(No Model.)

8 Sheets—Sheet 1.

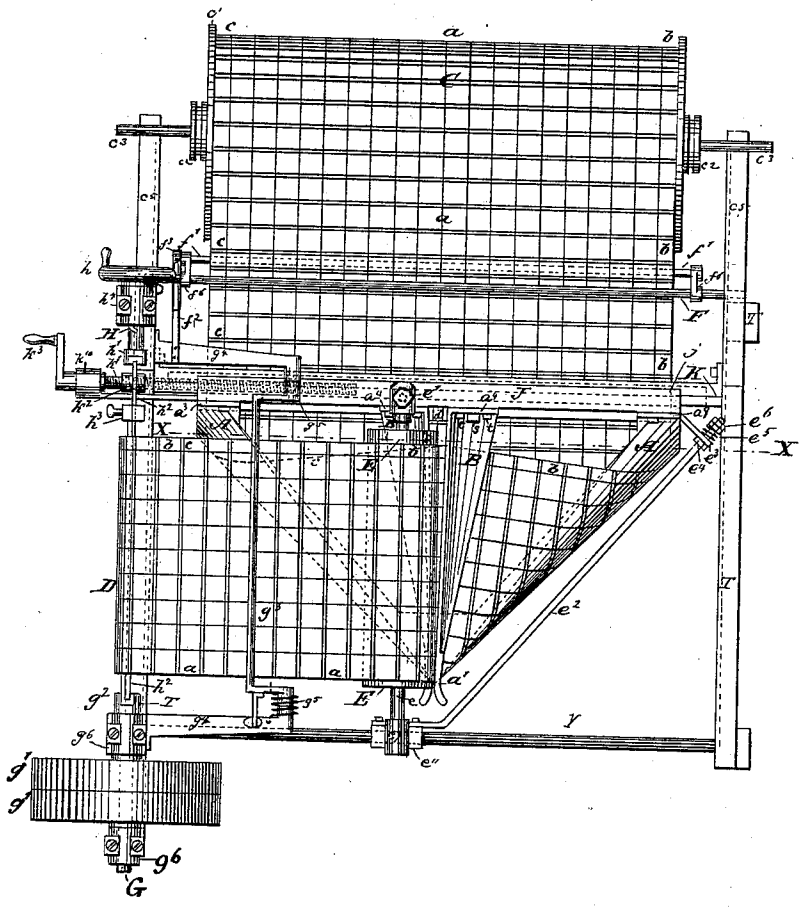
P. H. WATSON, Dec'd.

R. R. WATSON, Executrix.

MACHINE FOR PLICATING AND PACKAGING FABRICS.

No. 359,584. Patented Mar. 15, 1887.

Fig. 1.



WITNESSES:

L. B. Hills

W. B. Masson

INVENTOR

Peter H. Watson,

BY E. E. Masson

ATTORNEY

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.)

8 Sheets—Sheet 2.

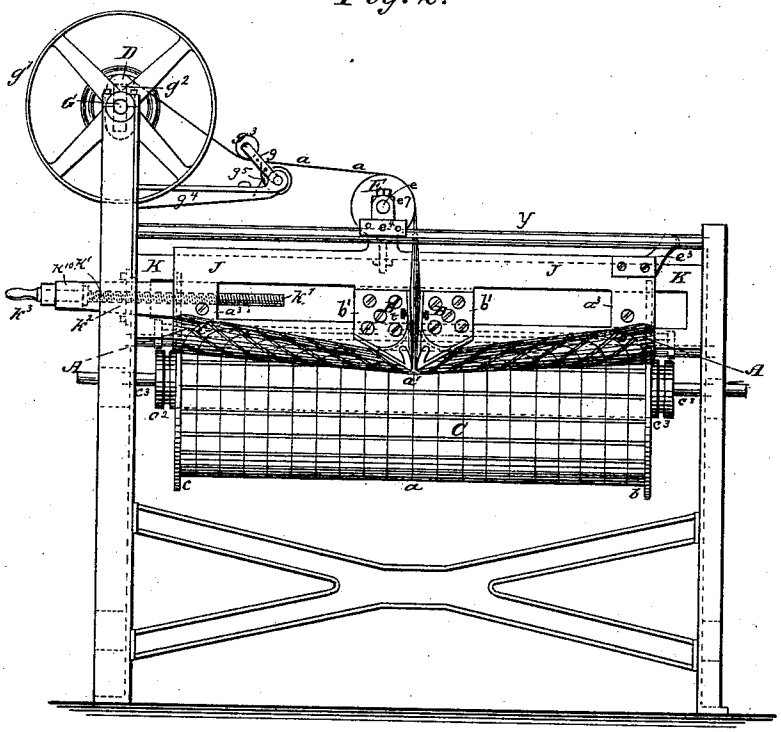
P. H. WATSON, Dec'd.

R. R. WATSON, Executrix.

MACHINE FOR PLICATING AND PACKAGING FABRICS.

No. 359,584. Patented Mar. 15, 1887.

Fig. 2.



WITNESSES:

L. C. Hills

W. B. Masson

INVENTOR

Peter H. Watson

BY E. E. Masson

ATTORNEY

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 3.

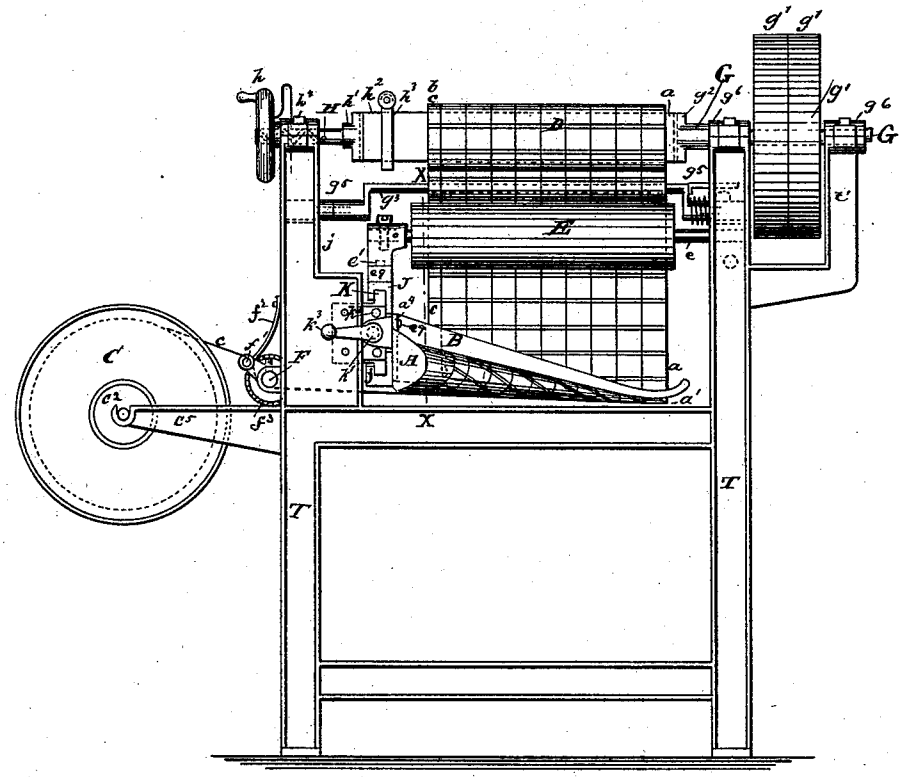
P. H. WATSON, Dec'd.

R. R. WATSON, Executrix.

MACHINE FOR PLICATING AND PACKAGING FABRICS.

No. 359,584. Patented Mar. 15, 1887.

Fig. 3.



