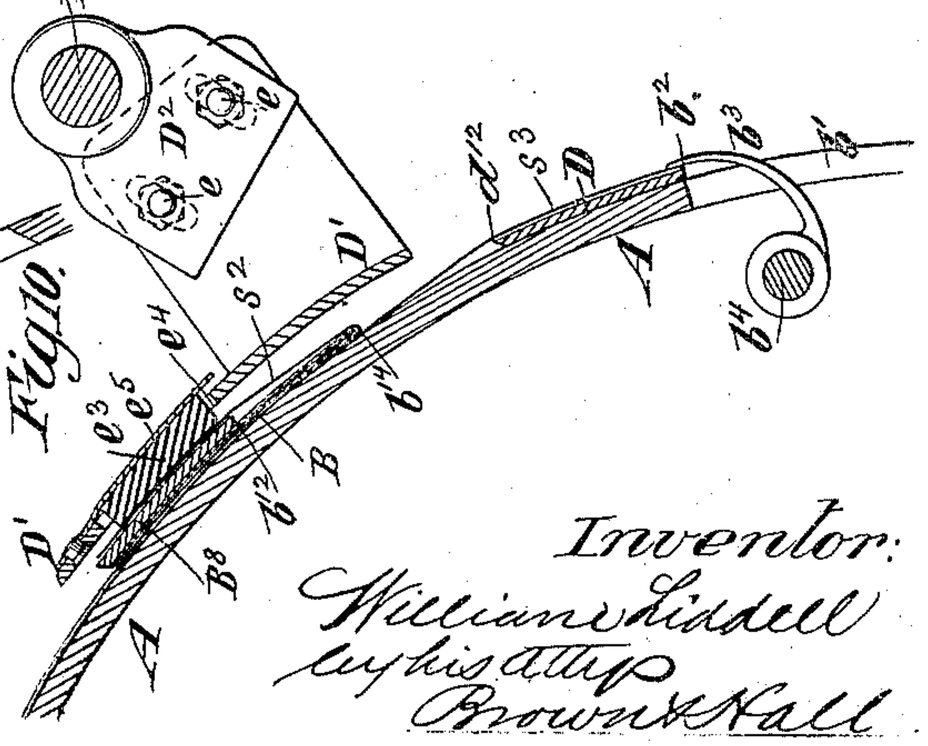


Fig. 10.



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(No Model.) 5 Sheets—Sheet 2.

W. LIDDELL.

MACHINE FOR MAKING SATCHEL BOTTOM OR SQUARE BOTTOM BAGS.

No. 370,548. Patented Sept. 27, 1887.

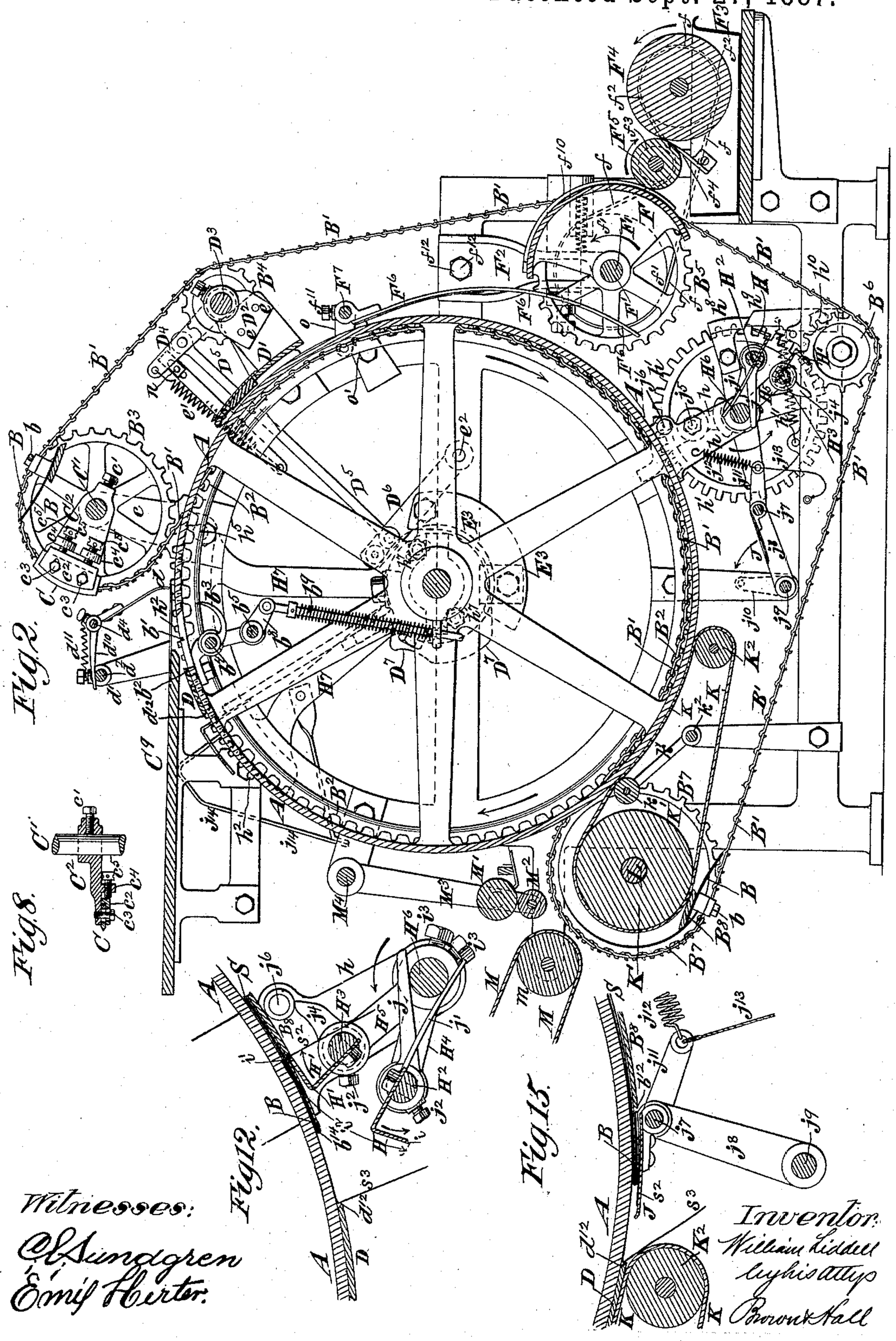

Fig. 2.

Fig. 8.

Fig. 12.

Fig. 15.

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MACHINE FOR MAKING SATCHEL BOTTOM OR SQUARE BOTTOM BAGS.

No. 370,548. Patented Sept. 27, 1887.

Fig. 3.

