

(Model.)

2 Sheets—Sheet 1.

D. R. BURNS.
MANUFACTURE OF PAPER.

No. 253,814.

Patented Feb. 14, 1882.

Fig. 1.

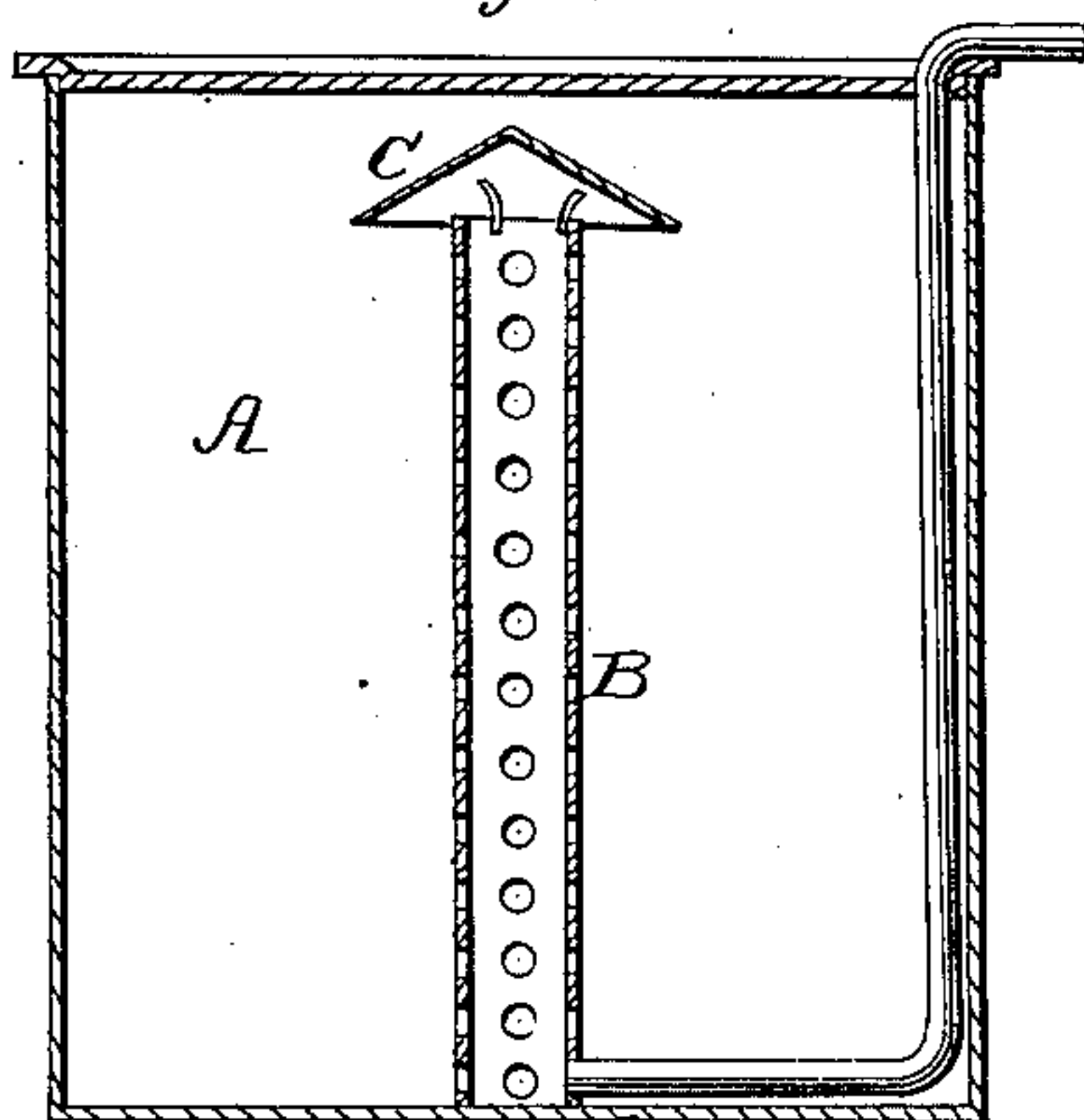


Fig. 3.