WITNESSES:

L. B. Hills

W. B. Masson

INVENTOR

Peter H. Watson,

BY E. E. Masson

ATTORNEY

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

8 Sheets—Sheet 4.

P. H. WATSON, Dec'd.

R. R. WATSON, Executrix.

MACHINE FOR PLICATING AND PACKAGING FABRICS.

No. 359,584. Patented Mar. 15, 1887.

Fig. 4a

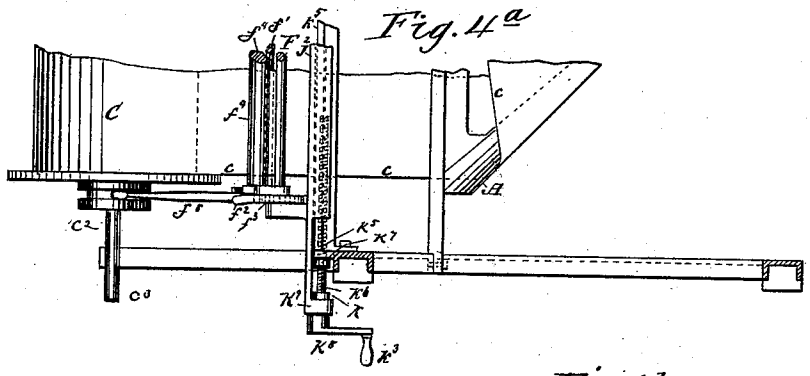


Fig. 4b

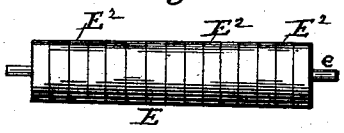
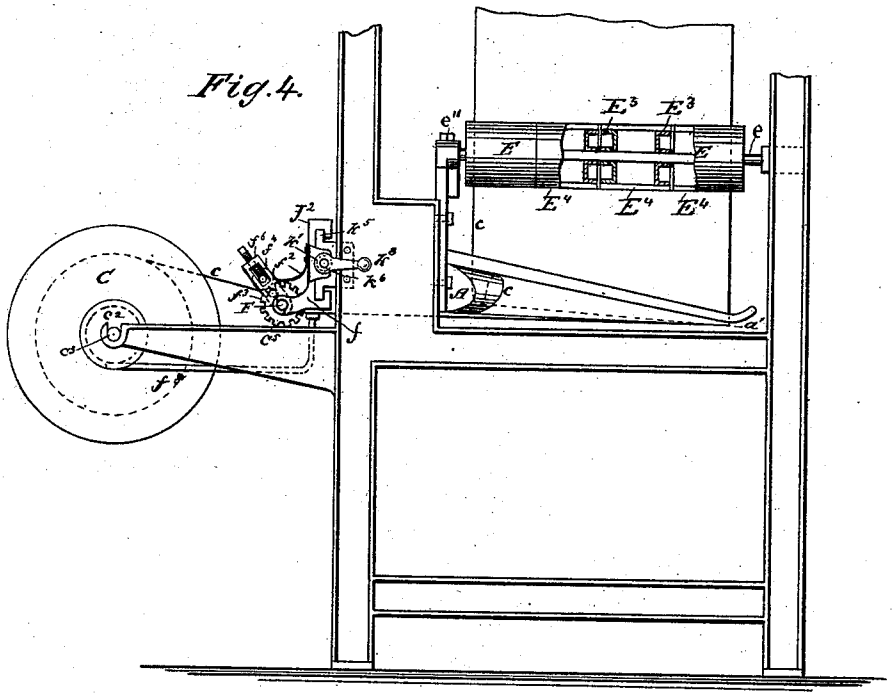


Fig. 4.



WITNESSES:

L. b. Hills

G. W. B. Masson

INVENTOR

Peter H. Watson,

BY E. E. Masson

ATTORNEY

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

8 Sheets—Sheet 5.

P. H. WATSON, Dec'd.

R. R. WATSON, Executrix.

MACHINE FOR PLICATING AND PACKAGING FABRICS.

No. 359,584. Patented Mar. 15, 1887.

Fig. 5.

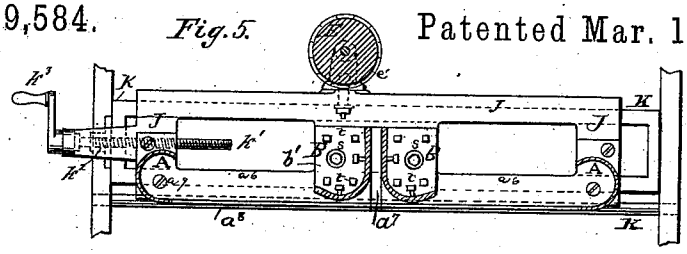


Fig. 6.

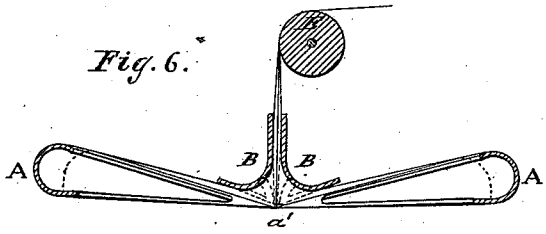


Fig. 7.

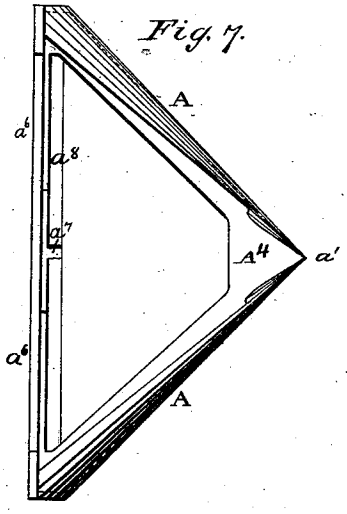


Fig. 7.a

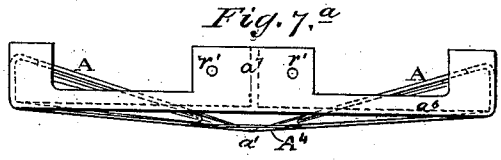


Fig. 7.b



Fig. 7.c

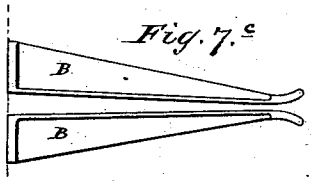


Fig. 7.e

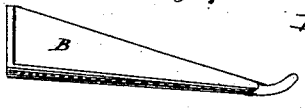
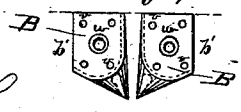


Fig. 7.d



WITNESSES:

L. C. Hillis

W. B. Masson

INVENTOR

Peter H. Watson,

BY E. E. Masson,

ATTORNEY

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 6.

P. H. WATSON, Dec'd.

R. R. WATSON, Executrix.

MACHINE FOR PLICATING AND PACKAGING FABRICS.

No. 359,584. Patented Mar. 15, 1887.

Fig. 8.

