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PATENTED NOV. 22, 1904.

J. H. SHUGG.
MACHINE FOR COATING FABRICS.

APPLICATION FILED JAN. 15, 1903.

NO MODEL.

Fig. 2.

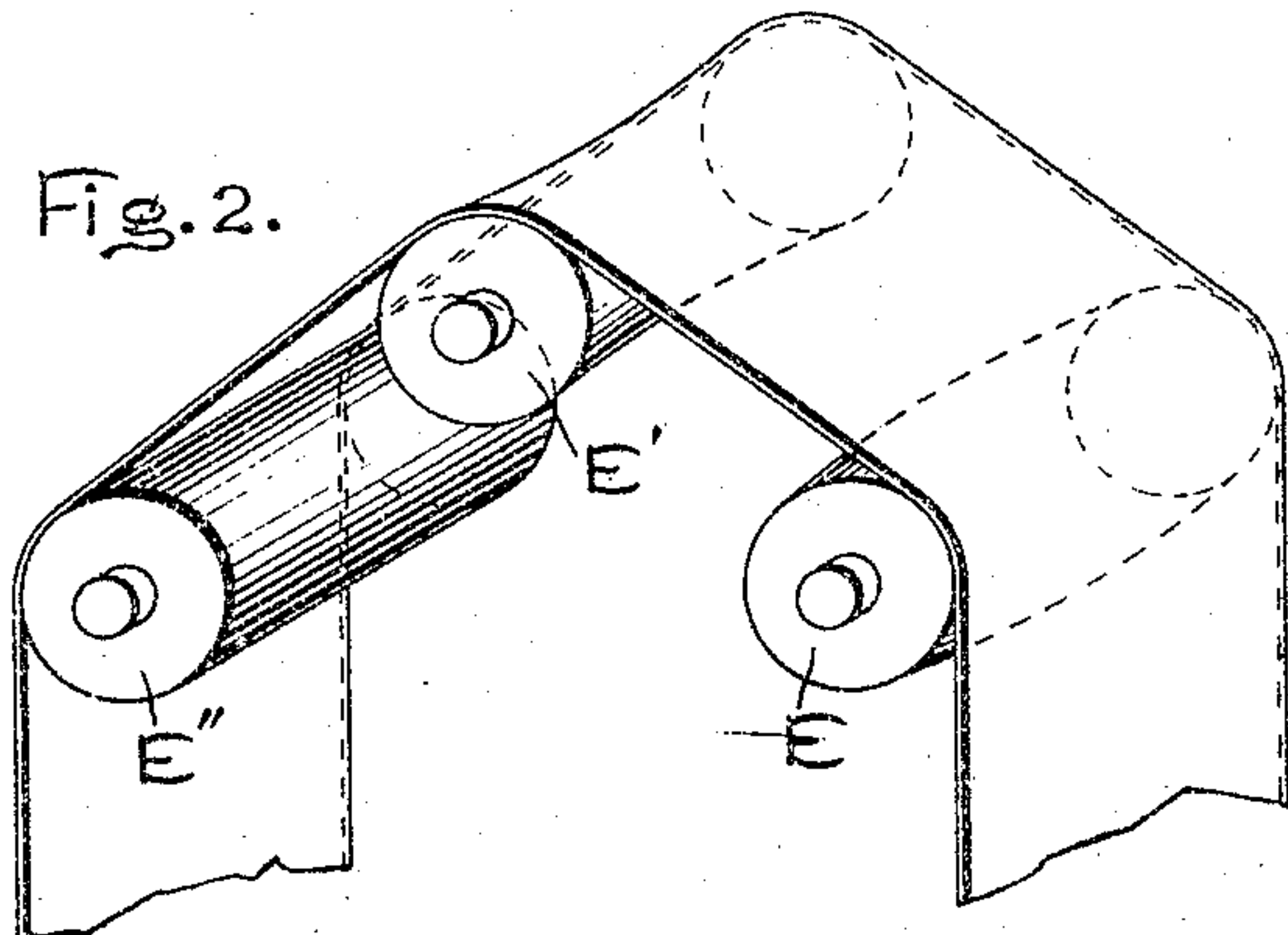


Fig. 3.

