

J. F. RYAN.

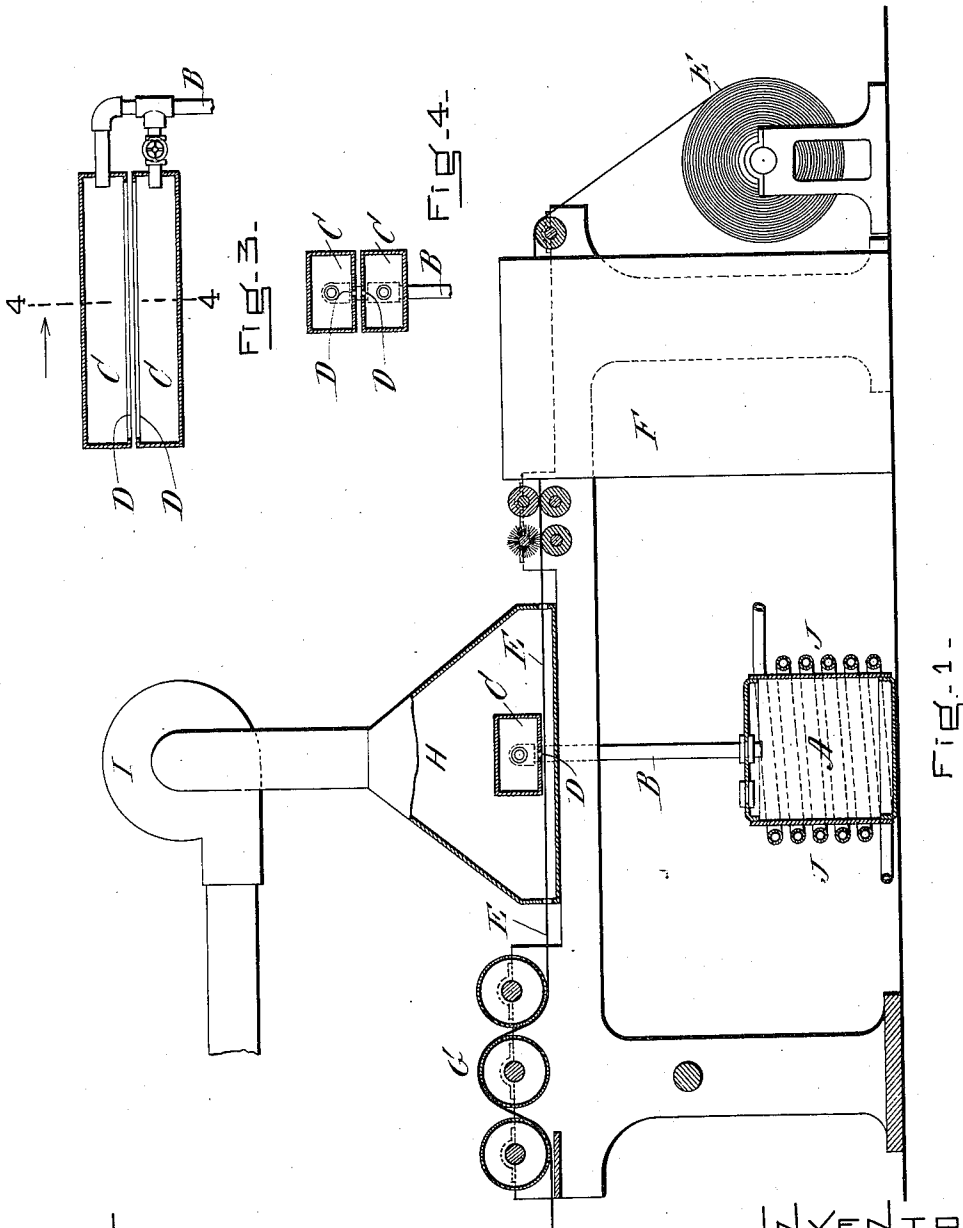
PROCESS FOR MAKING WATERPROOF MATERIALS AND COATINGS.

