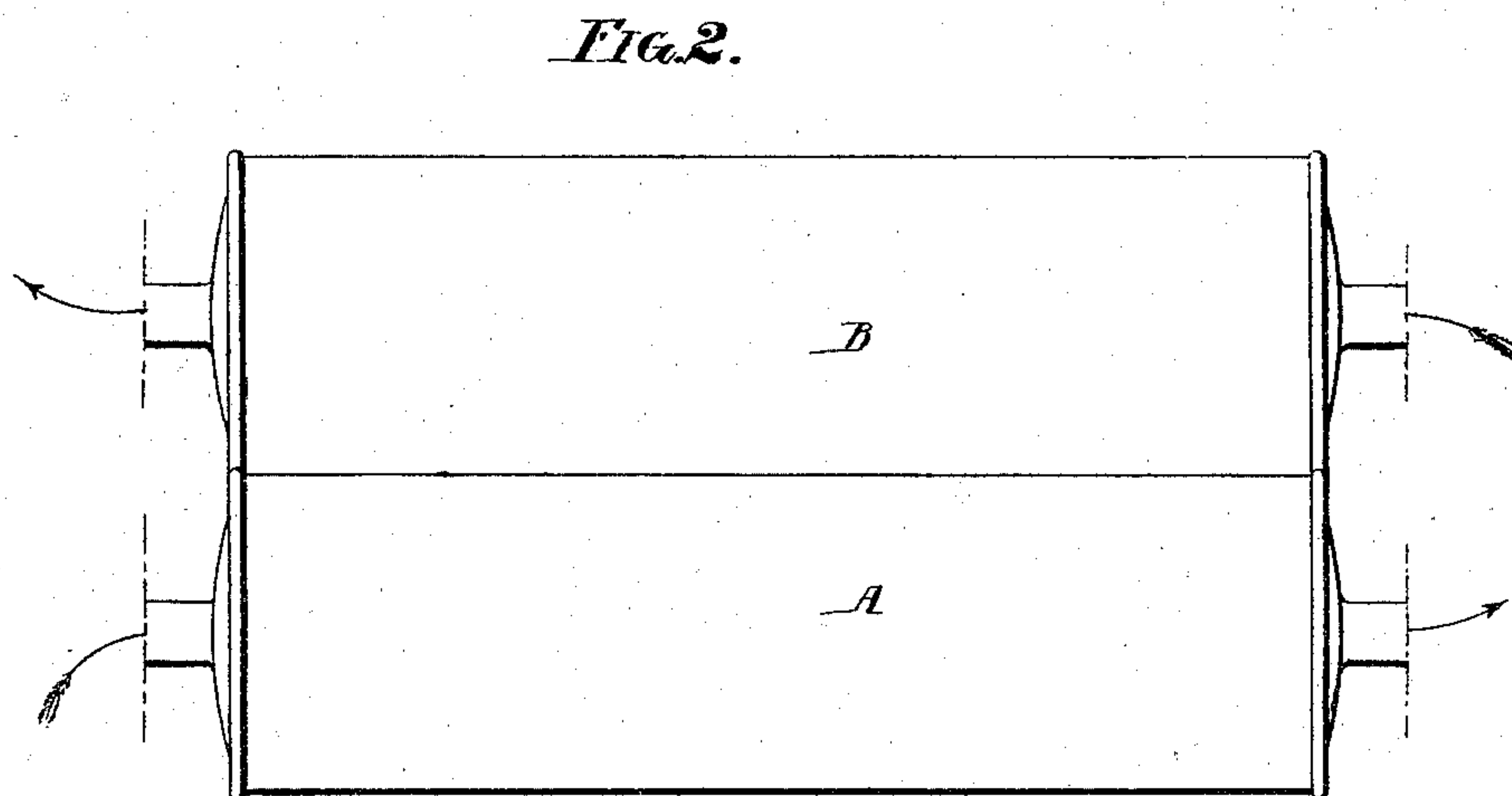
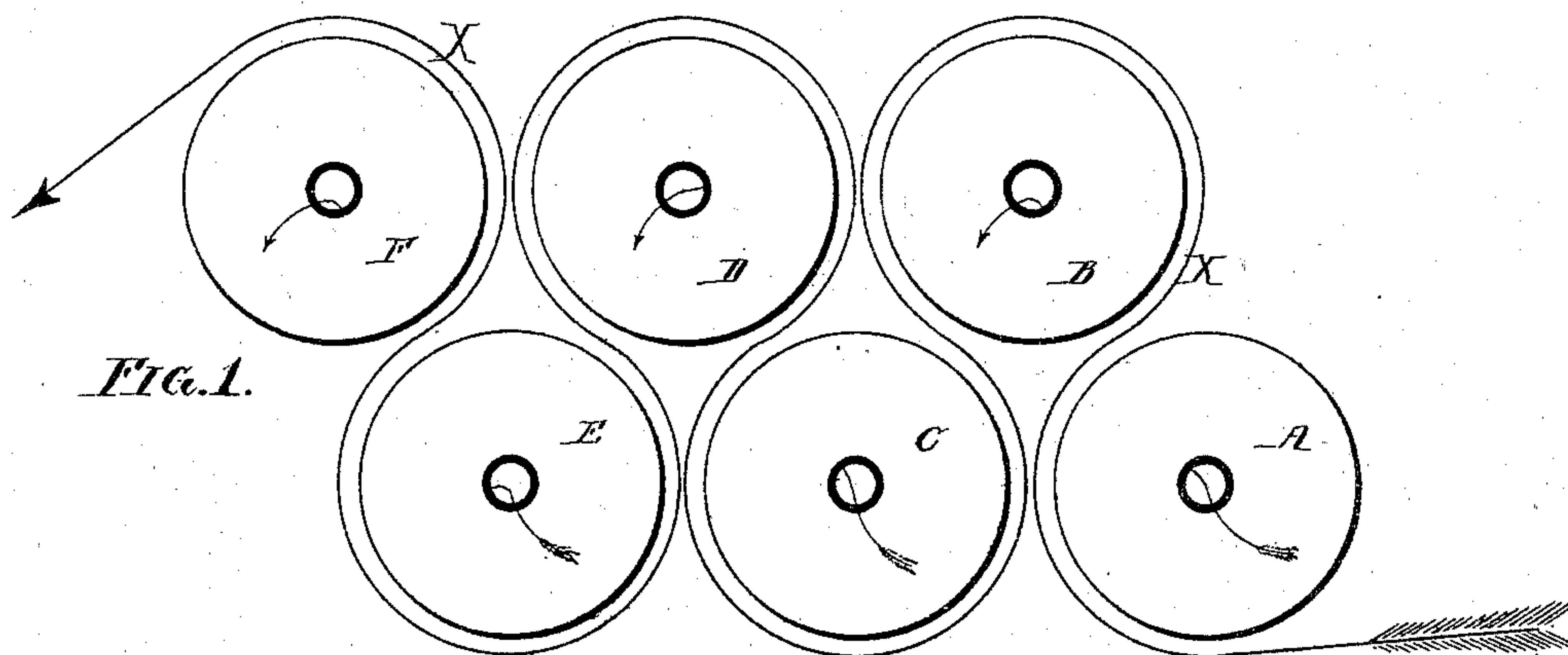


