2 Sheets--Sheet 1.

A. MAN.

Machines for Coating Fabrics with Fluids.

No. 149,874. Patented April 21, 1874.

Fig. 1.

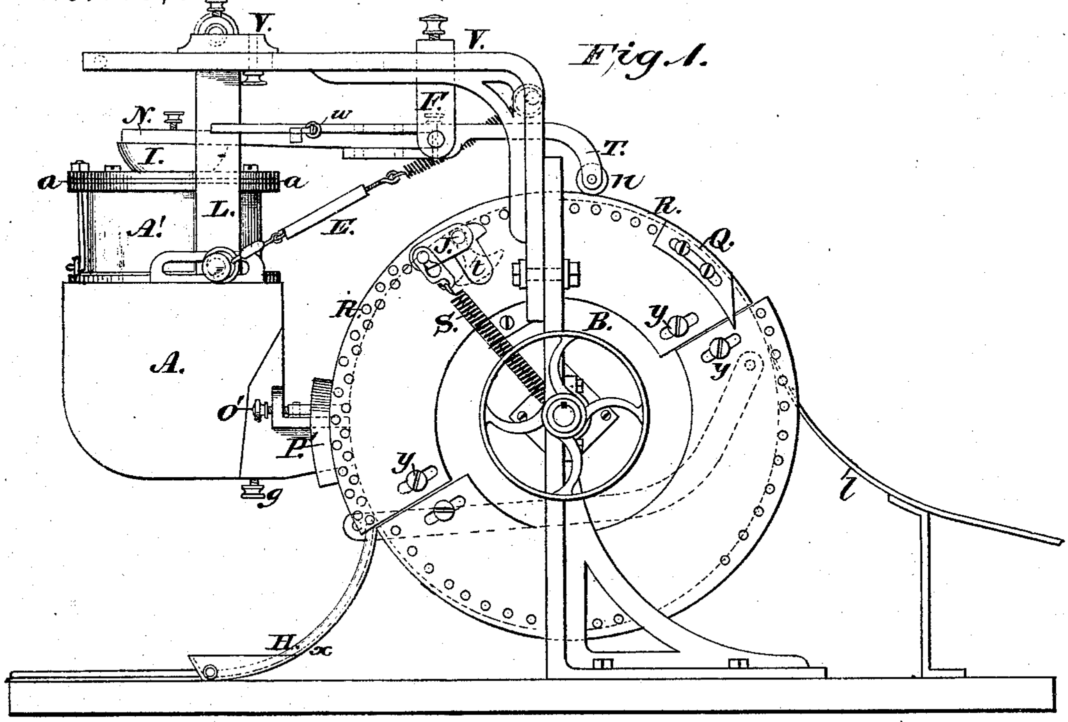
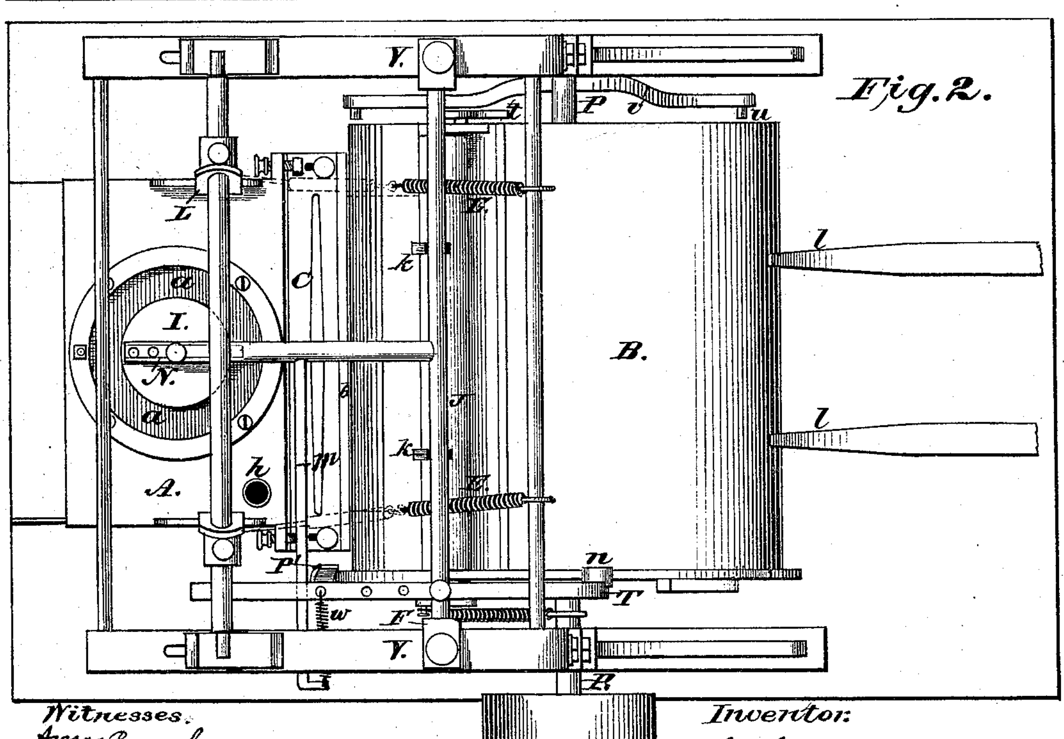