APPLICATION FILED JAN. 14, 1911.

Patented Mar. 23, 1915.

2 SHEETS-SHEET 1.

1,132,687.



WITNESSES =

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by his attorney
George P. Dwyer

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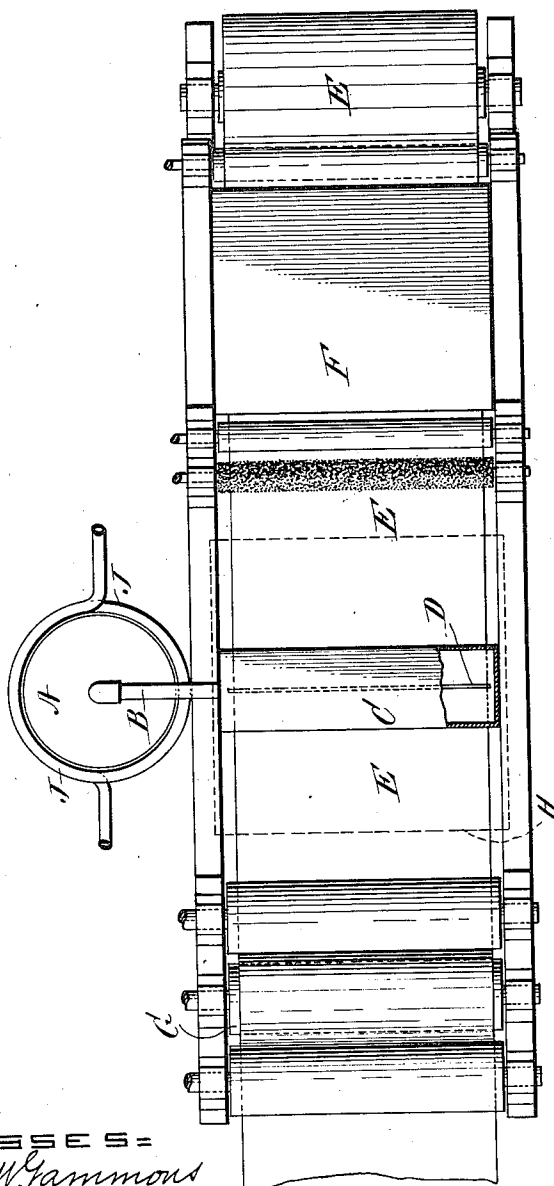


FIG. 2-



FIG. 5-

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UNITED STATES PATENT OFFICE.

JOHN F. RYAN, OF WINTHROP, MASSACHUSETTS.

PROCESS FOR MAKING WATERPROOF MATERIALS AND COATINGS.

1,132,687.

Specification of Letters Patent.

Patented Mar. 23, 1915.

Application filed January 14, 1911. Serial No. 602,588.

To all whom it may concern:

Be it known that I, JOHN F. RYAN, a citizen of the United States, residing in Winthrop, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Processes for Making Waterproof Materials and Coatings, of which the following is a specification.

My invention relates to improvements in waterproof materials which contain in their surface composition an insoluble compound resulting from the action of formaldehyde upon certain organic substances.

It has long been known that certain organic substances, when placed in liquid formaldehyde, will so combine with the formaldehyde, or be so affected by it, as to produce an insoluble solid compound. Various organic adhesive substances have this property, among them, animal glue and casein. I have learned that when any of these adhesives are mixed with other substances and exposed to the action of formaldehyde gas, this will render the whole mixture insoluble, provided the proportion of the adhesive to the whole mixture is sufficient, and I have applied this knowledge to the manufacture of waterproof materials, especially sheets of relatively thin material, such as paper, cloth and cardboard, by coating one or both surfaces of the material with compositions containing a considerable proportion of any one of the organic adhesives which have in a high degree the property of combining with formaldehyde, and exposing the surface or surfaces to the action of formaldehyde.

