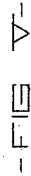
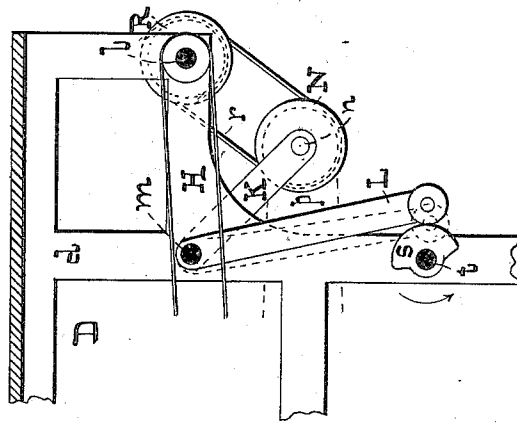
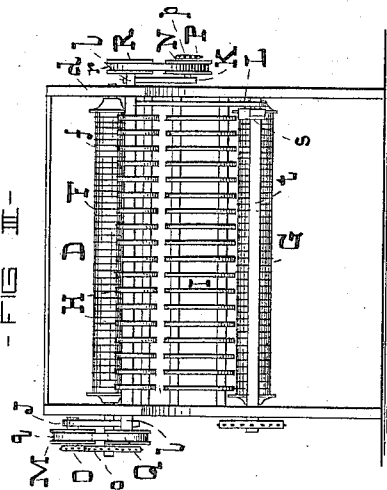
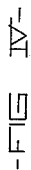
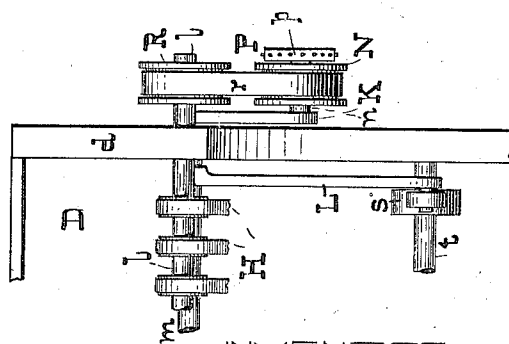


3 Sheets—Sheet 1.

No. 363,335.

Patented May 17, 1887.



-WITNESSES-

A. C. Eads

John E. Morris

-INVENTOR-

Francis K. Hopper,

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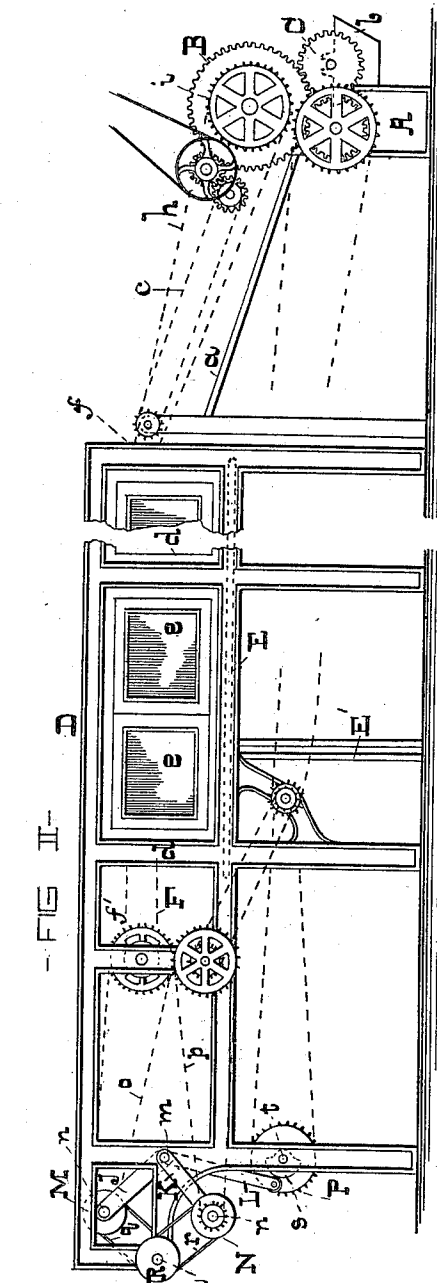
(No Model.)