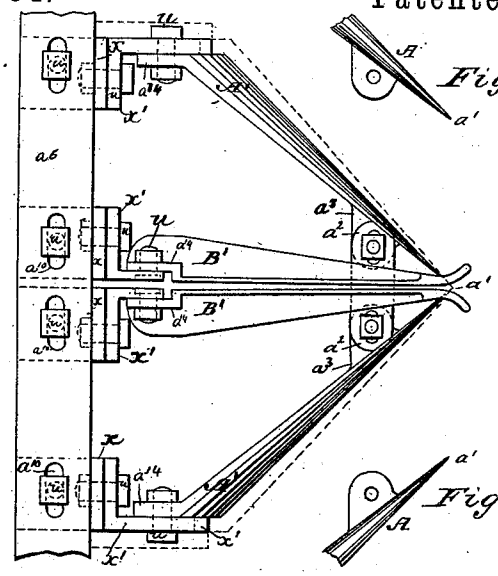


Fig. 8.e

Fig. 8.f

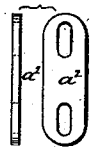


Fig. 8.d

Fig. 8.a

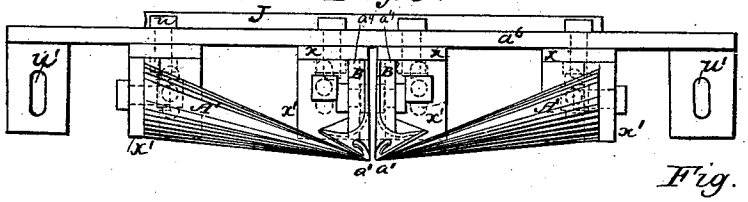


Fig. 8.g

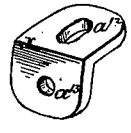


Fig. 8.b

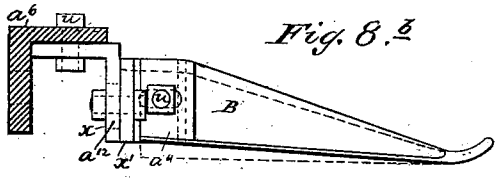
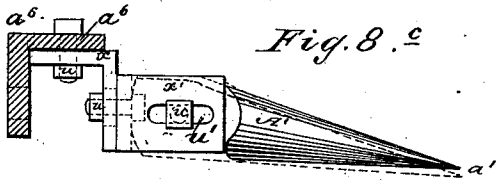


Fig. 8.c



WITNESSES:

L. B. Hills.

W. B. Masson

INVENTOR

Peter H. Watson,

BY E. E. Masson

ATTORNEY

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 7.

P. H. WATSON, Dec'd.

R. R. WATSON, Executrix.

MACHINE FOR PLICATING AND PACKAGING FABRICS.

No. 359,584. Patented Mar. 15, 1887.

Fig. 3a

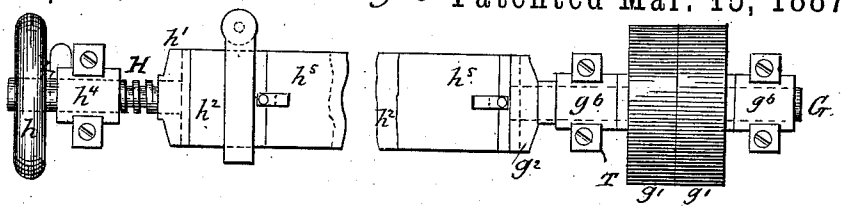


Fig. 3b

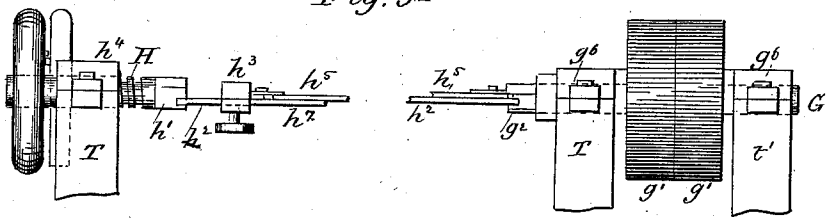


Fig. 9

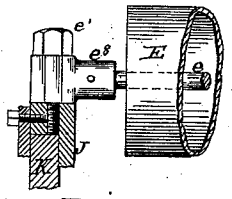


Fig. 9a

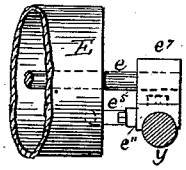


Fig. 9b

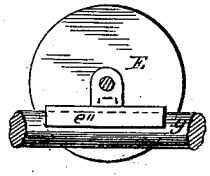


Fig. 11.

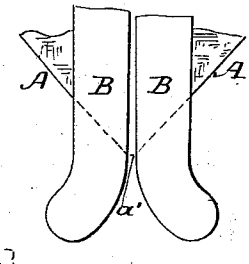


Fig. 9c



Fig. 9d



Fig. 12

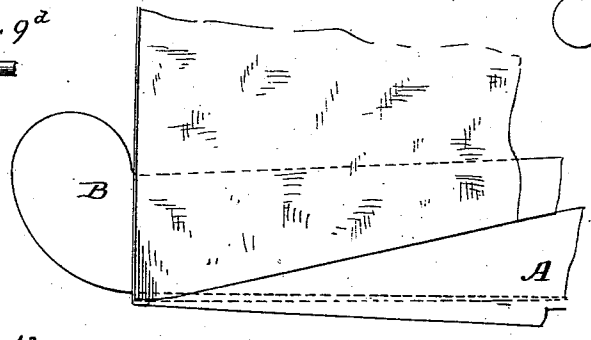
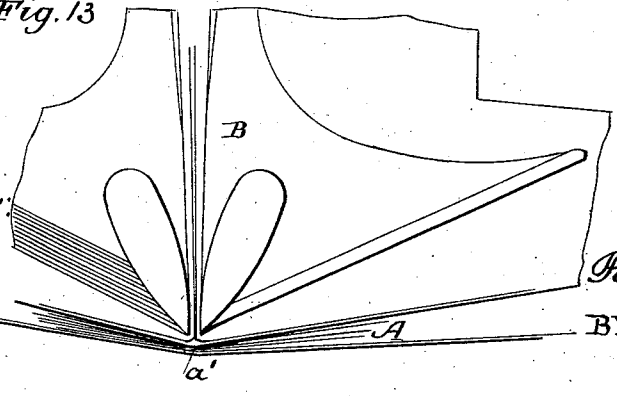


Fig. 13



WITNESSES:
L. C. Hills
W. B. Masson

INVENTOR:
Peter H. Watson
BY E. E. Masson
atty.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 8.

P. H. WATSON, Dec'd.

R. R. WATSON, Executrix.

MACHINE FOR PLICATING AND PACKAGING FABRICS.

No. 359,584. Patented Mar. 15, 1887.

Fig. 10.

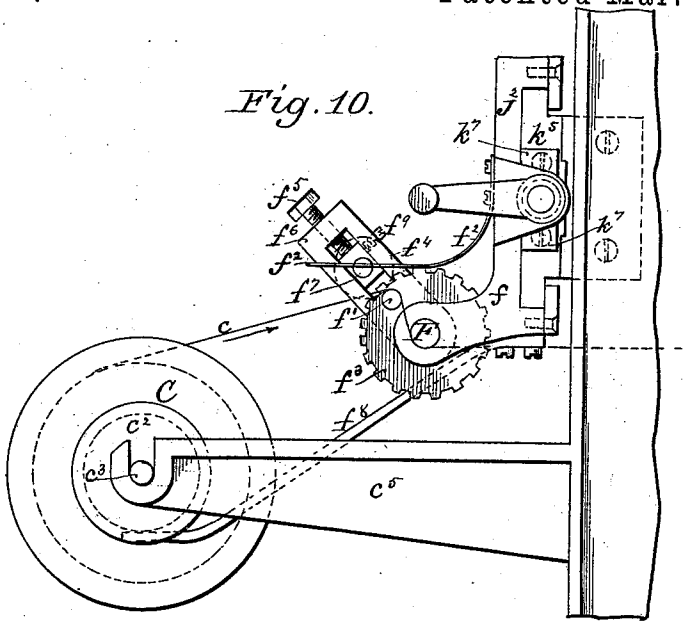
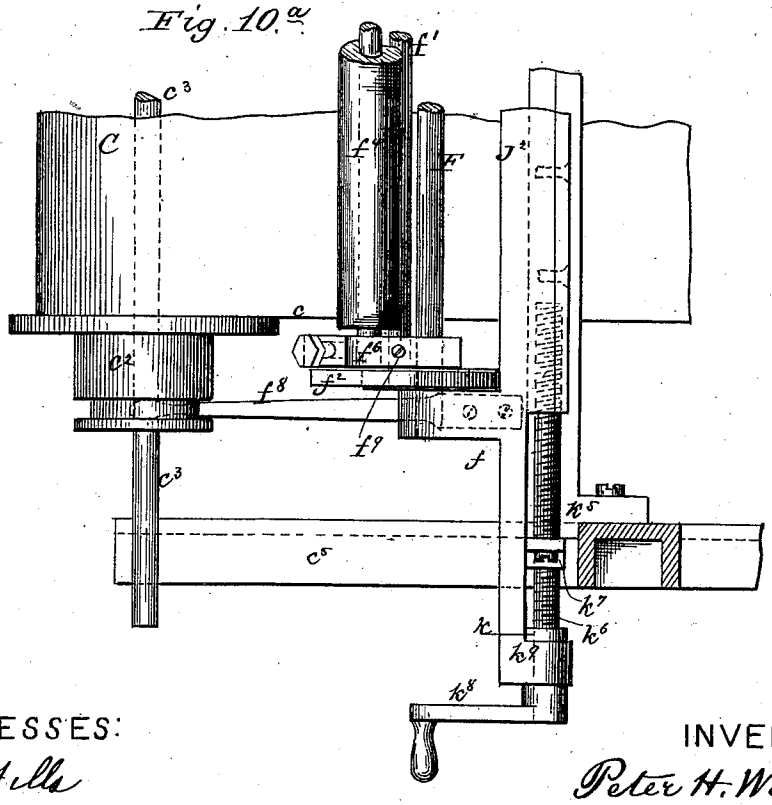