My invention consists in a process of manufacturing waterproof materials by treating the same with formaldehyde gas itself instead of with a liquid solution of the same as has heretofore been proposed and in the preferred embodiment of the invention to be described, I show how this is practicable, by associating a formaldehyde gas treating station with a liquid coating station in such a manner that the web of sheet material being treated is passed with continuous movement from the coating machine to the gas treating station whereby the gas is caused to act upon the same while it is still moist and therefore in condition to be susceptible in the required manner to the chemical action of the formaldehyde. I have found that the material can be effectively treated very rapidly in this way, the water-

proofing action of the jet of formaldehyde gas forcibly projected upon the moist coating of the sheet being practically instantaneous so that the web of material can be moved along with a continuous rapid movement to be subsequently dried by suitable drying means at a further adjacent station.

It is to be observed that in the practice of my invention not only is it practicable for the first time to waterproof thin and delicate coated paper by the formaldehyde process, since such papers are not strong enough to stand a subsequent moistening after coating as would be required for treatment by formaldehyde solution or vapor, but with my improved sequence of operations the formaldehyde treating and coating operations are combined in such a way that not only is there no separate moistening of the paper for the formaldehyde treatment required, but such treatment actually contributes to the drying out and hardening of the paper coating after the coating operation, making the coating and waterproofing steps substantially component parts of a single unitary operation for the production of waterproofed coated paper or other sheet material. My invention greatly accelerates the formaldehyde waterproofing treatment considered by itself since it will be apparent that the action of formaldehyde gas itself instead of a mere solution of the same in liquid is a more effective agent, and its efficiency is largely enhanced by the fact that it is blown upon the surface being treated, with some little force, preferably while the surface itself is in motion so that the treatment is expedited by kinetic action. I have found that in practice a jet of gas no more than one quarter of an inch in width is sufficient to adequately treat a web of material going past the same at a substantial rate of speed.

For an illustration, I shall describe a process especially adapted to thin and flexible materials, which consists of passing the material in a continuous strip past a chest from which formaldehyde in the form of gas escapes upon its surface. This process of manufacture is illustrated by the accompanying drawings.

Figure 1 is a vertical section, and Fig. 2 a plan, both illustrating the process of waterproofing a roll of thin and flexible material by applying formaldehyde gas on the upper

side only. Figs. 3 and 4 are longitudinal and transverse vertical sections of the gas chest, illustrating the manner of applying the formaldehyde gas on both sides of the material at once. Fig. 5 is a cross section of a sheet of coated material affected by formaldehyde, showing the material and the waterproof coating.

In the drawings, A represents any form of generator for generating formaldehyde gas; B, a pipe leading upward from the generator to a gas chest; C, the gas chest; D, a slot in the bottom of the gas chest; E, the material in process of waterproofing; F, any coating machine, such as is ordinarily used in coating paper; G, any system of drying rolls; H, a funnel for carrying off the gas; I, a suction fan or other suction device connected with such funnel; J, in Figs. 1 and 2, steam pipes heating the generator; K, in Fig. 5, a waterproof coating comprising the resultant of the reaction of an organic adhesive substance with formaldehyde; and L, in Fig. 5, a sheet or piece of material bearing such a waterproof coating.