J. BUTTERWORTH.
Driers.

No. 138,475.

Patented May 6, 1873.



WITNESSES. Thomas M. Shrain
Harry Smith

Jas. Butterworth
by his Attyys.
Howson & Son.

UNITED STATES PATENT OFFICE.

JAMES BUTTERWORTH, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
HIMSELF AND CHAS. C. BUTTERWORTH, OF SAME PLACE.

IMPROVEMENT IN DRIERS.

Specification forming part of Letters Patent No. **138,475**, dated May 6, 1873; application filed
January 24, 1873.

To all whom it may concern:

Be it known that I, JAMES BUTTERWORTH, of Philadelphia, Pennsylvania, have invented an Improvement in Drying-Machines, of which the following is a specification:

The object of my invention is to prevent unequal heating and drying of paper or other material in passing around the cylinders of a drying-machine. I accomplish this object by admitting the steam or hot air into the opposite ends, alternately, of the successive cylinders A B C D, &c., of the drying-machine, as indicated by the arrows in the elevations, Figs. 1 and 2 of the accompanying drawing; or by admitting the steam or hot air into the ends of some of the said cylinders at one side of the machine, and into other of the said cylinders at the opposite side of the machine, so that the paper or fabric X, which, in passing around one cylinder, may be heated and dried more at one edge than the other, may, in passing around the next cylinder, have this operation reversed; and so on through the machine, the action of the whole number of cylinders being thus equalized, and a uniform product obtained.

In drying-machines of the class illustrated in the drawing it has been customary to admit steam or hot air through the journals of the whole number of hollow cylinders at one side of the machine, and to discharge it from all of the said cylinders at the opposite side of the machine. It has been found, however, that, by reason of the cooling of the steam or hot air in its passage through the cylinders, the latter are invariably hotter at the end adjacent to the inlet-journal than at the opposite end, the consequence being that the paper or other material X is heated and dried more quickly at one edge than at the other, this causing, with paper especially, unequal contraction, and a frequent rupturing of the material.

In drying cotton goods, also, it is customary to pass two or three widths, arranged side by

side, around the same set of cylinders; and the difficulty in such case, in ordinary machines, is to prevent one piece of goods from being dried more than another, a slight but uniform degree of dampness being essential to the successful performance of the after operation of finishing the goods.

I have found that I can overcome the above objections and equalize the action of the several cylinders upon the paper or fabric, so as to obtain a uniform product, by reversing the direction of the currents of steam or hot air through the several cylinders, so that, while the material may be dried more at one edge than at the other in passing around one cylinder, the action may be reversed in passing around the next, and so on through the machine.

In Fig. 2, for instance, the steam is caused to pass through the cylinder A from left to right; and through the adjoining cylinder B from right to left; and the same alternation is indicated by the arrows in Fig. 1. It is not absolutely necessary, however, that the course of the steam or hot air should be alternated in the several cylinders, as nearly as good results could be obtained by changing the direction of the currents in sets of cylinders; two adjoining cylinders, for instance, to have the steam admitted at one side of the machine, and the next two at the opposite side of the machine.

I claim as my invention—

A drying-machine in which there are parallel hollow cylinders, to which steam or hot air is admitted so as to traverse some of the cylinders in one direction, and others in the opposite direction, substantially as and for the purpose set forth.

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

JAS. BUTTERWORTH.

Witnesses:

WM. A. STEEL,
HUBERT HOWSON.