Fig. 10a.



WITNESSES:

L. O. Hills

W. B. Masson

INVENTOR:

Peter H. Watson

BY E. E. Masson

atty.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

PETER H. WATSON, OF NEW YORK, N. Y.; ROSELLE REBECCA WATSON EXECUTRIX OF SAID PETER H. WATSON, DECEASED.

MACHINE FOR PLICATING AND PACKAGING FABRICS.

SPECIFICATION forming part of Letters Patent No. 359,584, dated March 15, 1887.

Application filed July 30, 1883. Serial No. 102,333. (No model.)

To all whom it may concern:

Be it known that I, PETER H. WATSON, a citizen of the United States, residing at the city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Machines for Plicating and Packaging Fabrics, of which the following is a specification, the accompanying drawings making part thereof, the same letters of reference, with their exponents, (when they have any,) referring to the same parts of the mechanism throughout the several parts of the drawings.

Figure 1 is a top view of a machine with a piece of plaid cloth in it in process of plication and packaging. Fig. 2 is an elevation upon one side of a machine, looking toward the point of the plicator. Fig. 3 is an elevation of another side of the machine—viz., that to which the cloth is delivered from the plicator and wound into a package. Fig. 3^a represents a top view of a part of the winding mechanism with a winding-bar driven at one end by a belt-pulley. Fig. 3^b is a side elevation of the parts shown in Fig. 3^a. Fig. 4 is an elevation of a part of one side of the machine, showing an adjustable guiding mechanism for feeding in the cloth, with so much of the plicator and cloth-roll as is required to show the relations of the parts, a part of the smoothing-roll being broken away. Fig. 4^a is a plan of portions of some of the parts shown in Fig. 4. Fig. 4^b is a side view of a modification of the smoothing-roll. Fig. 5 is a vertical sectional view on line $x\,x$, Figs. 1, 3, looking toward the base of the plicator, and showing so much thereof and of its slide, carriage, and adjustable screw as appear in those views. Fig. 6 is a vertical sectional view on line $x\,x$, Figs. 1, 3, looking toward the apex of the plicator, showing so much of the side bars, finger-guides, and smoothing-roll as appear in those views. Fig. 7 is a top view of the side bars of the plicator connected at their base and apex by cross-plates cast in one piece with the bars. Fig. 7^a is a view in elevation looking at the base of the side bars shown in plan in Fig. 7. Fig. 7^b is a view in side elevation of the side bar shown in Fig. 7. Fig. 7^c is a view in plan of the finger-guides disconnected from the side bars. Fig. 7^d is an elevation of the fingers shown in Fig. 7^c, looking at the base thereof. Fig. 7^e is a side elevation of one of the finger-guides shown in Fig. 7^c. Fig. 8 is a plan of the plicator and a portion of its carriage detached, with contrivances for adjusting the relative position of the parts. Fig. 8^a is an elevation of the parts shown in plan in Fig. 8, looking from the apex toward the base. Fig. 8^b is an elevation of one of the finger-guides detached, and of its adjustable bracket-connections with part of the base of the plicator, the latter shown in section. Fig. 8^c is an elevation of one of the side bars detached, and of its adjustable bracket-connections with part of the base-bar, the latter shown in section. Fig. 8^d is a top view of a detached portion of one of the side bars next to the apex, showing the lug by which it is connected by a link-plate to a corresponding lug on the opposite side bar. Fig. 8^e is a top view of a detached end of the side bar opposite to that shown in Fig. 8^d. Fig. 8^f represents a side view and an edge view of the link-plate for connecting, as shown in Fig. 8, the small ends of the side bars. Fig. 8^g represents in perspective one of the adjustable angle-plates or brackets for connecting the side bars and fingers to the base-bar of the triangular frame of the plicator. Fig. 9 represents a side elevation of a portion of the rear end of the smoothing-roll and of its shaft, a fragment of the upper part of the carriage, a stud projecting from the top of the carriage, and a block attached to the shaft, and having an eye formed in it to hang on the stud and form a hinge. Fig. 9^a represents a side elevation of a portion of the front end of the smoothing-roll and its shaft, with a bracket having a swivel-joint and sliding on a cross-bar of the frame of the machine. Fig. 9^b represents an elevation, looking from the end of the machine, of the parts seen in the last-named figure. Fig. 9^c represents in plan the rear portion of the shaft of the smoothing-roll, with its end expanded and a hole made through it to hinge onto the pivot. Fig. 9^d represents the side elevation of the parts shown in Fig. 9^c. Fig. 10 is a side elevation, upon an enlarged scale, of the pinching-roll and tension-regulating bars, with the adjustable carriage upon which they are mounted, together with the adjust-

able cloth-roll, the parts being constructed and arranged as in Fig. 4. Fig. 10ª is a plan of portions of the parts shown in Fig. 10. Fig. 11 is a top view, upon an enlarged scale, of a detached portion of the point of the plicator and adjacent parts of the finger-guides. Fig. 12 represents a side elevation of the parts shown in Fig. 11. Fig. 13 represents a front elevation of the parts shown in Figs. 11, 12, looking toward the point of the plicator.

On the 29th day of June, 1880, Joseph J. Scholfield received Letters Patent of the United States, No. 229,479, for a machine for plicating fabrics, in which machine a web or fabric is folded lengthwise by passing it over the face of a trianglar frame or plate, the two selvages of the fabric being turned over the sides of the triangle round to the middle of its back, where they meet at half the width of the fabric back from the apex and turn between two folding-bars placed parallel to each other and to the face of the triangle, and thence to a guiding-roll, or between nipping-rolls, to compress the two halves of the web together to make a flat fold, which then passes into a winding device to make up into a roll or bolt. One object of my invention is to improve that type of machine by appliances for feeding the fabric with more precision, for plicating with less friction and with more evenness and less hazard of overstrain or rupture, and packaging it with greater smoothness and celerity.