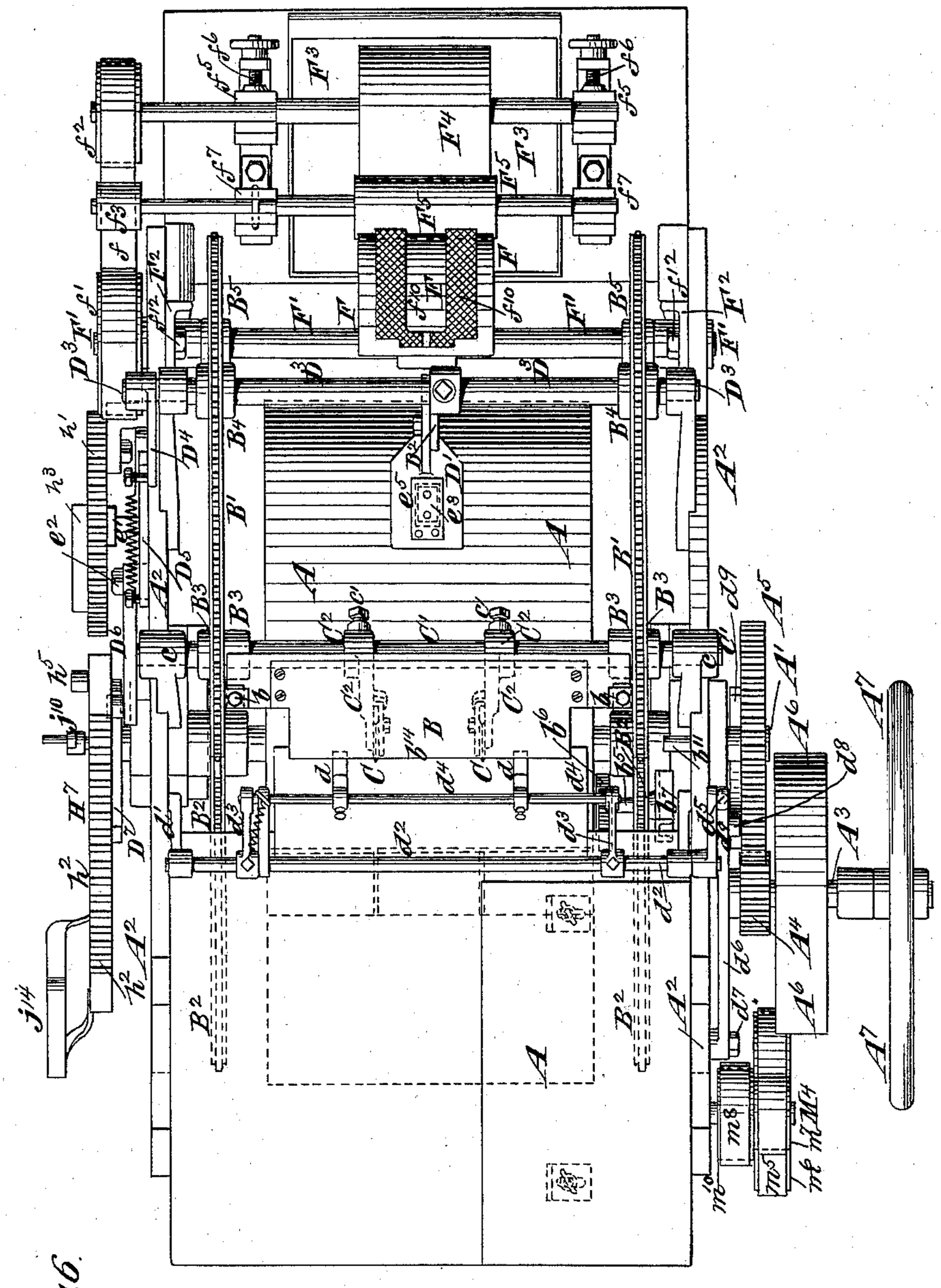

Fig. 6.

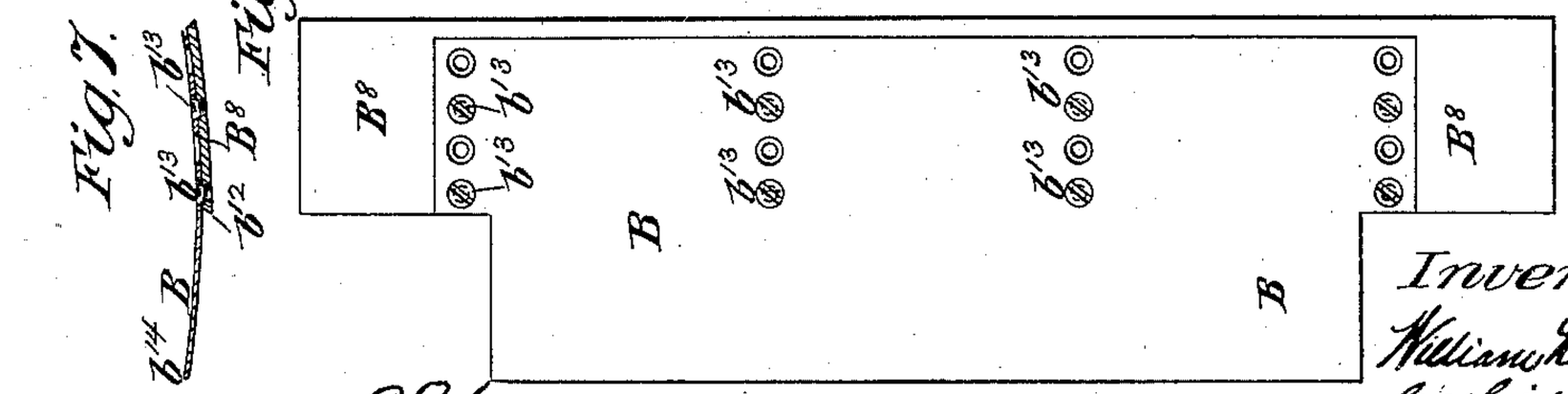

Fig. 7.

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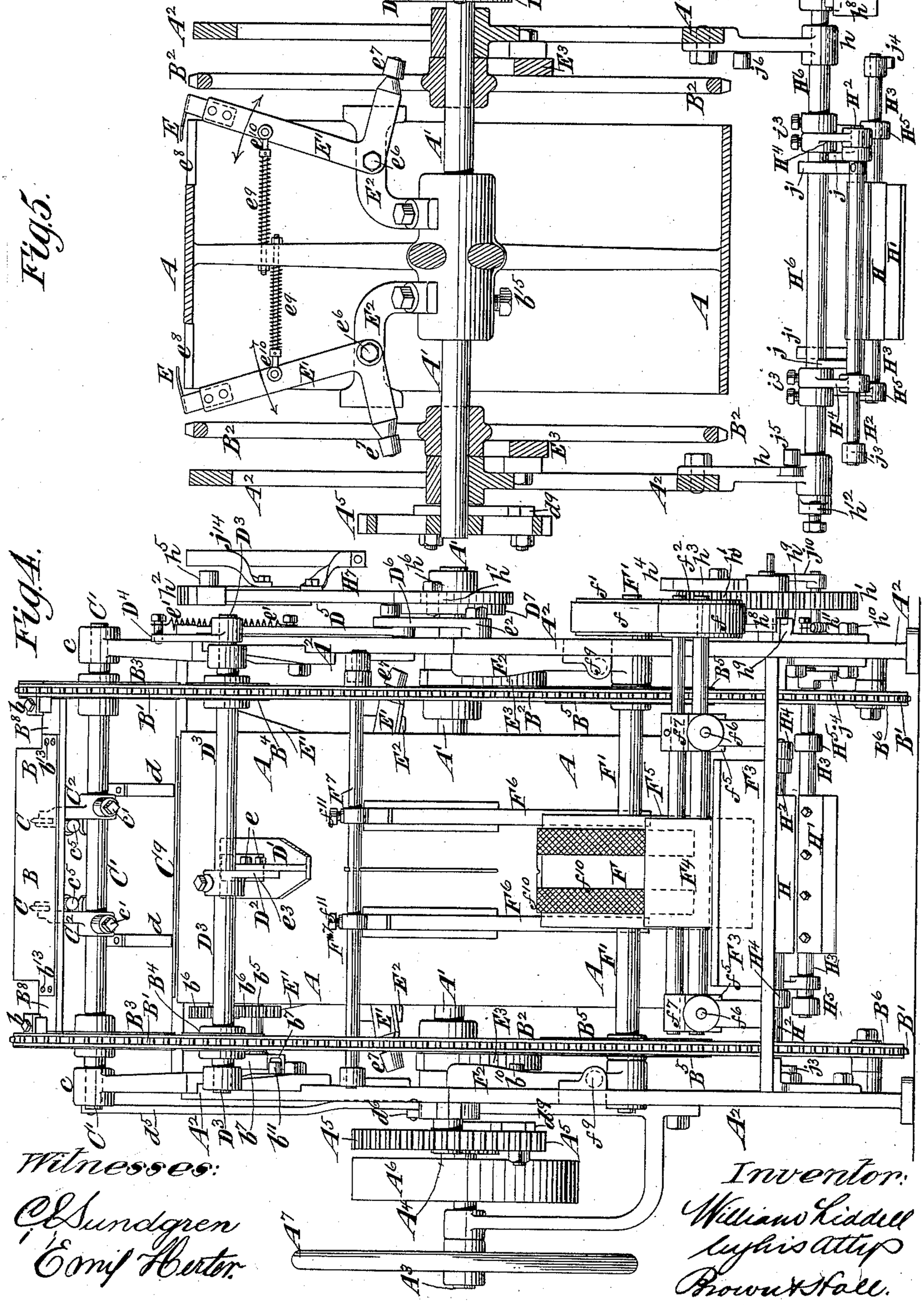
MACHINE FOR MAKING SATCHEL BOTTOM OR SQUARE BOTTOM BAGS.

No. 370,548. Patented Sept. 27, 1887.

Fig. 4.



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(No Model.) 5 Sheets—Sheet 5.

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MACHINE FOR MAKING SATCHEL BOTTOM OR SQUARE BOTTOM BAGS.

No. 370,548. Patented Sept. 27, 1887.

Fig. 18.