Fig. 2.



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AM. PHOTO-LITHOGRAPHIC Co. N.Y. (OSBORNE'S PROCESS.)

2 Sheets--Sheet 2.

A. MAN.

Machines for Coating Fabrics with Fluids.

No. 149,874. Patented April 21, 1874.

Fig. 3.

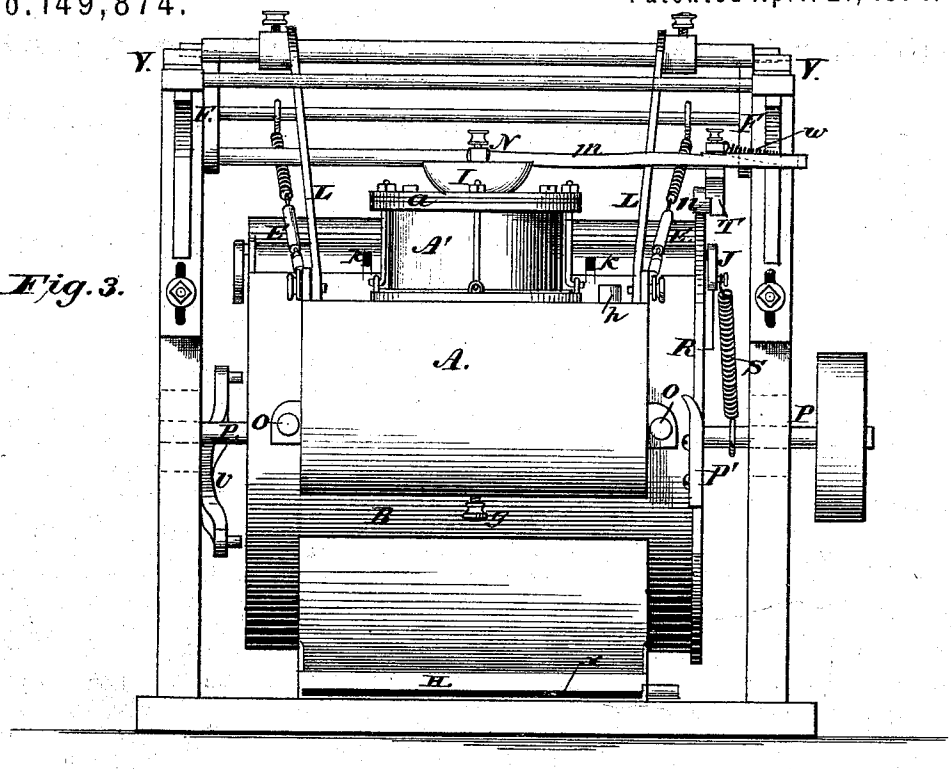
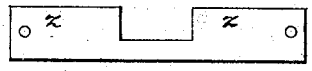


Fig. 6.

Fig. 8.

Fig. 7.



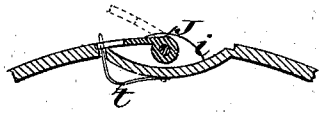


Fig. 5.

Fig. 4.