In my improved machine (see particularly Figs. 5 to 7ᵉ) the side bars, A, of the triangular plicating-frame are semi-tubular and exteriorly of rounded and tapering form, to give lightness, strength, and rigidity, and to permit the fabric to glide from under easily over them, they having enlarged base portions, as shown, and tapering therefrom toward the apex of the plicator. In other words, the said side bars are substantially conical, and the large end of each side bar is connected to, extends from, and is supported by a base-bar, a^6, of a length somewhat exceeding the breadth of the widest goods that the machine is designed to plicate. The convex surfaces of the side bars are smoothly finished and polished, converge toward and meet at the apex a' of the triangle, where a plate, A^4, joins them and strengthens their connection. The plate is very thin on its median line at the point, and is made gradually thicker from the apex backward. Against this apex the fabric is borne, and over it is smoothly turned in making the fold of the plicature without either unduly straining the fabric, or leaving unsupported or slack material to be drawn into wrinkles. The base and side bars may be made, together, with the strengthening-plate A^4, between the points of the side bars, of a single rigid piece, preferably by casting it of iron, as shown in Figs. 7 7ª; or these parts may be made in separate pieces and united, adjusted, and secured in position by perforated angle brackets and plates fastened by screw-bolts, as shown in Figs. S 8ª 8ᶜ 8ᵈ 8ᵉ 8ᶠ 8ᵍ.

In the solid triangular frame shown in Figs. 7, 7ª, and 7ᵇ the base-bar a^6 has on its inner face a vertical mid-rib, a^7, and on its lower edge a horizontal flange, a^8, for strength and to aid in the support and adjustment of a pair of folding or finger guides, B, as shown in Figs. 1, 5, 7ᶜ, 7ᵈ, 7ᵉ, 11, 12, 13, made semi-tubular, and rounded and of a conical or tapering form, such form serving to equalize the tension across the web of the fabric, keep it straight, and prevent its crowding toward the apex of the plicator. The finger-guides B B are smoothly finished and polished on their convex surfaces, which are convergent toward the apex a' of the side bars, A. These fingers, resting near the mid-rib and the flange, are securely fastened by their base-plates b' to the bar a^6 by means of binding-screws s, and are adjusted in relation to each other and to the side bars, A, by positing-screws t, that bear against the surfaces of the bar a^6, mid-rib a^7, and flange a^8. The binding-screws pass through holes w, Fig. 7ᵈ, in the base-plate b' of the fingers B B, large enough to allow the fingers to be moved up, down, or sidewise sufficiently for adjustment, and are fitted to screwed holes r' in the base-bar a^6. The positing-screws are fitted into screw-holes v, Fig. 7ᵈ, in the adjacent sides and base of the fingers, and being placed in those holes are turned until they protrude through them more or less, as may be required, to give the proper direction and a firm rest for the fingers. Each binding-screw s has a washer to bridge the enlarged hole in the base-plate of the finger. It is inserted in its screw-hole r' in the bar a^6 and turned until the finger is approximately in the desired position before the positing-screws are run through. Then it is turned back or forward, as may be required, to allow the positing-screws to be adjusted properly, and when this has been done with both fingers the binding-screws are finally turned up tight to make the fingers stand out firmly in place.

If it should be discovered in working the machine that either or both of the fingers have not in the first instance been posited quite right or have become displaced, or for any reason require a different positing, this can readily be accomplished by loosening the binding-screw s and then slackening some of the positing-screws t and tightening others in the manner in which the leveling-screws of an engineer's level are worked. Then when the required change of position is attained the binding-screw must be again turned up to hold all firm.

The fingers B are separated at their bases by the thickness of the mid-rib and the distance which the lateral positing-screws t protrude, aggregating about from one-half to three-fourths of an inch for fabrics of average thickness, and each finger extends small end forward from its seat on the base-bar a^6 to a point a little beyond, a little to one side, and a little above the apex a' of the side bars.

After leaving the finger-guides the cloth

passes over the smoothing-roll E, Figs. 1, 2, 3, and under the tension regulating and equalizing roll or bar g^3, to the winder, where it is made into a roll or package, D. If the cloth be knotty or not well smoothed, a little wider space between the points of the fingers and between them and the plane of the apex may be made to give more freedom to draw through the inequalities or smooth down any incipient wrinkles which such or other irregularities may cause. This widening may be effected by slightly readjusting the positing and binding screws in the manner already described; also, by these means the forward ends of the finger-guides may be set nearly together to support the cloth firmly at and near the crease, and a smooth and unwrinkled fold may thereby be produced.

The outer ends of the fingers B are shown slightly curved away from each other, or provided with divergent horns extending outwardly from the apex, such form having been found convenient for facilitating the insertion or threading of the fabric between them when commencing to plicate a piece of goods; but any form may be given to the ends of the fingers projecting beyond the apex that operators of the machine may prefer.

The adjustment of the fingers of the plicator by raising or lowering and separating or approximating their bases by means of the binding and the positing screws, as described, affords all the adjustment needed for the generality of goods to tighten or loosen the fabric toward its selvages, and to make it run smoothly and without undue stress in bending round the apex a' and turning through the space between the fingers to form the fold without leaving slack or unsupported material to wrinkle. In making such adjustment of the base of the fingers the place of their points is but little changed relative to each other or to the apex a' of the side bars, A. The latter, in plicators made for general work, being rigidly united and properly fitted and placed, would seldom have to be disturbed, except for repairs or to adapt the plicator to a wide change in the thickness and texture of goods to be folded. If the side bars, A, should need raising or lowering at their base, that could readily be done by loosening the screws a^9, each screw having a large washer under its head and passing through a hole in the base-bar a^6 considerably larger than its shank, to fasten the base-bar a^6, carrying the side bars, A, to the carriage J, then raising or lowering the base-bar a^6 as required, and retightening the screws. By inserting suitable narrow strips of sheet-metal packing below the screws a^9, between the lower edge of the base-bar and its seat on the carriage, the apex might be raised more than the base, or the apex might be lowered more than the base by inserting suitable packing-strips above the screws a^9, between the upper edge of the base-bar and the carriage, and the screws retightened, as before. The fingers B in either case will have to be reset by readjusting the positing and binding screws, as before described, to conform to the changed positions of the apex and of the base of the side bars, A A.

To meet the case of goods difficult to plicate from unusual susceptibility to extension, or for other causes, a general adjustability for the side bars and the finger-guides has been provided, as shown in Figs. 8 8^a 8^b 8^c 8^d 8^e 8^f 8^g. The base-bar a^6, Fig. 8, is made in a separate piece, as are the side bars, A′, and the fingers B′. The base-bar is fitted with longitudinal slots a^{10} at the places at which the side bars A′ and the fingers B′ are to be connected to it by means of angle plates or brackets x, Fig. 8. Each bracket consists of two flat plates or wings united together at right angles. One of the wings has an oblong slot, a^{12}, through it, and the other is pierced with a round hole, a^{13}. These holes are to receive binding screw-bolts u, which pass through them. The base of each of the side bars, A′, and fingers B′ has a flat arm or bracket, a^{14}, pierced centrally with a round hole. One of the brackets x being placed with its wing, having a round hole, a^{13}, against the under side of the base-bar a^6, with its hole under the middle of one of the slots a^{10}, a screw-bolt, u, is passed through both holes and a nut run upon the end of it to bind the bracket and base-bar a^6 together. If the nut of the binding screw-bolt u be a little slackened, the bolt may be moved toward either end of the slot a^{10} for the lateral horizontal adjustment of the bracket x, while the bolt u forms a pivot on which the bracket x can be turned and set at any required horizontal angle, and there firmly held by retightening the nut. The other wing of the bracket x, having the slot a^{12}, hangs down in front of the base-bar a^6. A second bracket, x', like that just mentioned, is placed with its wing perforated with the round hole centrally against the slot of the pendent wing of the bracket x, and a binding screw-bolt, u, is passed through the holes of both, which will permit of the adjustment of the bracket x' up and down along the slot a^{12} of the bracket x, and also permit it to be turned and set at any vertical angle required. The slotted wing of the bracket x' has the flat arm a^{14} of a side bar, A′, or of a finger, B′, laid against it, with its round hole centrally over the slot and a binding screw-bolt, u, passed through both holes. This will permit the side bar, or the finger, as the case may be, to be moved in or out and its point raised or lowered, while the movement in the slot of the bracket x will permit the base of the finger to be at the same time raised or lowered, and the turning of the bracket x on the bolt u binding it to the base-bar a^6 will permit the point of the side bar or finger to be turned horizontally. The side bars and fingers under this mode of general adjustability are each connected to the base-bar by adjustable brackets and binding screw-bolts in the same man-