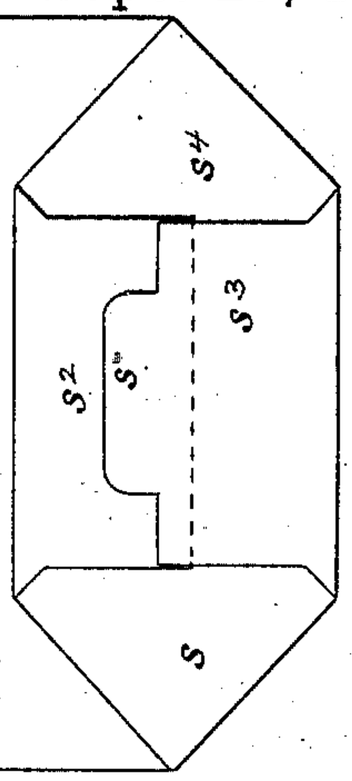


Fig. 14.

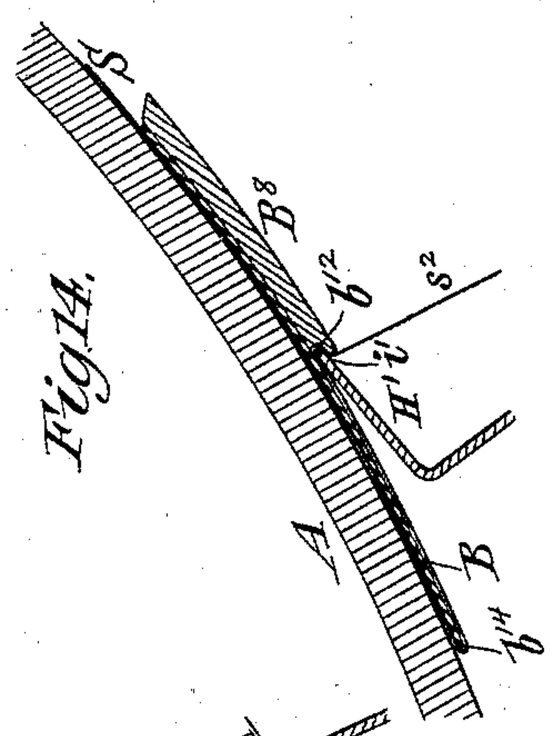


Fig. 17.

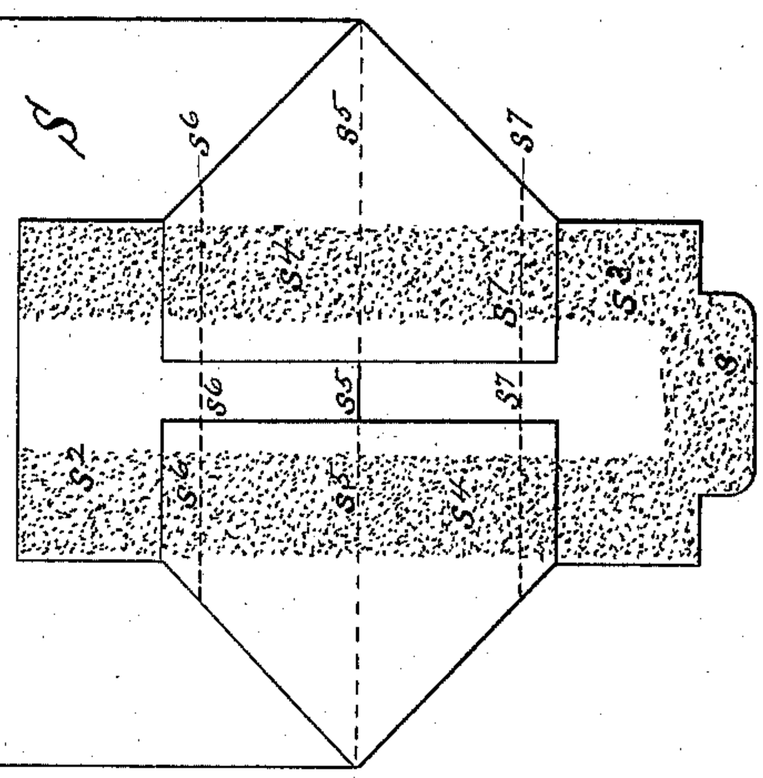


Fig. 13.

Fig. 11.

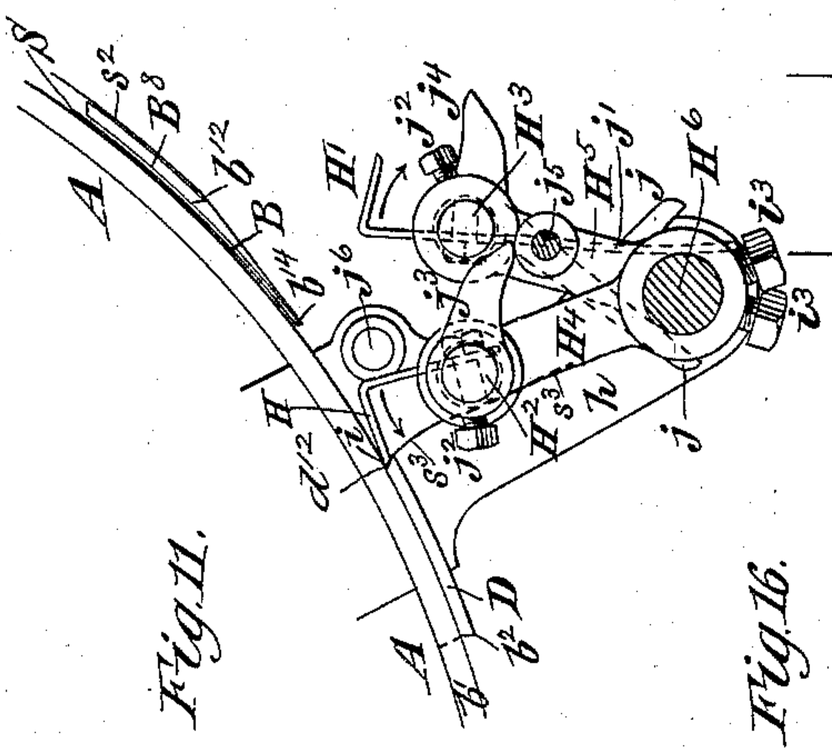
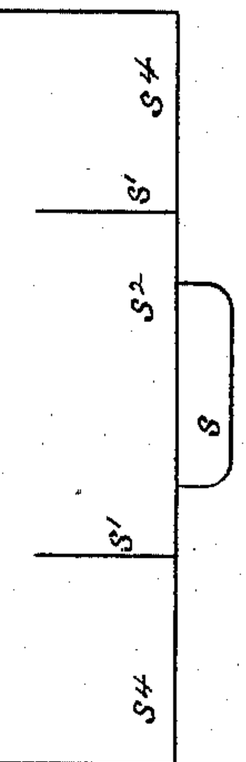


Fig. 16.



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Emil Herter.

Inventor { William Liddell
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UNITED STATES PATENT OFFICE.

WILLIAM LIDDELL, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO ROBERT GAIR, OF SAME PLACE.

MACHINE FOR MAKING SATCHEL-BOTTOM OR SQUARE-BOTTOM BAGS.

SPECIFICATION forming part of Letters Patent No. 370,548, dated September 27, 1887.

Application filed January 19, 1887. Serial No. 224,755. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM LIDDELL, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Machines for Making Satchel-Bottom or Square-Bottom Bags, of which the following is a specification.

Heretofore the machines in use for making satchel-bottom or square-bottom bags have usually been constructed to take the paper from an endless web, form it into a tube, cut the tube transversely into blanks, and then form the bottoms in one continuous operation. It is often desired to have printing upon both sides of the bag and also upon the bottom, and if the printing is left until after the bottom is formed and the bag completed, it cannot be done successfully, because the varied thickness in the bag-bottom, due to the folding and securing of flaps one on another, prevents a clear impression from being made and spoils the type-form. It is also undesirable to perform the whole operation of producing the bags from the web of paper by one machine, because the tube can be made and cut off into blanks many times faster than the bottoms can be formed, and one machine for forming a tube and cutting it transversely to form the blanks will produce enough blanks for several bottom-forming machines. For the above reasons my improvement more especially relates to machines which take the blanks after they have been formed and printed and simply do the work of forming the bottom, although my improvement may, if desired, be embodied in a machine for forming the complete bag from a web of paper.

The several operations which it is necessary to perform in completing the bottom of a bag are, first, to slit the blank from one end inward for a suitable distance, then to open the blank at the end and fold back the topmost thickness of paper, then to close in the sides, then to apply paste at the proper points, then to crease the paper at the proper points to form the outer folds or flaps, and finally to close in these outer folds or flaps one over the other and press them down upon the underlying side folds to cause the proper adhesion of the paste and complete the bottom.

