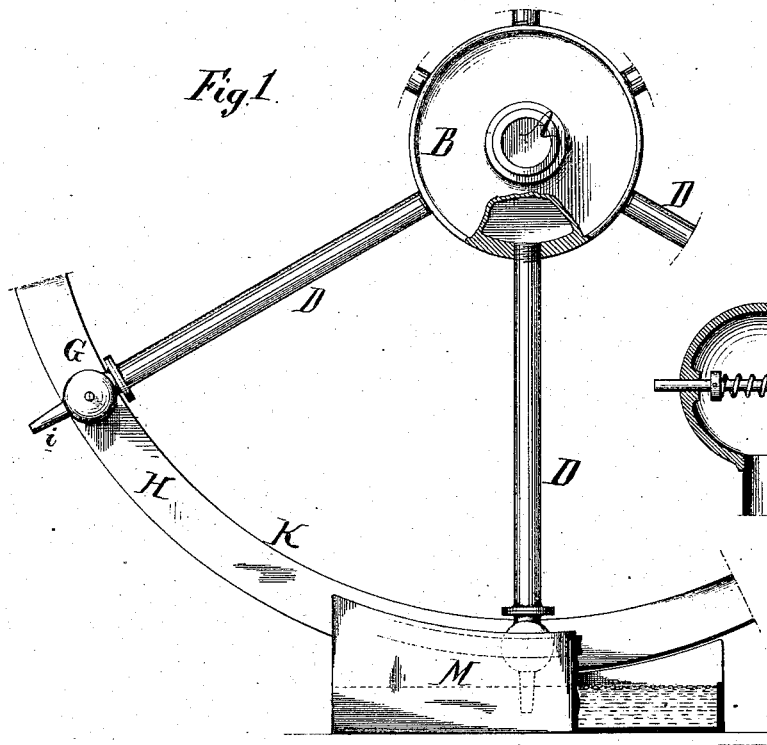
J. BUTTERWORTH.

Drying-Cylinder.

No. 163,150. Patented May 11, 1875.

Fig. 1.



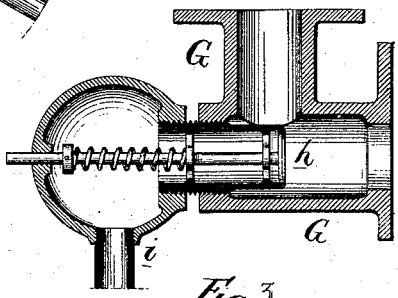
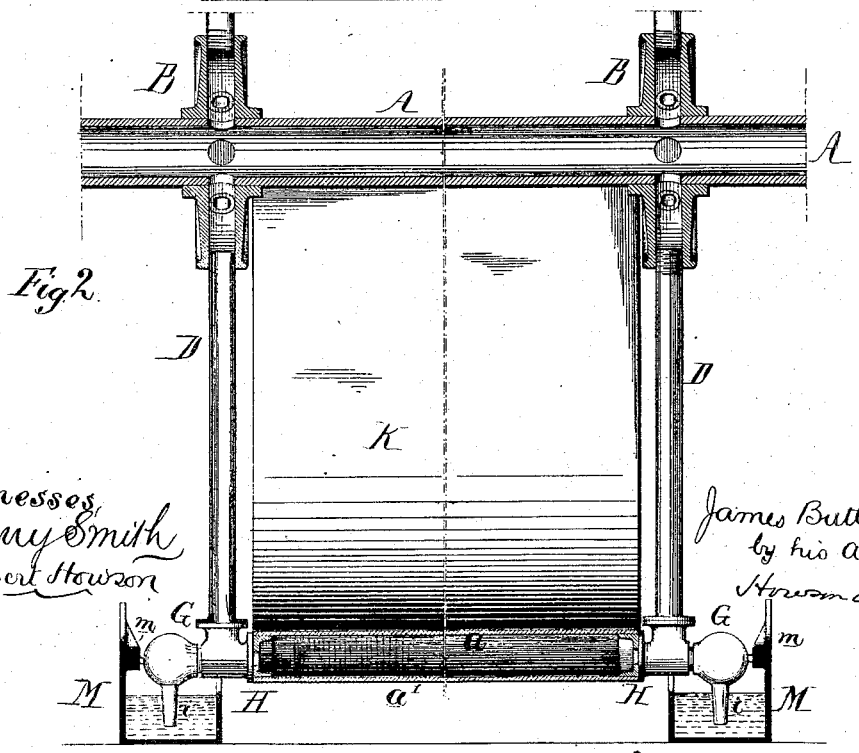


Fig. 3.

