

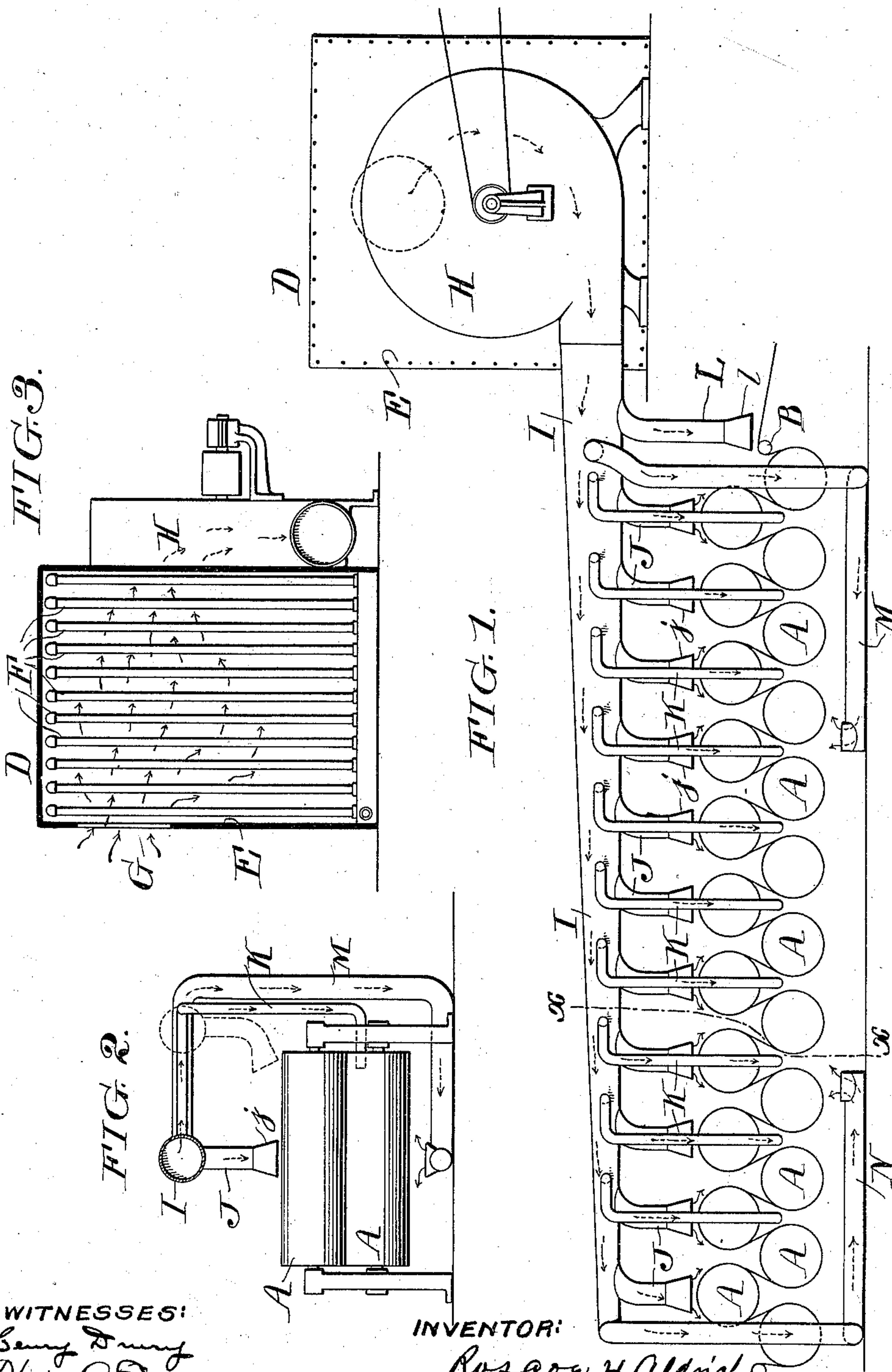
(No Model.)

2 Sheets—Sheet 1.

R. H. ALDRICH.
PAPER DRIER.

No. 558,628.

Patented Apr. 21, 1896.



WITNESSES:
Henry D. Dwyer
Wm. L. Evans

INVENTOR:
Roscoe H. Aldrich
By his atty
J. M. Smith

(No Model.)

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FIG. 4.