In carrying out my invention I employ a movable bag-support, which may advantageously consist of a rotary cylinder of suitable diameter, and along this support, or around such portion of the circumference of the cylinder as is necessary, are arranged, in the succession named, the slitting-cutters, the opener, the device for applying paste or adhesive substance, the creasing devices, and the closing or pressing devices, which perform the final operations of closing in the outermost flaps and pressing them upon the underlying portions of the bottom. The completed bags are then usually delivered upon an apron, which conveys them to a drying-cylinder. The moving bag support or cylinder is of course provided with grippers, which grasp the under thickness of the blank at its forward end, and in connection therewith I employ a binder, which has its edge parallel with the axis of the cylinder and which, by clamping and pressing the blank upon the cylinder, fixes the position of the center fold, on opposite sides of which the bottom extends equally. In my machine this binder, although operating in conjunction with the moving bag support or cylinder, is entirely independent thereof, and is preferably supported and moved by an endless carrier, which may consist of endless chains, and which is geared so as to travel synchronously with the surface of the moving support or cylinder; and another important feature of my machine is that the endless carrier which is geared with the cylinder and operates the binder also operates the slitting-cutters, the pasting-wheel, the pressing devices, which close in and press on the outermost flaps of the bottom, and delivery-rolls, whereby the completed bag is transferred from the moving surface or cylinder to the delivery-apron, thereby insuring the operation of all these several devices in exact time with the moving support or cylinder.

My invention consists in various novel features of construction and combinations of parts, which are hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a machine embodying my invention. Fig. 2 is a vertical section thereof in a plane transverse to the axis of the cylin-

der. Fig. 3 is a plan of the machine. Fig. 4 is an end elevation thereof, looking from the right hand of Figs. 1 and 2. Fig. 5 is an axial section of certain parts of the machine upon about the plane indicated by the dotted line *x x*, Fig. 1, and looking toward the left from said line. Figs. 6 and 7 are respectively a plan and transverse section, upon a larger scale, of a binder which is attached to the endless carrier. Fig. 8 is a horizontal section, showing the means for securing and adjusting the slitting-cutters upon the shaft which carries them. Figs. 9 and 10 are sectional views, upon a larger scale than the general figures, showing a portion of the cylinder, the grippers, and the opener or opening devices in two positions. Fig. 11 is a partly-sectional elevation of a portion of the cylinder and the forward creasing device, or the creaser which first comes into action. Fig. 12 is a view, similar to Fig. 11, of the two creasing devices, showing the rearward creaser, or that which last comes into operation in its active position. Figs. 13 and 14 are sectional details upon a still larger scale, showing the operative position of the creasers and the shoulders upon the cylinder, in conjunction with which they act to crease the blank. Fig. 15 is a sectional elevation upon the same scale as Figs. 11 and 12, showing the closing-blade or presser which operates to fold the flap which is rearward in the machine forward and upon the underlying portions of the bottom; and Figs. 16, 17, and 18 are diagrams illustrating the manner in which the bag-bottom is formed.

Similar letters of reference designate corresponding parts in all the figures.

I will first refer to Figs. 16, 17, and 18, in order that a clear idea may be had of the several operations which are performed and the parts of the blank which are operated on to complete the bottom.

The bag-blank, ready to be fed into my machine, preferably has upon the under thickness a forwardly-projecting tongue or lip, *s*, which is taken hold of by the grippers, as I shall hereinafter describe, and the blank is of course in the form of a section of a tube. The first operation performed upon the blank is to cut the slits *s'*, (shown in Fig. 16 extending a distance inward from the end corresponding to the size of the bottom which is to be formed,) thereby producing the top and bottom flaps, s^2 s^3, and side flaps or portions, s^4. The next operation is by an opener, which enters the end of the blank and turns or folds backward the upper thickness of the blank along the line s^5, and at the same time, or immediately after this opening, the side flaps or portions, s^4, are folded inward, bringing the several parts to the positions shown in Fig. 17. After paste has been applied upon the proper portions of the incomplete bottom, as indicated by the dotted ground in Fig. 17, the blank is creased upon the lines s^6 s^7, and then the flaps s^2 s^3 are folded inward in opposite directions upon these lines of creasing and are pressed together, so as to cause the pasted surfaces to adhere, thereby bringing the parts to the position shown in Fig. 18, with the flap s^3 outermost.

Turning now to the drawings of the machine, A designates a rotary cylinder, which in this example of my invention constitutes the movable bag-support and which is mounted upon a shaft, A'. This shaft has its bearings in suitable side frames, A^2, and may be operated from a counter-shaft, A^3, on which is a pinion, A^4, gearing into a wheel, A^5, upon the shaft A', as is best shown in Fig. 1. Upon the counter-shaft A^3 is a driving-pulley, A^6, and also, preferably, a wheel, A^7, as shown is Figs. 3 and 4, which forms a convenient means for turning the cylinder, when desired, for the purpose of adjusting the several parts.

In connection with the rotary cylinder, I employ binders B, which are entirely independent of and separate from the cylinder, and which, during a portion of the rotation of the cylinder, serve to press and hold a bag-blank thereon and to fix the place of the center fold in the bottom, which is indicated by the dotted line s^5 in Fig. 17. The binders B are attached to and are moved by an endless carrier, which consists, as here shown, of two chains at opposite sides of the cylinder, and to which the ends of the binder B are secured by bolts *b*, as shown in Figs. 3 and 4. The cylinder A, here represented, is of comparatively small size, and therefore in this example of my invention is intended to complete one bag only at each revolution, and I have shown upon the endless carrier B', at equidistant points in its length, two binders, B, as the carrier is of a length about double the circumference of the cylinder.

Upon the cylinder-shaft A', I have represented chain-wheels B^2, around which the chains B' pass and by which the chains are moved, and said chains are also carried around chain-wheels B^3 B^4 B^5 B^6 B^7, as best seen in Figs. 1 and 2. The chain-wheels B^4 and B^6 serve simply to keep the chain extended and properly direct its course; but the wheels B^3, B^5, and B^7 serve not only to direct the chain, but also receive motion from the chain and transmit such motion to the operating mechanism, which I shall soon hereinafter describe.

The cylinder A has in its periphery an ordinary gripper-recess, *b'*; and b^2 designates the receiving or feeding edge of the cylinder, on which clamp a series of grippers, b^3, mounted upon a shaft, b^4, which is journaled within the cylinder. The cylinder also carries a shaft or stud, b^5, which is geared by wheels b^6 with the gripper-shaft b^4, and has upon its outer end a gripper-cam, b^7, as shown in Fig. 1, and inward of its end an arm, b^8, upon which acts a spring-actuated rod, b^9. Upon one of the side frames, A^2, is a stud or projection, b^{10}, (shown in Figs. 1 and 4,) and when by the rotation of the cylinder in the direction of the arrows shown in Fig. 2 the gripper cam or tumbler b^7 arrives at the stud b^{10}, the gripper-shaft b^4 is turned, so as to open the grippers to the posi-

tion shown in Fig. 2, in which position they are held by the spring-actuated rod b^9. The grippers are held open after passing the stud b^{10} until they arrive at the position shown in Figs. 1 and 2; but as they pass the position there shown the gripper-cam b^7 encounters a stud or projection, b^{11}, upon the side frame, A^2, which closes the grippers, and by turning the stud b^5 the arm b^8 is moved to bring the pressure of the rod b^9 upon the other side of its center, and the spring b^9 thereafter holds the grippers closed.

C^9 designates the feed-board, from which bag-blanks are fed to the cylinder, and as the grippers b^3 close, as just described, they grasp the forwardly-extending lip s on the bag-blank, which is shown in Figs. 16 and 17, and carry forward the blank with the cylinder. As the grippers pass the position of the chain-wheels B^3, slitting-cutters C form in the blank the slits s', as shown in Fig. 11. The construction and mode of operation of these cutters will be best understood from Figs. 2 and 8; but the distance apart of said cutters is shown in Figs. 3 and 4. The cutters are mounted upon a shaft, C', which is journaled in bearings c and on which the chain-wheels B^3 are secured, and thus the cutter-shaft C' is rotated by the chains B'. Through these chain-wheels the cutters are operated in accurate time with the rotation of the cylinder.