ner as that just described for one of them, and the small ends of the side bars are so mitered and connected by a slotted link, a^2, secured by bolts to the lugs or brackets a^3, that in all positions of adjustment the ends of the bars will meet and form a smooth unbroken point, and when all the parts are put together the base-bar, a^6 with slots a', to permit its base to be raised and lowered, is attached to a carriage mounted on guides or slides similar to that hereinafter described for the plicator, with the side bars and base cast in one piece of metal, thus giving to these parts of the plicator universal adjustability within the limits required to adapt it to do its work.

The smoothing-roll E (see Fig. 4) is made of a sufficient number of light cast-iron heads or wheels, about six inches apart, with eyes through their hubs, that will allow the wheels to turn freely upon a fixed shaft, e. The wheels have a covering of narrow slats laid parallel to their shaft e, and secured upon their rims by small screws, the outer surface of the slats being turned smooth and cylindrical, and the diameter of the roll being made from five to nine inches, according to the size of the machine in which it is to be used, as shown in a companion application filed July 30, 1883, No. 102,332. The shaft e is held at its inner end by a projection, in Fig. 4, from the fixed frame, and in Figs. 1, 2, 3, and 9 from the top of the carriage J, which projection may be either a bracket, e'', as in Fig. 4, or a screw-pivot, e', as in the other figures, to pass through a hole formed in the shaft, as shown in Figs. 9^c 9^d, or through the eye of a cast-metal piece, e^8, Fig. 9, secured to the end of the shaft. The eye and pivot form a hinge, to allow the outer end of the shaft to swing in a small arc, and the eye may be kept in place by a head on the pivot, as shown in Fig. 9, or by a screw-nut at the top of the pivot.

The smoothing-roll, when supported at its rear end on a pivot, as described, is carried at its front end in a short bracket, e^7, Figs. 9^a 9^b, swiveled upon a foot, e'', having a pivot on its top fitting into a corresponding recess in the under side of the bracket e^7, and so permitting the latter to swivel to conform to a swinging movement of the roll E on the pivot e' of its shaft, the under side of the foot having a curved groove formed on it to fit the bar Y, on which it is supported, and on which it slides back and forth to accommodate a swinging movement of the front end of the shaft.

To hold the bracket in position, a bar, e^2, Fig. 1, is attached by its front end to the back of the foot e'', Fig. 1, and extends backward diagonally to a bracket, e^3, on the end of the carriage, passing loosely through a hole in the bracket a few inches to receive a helical spring, e^5, a stop-nut, e^4, to limit the movement of the bar backward through the aperture in the bracket, and nuts e^6, to compress the spring toward the bracket e^3 more or less, as may be required to cause it to pull the rod with the desired force. The rear end of the rod has a screw-thread formed on it, on which the nuts e^4 e^6 are fitted.

The smoothing-roll is so placed in relation to the plicator that the median plane of the latter, which passes vertically through its apex a', is tangential to the roll. The line of contact of the surface of the roll with such plane is across the path or direction of motion of the cloth therein. This roll performs several functions: first, it acts as a guide around which the cloth is brought into a convenient position and supported for winding into a package; secondly, the cloth being drawn and pressed upon it in the act of passing, the two plies are there brought into close contact, the pressure fixing the fold-crease and smoothing the doubled cloth before it passes to the winder.

Cloth to be plicated is found to vary in strength, pliability, and extensibility in different parts of its length and breadth. Sometimes the yielding is greatest at the edges and brings undue stress upon the middle, rendering it liable to be chafed or torn when passing the apex of the plicator. To prevent such a result the roll is made to swing or yield to the extra stress caused by undue friction or retardation of the cloth in turning over the apex a', yielding the most at the end above the apex, where the stress is greatest. The roll is held in its normal position by the brace e^2 and the adjustable spring e^5, that maintains any resistance to which the spring is set, but yields to any greater stress. Thus by the automatic yielding feature of the roll a third and an important function is performed.

The smoothing-roll may be made in one length, as described, or in several independent sections, E', as shown in Fig. 4, that the sections may accommodate themselves to the differing relative surface-velocities of the different parts of the cloth, as when under extra stress the cloth yields its circumferential motion upon the roll becomes different in the different sections, and when the extra stress ceases and the roll, under the action of the brace-spring e^5, is returning to its normal position a similar relative change of motion takes place. Such differential motion also results from differences of thickness, pliability, or extensibility of the goods, and produces, however caused, a brake action which tends to lessen the perfection of the work. Each section of the roll may consist of a series of narrow light cast-iron wheels, E^2, requiring no covering, or two heads or wheels, E^3, fitted to turn easily upon the shaft e, and connected, covered, and finished like the continuous roll, the outer ends of the hubs of the wheels projecting beyond the rims to bear against the adjacent hubs, or against collars placed on the shaft to hold the end sections in place; or the sectional roll may consist of a series of narrow cast-iron heads or wheels, E^2, turning easily on the shaft e, with their hubs projecting slightly beyond the rims, that the latter may run free. (See Fig. 4^b.)

Cloth, in being wound into packages, has a

tendency to form small oblique wrinkles in the layers, and one of the best means found of counteracting this tendency is to wind the cloth as tight upon the roll as can be done without stretching it so much as to impair its strength; and it is found that cloth run over a roll on fixed bearings will be torn by a stress while running over the point of the plicator that it would safely bear if run over an automatically-yielding roll; hence by the aid of the self-yielding roll the cloth can be laid in the package in more smooth and even layers.

When from any cause the use of a smoothing-roll is inadmissible, in lieu thereof there may be employed a cylindrical bar of polished metal, arranged, like the roll E, before described, with its side parallel to and near the vertical plane passing through the median line of the plicator. This bar is supported by a hinge at one end in a fixed bracket on the carriage J, and at the other end in a bracket sliding on a cross-bar of the frame, in a manner similar to that already described for supporting the shaft of the smoothing-roll.

For the purpose of giving the proper degree of smoothing and tension to the fabric as it passes to the plicator, there is a smoothing-bar, F, Figs. 1, 3, carrying in arms f^6 a stretching-rod, f'. The smoothing-bar F is so hung in bearings or journals upon the frame of the machine that the cloth c, Fig. 3, passing through may be cramped by bending it over and between the smoothing-bar F and the stretching or cramping rod f more or less, according to their relative position, as determined by the adjustment of their detent-wheel f^3, so that varying resistance to a pulling stress upon the cloth can be had. The smoothing-bar F and stretching-rod f are adjusted and held in position by a spring-pawl, f^2, attached to the frame of the machine, and entering one of the notches of a detent-wheel, f^3, secured firmly to the bar F. The bar and rod are round and polished, and made of iron or steel. They are located between the plicator and the cloth-roll, and they act not only as smoothing and stretching bars, but also as guide-bars, to lead the cloth at a proper level to the plicator, whether it be taken from a roll, C, full, or nearly empty, or from a pile.