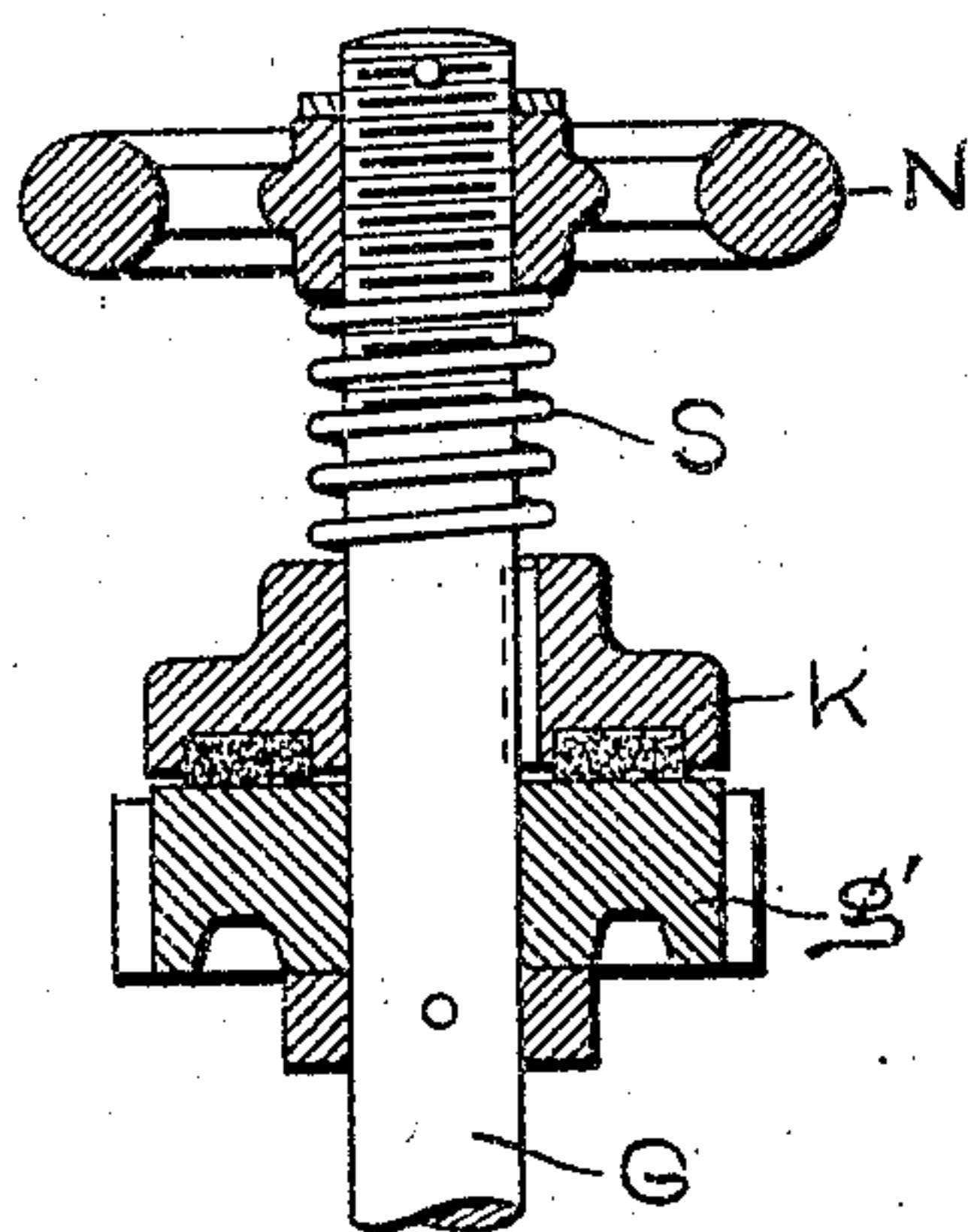
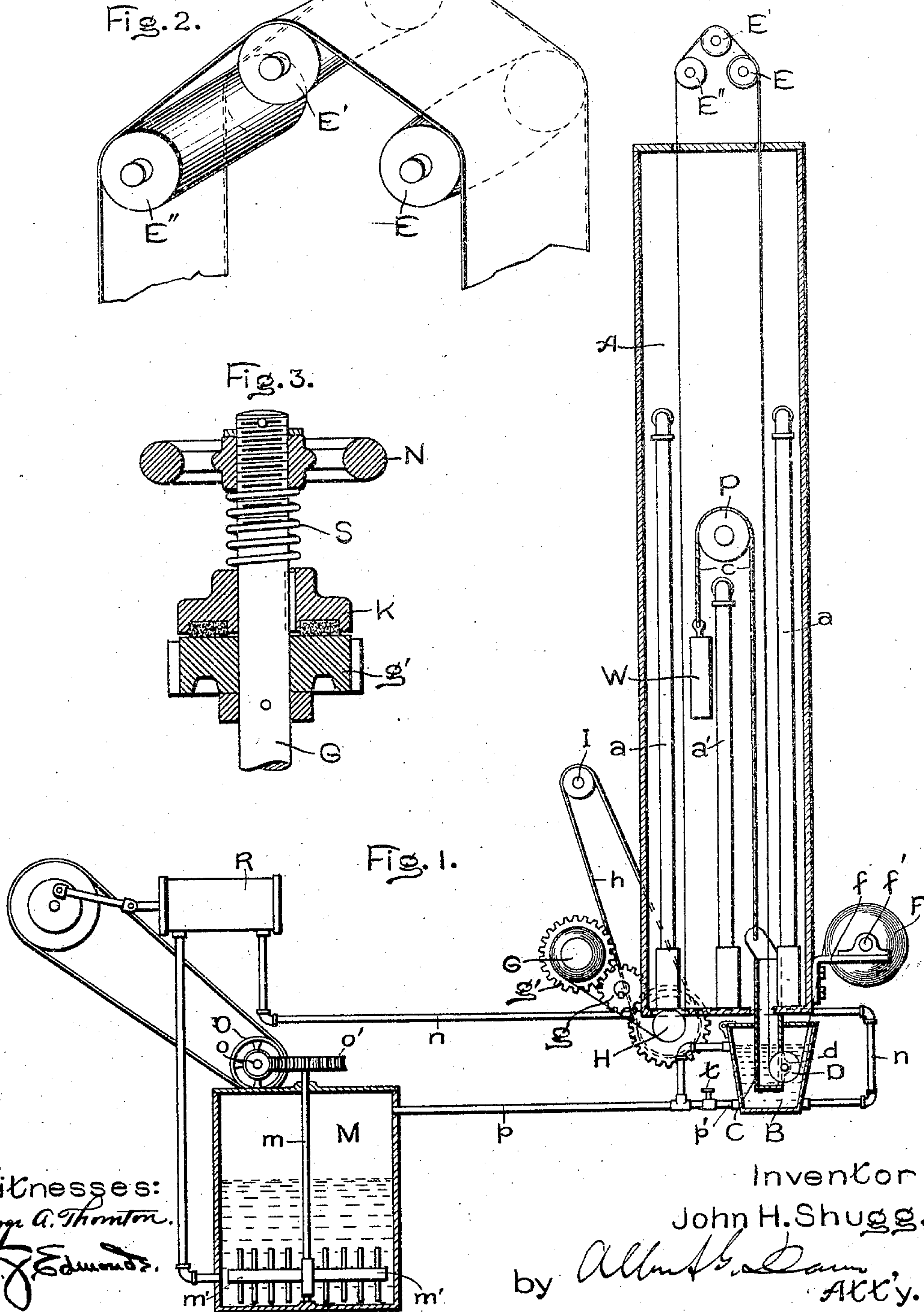