The cutters or knives C are carried by cutter-stocks C^2, which are secured by set-screws c' upon the shaft C', and hence it is obvious that the cutters may be adjusted both axially on the shaft C', to bring them at the desired distance apart, or circumferentially upon the shaft. Each cutting blade or knife C is secured by an angular clamping-plate, c^2, to the cutter-stock C^2, and screws c^3, passing through slots in this clamping-plate and the cutter, hold the cutter securely in place upon the stock. The cutter-stock C^2 has lugs or ears c^4 projecting from its face and forming nuts, in which are threaded adjusting-screws c^5, bearing on the back of the clamping-plate C^2. By loosening the clamping-screws c^3, and by turning the adjusting-screws c^5 in one direction or the other provision is afforded for adjusting the cutter or knife C to give it any desired radial projection from the shaft C', and after proper adjustment the knife is held securely in place by the clamping-screws c^3.

In connection with the feeding of blanks to the cylinder, I employ feeding gages or stops d, which are necessary to a proper operation of the machine, although they form no part of my invention. Upon the top of the frame are bearings d', wherein is journaled a rock-shaft, d^2, and this rock-shaft has an arm, d^3, supporting a shaft, d^4, which carries the feed-gages d. The feed-gages are raised by means of a rod, d^5, which extends from a lever, d^6, fulcrumed at its end d^7 and provided with a truck-roller, d^8, on which operates a cam, d^9. By this mechanism, at the proper time and through the rod d^5, the feed-gages d are lifted and the grippers b^3 take a blank to carry it forward with the cylinder. The proper position of the points of the feed-gages on the feed-board is maintained by an arm, d^{10}, which bears upon the rock-shaft d^2, and is held thereon by a spring, d^{11}, as shown in Fig. 2.

Secured to the periphery of the cylinder at its receiving-edge b^2 is a removable plate, D, which may be of brass, and against which the cutters C act, so as to form a comparatively soft bed for the cutters and avoid cutting the cylinder. This removable plate D is also necessary, as its rear edge, d^{12}, forms one of the creasing-shoulders, as will be hereinafter described, and plates D of different widths must be employed for making different-sized bottoms. As the cutters C complete their work of forming the slits s' in the blank, the binder B comes upon the blank rearward of the plate D and grippers, and clamps and holds the blank, which I have represented in the drawings by the letter S, closely against the cylinder. The position of the binder B, when it comes upon and presses the bag-blank S to the cylinder A relatively to the strip D and grippers and relatively to the receiving-edge b^2 of the cylinder, is best shown in Figs. 9 and 10.

It will be observed in Figs. 1 and 2 that the chain-wheels B^3, which carry the chains B', are somewhat removed from the periphery of the cylinder in a radial direction, and consequently the binder B, as it rounds the wheels B^3 and comes nearly to its clamping position on the cylinder, has to pass downward or inward slightly before it clamps tightly upon the bag-blank. Although the chains B move synchronously with the cylinder, this slight downward or inward movement which the binder B has as it comes into action causes it to drag slightly relatively to the cylinder at this point and draws back upon and smooths the blank, which is held at its foward end by the grippers b^3.

The construction of the binder itself is best shown in Figs. 6 and 7. It consists of a stock piece or plate, B^8, which is attached directly to the chains B', and the binder proper, B, which consists of a wider plate secured by screws b^{13} to the stock piece or plate B^8. As is shown in Fig. 6, a greater number of screw-holes are provided in the binder proper than there are screws, and this enables the binder proper to be adjusted on its stock piece or plate B^8, so as to bring its edge b^{14} at a greater or less distance from the edge b^{12} of the stock piece or plate B^8. The edge b^{14} of the binder proper defines or fixes the place of the center fold in the bottom, (indicated by the dotted line s^5 in Fig. 17,) while the edge b^{12} constitutes a creasing-shoulder, as hereinafter described, and defines or fixes the place of one of the side folds of the bottom, as indicated by the line s^6 in Fig. 17. The shoulders b^{12} d^{12} may be considered as provided, respectively, upon the binder and upon the cylinder. When a bottom is to be formed of larger or smaller

size than that shown, a strip D larger or smaller than that shown in the drawings, is substituted for the one there shown, and the binder proper, B, is adjusted outward or inward relatively to the shoulder b^{12}, and secured in its new position. When the machine is to be adapted for operating on a different-sized bag, it is obvious that the distance from the receiving-edge b^2 of the cylinder at which the edge b^{14} of the binder B comes upon the cylinder must be varied, and this adjustment may be accomplished by turning the cylinder A relatively to the chain-wheels B^2, or by turning said chain-wheels relatively to the cylinder. Preferably the cylinder is turned as it necessitates the adjustment of but one part. If a bottom of larger size is to be formed, a wider strip D is substituted, the binder B is moved ahead relatively to the creasing-shoulder b^{12}, and the cylinder A is turned ahead upon its shaft relatively to the chain-wheels B^2. If a bottom of smaller size is to be made, the reverse adjustments are performed. The cylinder may be secured upon its shaft A′ by a set-screw, b^{15}, as shown in Fig. 5, in order to provide for its proper adjustment.

After the binder B comes to clamping position on the blank the next operation is the opening of the blank and the folding backward of its uppermost thickness along the edge of the binder. (Indicated by the dotted line s^5 in Fig. 17.) This operation is performed by an opener, D′, which is shown in Fig. 2, but with greater clearness in Figs. 9 and 10. The shape of the opener is shown in Figs. 4, 9, and 10, and it consists of a flat plate adjustably secured by screws or bolts *e* to a bracket, D^2, upon the shaft D^3. The screws or bolts *e* may be passed through slots, so as to provide for adjusting the opener D′ at the desired angle, and when the moving bag-support consists of a cylinder, as here shown, the opener should be curved lengthwise, as it here is, to conform approximately to the curvature of the cylinder. The opener D′ has a tilting or rocking motion upon its shaft D^3, and this is the only motion that the shaft D^3 has, the chain-wheels B^4 being loose thereon. In this example of my invention the opener D′ is drawn toward the cylinder by means of a spring, *e*′, and is moved away from the cylinder by an arm, D^4, on the shaft D^3 and a rod, D^5, which is connected with the lever D^6, fulcrumed at e^2, and the cam D^7, concentric with the cylinder-shaft A′. The movement of the opener D′ toward the cylinder is limited by a stop, *n*, (shown in Fig. 2,) against which the arm D^4 bears. The point of the opener as the open end of the bag-blank reaches it is depressed close to the cylinder, and by passing into the open end of the bag-blank, or rather by the movement of the bag-blank over it, the upper thickness of paper in the blank is folded backward upon the edge b^{14} of the binder B, which is represented by the dotted line s^5. This opening action brings the flap s^2 backward upon the body of the bag, and the two side flaps or portions, s^4, are, by the opening action, closed inward in the direction toward the surface of the cylinder, and toward but not to the position shown in Fig. 17. The rocking or tilting action which is imparted to the opener D′, and which raises its forward end or point away from the cylinder, is to enable the binder B to pass under the opener, and, in order to smooth the backwardly-folded paper down upon the binder and surface of the cylinder, the opener D′ is preferably provided on its under side with a friction-producing surface. This surface is here represented as consisting of a pad, e^3, which may be of india-rubber, and which is supported in a slot, e^4, in the opener D′ by a spring, e^5. The friction-pad e^3 is therefore pressed down against the paper with a yielding force as the paper passes under it, and the flap s^2 of the bag-bottom is smoothed backward closely upon the binder and surface of the cylinder.

Before paste can be properly applied it is necessary to close in and press down against the surface of the cylinder the side flaps or portions, s^4, (see Fig. 17,) and this office is performed by a pair of clamps, E, arranged at opposite sides of the cylinder, as best shown in Fig. 5. The clamps E are supported by bell-crank levers or bent arms E′, which are fulcrumed at e^6 to brackets E^2, secured, as here represented, to the cylinder-hub. The faces of these brackets and the corresponding sides of the arms or levers E′, which bear against them, may be faced off truly, so that they will guide the said levers in their swinging movements in the directions indicated by the double-headed arrows in Fig. 5. These levers E′ are therefore carried round in a rotary path by the rotation of the cylinder; and upon their ends are rollers e^7, which at the proper time come against cams E^3 and thereby move the levers E′ inward toward each other through slots e^8 in the cylinder and bring the clamps E to a bearing upon the side flaps or side portions, s^4, to press such portions closely to and confine them against the surface of the cylinder. The movement of the clamps E in a direction away from each other may be performed by springs e^9 applied to rods e^{10}, which are pivoted to the bell-crank levers E′. It will therefore be understood that as the opener D′ completes its operation the clamps E close the side portions or flaps, s^4, inward and hold them in place ready for the application of paste or adhesive substance by the paste wheel or segment F. This paste wheel or segment F is upon a shaft, F′, which is mounted in swinging bearings F^2, pivoted at f^{12}, and a rotary motion in the direction of the arrow is imparted to this paste-wheel by the endless chains B′, which engage with chain-wheels B^5, and through them rotate the shaft and paste-wheel.