It is found in practice that almost any woven fabric will, from inequalities in width, thickness, strength, stiffness, or elasticity, however straight it may enter the plicator, tend to run irregularly from side to side as it passes through the plicator, causing the edges of the plies to overlap each other more or less. To obviate this defect, as well as to permit the plicator to be adjusted to suit different widths of cloth or plies thereof, a lateral adjustment of the plicator in relation to the course of the cloth passing through it from the roll C is provided. For this purpose the side bars and the fingers of the plicator, and the smoothing-bar F are mounted upon a carriage, J, Figs. 1, 2, 3, which is fitted to and secured by glands j upon a slideway, K, Figs. 1, 2, 3, extending across and fastened to the main frame. The carriage is moved back and forth on the slideway by means of a screw, k', passing through a stationary bracket, k^{10}, which fits between the hub of the handle k^3 and a collar on the screw, the latter also passing through a nut, k^2, on the slideway. The screw is turned by the handle k^3, by means of which the operator can, the moment he perceives the cloth beginning to swerve to either side of its proper course at any time during the progress of the work, and without stopping the machine, adjust the carriage, and with it the plicator, so as to counteract the swerving, and bring the cloth to its right course before it can deviate far enough to produce irregularity of importance, thus bringing and keeping the two selvages of the doubled cloth together, fairly and evenly, upon the smoothing-roll, notwithstanding the irregularities of texture mentioned, such lateral adjustment being made at will without affecting the direction of the motion of the cloth from the smoothing-roll E toward the winding mechanism, and so conduces to the automatic production of a smooth and neat package. To render even in width the two halves of the doubled cloth while running is in an important degree a matter of relation between the plicator and the manner of directing the cloth into it; hence, in the case of cloth very difficult to plicate I have found it useful to make a short lateral adjustment of the cloth in passing it to the plicator from the feed-roll C, and for this purpose the shaft c^3 of said feed-roll is made longer than the width of the machine. The lateral adjustment of the entering cloth, effected by sliding the feed-roll with its cloth bodily to and fro in its bearings a very little, will cause the cloth to enter properly into the plicator and greatly lessen the range and frequency of traverse of the plicator-carriage J, subsequently required for the evening of the fold, in this way both lessening the labor of the attendant and doing the work more perfectly. The sliding of the cloth-roll while turning on its journals requires very little force and is attended with no difficulty.

Sometimes very thin fabrics, and especially such as are glazed and stiffened, are with difficulty kept running straight into the plicator. They tend to deviate to one side or the other, and so obstruct the laying of the plies evenly together. If such fabric be tighter, stiffer, or thicker toward one edge, or more slack, soft, or thin toward the other edge, these differences in texture seem to increase the difficulty of feeding evenly, and are to be overcome by mechanically constraining the cloth to keep in a straight course. An attempt to keep such cloth going equally on the opposite sides of the median line of the plicator by causing guides or directors to bear against its edges only results in crumpling and wrinkling the edges without changing the direction of the path of the body of the cloth; but I have discovered

that an effective way to control the course of the cloth into the plicator is to grip it as it is passing over a smooth bar, by means of a pinching-roll borne upon it by adjusting screws or springs. An arrangement for accomplishing this is shown in Figs. 4 4ª 10 10ª, in which a slideway, k^5, is attached across the frame behind the plicator, on which slideway a carriage, J^2, is borne having a bracket, f, projecting near each end, in which the smooth bar F is journaled. Near each end of this bar an arm, f^6, is firmly secured to carry a stretching-bar, f', at a short distance—say about two inches—from the smoothing-bar. A pinching-roll, f^4, is also carried in adjustable boxes f^7, that are held in slotted guides in the arms f^6, and set down by an adjusting-screw until the roll f^4 is borne against the cloth passing over the bar f', as shown in Figs. 4, 10. From the under side of the bracket f of the carriage J^2 an arm, f^8, extends back to a grooved pulley, c^2, secured on the shaft c^3 at the end of the cloth-roll C. This groove in cross-section is right-angled, and the end of the arm f^8, which is enlarged, fits into it, so that if the carriage, with its smoothing and stretching bars and pinching-roll, were moved in one or the other direction across the machine the cloth-roll would be moved correspondingly. If the supports for the roll C were placed farther than shown from the tension and smoothing bars F f', the guiding-arms f^8 and the grooved pulley c^2 might be dispensed with, as the lateral flexure of the cloth would permit it to swing into the proper feed-line.

The carriage J^2, on which are mounted the pinching-roll f^4 and the guide and smoothing bar F and the stretching-bar f', is moved back and forth on its slideway k^5, within the short range required for governing the course of the cloth passing to the plicator, by means of a screw, k^6, held in a journal-box in the bracket k^9, between the shoulder of the hand-crank k^8 and the collar k, and turning in a nut, k^7, attached to the back of the slideway k^5. The screw is turned by the attendant of the machine. This form of feeding mechanism is worked as follows: A roll of cloth, C, to be plicated, being placed with the bearings of its shaft c^3 on the brackets c^5, Figs. 4 4ª, 10 10ª, the end of the cloth is passed by the attendant through between the pinching-roll f^4 and the stretching-bar f', thence through between the stretching-bar and the smoothing and guiding bar F, and carried forward and threaded through the plicator. The pinching-roll is pressed by the screws f^5 upon the cloth on the stretching-bar f' to hold it steady while gliding around the bars and to the plicator, the cloth being placed with the line of the fold of the intended plication to coincide with the median line of the plicator. Then the cloth roll C, pinching-roll, and the stretching and the smoothing bars should be set to agree with this position of the entering cloth.

If the cloth in passing into the plicator is perceived to be deviating to one side or the other, the screw k^6 must be turned a little to move the carriage, and with it the cloth, bodily in the opposite direction just far enough to correct the deviating tendency at the time, and from time to time, as the condition of the work may indicate.

By turning the stretching-bar f and pinching-roll f^4 to deflect and cramp the cloth passing between them more or less the tension upon the cloth in feeding it into the plicator can be increased and diminished at will, and the cloth, when the pinching-roll f^4 is grasping it, is as readily moved edgewise from side to side as if it were a rigid sheet of metal. By screwing up the boxes of the pinching-roll f^4, so that the roll will not bear against the stretching-bar f', and causing the stretching and smoothing bars f' F to act as cramping-bars, or in case the pinching-roll should be dispensed with, as in Figs. 1, 2, 3, and the cloth bent over and cramped tightly by deflecting the stretching-bar, many kinds of cloth might be adjusted from side to side by the adjusting-screw k^6, but not in all cases with as much certainty and effect as if the pinching-roll were in action.

In cases where the laying of the leaves of the fold upon each other very evenly is not deemed of so much importance as the saving of cost in constructing the machine, the regulation of the plication might be effected by traversing the entering cloth, (held by friction by partially turning it round the smoothing and stretching bars, as described,) and dispensing with the carriage and slideway for the traversing of the side bars, fingers, and smoothing-roll. In some cases, however, while watching the fabric as it passes through the machine and to facilitate the even packaging of the goods on the desired line, it is necessary for the operator not only to be able to adjust the fingers, side bars, &c., but to guide the fabric from the rear of the machine. In such cases both means of adjustment above described are used, the lateral adjustment of the carriage for fabrics of different widths, and the other for guiding the fabric into the folding mechanism.

The method of imparting tension to and momentarily stiffening thin flexible cloth transversely while feeding it, and, when thus stiffened and without interrupting the feeding, adjusting it edgewise and crosswise, is applicable and useful in packaging fabrics without plicating them, and also in all other finishing operations where transverse adjustment of a thin, soft, pliable, and outspread web of fabric while running is desirable.