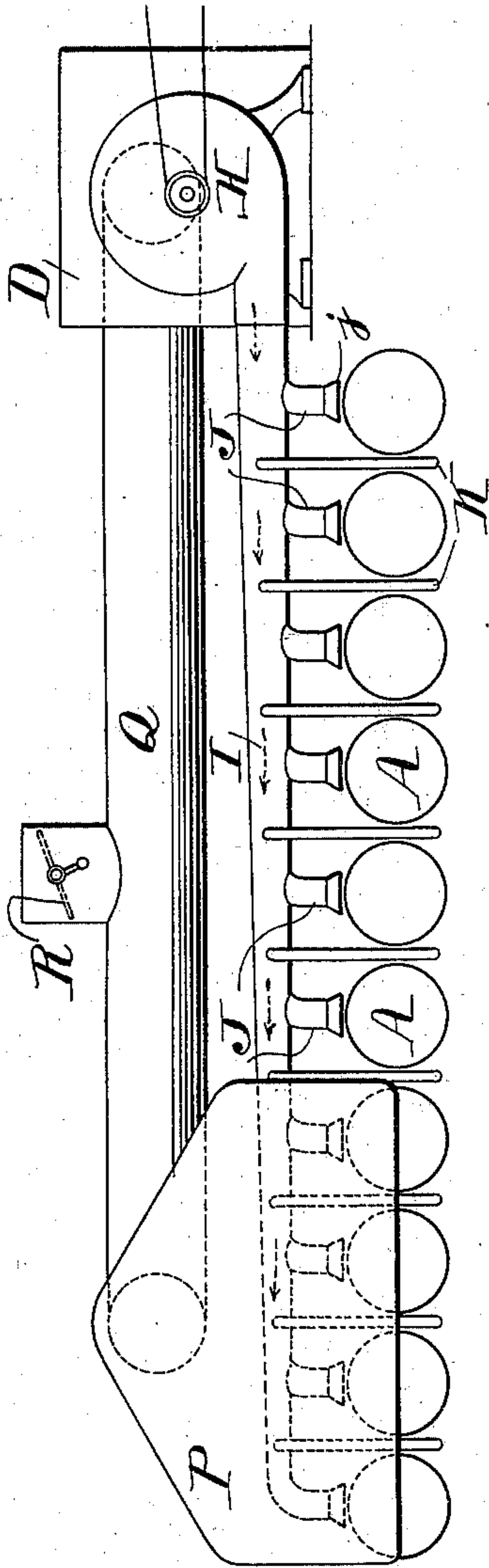


FIG. 5.