F^3 designates a paste-fountain, in which rotates a fountain-roller, F^4; and between this fountain-roller and paste-wheel F is an intermediate roller, F^5. By means of a belt, *f*, passing from a pulley, *f*′, on the shaft of the

paste-wheel to a pulley, f^2, on the shaft of the fountain-roller F^4 and under a pulley, f^3, on the intermediate roller, F^5, these several parts will be rotated in the directions indicated by the arrows in Figs. 1 and 2. From these arrows it will be seen that the intermediate roller, F^5, is rotated in a reverse direction to the paste-wheel and fountain-roller, and serves to grind up any lumps of paste before they are applied to the paste-wheel. A scraper, f^4, may be employed to free the roller F^5 of any surplus paste.

The journals of the fountain-roller F^4 are fitted in sliding bearings f^5, which may be adjusted by means of screws f^6, so as to bring the fountain-roller into proper bearing against the intermediate roller, F^5, which also has its bearings in sliding boxes f^7. The screws f^8 serve to adjust the swinging bearings F^2 of the paste-wheel, so as to limit the approach of said wheel toward the cylinder, and springs f^9 may be employed for maintaining a constant pressure upon the paste-wheel in a direction toward the cylinder.

I have before described that the endless chains B′, here shown, are represented as provided with two binders, B, at equidistant points in their length, and it is necessary or advantageous to employ a segment of a paste-wheel instead of a complete cylinder, because then opportunity is afforded for the passage of one binder between the shaft of the paste-wheel and the roller F^5 while the other binder is in action to hold a bag-blank upon the cylinder.

The surface to which paste is to be applied of course varies with different-sized bags, and the paste wheel or segment F is therefore provided with adjustable strips or pieces f^{10}, which constitute the surface whereby paste is applied over the area indicated by stippling in Fig. 17. In order to better hold the folded portions of the bottom flat upon the cylinder while paste is being applied, I have represented guards F^6, which are shown clearly in Fig. 2 and also in Fig. 4. These consist simply of curved strips, which hang from a rod, F^7, extending across the face of the cylinder, and which may be adjusted thereon at any desired distance apart and secured by set-screws f^{11}. These guards F^6, being hung at their upper ends at about midway in the height of the cylinder shown, fall clear from the surface of the cylinder by gravity, as shown in Fig. 2, and as the paste-segment comes to its work it presses these guards tightly down against the folded bottoms of the blank and maintains them in such position during the operation of applying the paste.

From Fig. 4 it will be understood that the guards F^6 are set at such distance apart that the facing-strips f^{10} upon the paste-segment F just pass between them, and they therefore prevent the application of paste to any but the proper surfaces of the bag-blank. On the rod F^7 is a stop-arm, *o*, which by contact with the supporting-bracket *o′* limits the movement of the guards F^6 away from the cylinder.

After paste has been applied the next operation is to properly crease the bag-blank upon the shoulders d^{12} b^{12}, formed, respectively, by the rear edge of the strip D and the forward edge of the stock piece or plate B^8, the same being performed along the dotted lines s^6 s^7. (Shown in Fig. 17.) This creasing is performed by two creasing-blades or creasers, H H′, which, as best shown in Figs. 11 and 12, are bent into angular form or made in the form of angle-plates secured to the rock-shafts H^2 H^3. These rock-shafts are journaled in pairs of arms H^4 H^5, which are mounted on a rotary shaft, H^6, supported in bearings *h* upon the two side frames, A^2. The shaft H^6, together with the arms H^4 H^5, constitutes a rotary carrier for the creasers H H′, and the parts are so organized in this example of my invention that at each creasing operation the rotary carrier makes one complete rotation in the direction indicated by the arrows in Figs. 11 and 12 and also in Fig. 2.

Upon the end of the shaft H^6 is a gear-wheel, *h′*, and upon the cylinder-shaft A′ is an arm, H^7, carrying a gear-sector, h^2, which engages once during each revolution of the cylinder with the gear wheel or pinion *h′*, and so rotates the creaser-carrier. It is important to the proper operation of these parts that the sector h^2 should come smoothly and accurately into gear with the wheel *h′*, and to effect this result I have represented the wheel *h′* as having secured to it an arm, h^3, carrying a projecting tooth, h^4, and on the sector-arm H^7 is a pin, h^5, which comes in contact with the tooth h^4, and, by starting the creaser-carrier slightly ahead, brings the teeth of the sector h^2 accurately into gear with those of the wheel *h′*.

The sector-carrying arm H^7 is secured fast upon the shaft A′, and, as I have shown in Figs. 2 and 5, the cam D^7, which serves to operate the opener D′, is secured to the sector-arm by bolts h^6, which pass through slots in the arm and through holes in the cam. These arc-shaped slots h^7 are shown by dotted lines in Fig. 2, and this adjustment of the cam provides for accurately fixing it in place to operate the opener D′ at the proper time.

In Fig. 2 I have represented the creaser-carrier as in the position at which it is at rest and at which the sector h^2 engages with the wheel *h′*. In this position it is held by the projection or stop h^8, resting against the top of the pawl or yielding stop h^9, which is pivoted at h^{10}, and by a spring, h^{11}, is held in the path of said stop, as shown in Fig. 2. Upon the end of the carrier-shaft H^6, I have represented an arm, h^{12}, (see Fig. 1,) to which is connected a spring, h^{13}. When by the rotation of the cylinder in the direction of the arrows, Fig. 2, the sector h^2 gears into the wheel *h′*, the creaser-carrier is turned from the position shown in Fig. 2 in the direction indicated by the arrows somewhere about a half-revo-

lution, and as the sector leaves the wheel h' the spring h^{13}, which has been put under tension, exerts its force and completes the rotation of the carrier, the action of the spring and the momentum of the rotary carrier causing the projection or shoulder h^8 to push aside and pass the yielding stop h^9, and then to come back to a bearing thereon, as shown in Fig. 2.

As best shown in Figs. 13 and 14, the creasing shoulders d^{12} b^{12}, with which the cylinder and binder are respectively provided, are undercut or grooved next the cylinder, and, as shown in Figs. 11 and 12, the creasing-edges i i' of the creasers H H' are correspondingly beveled. It will be understood that in order to properly effect the creasing operation the distance apart of the creasing edges i i' along the line i^2 (see Fig. 12) must be equal or very slightly less than the distance between the creasing-shoulders d^{12} b^{12}, and, inasmuch as these shoulders d^{12} b^{12} are adjusted at different distances apart for different-sized bags, the creasers H H' must be correspondingly and equally adjusted. This result may be accomplished by turning one pair of arms, H^4 or H^5, relatively to the other pair upon the shaft H^6, and I have represented the arms as secured upon the shaft by set-screws i^3, whereby provision is afforded for the rotary adjustment of one pair relatively to the other.

It will be understood that if the creasers H H' have the proper radial projection from the axis of the shaft H^6 they will, when they are brought nearest the cylinder by the rotation of the creaser-carrier, pass the shoulders d^{12} b^{12}, or, in other words, come in the same plane therewith, as shown in the case of the creaser H' in Fig. 12 and the creaser H in Fig. 11. The rock-shafts H^2 H^3 are not held fast in the arms H^4 H^5, but are held against turning therein by yielding and elastic resistance devices, and in this example of my invention the resistance devices for holding each rock-shaft H^2 H^3 against turning consist of a fork or bifurcated arm embracing the shaft H^6 and composed of two members, j j', as best shown in Figs. 11 and 12 and also in Fig. 2. The member or jaw j of the fork is rigid and secured fast to the rock-shaft H^2 or H^3 by a set-screw, j^2; but the other member, j', is elastic or yielding, or consists of a spring-arm, which may be secured by a bolt to the flattened portion of the rock-shaft H^2 or H^3, to which the creaser H or H' is secured. This construction will permit the creasers to yield or move in the direction indicated by the arrows adjacent to them in Figs. 11 and 12, but will hold the creasers securely against movement in a reverse direction. In other words, the rock-shafts H^2 H^3 will yield slightly under the resistance of the spring-arms j', to permit the described movement of the creasers.

Upon one end of the rock-shaft H^2 is a toe or short arm, j^3, and upon the other end of the rock-shaft H^3 is a corresponding toe, j^4.