3 Sheets—Sheet 2.

F. X. HOOPER & W. HOLLINGSWORTH.
APPARATUS FOR DRYING COATED SHEETS OF PAPER.

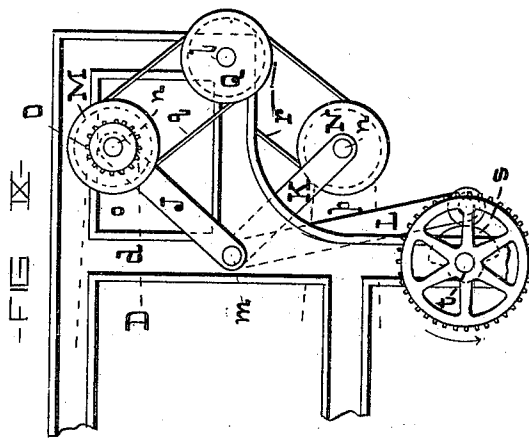
No. 363,335.

Patented May 17, 1887.

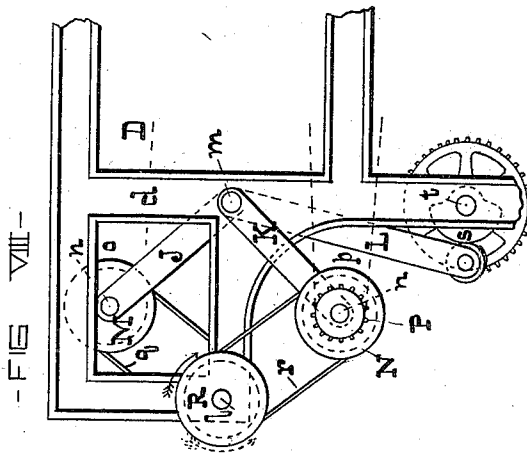


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-FIG. IX-



-FIG. VIII-

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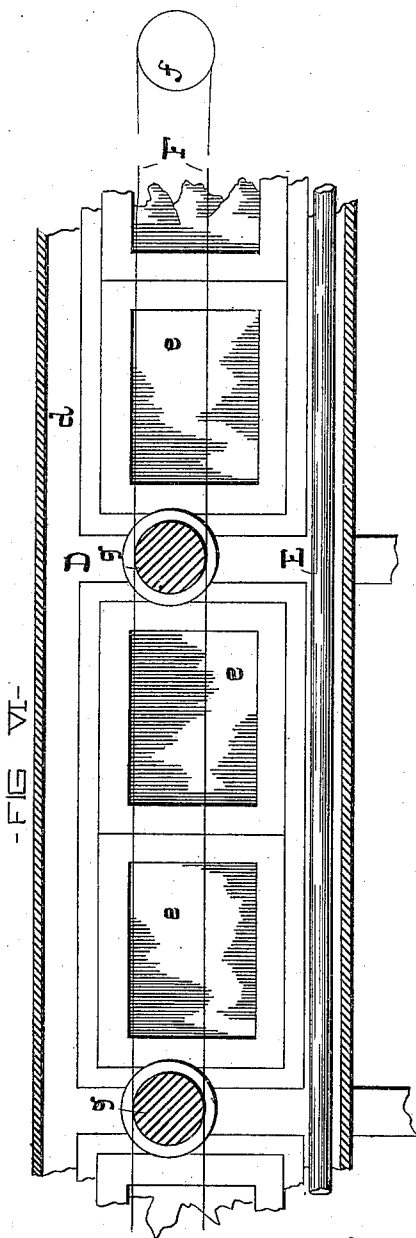
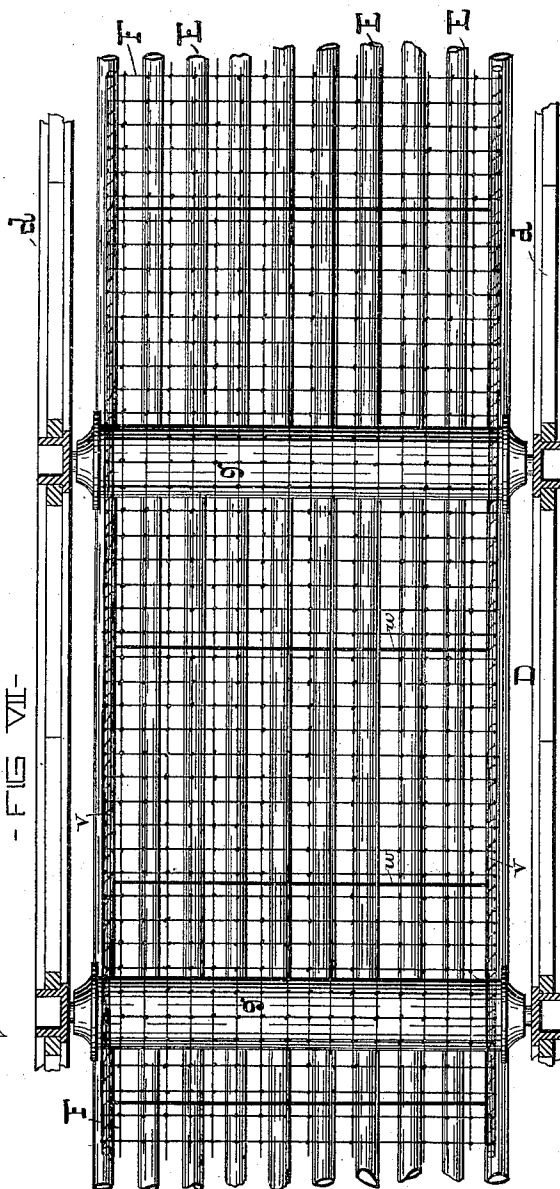
(No Model.)