From the smoothing-roll the plicated cloth passes to a tension regulator and equalizer and thence to a revolving winding board or bar, upon which it is wound with a strong pull (the tension being regulated by the adjustment of the stretching-bar f' and the springs g^5, hereinafter referred to) into a

smooth and compact package. When winding a flat roll of cloth upon a broad board, the draft, being made through the revolving-board, is of unequal force and speed in different parts of its revolution, and if not measurably compensated the rapid revolution of the board would cause a quick succession of jerks and corresponding slackening and tightening of the cloth that would injuriously affect both the plicating and the packaging operations. To counteract such injurious action, a vibrating tension regulator and equalizer is provided, which consists of a swinging bar or roll, g^3, Fig. 2, under which the cloth passes, the roll being secured upon swing-arms g, provided with a series of holes to connect with a spring, and the axes of the arms being supported by brackets g^4. The arms are pressed downward by springs g^5, each attached by one end to one of the brackets g^4, and by the other end adjustably connected to either of the holes in the arms g, in the arm of the roll or bar g^3, to bear the roll or bar constantly against the cloth, and alternately yield up slack to prevent a too high tension and take up slack to prevent the tension from falling too low, thus at once preventing bagging and flapping of the cloth and reducing the inequality of the pull upon the plicator.

The winding mechanism shown in Figs. 1, 2, 3, 3^a, 3^b consists of a shaft, G, fitted to run in journal-boxes g^6 in the frame T and bracket t' of the machine, upon which shaft are fast and loose pulleys g' g' for driving it. On the inner end of the shaft G is secured a winding head or chuck, g^2. A box-nut, h^4, also in the frame T, is fitted with a screw-shaft, H, having a hand-wheel, h, on its outer end, and on its inner end a loose revolving head or center, h'. A slightly-tapered winding-bar, h^2, either flat or square, according to the desired form of the package, is placed between the head g^2 and loose head h', with its ends inserted in grooves or recesses formed in these heads in the usual manner, and gripped firmly by turning the screw-shaft H by means of the hand-wheel h. The end of the fabric being secured to the winding-bar by a turn thereon, the machine is started and the cloth wound into a finished roll or package, the same operation also drawing the cloth through and actuating the other parts of the machine, as described. In winding the flattened form of package a board, h^5, may be first laid to the side of a flat winding-bar, h^2, the board being held between the head g^2 and the adjustable clamp h^3, and the cloth wound around the board h^5 and winding-bar together. When the winding is complete, the screw-shaft H is withdrawn, the package taken from between the heads g^2 h', and the steel winding-bar h^2 being drawn out and the board left in the package, the winding-bar is returned to its place in the winding-heads to wind another package. In cases where there is not too much strain to revolve the package by the winding-board alone the winding-bar h^2 may be dispensed with and the board held in the usual manner between winding-heads, either or both driven by power, as may be most suitable.

If the triangular finger-guides B and their connections should be reversed, as is often done, then the terms above and below, and their equivalents, as herein applied to these parts, must be understood to be correspondingly reversed.

The devices shown and not claimed in this application, so far as they are shown and claimed in the application of Andrew H. Sutton and Peter H. Watson, No. 102,350, for a machine for measuring textile fabrics, are herein and hereby disclaimed as of my sole invention.

In machines for plicating and packaging textile fabrics, I claim—

1. The combination of the plicating side bars, A, the fingers B, the means whereby the fingers B are supported at their bases and adjusted, substantially as described, smoothing-roll E, and winding mechanism, with the tension regulating and equalizing bar g^3, and adjustable springs g^5, substantially as described.

2. The combination of the tapering and triangularly-arranged side bars, A, meeting at their small ends and forming an apex, a', and a base-bar, a^6, to which the side bars are attached by their bases and by which they are united and upheld, with correspondingly-tapered fingers B, the adjustable connections securing said fingers to the base-bar to uphold them and permit their bases or their small ends, or both, to be adjusted toward or from each other, or raised or lowered, whereby the co-operating converging plicating-surfaces of the fingers and side bars shall support the cloth by surfaces at and all round the apex to insure the formation of an even unwrinkled fold without undue strain of the cloth, substantially as described.

3. The combination of the triangularly-arranged side bars, the finger-guides, and the smoothing-roll, with a carriage, a slideway to support the carriage, and means for adjusting the carriage, as described, during the process of plication, whereby the plies of the fold may be regulated in width and laid more evenly together, substantially as described.

4. The combination of the plicator, having side bars, A, and finger-guides, substantially as described, to fold webs of fabrics lengthwise, with the bars F f', arms f^6, the notched detent-wheel f^3 and its pawl, the pinching-roll f^4, the carriage J^2, slideway k^5, and traversing-screw k^6, substantially as described.

5. The combination of the slideway k^5, carriage J^2, and its traversing-screw k^6, with the smoothing-bar F, the stretching-bar f', and means for adjusting said stretcher-bar, arranged and operating substantially as described, whereby a web of thin flexible fabric may be moved quickly to and fro sidewise and

edgewise without wrinkling, to regulate its course into a packaging or a plicating machine, substantially as described.

6. The combination of the slideway k^5, carriage J^2, and its traversing-screw k^6, with the smoothing-bar F, the stretching-bar f', and means for adjusting it, the pinching-roll f^4, and means for adjusting it, arranged and operating substantially as described, whereby a web of thin flexible fabric may be firmly grasped and quickly moved to and fro edgewise without wrinkling, to regulate its course, without interrupting its progress into a packaging or a plicating machine, substantially as described.

7. The combination of the cloth-carrier C and grooved pulley c^2 with the carriage J^2, and means to adjust it, the pinching-roll f^4, bars F f', arms f^6, and adjusting and holding hand-screw k^6, and arm f^8, to govern the course of the cloth, substantially as described.

8. The combination of a swinging smoothing roll or bar, E, and its supports, the yielding brace e^2, and spring e^5, and means to adjust its tension with the plicator, having side bars, A, and finger-guides, whereby the roll will yield to any suddenly-increased resistance to the passage of the fabric round the plicator, and so lessen the danger of interrupting the work or breaking the machine, substantially as described.

9. The combination of the winding mechanism and the plicator having side bars, A, and finger-guides, as described, with a swinging smoothing-roll composed of loose independent sections, and supports for said roll, substantially as described.

10. The combination of the plicator composed of the side bars, A, the fingers B, and the smoothing roll or bar E, and a rotary winder, with an equalizer, g^3, having swinging arms g, and adjustable springs g^5, arranged between the plicator and winder to promote even plication, safety, and smooth winding of the fabric, substantially as described.

11. The combination of the triangular frame of the plicator, and means, substantially as described, for the adjustment of the plane of its inclination, with guide-fingers, and means, substantially as described, to render them reciprocally adjustable, substantially as described, whereby the tension may be duly apportioned to the several parts of the fabric turning on the side bars, apex, and fingers, and the pressure of the fabric against the apex increased or diminished, substantially as described.

12. The combination of the side bars, the fingers, the link-plate a^2, and means to adjustably connect the same to the side bars, the angle-brackets x x, slotted and perforated, as described, and means to secure them to the side bars, fingers, and base-bar, with the base-bar a^6, provided with adjusting-slots w', the carriage J, and means for securing the base-bar thereto, whereby a general adjustability of the parts of the plicator is attained, giving it a wide adaptability to the plication of fabrics of different textures, substantially as described.

13. The combination of a triangular plicator having conical sides which converge to a point and form an apex to bear against and distend the crease of the fold, with conical finger-guides converging to substantially the same apex, the fabric under plication being allowed to pass around and between the said finger-guides, substantially as described.

14. The combination of a triangular folding plate or frame with the finger-guides B, and means to adjust them, as described, whereby their forward ends may be set nearly together to support the cloth firmly at and near the crease, whereby a smooth and unwrinkled fold may be made, while farther from the crease the space between the guides widens to avoid unnecessary pressure and friction against the passing cloth while giving it sufficient guidance, substantially as described.

P. H. WATSON.

Witnesses:
ALOHA VIVARTTAS,
R. W. WATSON.