Attached to one of the brackets supporting the bearings h for the carrier-shaft H^6 is an arm or cam-like projection, j^5, with which the toe j^3 on the rock-shaft H^2 makes contact as the creaser-carrier is rotated, and upon the corresponding bracket, at the other side of the machine, is a similar roller or cam-like projection, j^6, with which the toe j^4 on the rock-shaft H^3 makes contact as the creaser-carrier is rotated. In order to properly effect the creasing, it is necessary that the creasers, in addition to their movement in a circular path by the rotation of their carrier, should have a slight independent movement upon the axes of their respective shafts H^2 H^3. This movement will press or throw the creaser H slightly forward in the direction indicated by the arrow thereon in Figs. 11 and 12, and will throw or press the creaser H' slightly backward in its rotary motion. This slight pressure or movement of the creasers independent of their rotary motion throws the beveled edge of the creaser H forward into the undercut groove or depression in the creasing-shoulder d^{12}, so as to raise the flap s^3 away from the surface of the cylinder and cant it backward, as shown in Figs. 11, 12, and 15, and the backward pressure or movement which is momentarily imparted to the creaser H' forces its beveled edge into the beveled or undercut edge of the binder, which constitutes the shoulder b^{12} and gives the flap s^2 a forward inclination, as shown in Fig. 12. In order that the creasing action of these devices H H' may be better understood, I have in Figs. 13 and 14 shown upon a very large scale the edge portion of the creasers, together with the shoulders upon which they act. As the creaser-carrier is rotated in the direction of the arrow in Fig. 2, the creaser H has its edge i first brought into coincidence with the creasing-shoulder d^{12}, and by the toe j^3 at that moment striking the roller or cam-like projection j^5 the creaser is given a momentary and slight forward movement independently of its forward rotary motion, whereby its edge is caused to crease and set backward the flap s^3, as shown in Fig. 13. After the creaser H has performed its office the creaser H' comes to the position shown in Figs. 12 and 14, and by the toe j^4 at this instant striking the roller or cam-like projection j^6 the creaser H' is moved momentarily and slightly backward and caused to properly crease the paper and to direct the flap s^2 forward.

The paper having been thus creased to give the flaps s^2 s^3 the desired direction, it only remains, to complete the bag-bottom, to close such flaps down upon the underlying portions of the bottom and to press them to secure their adhesion to the bottom portions by the paste. The office of closing and pressing down the two flaps is performed by the closing blade or presser J and by an endless apron, K. The closing blade or presser J is carried upon a rock-shaft, j^7, which is journaled in arms j^8, extending from a rock-shaft, j^9, and to this latter shaft, at one end, is secured an arm, j^{10}. The rock-shaft j^7, which carries the closing blade or plate or presser J, has an arm, j^{11}, to

which are attached in this example of my invention, and as best shown in Fig. 2, a spring, j^{12}, and a cord, j^{13}. As shown in Fig. 2, the parts are in a position of rest; but upon the sector-carrying arm H^7 is a cam, j^{14}, and when this cam, by the rotation of the cylinder, comes to the arm j^{10} the shaft j^9 is turned, and the arms j^8, together with the closing blade or presser J, are swung upward in the direction of the arrow shown thereon in Fig. 2. As soon as the cord or flexible connection j^{13} is taut, it pulls upon the arm j^{11} and thereby swings the blade or presser J upward and forward until it is nearly at right angles to the arms j^8 and conforms nearly to the curvature of the cylinder. By this action the flap s^2, which was previously creased against the shoulder b^{12}, is folded forward against the underlying portions of the bag-bottom and pressed closely against the pasted surfaces thereon. A spring, j^{18}, applied to an arm, j^{17}, on the shaft j^9, returns the plate or presser J to the position shown in Figs. 1 and 2, after operation by the cam j^{14}, such return being limited by the stop-arm j^{19} striking the bracket j^{20}. On the shaft j^7 is an arm, j^{15}, which by contact with the stop-pin j^{16} holds the presser J in the position shown in Fig. 2.

The apron K is mounted upon rollers K' K^2, which are free to turn owing to the apron making contact with the surface of the cylinder A, and the apron is maintained pressed against the cylinder-surface by the roller K^2 and by a small roller, k, which is carried by arms k', projecting from a rock-shaft, k^2. The rock-shaft k^2 has a downwardly-extending arm, k^3, as shown in Fig. 1, and by means of a spring, k^4, applied to the said arm the roller k is caused to maintain a constant pressure of the apron K against the cylinder. As soon as the flap s^3 comes against the roller K^2, as shown in Fig. 15, it is pressed down against the underlying pasted surfaces of the bag-bottom, and by the passage of the bag-blank between the cylinder A and the apron K the firm adhesion of the several folds in the bottom is secured.

It will be understood that before the creasing of the bag is performed by the creasers H H′ the grippers b^3 have released their hold upon the lip s of the bag-blank, thereby leaving both flaps s^2 s^3 free to assume the positions resulting from the action of the creasers H H′. The chain-wheels B^7 are in this example of the invention secured fast to and impart motion to a shaft, L, (shown in Fig. 2,) and the apron-roller K′ is loose and free to turn on this shaft.

I have in Fig. 2 shown a portion of a delivery-apron, M, which is upon a roller, m, and which is employed to convey the completed bag to a drying-cylinder of usual construction, and which I have not shown. For transferring the completed bag from the apron K to the delivery-apron M, I have represented a pair of feed-rolls, M′ M^2, which are geared together by pinions m', as shown in Fig. 1, and which are journaled in an arm, M^3, hung from a shaft, M^4. By means of a belt, m^5, and pulleys m^6 m^7 motion is transmitted from the shaft L to the shaft M^4, and by means of a belt, m^8, and pulleys m^9 m^{10} motion is transmitted from the shaft M^4 to the pair of rolls M′ M^2. By means of the rolls M′ M^2 the bag as it protrudes from between the apron K and the cylinder A is grasped and transferred onto the delivery-apron M, and inasmuch as said rolls receive their rotary motion from the endless chains B′, which move synchronously with the cylinder, it will be understood that the speed of delivery of the rolls will conform to the speed of the cylinder and chains.

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

1. In a machine for bottoming bags, the combination, with a traveling bag-support, of a binder moving with but entirely unconnected with the support and serving to clamp the bag upon the support and to fix the place of the fold in the bag, substantially as herein described.

2. The combination, with a movable bag-support, of a binder for clamping the bag to the support and over which the bag is folded in forming the bottom, and a carrier for the binder independent of the support, but geared to move synchronously with the support, substantially as herein described.

3. The combination, with a rotary cylinder forming a bag-support, of an endless carrier geared to move synchronously with the cylinder, and a binder secured to said carrier parallel with the axis of the cylinder and serving by its edge to fix the place of the fold at the center of the bag-bottom, substantially as herein described.

4. The combination, with a rotary cylinder forming a bag-support, of chain-wheels concentric with and at opposite sides thereof, endless chains gearing with said wheels and having attached to them the ends of a binder for fixing the place of the central fold in the bag-bottom, and supporting chain-wheels whereby the chains are caused to move in a path concentric to the cylinder throughout a portion of its circumference and to return the binder at a distance from the cylinder to its starting-point, substantially as herein described.

5. The combination, with a rotary cylinder forming a bag-support, of an endless carrier geared to move synchronously therewith and provided at about equidistant points in its length with binders, which act alternately to hold a bag against the cylinder and fix the place of the central fold of its bottom, a paste-roller, and a paste-segment, or a wheel having a gap in its circumference for transferring paste from the paste-roller to a bag-blank, whereby provision is afforded for the passage of the binders between the paste-roller and the segment-wheel, substantially as herein described.

6. The combination, with a rotary cylinder forming a bag-support, of an endless carrier geared to move synchronously with the cylinder and provided with a binder for holding

a bag against the cylinder and to fix the place of the central fold of the bag-bottom, and wheels for supporting the carrier, the wheels which are at the point where the binder comes upon the cylinder being arranged with their peripheries slightly removed from the plane of the cylindric surface, so as to give the binder as it comes against a bag a slight drag, which will smooth the paper, substantially as herein described.

7. The combination, with a movable bag-support and an endless carrier geared to move synchronously therewith, of a binder serving to hold a bag to the support and consisting of a stock piece or plate, B^8, attached at the ends to the carrier, and the adjustable plate or blade B, the edges of the two said parts serving to fix the place of the center and one side fold of the bag, substantially as herein described.

8. The combination, with a rotary cylinder forming a bag-support, chain-wheels concentric therewith, and a common shaft on which the cylinder and wheels have a rotary adjustment one relatively to the other, the cylinder having upon its surface a creasing-strip parallel with its axis to fix the place of one of the side folds of the bag-bottom, of endless chains moved by said wheels and carrying a binder composed of the stock piece or plate B^8 and the adjustable piece or plate B, which serve, respectively, to fix the places of the center fold and the other side fold of the bag-bottom, and mechanism, substantially as described, for opening, pasting, creasing, and closing the flaps of the blank or bag, substantially as herein set forth.