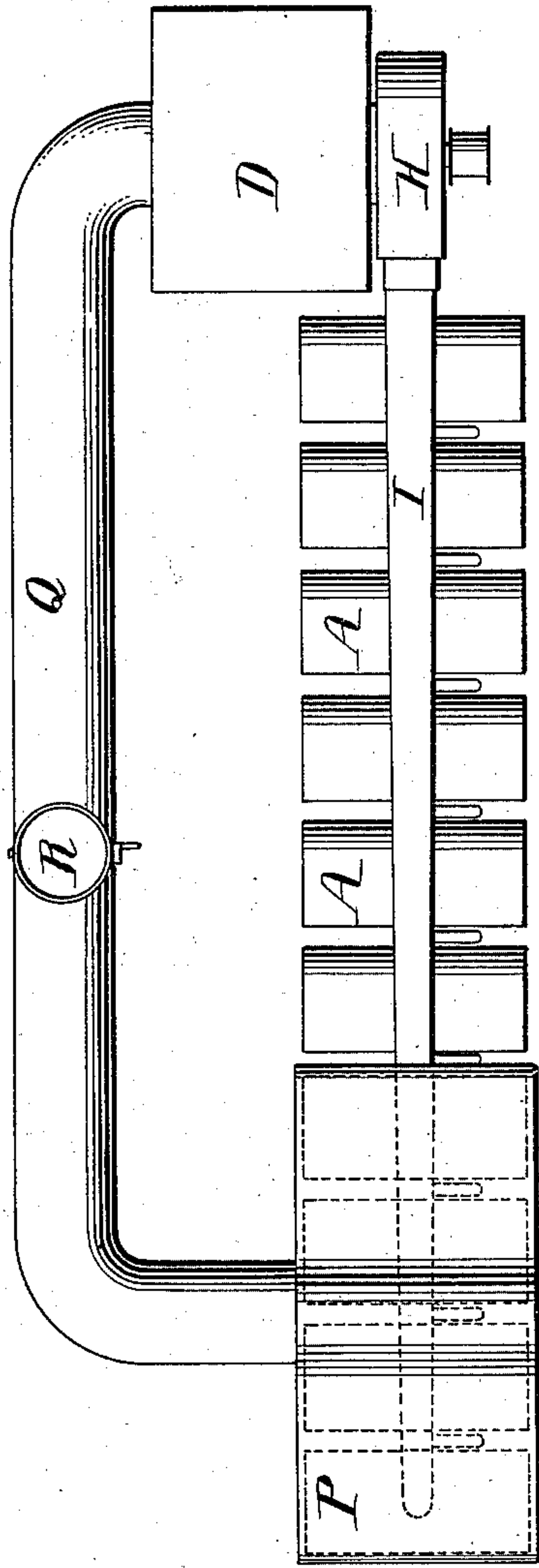
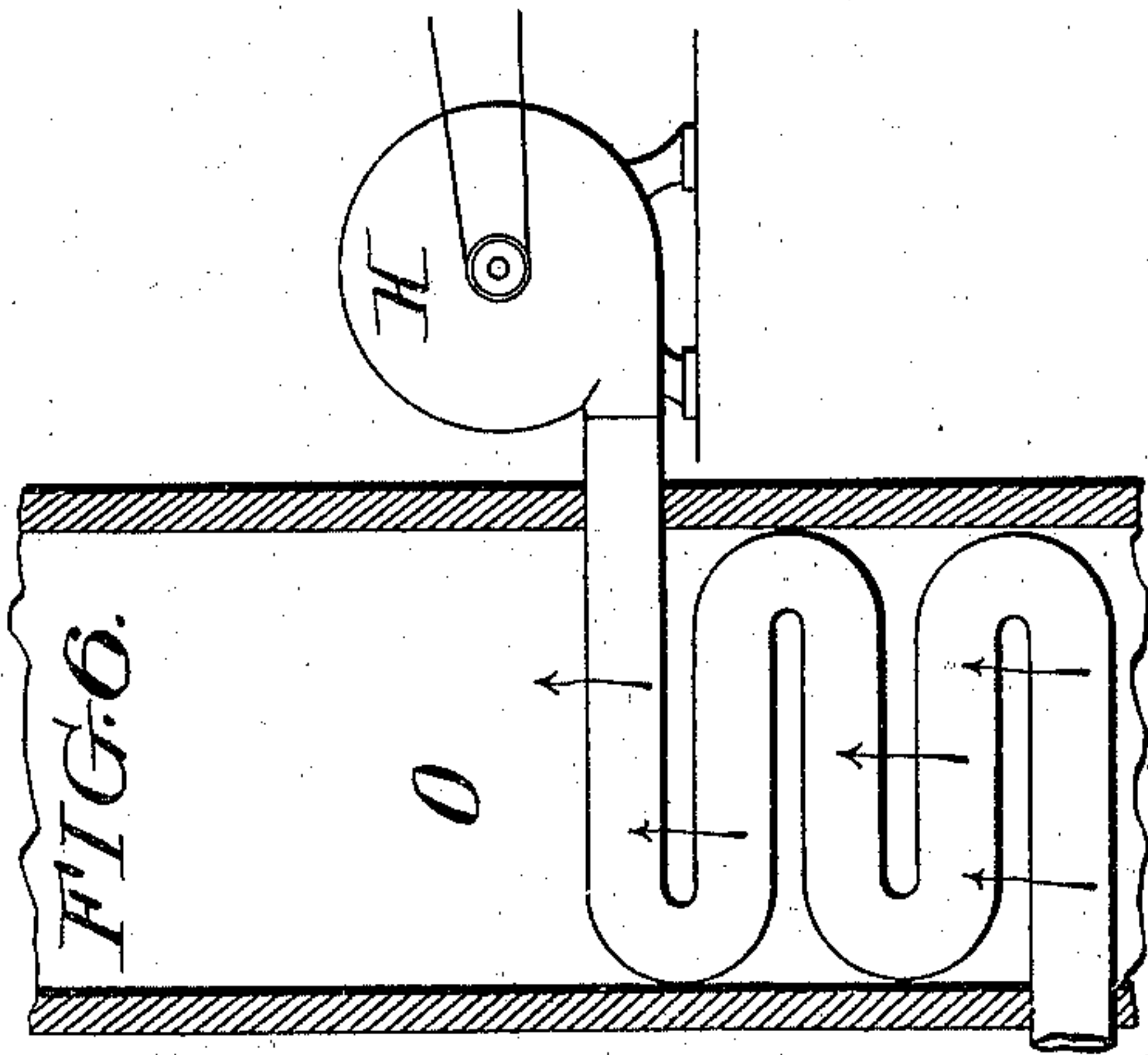


FIG. 6.