Fig. 1.



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by *Alfred B. Damm*
Att'y.

UNITED STATES PATENT OFFICE.

JOHN H. SHUGG, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MACHINE FOR COATING FABRICS.

SPECIFICATION forming part of Letters Patent No. 775,684, dated November 22, 1904.

Application filed January 15, 1903. Serial No. 139,114. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. SHUGG, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Machines for Coating Fabrics, of which the following is a specification.

This invention relates to a machine for preparing fabric capable of withstanding considerable heat and thoroughly waterproof. Fabrics of this kind are extensively used in electric apparatus for insulating coils and for other purposes. A web of muslin, paper, or other supporting material is coated with a hardening compound, such as linseed-oil, and then baked, the operation being repeated if it is desired to increase the resisting power of the product. Fabrics of this kind are prepared in large sheets or in a continuous roll and afterward cut in strips of the required dimensions. The method of coating fabric from a continuous roll is obviously the more desirable, as it admits of doing most of the work mechanically, and thus greatly reduces the cost of the coated fabric. Great difficulty has been experienced, however, in producing a uniform coating of film. The sagging and gathering of the fabric tends to make the compound settle thicker in the center than on the sides or in streaks across the strip, and impurities in the compound or oxidation products collect in the coating-trough and are deposited on the fabric. By my device I am able to secure an absolutely uniform coating of the insulating compound, and by passing the fabric through several machines, so that it receives a number of coatings, a flexible insulator of high dielectric strength is produced at a minimum cost.