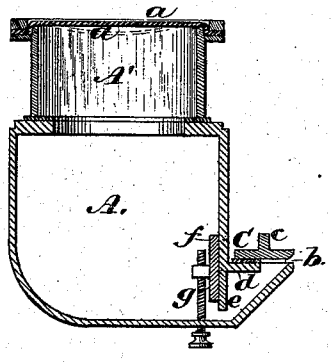
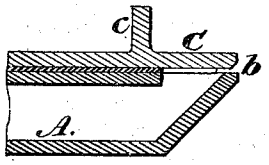


Fig. 9.



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UNITED STATES PATENT OFFICE.

ALBON MAN, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN MACHINES FOR COATING FABRICS WITH FLUIDS.

Specification forming part of Letters Patent No. **149,874**, dated April 21, 1874; application filed August 28, 1873.

To all whom it may concern:

Be it known that I, ALBON MAN, of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Machine for Coating Fabrics with Fluids; and I do hereby declare the following to be such a full, clear, and exact description of the same as will enable any one skilled in the art to which my invention most nearly appertains to make and use the same, reference being had to the accompanying drawing, making part of this specification.

Figure 1 represents a side elevation of a machine by which my said invention is put in practice; Fig. 2, a top view of said machine; Fig. 3, a front elevation thereof; and Figs. 4, 5, &c., detail parts of said machine to be hereinafter more fully explained.

The object of my said invention is to facilitate and regulate more effectually the application of adhesive, plastic, or coloring material or substance to paper or other thin fabric to which it may be desirable to apply any, all, or either of said materials or substances; and my said invention consists in spreading said material or substances upon the surface of the paper or other fabric under a pressure produced through the agency of air acting directly or indirectly upon the coating or coloring matter as it flows and spreads upon the paper or other material, and in instantaneously stopping the flow and spreading of such adhesive or other material by the pressure of the atmosphere when it is desirable to stop it.

The construction and operation of the machine whereby my said invention is carried into practice will be understood by the following description, reference being had to the drawings above referred to.

Let us assume that the covering or coloring material has been prepared and the paper furnished of the size and form required, the thing to be done is to apply the one to the other in the manner above indicated. To do that I put the covering or coloring material in a can or reservoir, shown in the drawing by A, the upper part A′ whereof, for the sake of convenience, may be made of glass. The top of this can is fitted with an elastic or yielding cover, snugly fitted, and made of some material impervious to the air and fitted to exclude it, such as india-rubber, for example, of which the cover in this instance is made, though it may be made of metal. The cover is shown by *a*. This can is made as wide as the maximum width of the paper to be coated or colored, and its front side is fitted with a delivering or spreading nozzle, *b*, in width equal to that of the can. This nozzle I call the "applier." The top side of the spreading nozzle of said can consists of a plain smooth surface, with a narrow opening made therein along its entire length. This surface of said nozzle is covered with a plate, *c*, accurately fitted thereto, so that the two surfaces when the plate is screwed down form a joint tight enough to exclude the air or hold the fluid in the can. Said nozzle is also fitted with a diaphragm-plate, *e*, extending along its entire width and reaching down to very near the bottom of the can, which in this case is also the bottom of the nozzle. In this diaphragm-plate, which in this case is the front plate of the can, a hole or gateway, *d*, is made, covered with a valve, *f*, fitted with a valve-stem, *g*, passing down through the bottom of the can, in which a stuffing-box should be made, by which said valve-stem can be tightly packed. The reservoir or can having been thus constructed is ready to receive the coating or coloring material, which may be introduced through the orifice *h*, Fig. 2. The filling is done by turning the can back and throwing in the material until the necessary supply is obtained. In filling the can with the coating or coloring material the air is for the most part excluded, so that after the orifice *h* is tightly closed, and the plate *c* taken off of the nozzle, the altitude of the fluid in the reservoir, if it happens to be higher than the top of the nozzle, will be maintained by the external pressure of the atmosphere upon the exposed fluid in the nozzle, in the same manner precisely as the mercury is maintained in the long arm of the siphon barometer, so that none will run out. But the top of the nozzle may in construction be so placed, if desirable, that it will always be as high as the top of the fluid in the reservoir. After the reservoir has been thus supplied the coating material is made to flow with a force