3 Sheets—Sheet 3.

F. X. HOOPER & W. HOLLINGSWORTH.
APPARATUS FOR DRYING COATED SHEETS OF PAPER.

No. 363,335.

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- WITNESSES -

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Francis X. Hooper,

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By Chas B. Mann Atty

UNITED STATES PATENT OFFICE.

FRANCIS X. HOOPER AND WILLIAM HOLLINGSWORTH, OF BALTIMORE,
MARYLAND, ASSIGNORS TO F. X. HOOPER & CO., OF SAME PLACE.

APPARATUS FOR DRYING COATED SHEETS OF PAPER.

SPECIFICATION forming part of Letters Patent No. 363,335, dated May 17, 1887.

Application filed August 13, 1886. Serial No. 210,789. (No model.)

To all whom it may concern:

Be it known that we, FRANCIS X. HOOPER and WILLIAM HOLLINGSWORTH, citizens of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Varnishing and Drying Paper, of which the following is a specification.

Our invention relates to improvements in apparatus for drying sheets of paper or other material which have been coated with varnish, gum, or any preparation or liquid which requires heated air to properly dry it.

To fully understand the nature and object of this invention it must be known that there is a class of work—such as labels for fruit, oysters, or other canned or preserved goods, and printed or lithographed sheets used as advertising media—which are varnished to protect them against the effects of moisture and to improve their appearance. To dry this class of work the coated sheets require to be exposed for a certain length of time to the action of heated air and afterward cooled in the atmosphere before they are in condition to handle or be placed in piles.

In the accompanying drawings, which illustrate the invention, Figures I and II are exterior elevations of the improved apparatus as seen from different sides. Fig. III is a rear end view of the same. Fig. IV is an enlarged view of parts shown in Fig. III. Fig. V is a longitudinal horizontal section of the rear end of the apparatus on an enlarged scale. Figs. VI and VII are vertical section and horizontal section views, respectively, of the hot box. Figs. VIII and IX are views as seen from different sides of the mechanism for effecting the reverse movement of the apron H, and correspond with the same parts as seen in Figs. II and I.

The letter A designates the varnish or other sheet-coating machine, and B the feed-roll which carries the sheets from the feed-table *a* over the varnishing-roll C, which is supplied with varnish from the trough *b*, to the endless apron *c*. This apron is preferably formed of tapes; but it may be constructed of any other material, if desired, as its office is merely to convey the newly-varnished sheets, coated

side up, to a second endless apron, F, or sheet-carrier, hereinafter described, and situated in the hot box D. This box is formed of an iron frame-work, (represented by *d*), with glass panels, or rather glass hinged doors *e*, which give ready access to the interior of the box, and also admit of the inspection of its contents when the box is closed. The box is heated by means of a coil or gang of steam-pipes, E, arranged in a horizontal plane, and shown in dotted lines in Figs. I and II and in full lines in Figs. VI and VII, having suitable means for the admission and discharge of steam. These heating-pipes are placed near to the bottom of the hot box D, and this hot box in Figs. I and II is shown with the central portion broken out and removed to shorten it.

F is the endless apron or sheet-carrier, before alluded to as being situated in the hot box D, and it is constructed of netting with rope edges *v* to strengthen it, and having cross-bars of iron, *w*, or other suitable material, placed at suitable distances apart to keep the apron stretched to its full width. These cross-bars are covered with thread or cord in a whipbraiding machine, to prevent injury to the netting as it comes in contact with them. It is supported above the heating-pipes by means of the two rolls *f f'* and the intermediate ones, *g*, which latter prevent excessive droop or swag of the netting. (See Fig. I.) The forward roll, *f*, is driven by means of an endless chain, *h*, from a chain-head, *i*, on one of the rotary shafts of the varnishing-machine, as shown in Figs. I and II. It is found that hempen or cotton netting strengthened at the edges by means of rope, as shown, is the best material for the endless apron F, as it is not injuriously affected by heat, is very flexible and strong, and gives good support to the sheets without intercepting the hot air arising from the steam-pipes. A second endless apron or sheet-carrier of netting, G, is situated under the hot box and used to carry back the sheets after they have passed through the hot box D and deliver them under the trough of the varnishing-machine, or to some other convenient place. This apron corresponds in construction with the one, F, before described, but moves in an opposite direction.