In carrying out my invention I provide a vertical oven heated by ranges of steam-pipes. The oven is supported on uprights, and beneath it is a trough or tank containing the insulating compound. In the trough and below the level at which the compound is maintained is a roller. The fabric is drawn into the trough around the roller and then

upward vertically through the oven between the ranges or walls of steam-pipes.

I have found that by drawing the fabric vertically from the compound through the oven and over a roller at the top of the oven that is slightly crowned the middle portion of the strip is supported and sagging and gathering prevented. I therefore mount a crowned roller above the oven and at a sufficient distance therefrom to permit the coating of film substance to be cooled by contact with the air before it bears on any part of the machine, as when heated the film is tender and easily damaged. The fabric is drawn over the roller and then downward vertically through the oven a second time. I find it advantageous to use three rollers rather than one at the top of the oven, so that the fabric may not bear too heavily on any one of them, and to offset the convexity of the first roller by forming the following one with a slightly-concaved surface.

I have found it highly important that the fabric should be protected from dust and from contact with the cold air after it emerges from the insulating compound and before it reaches the steam-pipes. I therefore provide a sleeve extending from the oven down into the trough, and through this the fabric passes from the compound into the oven without being exposed. This sleeve, moreover, keeps the surface of the compound in the trough about the web of fabric that is leaving the compound in a still and untroubled condition, which conduces toward greater smoothness and evenness of the coat. In order to facilitate removal of the trough for cleaning, I hang the sleeve from a pulley, balancing it with a counterweight.

If no means were provided for keeping the insulating compound in the trough in motion continually, a skin would form on the surface due to oxidation products of the linseed-oil in the compound, and portions of this skin would be carried up by the fabric at intervals, spoiling a section of the strip each time it occurred. Furthermore, the compound used generally contains a solvent, such as tur-

pentine or naphtha, which evaporates freely, and unless provision is made for keeping the compound of the proper consistency it thickens and increases in specific gravity until it no longer soaks into the fabric, but forms a thick gummy coating on the outside. I therefore provide a mixing-tank in which the insulating compound is mixed and maintained at the proper consistency, and from this tank the compound is continually pumped into the various troughs, from which it passes again into the mixing-tank. I find this system of circulation of the insulating substance very advantageous, and as several machines are generally used tandem in order to give the fabric in one treatment the number of coatings sufficient to give it the required strength the trough of each machine can be constantly supplied from the one mixing-tank.

My invention therefore consists of a machine for coating fabric with a film, adapted to secure a uniform coating by preventing sagging and gathering of the fabric, and provided with means for protecting the fabric from exposure while the film is soft, and, further, it embraces a circulating system by which the material for the film is pumped continually from a mixing-tank through the troughs of the coating-machines, whereby the film substance in the troughs can be maintained at a uniform consistency.

It comprises also other features the novelty of which will hereinafter be set forth.

Though I have described my device with particular reference to the preparation of insulated fabric, it is to be understood that it is of general application in the manufacture of coated fabrics.

In the accompanying drawings, which illustrate an embodiment of my invention, Figure 1 is a sectional elevation of my improved insulating-machine and the circulating system. Fig. 2 is a perspective view of the rollers over which the fabric passes above the oven, the curvature of the sides being greatly exaggerated; and Fig. 3 is a view of the clutch partly in section.

In Fig. 1, A represents the oven heated by a vertical range of steam-pipes a a' a'' , and having arms f on its sides carrying the roller f' , on which the fabric F is wound. Below the oven is a trough B, containing the insulating compound. Extending from the oven down into the trough is a sleeve C, through which the fabric passes and which protects the fabric from dust while the compound is soft and from exposure to the air before baking. The sleeve C is hung from the pulley P by the rope c and counterweight W, and can therefore be easily raised out of the trough when necessary for cleaning or other purposes. On the ends of the sleeve C and near the bottom are plates d , in which the roller D is mounted, and in the side of the sleeve C is an opening through which a portion of roller

D extends. Above the oven are mounted three rollers, E E' E'', one above and equidistant from the other two. The first of these rollers, E, is crowned or convex, and the second, E', concave, as shown on an exaggerated scale in Fig. 2.