proportionate to the pressure applied to the flexible or yielding cover *a*, and the flow will stop as soon as the pressure on the cover is removed. The cover will then resume its normal position and leave the atmosphere in the can over the fluid rarefied, as it will then occupy a larger space in the can, thus creating a partial vacuum over the fluid. This vacuum will, however, be instantly destroyed by the pressure of the atmosphere, which first forces back all fluid in the slit between the lid and the nozzle, preventing further flow upon the paper, and causes the fluid to flow back into the can or reservoir until the level of the fluid in the nozzle or fountain is brought down to the lower edge of the valve *f* in the gateway *d*, when air passes through under the valve until the equilibrium is restored between the air within the reservoir and the outer atmosphere. Thus, the position of the valve *f* regulates the height of the fluid in the nozzle or fountain when the machine is at rest, and prevents the unnecessary withdrawal of too much fluid from the nozzle or fountain when air is taken into the can or reservoir to supply the place of the fluid used, as such unnecessary withdrawal of fluid from the nozzle would necessitate its being resupplied, and the air that would occupy its place forced out when pressure should be applied, and the machine set at work before any fluid would be applied to the paper. The gateway being narrow and above the slit in the diaphragm, through which the fluid mainly flows, the air in its passage into the can or reservoir, being but a small quantity each time, passes through it in a body, and not in small bubbles, as it would if introduced along the whole length of the slit in the diaphragm, and rapidly rises to the surface of the fluid in the reservoir, and is in no danger of being again forced out into the nozzle or fountain with the fluid, nor of breaking up the fluid with foam. For this purpose the gate and valve are fitted in the diaphragm-plate, by which a passage is furnished for air, which is in addition to the long narrow opening under the diaphragm-plate, which latter opening is made necessarily in that form to insure a solid, uniform, and simultaneous flow of the coating material along the entire length of the nozzle.

Having thus described a proper reservoir to contain the coating or coloring material, I now proceed to bring the paper or other fabric in proper relation to the reservoir or can to receive the coating. To do this I feed the paper through a feeder, H, composed of tin, fitted with a double bottom, as shown by *x*. The paper is shoved through this feeder between the bottoms until the end strikes the surface of a cylindrical drum revolving upon its axis, as shown by B. After the paper has been shoved through the feeder far enough to lap a short distance against the surface of the drum—say, half an inch—the end or edge of the sheet is caught by a clutch, J, fitted in a slot cut in the shell of the drum parallel to its axis, and along its entire length, as shown by *i*. A cross-section of this clutch is shown by J, Fig. 5. It is in length equal to that of the drum. It is hung on pivots in suitable bearings, set in the drum near its ends, about which pivots the said clutch moves on a center from one side of the slot to the other, griping the paper when it is thrown forward, and releasing it when it is thrown back, the clutch being actuated by a cam fitted on the end of its pivot outside of the drum, and which cam is so arranged as to come in contact with stationary pins *u* set in a bracket, *v*, bolted to the frame of the machine, the cam striking the pins as the drum revolves, throwing the clutch from side to side of the slot, griping and carrying the paper upon the drum, and releasing it as soon as the coating is completed. The griping force of this clutch is due to a spring, S, applied to one end of it, and attached to one end of the drum, the spring yielding enough to allow the clutch to move from side to side, and draw it down on either edge of the slot with equal force. As soon, then, as the end or edge of the sheet has been pressed far enough against the surface of the cylinder, it is caught by the clutch and carried up between the surface of the drum and the nozzle of the supply-chamber A, the nozzle of the can being adjusted against the surface of the cylinder, and parallel to its axis, the can itself being hung in front of the cylinder on the frame V, by means of the arms L, which, it will be seen, are also adjustable, by which the can may be nicely adjusted to its proper position. To keep the nozzle of the can up against the surface of the cylinder a pair of springs is applied, as shown by E, and which springs are drawn up by means of adjusting-screws, as shown. By this means the paper and other fabric are brought in contact with the coating or coloring material, which is spread over its surface as the drum revolves.