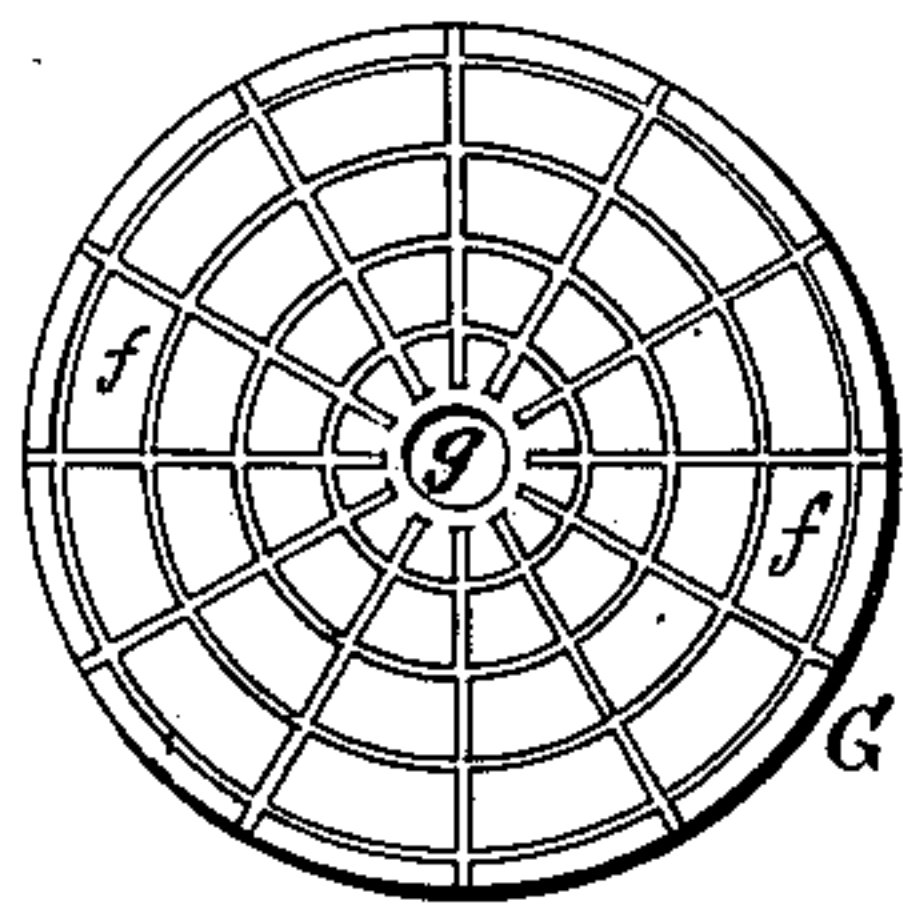