WITNESSES:
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UNITED STATES PATENT OFFICE.

ROSCOE H. ALDRICH, OF BUFFALO, NEW YORK, ASSIGNOR TO WARREN WEBSTER AND THEODORE L. WEBSTER, OF MERCHANTVILLE, NEW JERSEY.

PAPER-DRIER.

SPECIFICATION forming part of Letters Patent No. 558,628, dated April 21, 1896.

Application filed August 17, 1894. Serial No. 520,553. (No model.)

To all whom it may concern:

Be it known that I, ROSCOE H. ALDRICH, of the city of Buffalo, county of Erie, and State of New York, have invented an Improvement in Methods of Drying Paper and other Materials in the Web and in Apparatus Therefor, of which the following is a specification.

My invention relates to an improved method of drying traveling material in the web, such as paper, and to the apparatus therefor; and it consists of the improvements hereinafter described and claimed.

My invention is especially adapted to the drying of paper in the web, and is designed to accomplish a more efficient and economical drying effect and to improve the quality of the paper.

The proper drying of any material depends upon four conditions—the degree of temperature, which increases evaporation by raising the elastic force of the vapor, the humidity of the surrounding atmosphere, the renewal of the surrounding atmosphere, and the area of the evaporating-surface. It is the object of my invention to take advantage of all of these conditions to obtain the most efficient and economical effects. It is apparent that the temperature that may be efficiently employed depends largely upon the quality of the material to be dried, and that a higher temperature may be used with some materials than with others. This is true of different kinds of paper.

It is one of the objects of my invention to enable the temperature to be easily regulated to suit the quality of the paper and material being dried.

With the ordinary system of drying paper by passing it over a series of internally-heated steam-cylinders the evaporation is greatly retarded by the humidity of the surrounding air and the difficulty of renewing the air, which has become more or less saturated. In consequence of these defects and to overcome the obstruction to the operation of drying due to the pressure of an enveloping atmosphere or more or less saturated air it has been necessary to heat the cylinders to a very high temperature.

In carrying out my invention I envelop the material as it travels over the internally-heated cylinders in a constantly-renewed at-

mosphere of hot dry air, the temperature of which, together with the temperature of the cylinders, may be regulated to suit the exact requirements of the material under treatment, so as always to obtain the most efficient temperature. The hot dry air is brought in contact with the surface of the traveling material and not only increases evaporation by its contact, but also drives away the air as fast as it becomes saturated by the moisture given off by evaporation from the material which is being dried. This hot dry air is applied by air-forcing devices near the surface of the traveling material, and preferably upon both the upper and lower exposed surface, and more or less evenly distributed throughout the length of the moving material.

By my improved method of drying less heat is necessary in the cylinders, so that the application of excessive heat may be avoided and an improved product produced. The operation of drying may also be carried on more quickly and efficiently, so that the capacity of the mill may be increased.

I shall now refer to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved drying apparatus. Fig. 2 is a transverse vertical sectional view of the same on line $x x$ of Fig. 1. Fig. 3 is a vertical sectional view of the heating and forcing apparatus such as may be employed. Fig. 4 is a side elevation of a modification of the apparatus. Fig. 5 is a plan view of the same, and Fig. 6 is an elevation of a modification of the heating and forcing devices.

A are the drying-cylinders, which may be of the usual construction and of which any number may be employed. The usual internally-steam-heated cylinders may be used, but with my improved system much less heat will be required in the cylinders.

B is the usual guiding-roll for guiding the web material to the drying-cylinders, and C is the guiding-roll for guiding the dry material from the cylinders.

D is the heater, which may be of any suitable construction adapted for heating a sufficient volume of air to the requisite temperature.