I do not intend to confine myself to the exact process illustrated, or even to a process suitable only to the waterproofing of thin and flexible materials, as the essential feature of the process, to wit, passing the material near a chest from which formaldehyde gas is escaping, can be carried out with rigid materials. For purposes of illustration, however, I am describing a process carried out with thin and flexible materials capable of being coated by processes in ordinary use, because in practice it is more economical, where a material is to be coated and made waterproof, to apply the coating and the formaldehyde gas in one continuous process. In the following description I take, as an example of a thin and flexible material, a roll of paper, and describe the process of coating it and making it waterproof by the action of formaldehyde gas. The paper, E, is shown at the right of Figs. 1 and 2 in the form of a roll. As it unrolls it passes through the coating machine, which contains a coating composition comprising some organic adhesive. The percentage of organic adhesive in the composition depends upon the adhesive used. With either glue or casein, the adhesive should be at least fifteen per cent. of the total mass of the coating composition. The paper passes through the coating machine, F, bearing on its upper side a coating of the composition used, and passes from it, by the gas chest, C, to the drying rolls, G. The coating is moist when the paper issues from the coating machine, and remains moist when it passes by the gas chest, and is therefore more readily susceptible to the action of formaldehyde gas than it would be if it had been allowed to harden. The gas, generated in the generator, A, as-

cends by its own pressure to the gas chest, C, from which it escapes either by its own pressure or by the use of blowers or other devices, through the slot, D, directly upon the moist coating of the paper, E. The gas, so escaping, acts upon the coating composition and, by some chemical action the exact nature of which I do not know, but which, for brevity, I call a reaction, produces the waterproof coating.

To begin the foregoing process, the end of the roll is placed by hand in the coating machine, and drawn through it past the gas chest, C, to the drying rolls, G. As soon as the paper is engaged by the drying rolls, the process is continued automatically, the paper being unrolled by the movement of the drying rolls and drawn past the gas chest.

If the coating machine used coats the paper on both sides, the process is the same, except, that, instead of one gas chest, two are used, C C, Figs. 3 and 4, each chest containing a slot, D D, Figs. 3 and 4.

The generator for making the gas may be heated in any manner desired. The coiled steam-pipes, J, Figs. 1 and 2, illustrate one method of heating, but any other may be used.

If any thin flexible material, other than paper, is desired to be made waterproof the foregoing process can be applied in exactly the manner above described.

I do not consider the coating process described an essential part of my invention, and any coating process may be used.

With materials which are not flexible, the process of coating the material and subjecting it to the action of formaldehyde gas must be different in detail, but the essential feature of the process will remain the same, to wit, passing the material or its coated surface in close proximity to a chest from which formaldehyde gas is escaping. This may be done by any appropriate means, as a moving table on which pieces of the material are placed, by which they are carried past the gas chest, and from which they are removed after passing by the chest.

In order to avoid having the formaldehyde gas fill the room in which the process is being carried on, and also in order to save the gas, it is advisable to have some means of carrying off the gas that remains after acting on the material or coating made waterproof. For this purpose I use a funnel, H, Fig. 1, connected with a suction fan or other suction device. The gas, being lighter than air, rises and is caught by the suction, by which it is drawn either to the outer air or to a reservoir for collecting it. Any other method of disposing of the remaining gas may be used.

Instead of generating the gas, it is possible to supply it directly from a reservoir or pressure tank, and I intend to include this

method of supply in the claims of my invention.

It is sometimes advisable, by the use of some means for increasing the pressure of the gas in the chest, or by blowers or other means, to increase the force with which the gas leaves the slot in the chest and strikes the coated surface of the paper, and on the other hand it is sometimes advisable, by reduction valves or other means, to prevent it from issuing with excessive force. None of these means are of the essence of my invention, and I intend to claim the process of making waterproof material, both with and without their use.

I make the following claims:

1. The herein described process which consists in moving sheet material through a coating station where it receives coating adapted to be waterproofed by formaldehyde, thence moving the material past a gas treating station, and projecting formalde-

hyde gas upon the same as it moves past the gas treating station.

2. The herein described process which consists in moving material having a component adapted to be waterproofed by formaldehyde past a gas treating station, and projecting a jet of formaldehyde gas thereupon during the progress of such movement.

3. The herein described process which consists in moving a web of material past a station imparting thereto an organic adhesive substance adapted to combine with formaldehyde, thereafter directing the material past a gas treating station, and projecting formaldehyde gas upon the material as it moves past said station.

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Witnesses:

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