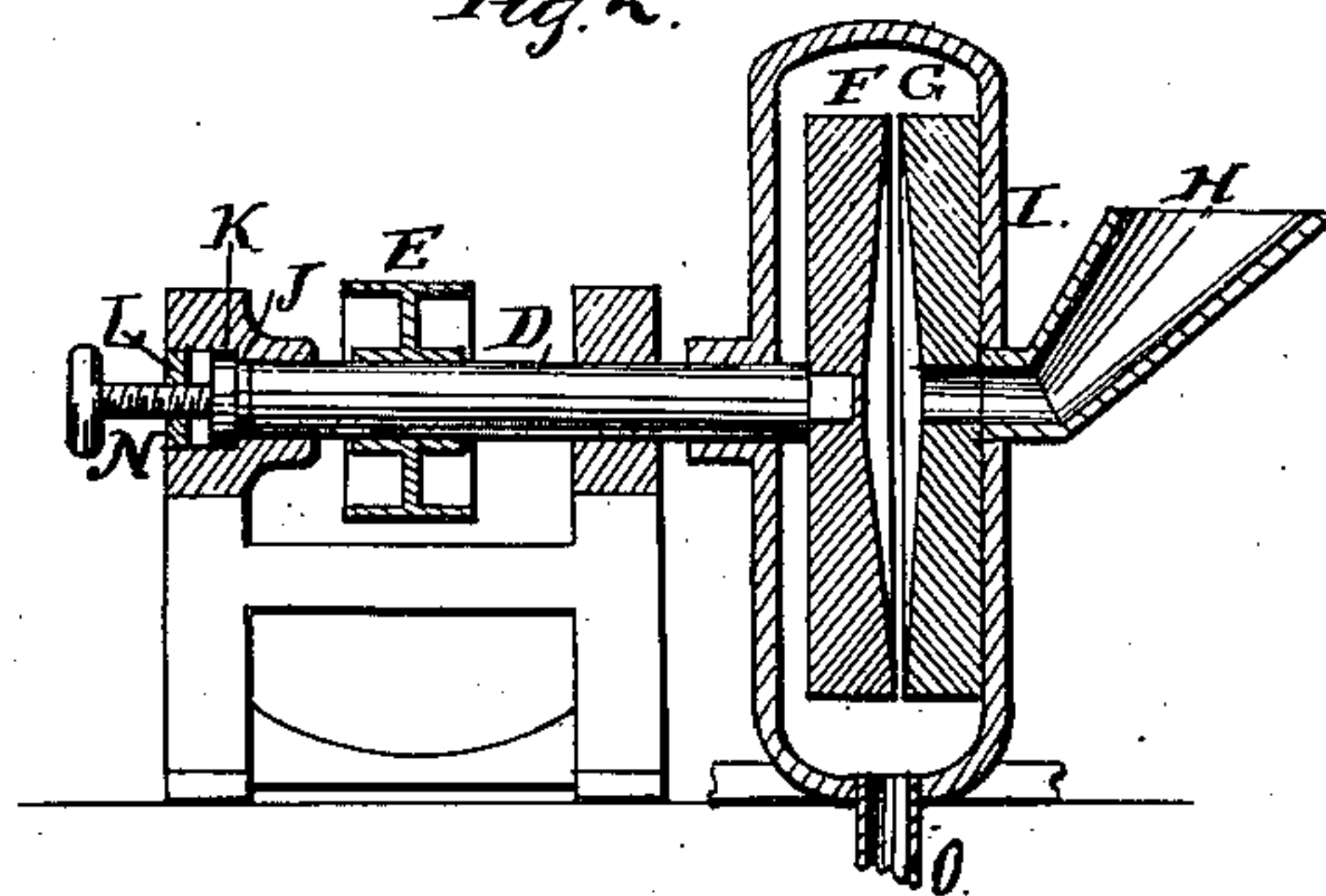