The fabric is drawn from the roll F into the trough B, around roller D, into and up through sleeve C and the oven A. As it moves very slowly, the fabric is thoroughly soaked with the insulating compound before leaving the trough and then baked in the oven. After being baked it passes out into the air above the oven, where the compound is partially hardened by the air, then over crowned roller E, concave roller E', and cylindrical roller E'', down through the oven again and over roller H, which is driven by a belt h from a source of power I. As the strip of fabric between the trough and the first roller on which it bears is in a vertical position, the weight of the coated fabric tends to pull the middle part of the strip downward, so that threads running crosswise would be curved downward. If this should occur to any great extent, the fabric would wrinkle, making it impossible to get an even coating of insulation. By crowning the first roller over which the fabric passes the middle portion of the strip is supported, so that the crosswise threads are held substantially horizontal.

From roller H the fabric passes to and is wound up on roller G. On account of the increasing diameter of the roll as the fabric is wound on it I drive roller G by means of a friction-clutch. (Shown in Fig. 3.) The gear-wheel g' is loose on the shaft or roller G and is driven from roller H by a gear-wheel on the end of that roller and the pinion g . The clutch k is splined to the shaft, so as to allow movement longitudinally thereon and is urged forward by spring S, the tension of which is regulated by the hand-nut N. By regulating the clutch the roller G is made to take up the coated fabric and to pull the strip against roller H tightly enough to enable that roller to draw the fabric through the trough and oven. As more than one coating of the insulation is generally necessary, it is usual to place two or more of these machines side by side and run the fabric through all of them continuously. When this is done, the clutch is drawn back, so that it does not press on gear-wheel g' , and the strip of fabric passes over roller G and down into the trough of the next machine.

The tank M, in which the compound is mixed, is provided with a central shaft m , having arms m' m' thereon for stirring the liquid and mixing the ingredients together. A motor O or other source of power keeps the stirrer constantly in rotation by means of the worm o and worm-wheel o' . From the tank the compound is pumped by pump R through pipe n to the trough of the insulating-machine, and

from the trough it runs back into the tank through pipe *p*, which enters the trough at the level at which the compound is to be maintained. From the bottom of the trough is a drain-pipe *p'*, connected to pipe *p* and having a valve *t* therein, so that the trough can be drained by opening valve *t* for cleaning or other purposes. The feed-pipe *n* and the return-pipe *p* connect in a similar manner with all the machines in use, so that the compound is kept continually in circulation from the mixing-tank through the troughs of all the coating-machines.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A coating-machine comprising a vat containing the liquid coating, and a guard-sheath through which the web of material is passed and having its lower end immersed in the liquid coating so as to produce a still surface within the guard-sheath.

2. A coating-machine comprising a vat for containing the liquid coating, a guard-sheath into which the web of material is passed and having its lower end immersed in the liquid coating so as to produce a still surface within the guard-sheath, and a guide-roller submerged in the liquid coating under which the web of material is passed.

3. A coating-machine comprising a vat for containing the liquid coating, and an adjustable guard-sheath through which the web of material is passed and having its lower end immersed in the liquid coating so as to produce a still surface within the guard-sheath.

4. A coating-machine comprising bearing-boxes, roll and reel shafts journaled in the bearing-boxes and on which the roll of material to be treated is unwound and rewound, a vat for the liquid coating in which the web is immersed and through which it is passed, a depending guard-sheath suspended over and extending into the contents of the vat through which the web of material is drawn upwardly, and drying-pipes located above the vat on opposite sides of the guard-sheath, between which the web of material is passed for drying the liquid coating.

5. A coating-machine comprising a vat for containing the liquid coating, and a guard-sheath through which the web of material is passed, said guard-sheath having its lower end immersed in the liquid coating.

6. A coating-machine comprising a vat for containing the liquid coating, a guard-sheath through which the web of material is passed, said guard-sheath having its lower end immersed in the liquid coating, and a guide-roller submerged in the liquid coating under which the web of material is passed.

7. A coating-machine comprising a vat for containing the liquid coating, and an adjustable guard-sheath through which the web of material is passed, said guard-sheath having its lower end immersed in the liquid coating.

8. A machine for coating fabric with a film, comprising an oven, a trough situated below the oven, and a sleeve extending from the oven into the trough.