In Figs. 1 and 3 I have shown a heater consisting of a closed case E, having a series

of internally-steam-heated pipes F and an air-inlet G and an outlet to the fan or air-forcing device. The fan or air-forcing device H is shown connected with the outlet of the heater D and drawing the air into the heater through the inlet G.

I is the main pipe leading from the fan or air-forcing device H to the series of drying-cylinders.

J are a series of discharge-pipes leading from the main I and directed toward the cylinders A, so as to discharge the hot air over the cylinders close to the moving material. These discharge-pipes, as shown, are provided with enlarged or funnel-shaped mouths or outlets j, which I prefer to employ for the purpose of distributing the hot air more widely. The discharge-pipes J may lead directly over the center of the cylinders or may discharge air upon one side, as shown in dotted lines in Fig. 2.

K are a second series of pipes leading from the main I to points below the traveling material, and preferably in the space below each pair of lower cylinders and the intermediate cylinder, as shown in Fig. 1, when two series of cylinders are employed. It is of course not necessary that the cylinders should thus be arranged; but when they are so arranged I prefer to have the pipes K leading to the space between the cylinders, as shown, as they will then more effectively distribute the hot air upon the moving material. The pipes K may have their outlets at the middle of the cylinders or on one side, as in the case of the pipes J.

L is an additional supply-pipe which may be employed to lead hot air from the main I to the material before it passes to the cylinders A. I have shown the pipe with a funnel-shaped mouth l arranged above the guide-roll B.

M and N are auxiliary pipes leading from the main I to points below the drying-cylinders for introducing auxiliary blasts of hot air below the entire apparatus.

In operation the external air is drawn into the heater by the fan or device H and after becoming highly heated by its passage through the heater is forced through the main I and is delivered by the pipes J upon the upper surface of the moving material and by the pipes K upon the lower surface thereof. These pipes H and K thus serve to keep the traveling material constantly enveloped in an atmosphere of highly-heated air and by the pressure of the air discharged by them close to the traveling material the moist air, which has taken up the moisture evaporated from the traveling material, is driven off. The air which comes in contact with the traveling material is thus kept highly heated and comparatively dry, so that the greatest drying effects are produced. This effect may be further increased by the blasts introduced through the pipes M and N below the drying apparatus. It is to be understood that no particular form

of heater is required, but any suitable appliance may be employed for imparting the requisite heat. In Fig. 6 I have shown a coil O located in the chimney and receiving heat from the waste products of combustion arising therein. The air drawn in by the forcing apparatus H is forced through the coil O and thence into the main I, or it may be drawn from the coil O and forced into the main, as in the combustion shown in Figs. 1 and 3. As the material reaches the end of the train of drying-cylinders in a comparatively dry condition, and consequently gives off but little moisture, it may be desirable to utilize again the comparatively dry air arising from that part of the machine. For this purpose I propose to employ a hood arranged over and partly covering the rear end of the drying-cylinders and a return-main Q, leading from the hood P back to the heater, as shown in Figs. 4 and 5, so that the air which arises from the rear portion of the apparatus may be drawn back to the heater and utilized again. The return-main Q may be provided with an inlet and damper R, by which the quantity of fresh air admitted may be controlled.

I do not limit my invention to the minor details shown, as they may be varied in many ways without departing from the invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a drying apparatus the combination with a series of drying-cylinders, of a heater for heating hot air, an air-forcing device for forcing the hot air from the heater, a supply-pipe receiving the hot air from the air-forcing device and extending to the drying-cylinders for supplying blasts of hot dry air to the material passing over the cylinders at different points in its line of movement, a hood arranged above the rear portion of the series of drying-cylinders to receive the hot air arising therefrom, and a return-main leading to the heater for returning said hot air to the heater.

2. In a drying apparatus the combination with a series of drying-cylinders, of a heater for heating hot air, an air-forcing device for forcing the hot air from the heater, a supply-pipe receiving the hot air from the air-forcing device and extending to the drying-cylinders for supplying blasts of hot dry air to the material passing over the cylinders at different points in its line of movement, a hood arranged above the rear portion of the series of drying-cylinders to receive the hot air arising therefrom, and a return-main leading to the heater for returning said hot air to the heater, provided with an inlet and damper for regulating the supply of fresh air.

In testimony of which invention I have hereunto set my hand.

ROSCOE H. ALDRICH.

Witnesses:

E. B. JUDD,

WILLIS M. ROBERTS.