9. The combination, with a movable bag-support and a binder geared to move synchronously therewith, of a cutter shaft, C′, cutter-stocks C^2, adjustable axially and circumferentially on the shaft, the knives C, their angle clamping-plates c^2, and the knife clamping and adjusting screws c^3 c^5, substantially as herein described.

10. The combination, with a movable bag-support and an endless carrier geared to move synchronously with the said support and provided with a binder for holding a bag-blank on the support and fixing the place of the center fold to form the bottom, of a rotary cutter or cutters for slitting the bag-blank, and which is or are operated by said carrier, substantially as herein described.

11. The combination, with a movable bag-support and a binder for holding a bag thereto and fixing the place of the fold in the bag-bottom, and geared to move synchronously with the support, of an opener having a tilting or rocking action, whereby it is brought close to the support to enter the open end of the bag-blank and is then raised to permit the binder to clear it, substantially as herein described.

12. The combination, with a movable bag-support and a binder for holding a bag-blank thereto and fixing the place of its fold, and geared to move synchronously with the cylinder, of a tilting or rocking opener, whereby the end of the bag-blank is opened and folded over the binder, and which has a friction surface on its under side for drawing the paper back smoothly over the binder, substantially as herein described.

13. The combination, with a rotary cylinder forming a bag-support, of an endless carrier geared to move with the cylinder and a binder, B, upon the carrier, whereby the bag-blank is clamped upon the moving cylinder, an opener, D′, curved lengthwise to the approximate curvature of the cylinder and having a tilting or rocking action, whereby it is brought close to the cylinder to open the open end of the bag-blank and is then raised to permit the binder to clear it, substantially as herein described.

14. The combination, with a movable bag-support and a binder, B, geared to move synchronously with the support, of an opener, D′, provided with a spring-supported friction-pad, e^3, substantially as herein described.

15. The combination, with the cylinder A and a binder geared to move synchronously therewith, of the tilting or rocking opener D′, a spring for holding the opener in position to enter the open end of a bag-blank, and cam-actuated connections for tilting the opener to permit the binder to pass beneath it, substantially as herein described.

16. The combination, with a movable bag-support and an endless carrier geared to move synchronously with the support, of a binder upon the carrier, serving to clamp the bag-blank on the support, an opener for entering the open end of the bag-blank and folding it backward, and side clamps, E, for closing in upon the support the sides of the bag-blank after the operation of opening, substantially as herein described.

17. The combination, with a movable bag-support and an opener for entering the open end of the bag-blank and folding it over and backward, of the levers E′, working in slots in said support transversely to its line of movement and armed at the ends with side clamps, E, and cams upon which the ends of the levers E′ bear and which serve to move them inward to close and hold the clamps on the bag-blank, substantially as herein described.

18. The combination, with a rotary cylinder forming a bag-support and an opener for opening the blank, of a paste-wheel for applying adhesive substance to the partially-formed bottom, and guards or clamps which are between the said cylinder and wheel and which are by the wheel pressed against the partially-formed bag-bottom, substantially as herein described.

19. The combination, with the rotary cylinder and an opener for opening or spreading the blank, of the paste wheel or segment F and the clamps or guards F^6, hung at their upper ends to drop away from the cylinder by gravity, and which are by said wheel or seg-

ment pressed against the partially-formed bottom and cylinder, substantially as herein described.

20. The combination, with a movable bag-support and an endless carrier geared to move synchronously therewith and carrying a binder for holding a bag-blank on the support and fixing the place of its fold, of a paste wheel or segment geared with said endless carrier, substantially as herein described.

21. The combination, with a movable bag-support and an endless carrier geared to move synchronously therewith and carrying a binder for holding a bag-blank on the support and fixing the place of its fold, and mechanism operating in connection therewith to open the bag-blank and form the folds of the bottom, and the paste wheel or segment geared with said endless carrier, of a fountain-roll and a roller interposed between the wheel or segment and the fountain-roll, and geared to rotate in a reverse direction to the fountain-roll, whereby lumps of paste will be ground or crushed before passing to the paste wheel or segment, substantially as herein described.

22. The combination, with the cylinder A and the paste-segment F and fountain-roll F^4, both arranged in movable bearings, and the interposed roller F^5, of the screws f^8 f^6 for adjusting the said bearings, and the springs f^9 for pressing the paste-segment upon the bag bottom and cylinder after leaving the roller F^5, substantially as herein described.

23. The combination, with a movable bag-support provided with grippers and having rearward of the grippers a shoulder, d^{12}, and a binder geared to move with the support and having a shoulder, b^{12}, of a pair of creasing devices or creasers and a rotary carrier therefor, by the movement of which the creasers are projected inward past the said shoulders to crease the blank to form the flaps or folds for the bottom, substantially as herein described.

24. The combination, with a rotary cylinder and a binder geared to move synchronously therewith, said parts being provided with creasing-shoulders, of a pair of creasers and a rotary carrier therefor geared with the cylinder and arranged to make one rotation at each operation, and a yielding stop past which the creaser-carrier moves as it completes each rotation and which holds it against backward movement, substantially as herein described.

25. The combination, with a rotary cylinder and a binder geared to move synchronously therewith, said parts being provided with creasing-shoulders, of a pair of creasers mounted on a rotary carrier, which is arranged to make one rotation at each operation, a sector on the cylinder-shaft serving to rotate the creaser-carrier throughout the first portion of its rotation, a spring for completing the movement of said carrier, and a stop which yields to the direct rotation of the carrier and blocks its return rotation, substantially as herein described.

26. The combination, with a movable bag-support and a binder geared to move synchronously therewith, said parts being provided with creasing-shoulders, of a pair of creasers and a rotary carrier, whereon they are mounted and by the movement of which the creasers are projected inward past said shoulders, and cams whereby the creasers are forced, the one forward and the other backward, during and independent of their rotary movement, to crease the blank, substantially as herein described.

27. The combination, with a movable bag-support and a binder geared to move synchronously therewith, said parts being provided with creasing-shoulders, of a pair of creasers or creasing-blades for operation in conjunction with said shoulders, and a rotary shaft and pairs of arms on said shaft carrying the creasers, the arms carrying one creaser being adjustable on the shaft relatively to those carrying the other creaser, substantially as herein described.

28. The combination, with the cylinder and binder provided with creasing-shoulders, of the shaft H^6, the arms H^4 H^5 on the shaft, the rock-shafts H^2 H^3, carrying the creasers H H′, and turnable in said arms and provided with toes j^3 j^4, yielding and elastic resistance devices for holding the rock-shafts against turning, and cam projections on which said toes act to turn the rock-shafts and press the creasers one forward and the other backward, substantially as herein described.

29. The combination, with the cylinder and binder provided with creasing-shoulders, of the shaft H^6 and its arms H^4 H^5, the rock-shafts H^2 H^3, turnable in said arms and each having a fork embracing the shaft H^6, and one side or member of which is elastic, the toes j^3 j^4, and creasers H H′ on said rock-shafts, and the cam projections j^5 j^6, on which said toes act to turn the rock-shafts, substantially as herein described.

30. The combination, with a movable bag-support, an endless carrier geared to move synchronously with said support and carrying a binder for clamping a bag-blank to the support, and the opening, paste-applying, and creasing devices operating in connection therewith, of a closing plate or presser carried by a rock-shaft, and which by the turning of said shaft is operated to close the rearward flap of the bottom forwardly upon the support, substantially as herein described.

31. The combination, with a rotary cylinder and opening, paste-applying, and creasing devices operating in conjunction therewith, of the closing plate or presser J, the shaft j^7, on which it and the arm j^{11} are mounted, the rock-shaft and arms j^9, j^{10}, and j^8, carrying the shaft j^7, and a cam and spring for operating said plate or presser in reverse directions, substantially as herein described.

32. The combination, with a rotary cylinder and a binder upon an endless carrier,

which is geared to move synchronously with the cylinder, of opening, paste-applying, and creasing devices operating in conjunction with the cylinder and binder, and a pressing-apron for holding the formed bottom in position against the cylinder, substantially as herein described.

33. The combination, with a rotary cylinder and a binder upon an endless carrier, which is geared to move synchronously with the cylinder, of opening, paste-applying, and creasing devices operating in conjunction with the cylinder and binder, a delivery-apron, and delivery-rolls for transferring the completed bag from the cylinder to the apron and which are geared with and operated by the endless carrier, substantially as herein described.

WILLIAM LIDDELL.

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