Fig. 2.



Witnesses,
Harry Smith
Hubert Howson

James Butterworth
by his Attorneys,
Howson and Sons

UNITED STATES PATENT OFFICE.

JAMES BUTTERWORTH, OF PHILADELPHIA, PA., ASSIGNOR TO JAMES BUTTERWORTH AND CHARLES C. BUTTERWORTH, OF SAME PLACE.

IMPROVEMENT IN DRYING-CYLINDERS.

Specification forming part of Letters Patent No. **163,150**, dated May 11, 1875; application filed April 15, 1875.

To all whom it may concern:

Be it known that I, JAMES BUTTERWORTH, of Philadelphia, Pennsylvania, have invented certain Improvements in Drying-Cylinders, of which the following is a specification:

The object of my invention is to construct a steam-heated drying-cylinder, throughout the periphery of which the heat will be more uniformly distributed than in that class of cylinders in which steam is admitted at one end of the tubular shaft and exhausted at the other. This object I attain in the manner which I will now proceed to describe, reference being had to the accompanying drawing, in which—

Figure 1 is a side view of sufficient of a drying-cylinder to illustrate my invention; Fig. 2, a transverse section; and Fig. 3 an enlarged view.

A is the tubular shaft, driven by any appropriate appliances, and adapted to bearings on a suitable frame, which it has not been deemed necessary to illustrate in the drawing. To this shaft are secured two hollow hubs, B B, with the interior of which the said shaft communicates through openings, as shown in Fig. 2; and to each hub are secured a number of tubular radial arms, D, the outer end of each arm being secured to a chest, G, which is attached to or forms a part of a rim, H, the opposite rims, with the plates *a* and *a'*, which connect them together, constituting the hollow periphery K of the drying-cylinder, with which the said chests communicate. It should be here understood that steam is introduced into the shaft A at both ends of the same through suitable stuffing-boxes, and that it can circulate freely through the hollow arms and hollow periphery. Each chest G contains a valve, *h*, which is maintained in contact with its seat by a spring, so as to close the communication between the discharge-nozzle *i* and the hollow arms and periphery, excepting when each chest arrives at a trough, M, containing a supply of water. On this trough is a curved projecting rib, *m*, secured within the range of the valve-spindle, the rib having inclined ends, so that the spindle of each valve, when brought in contact with the rib, is forced inward and the valve *h* opened, thereby permitting the water of condensation or surplus steam in the hollow arms and hollow periphery to escape into the trough through the nozzle *i*, the valve being closed by its spring after it has passed beyond the control of the rib. This rib, however, is so formed and arranged that the discharge cannot take place until the mouth of the nozzle is immersed in the water in the trough, otherwise there might be an unnecessary escape of steam from the hollow arms and periphery.

It has been the practice in constructing large drying-cylinders to introduce the steam into one end of the tubular shaft and exhaust it from the other end after it has circulated through the arms and hollow periphery, but the steam became cool before it had completed its circulation, hence the hollow periphery was at different temperatures. To obviate this evil it has been common in drying paper and other fabrics to employ a number of small cylinders, in which a more equal temperature could be maintained, the fabric passing from one cylinder to another, in doing which the web of paper is frequently torn. For this reason, and to prevent the distortion and creasing of the fabric, it is best to dry it by means of one large cylinder, of such large diameter that the fabric will be dried before it leaves the periphery.

By introducing the steam into both ends of the tubular shaft a more uniform heat can be imparted to the hollow periphery of a cylinder or drum of large diameter than by the usual plan of admitting the steam at one end of the shaft and discharging it at the other.

I claim as my invention—

1. A drying-cylinder, in which are combined a tubular shaft, into both ends of which steam is introduced, hollow arms, and a hollow periphery, with valves near the latter to permit the water of condensation and surplus steam to escape at intervals, all substantially as and for the purpose herein set forth.

2. The combination of the hollow arms D and hollow periphery K of a drying-cylinder with chests G, each containing a valve, and

with a device by which the said valve is opened at intervals as the cylinder revolves.

3. The combination of the chest G, communicating with the hollow arms and hollow periphery of the drying-cylinder, the valve *i*, nozzle *h*, and trough M with rib *m*, all substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAS. BUTTERWORTH.

Witnesses:

HUBERT HOWSON,

HARRY SMITH.