I have now described the construction of the reservoir in which the coating or coloring material is placed, and by which it is supplied to the paper, and I have also described how the paper is brought in contact with the covering material. It remains now to describe the manner of regulating the flow of the fluid and its application to the paper, and also the discharge of the paper from the drum. It is sometimes necessary to put the adhesive material on thick; sometimes it must be put on thin; sometimes a large surface is to be covered; sometimes only a small one; sometimes a wide margin is desirable on the sheet; sometimes a narrow one only is necessary. It therefore becomes a matter of great importance to regulate the volume, extent, and continuation of the flow or supply of the coating material. The amount of material to be spread upon the paper is regulated by the size of the opening through which it flows out of the nozzle, and by the pressure applied to the fluid, as compared with the pressure of the nozzle against the drum, and by the

position of the lid upon the nozzle, whether more or less advanced. This opening or slit is shown by *b*, Fig 4. It has already been stated that the plate C is accurately fitted on the top side of the nozzle, so as to form a tight joint when screwed down to its place, entirely excluding the flow of the fluid. To allow the coating material to flow, therefore, it is necessary to pack up this plate, thus forming a slit or crack between the plate and the top of the nozzle wide enough to allow the material to flow in the desired volume. The packing employed for this purpose consists of paper, soft metal, or leather, cut, in the form shown by Fig. 6, from a sheet of the necessary thickness, the width of the opening, and the amount of material spread upon the paper, being, of course, regulated by the thickness of the material used for packing. By these packing-pieces the thickness of the material spread upon the paper is not only regulated, but, by them, is also regulated the width of the surface to be covered, because the length of the opening in the nozzle is governed by the distance between the points *z z*, as shown by Figs. 7 and 8.

Fig. 8 shows how the packing should be made to lay to the coating or coloring material on the paper in narrow or broad stripes, in case that should be found desirable.

It should here be observed that, in making the plate C for the nozzle, the under front edge should be chamfered or beveled up, as shown in the drawing, Fig. 9, so that the material will flow off of a flat surface and not off of a sharp angle, the flat surface yielding a uniform flow, and the angle an irregular one, and for the further reason or purpose of giving a wider surface or space than the narrow slit, through which the fluid emerges from the nozzle, in which to apply the pressure of the fluid to the paper.

The shape of the space formed by the beveled edge of the lid, the top of the nozzle, and the surface of the drum, against which the nozzle presses, is that of a triangular prism, its apex or highest point being an acute angle. I propose to call this space "the chamber of application," and its form is such that the fluid is clearly and quickly withdrawn from it when the pressure that causes flow is removed, and the atmospheric pressure is allowed to act in the opposite direction, at the same time that it serves the purposes above mentioned.

It has already been stated that the coating material will be laid on the paper with a force equal to that applied to the yielding cover *a*, and that the flow of the material will stop when the pressure is removed from the cover.

Now, if the pressure of the nozzle against the drum be just equal to, or less than, the pressure of the fluid, and the drum be at rest, the air in the nozzle and chamber of application being expelled, both will be filled with fluid, but none will escape if the edge of the nozzle and the lid are even with each other; and if the drum be revolved no fluid will be applied, except such as permeates the paper, the quantity being regulated by pressure alone upon the fluid, and, perhaps, slightly by the rapidity of movement of the paper. Second, if the pressure on the fluid be now increased to exceed the pressure of the nozzle upon the drum, the latter being at rest, fluid will escape upward and downward, but if the drum at the same time be revolved to move the paper upward with a velocity equal to the downward tendency of the escaping fluid, the fluid will all pass upward and be applied to the paper, and will have the appearance as of a dead surface, not polished, the quantity being regulated by pressure and the size of the orifice between the lid and the top of the nozzle, and a like result may be produced by projecting the lid forward beyond the nozzle by the set-screws hereinafter mentioned. Thirdly, the pressure of the fluid being less than, or equal to, the pressure of the nozzle against the drum, if, now, the lid be very slightly drawn backward by the adjusting-screws *o'*, Fig. 1, back of it, the fluid will escape upward only, and if the drum be now revolved to move the paper upward the fluid will flow out and be applied to it smoothly, evenly, and with a polished surface, the quantity being regulated by pressure of fluid and size of orifice, and greater or less withdrawal of the lid, so that, by different adjustments, different results are produced.