It will be understood that while the sheets are passing through the hot box the volatile constituents of the varnish are driven off, and to complete the drying operation it is then necessary that the sheets should be cooled. This cooling is accomplished as the sheets are conducted from the rear of the hot box to the forward end of the machine by means of the second endless apron G, just described.

Of course it is not essential in cooling the sheets that they be returned toward the coating-machine; but conducting them back in this direction economizes floor-space.

The means for transferring the sheets from the apron F in the hot box to the cooling-apron G consist of the following - described mechanism: An endless apron, H, Fig. 1, formed of tapes, and which we call the "reversing-apron," is supported on shafts *kl* at the rear end of the machine, one of which shafts, *k*, is placed directly under the roller *f'*, in order that the sheets from the apron F may fall on the reversing-apron H. This reversing-apron has a forward and backward motion, effected as hereinafter described, and a sheet delivered to it is first carried back until it is perfectly clear of the apron F, when the motion is reversed and the sheet conducted forward and delivered to the feed-apron I, which moves continuously in one direction and delivers the sheet to the cooling-apron G, before described.

The reverse movement of the apron H is effected as follows: A rock-shaft, *m*, extends entirely across the frame *d* of the hot box and turns in suitable bearings. It is provided at one end with an upward-inclined arm, J, and at the other with a downward-inclined arm, K, and between these arms, and inside the framework of the hot box, (which at this point has opensides,) the said rock-shaft has a third arm, L, for a purpose hereinafter described. The arms J K have each a pin, *n*, on which revolves loosely the pulleys M N, with their chain-heads O P. The pulleys M N are rotated in opposite directions through the medium of chains *o p*, which derive their movement from rotary shafts forming parts of the varnishing-machine. The pulleys M N each bear a belt, *q r*, by which they are united to similar pulleys, Q and R, which latter are both on one shaft, L, which is the driving-shaft of the reversing-apron H. The belts *q* and *r* are normally slack, but both are alternately rendered tight and so operative to revolve its pulley on the

common shaft I by the vibration of the arm L in the proper direction. This vibration of the arm L is effected by means of a cam, *s*, on the shaft *t*, which shaft is continually revolved in one direction by means of a chain and suitable gearing.

From the foregoing it will be seen that when the cam *s* pushes the arm L outward the pulley M is thrown up and back and the upper belt, *q*, tightened, which has the effect of making it operative to drive the pulley Q and the shaft I in the direction indicated by the arrow in dotted lines in Fig. VIII. During this movement the lower belt, *r*, is slack and inoperative; but as the full part of the cam *s* is withdrawn from the roller on the end of the arm L that arm falls by the force of gravity, and thereby rocks the shaft *m*, and the upper belt, *q*, is slackened, while the lower one, *r*, is tightened and made to revolve the shaft L in the opposite direction. (Indicated by the arrow in full lines.)

It is obvious that an apparatus embracing the parts and combinations herein described may be used for sheets coated with varnish, gum, paint, or any other liquid substance.

Having described our invention, we claim and desire to secure by Letters Patent of the United States—

1. In an apparatus for drying coated sheets, the combination of a coating-machine, a hot box containing a sheet-carrier, a conveyer-apron to carry the newly-coated sheets from the said machine to the sheet-carrier in the hot box, a sheet-carrier situated exteriorly of the hot box for cooling the sheets, and a forward and backward moving apron to transfer the sheets from one sheet-carrier to the other, whereby the coated sides of the sheets are not touched, nor are they turned over, as set forth.

2. The combination of the shaft I, having the pulleys Q and R, the rock-shaft *m*, having the arms J and K, carrying the reverse rotating pulleys M and N, each connected, respectively, by a slack belt to the pulleys Q and R, the arm L, secured to the rock-shaft *m*, and the rotary cam *s*, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

FRANCIS X. HOOPER.
WILLIAM HOLLINGSWORTH.

Witnesses:

JNO. T. MADDOX,
W. ROSS WILSON.