9. A machine for coating fabric with a film, comprising an oven, a trough situated below the oven, and a sleeve extending from the oven into the trough arranged to be raised out of the trough.

10. A machine for coating fabric with a film, comprising an oven, a trough situated below the oven, a sleeve extending from the oven into the trough, and a roller mounted on said sleeve near its lower end.

11. A machine for coating fabric with a film, comprising an oven, a tank situated below the oven, a roller mounted in the tank, and a sleeve extending from the oven down into the tank to protect the fabric from exposure.

12. In a machine for coating fabric with a film, an oven, a tank containing the material for the film, a roller having a convex surface, and means for drawing the fabric through the tank and oven and over said roller whereby the middle portion of the fabric is raised and sagging prevented.

13. In a machine for coating fabric with a film, an oven, a tank containing the material for the film, a plurality of rollers, one having a convex surface and a following one having a concave surface, and means for drawing the fabric through the tank and oven and over said rollers.

14. In a machine for coating fabric with a film, an oven, a tank containing the material for the film, a roller having a convex surface situated above the oven, and means for drawing the fabric through the tank and oven and over said roller.

15. In a machine for coating fabric with a film, an oven, a tank containing the material for the film, a plurality of rollers situated above said oven, one of said rollers having a convex surface and a following one having a concave surface, and means for drawing the fabric through the tank and oven and over said rollers.

16. In a machine for coating fabrics with a film, an oven, a tank situated below the oven containing the material for the film, means for preventing exposure of the fabric while passing from the tank to the oven, a roller having a convex surface situated at the top of the oven, and means for drawing the coated fabric through the oven and over said roller.

17. In a machine for coating fabric with a film, an oven, a tank containing the material for the film, arranged so that the fabric is drawn vertically from the tanks through the oven, means for preventing exposure of the fabric while passing from the tank to the oven, and means for advancing the middle portion of the coated fabric ahead of corresponding points on the edges.

18. In a machine for coating fabric with a

film, a coating device, means for feeding the fabric to the same, means for advancing the middle portion of the coated strip ahead of corresponding points on the edges, and means
5 for compensating for that advance.

19. In a machine for coating fabric with a film, an oven, a trough situated below the oven, a sleeve extending from the oven into the trough, means for drawing the fabric through
10 the sleeve into the oven, and means for preventing sagging of the fabric.

20. In a machine for coating fabric with a film, an oven, a trough situated below the oven, a sleeve extending from the oven into the trough, a roller above the oven, and means for
15 drawing the fabric into the trough, through said sleeve and oven and over said roller.

21. In a machine for coating fabric with a film, an oven, a trough situated below the oven, a sleeve extending from the oven into the trough, a roller above the oven, means for
20 drawing the fabric into the trough, through said sleeve and oven and over said roller, and means for preventing sagging of the fabric within the oven.

22. In combination with a machine for coating fabric, a tank wherein the coating compound is mixed, means for pumping the compound from the tank to the trough of the coating-machine, and means for permitting the
30 compound to flow back into the tank when it reaches a certain level in the trough.

23. In combination with a machine for coating fabric, a tank for mixing the coating compound, means for pumping the compound from the tank to the trough of the machine, means
35 for permitting the compound to flow back into the tank when it reaches a certain level in the trough, and means for draining the trough.

24. In a machine for coating fabric with a film, an oven, a trough below the same, a sleeve extending from the oven into the trough, means for drawing the fabric from the trough through the sleeve into the oven, and means
40 for maintaining a continuous circulation of the material for the coat within said trough.

25. In a machine for coating fabric with a film, an oven, a trough below the same, a sleeve extending from the oven into the trough, means for drawing the fabric from the trough through said sleeve, a tank containing the material for the film, means for pumping the material from the tank into the trough, and means
50 for permitting the return of the material from the trough to the tank.

26. In a machine for coating fabric with a film, an oven, a trough below the same, a sleeve extending from the oven into the trough, means for drawing the fabric from the trough through the sleeve into the oven, means for
60 preventing sagging and gathering of the fabric, and means for keeping the substance in the trough constantly in motion.

27. In a machine for coating fabric with a film, an oven, a trough situated below the oven, a crowned roller situated above the oven, means for drawing the fabric from a continuous roll through the trough, through the oven, over the crowned roller and through the oven
65 again, and means for keeping the substance in the trough constantly in motion.

In witness whereof I have hereunto set my hand this 10th day of January, 1903.

JOHN H. SHUGG.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.