Now, to obtain the pressure upon the yielding cover of the can, a cam is bolted to the end of the cylinder, as shown by R. On this cam the end of the lever T is made to ride. This lever has its fulcrum on a shaft pivoted in the brackets F, and to this shaft is attached an arm, N, fitted with a bearing-block, I, in the manner substantially as shown. The end of the lever T is fitted with a roller, *n*, and when the machine is not at work this end of the lever hangs down against the side of the cam, but when the cylinder is put in motion the roller in the end of the lever strikes the inclined plane Q fitted on the side of the cam and raises the end of the lever up on the top of the cam, where it is kept by the action of a spring, W, of Fig. 3, until it strikes a wedge-shaped cam, P', fastened on the top of cam R, by which the end of the lever is thrown off of the latter cam, and the pressure on the yielding cover of the cam is discontinued. Now, the relative action of this cam and lever to force the coating material out of the can and the clutch to gripe the paper is such that, as soon as the clutch has taken hold of the paper, the lever is thrown on the cam, and the coating material is forced out of the can on the paper, and the pressure continues until the sheet is covered, or as much of it as may be desired. The fluid will flow as long as the cam presses up the end of the lever, and that will continue from the time it is thrown on the cam by the inclined plane Q until it is thrown off by the wedge-shaped cam, P', both of which are adjustable, and may be shoved up near each other, as indicated by the holes in the side of

the cam R, in which case the lever will act on the cam a shorter time, and the duration of the flow will be correspondingly shorter. It may be that the lever T will not press with sufficient force on the can *a* to expel the coating material with sufficient force, or long enough to coat the sheet over its entire length, in which case it is necessary to drop the pressure-block I, which may be done by means of an adjustable screw, by which it is secured to the end of the lever; or the same object may be accomplished by raising the cam higher above the surface of the drum through the agency of the adjusting-screws shown by Y. The lever T is pivoted upon the shaft to move sidewise only, so that the roller N at its end may be thrown aside and held by a catch, so as not to engage with the inclined plane Q or the cam R, in which case, though the cylinder be revolved, no pressure will be applied to the fluid, and none will flow out.

In describing this machine, I have referred to but one cam, R, and one clutch, J; but really there are two cams and two clutches, as shown by the drawing. The one, however, is a mere duplicate of the other, for the purpose of coating two sheets of paper at every revolution of the cylinder instead of one.

After the paper has been coated, as above described, it is discharged from the machine by means of fingers. The small ends of these fingers are made to ride against the back surface of the cylinder, and pass through the notches *k* made in the clutch, when it comes to the slot cut in the cylinder. Now, to raise up the edge of the paper after the clutch has released it, there is a series of small springs set inside of the drum under the clutch, by which the edge of the paper, as soon as the clutch falls back, is pressed up so as to allow the fingers to pass under it and receive it on the finger-table shown in the drawing.

In place of the cylinder in this machine, a revolving belt or moving table may be used; or the can or applier may be moved over a plain surface while the paper or other substance is at rest upon it.

The machine, as described, is particularly applicable to gumming, pasting, sizing, or laying grounds, in colors or otherwise, on paper or other flexible material in sheets, leaving a margin on all its edges. To make application to paper or other material in rows or long strips, the cam R may be converted into a spiral on the end of the drum, to give greater length of time during which pressure will be applied to the fluid, or any other means adopted to produce a continued and equal pressure of air upon the fluid in the reservoir, such as air-pumps, the pressure of a column of liquid, or the like; and the apparatus for this purpose is not necessarily a part of the reservoir in which the substance to be applied is contained, but needs only to be connected therewith by tubes or other air-tight connections.

Having now described my invention, and the means of carrying the same into practice, what I claim, and desire to secure by Letters Patent, is—

1. The reservoir A, provided with an air-chamber, fitted with a compressor, and combined with the cylinder B, as described, by which the pasting or coloring material is spread upon the paper, substantially as set forth.

2. The cylinder B, combined with an air-tight can or reservoir, A, fitted with an adjustable nozzle, substantially as described, to spread the coating or coloring material upon the paper in broad or narrow strips, or lay it on thick or thin, substantially as set forth.

3. In combination with the can or reservoir, the cylinder B, fitted with cams and levers, as described, to automatically operate the compressor and force the fluid upon the paper or fabric moving with the cylinder, as set forth.

4. The nozzle *b*, constructed substantially as described, and fitted with the diaphragm-plate *e*, valve *f*, packing-pieces shown in Figs. 6, 7, and 8, and adjustable lid *c*, with its front edge chamfered to form the chamber of application by which the application and flow of the material is regulated.

5. The reservoir A, provided with an air-chamber fitted with an exhauster, and combined with or connected to the supply-nozzle, by which the atmosphere is made to force back the fluid in the reservoir, in the manner substantially as described.

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