Fig. 2.



Attest:

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Inventor:

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(Model.)

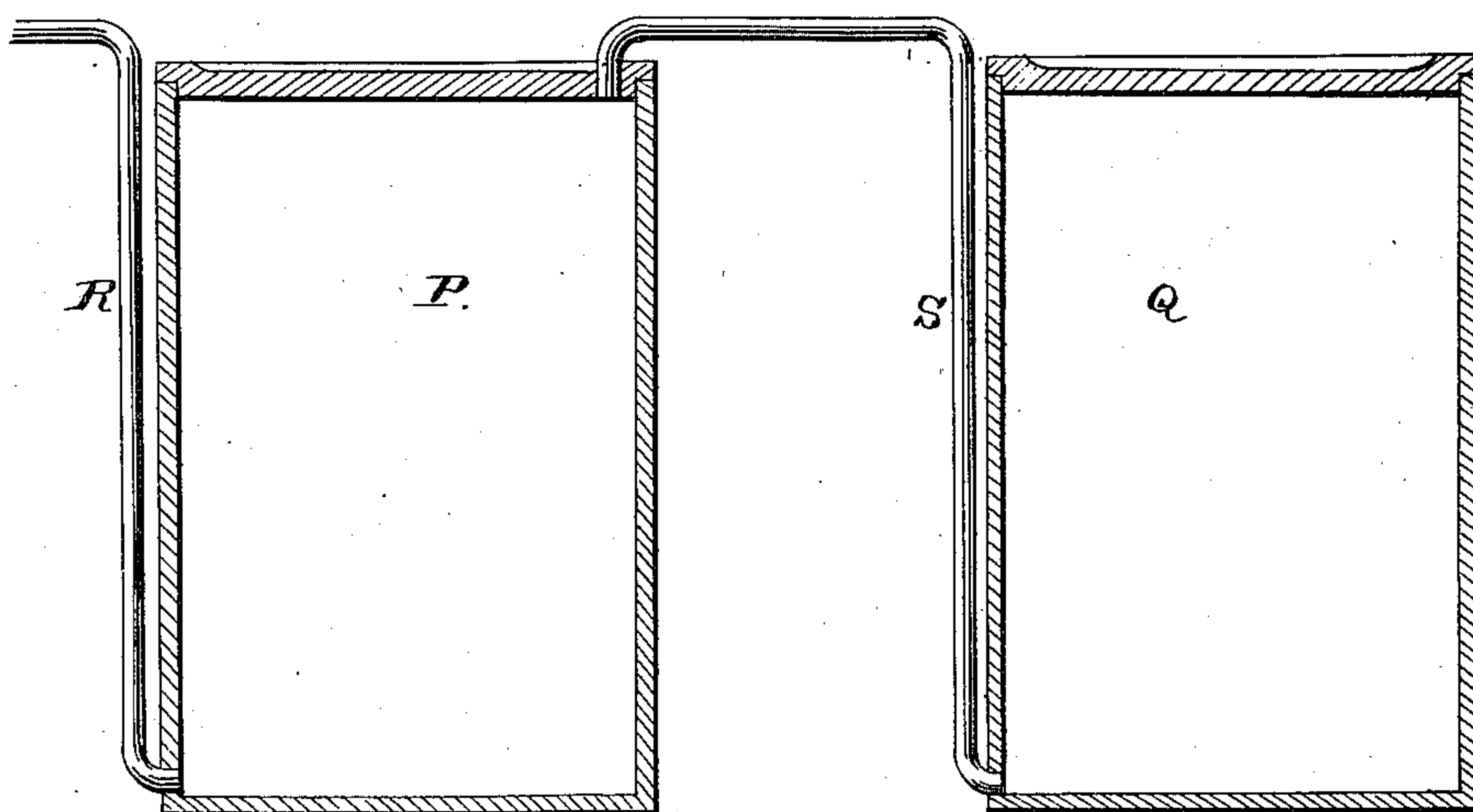
2 Sheets—Sheet 2.

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Fig. 4.



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UNITED STATES PATENT OFFICE.

DANIEL R. BURNS, OF DAYTON, OHIO, ASSIGNOR OF ONE-HALF TO FRANCIS J. McCORMICK, OF SAME PLACE.

MANUFACTURE OF PAPER.

SPECIFICATION forming part of Letters Patent No. 253,814, dated February 14, 1882.

Application filed January 9, 1882. (Model.)

To all whom it may concern:

Be it known that I, DANIEL R. BURNS, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in the Manufacture of Paper; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

Heretofore in the art of making paper the straw, rags, or other material or stock has been reduced to pulp by means of beating-machines, or by means of a machine having a rotary cylinder carrying a series of cutting-knives. The objections to these machines are several, among which may be stated the fact that the fiber of the stock is completely cut to pieces, and that the bleaching material in solid particles is introduced into these machines, both of which objections, especially where straw-stock is used, tend to make the paper, straw-board, and the like made thereby extremely brittle, rotten, and altogether unsatisfactory to the trade.

To remedy these objections is the object of my present improvement; and my invention consists in a process by means of which the stock is first cooked, then disintegrated by separating and tearing the fiber apart without destroying the fiber itself, and whereby it may retain all its albumen and gluten properties, and finally subjecting it to a bleaching process without the contact therewith of any solid-matter bleaching material.

It consists, also, in a cooking-vessel having a central perforated steam-pipe communicating at the bottom.

It consists, also, in a rotary-disk disintegrating-machine of peculiar construction for reducing the paper-pulp.

It further consists in a bleaching-tub arranged for the introduction therein of chlorine gas.

Figure 1 of the drawings represents a vessel used in the first part of my process. It consists of the vessel A, having a suitable cover,

and in which the stock is first placed to be cooked. It is provided with an upright perforated central tube, B, having a deflecting-cap, C, at the top and a steam-pipe entering it at the bottom. The stock is placed around this pipe B, and the steam from the steam-pipe, entering said pipe B and passing out through its perforations, thoroughly cooks the stock all through. After being cooked it is taken therefrom and fed into the disintegrating-machine. (Shown in Fig. 2.) This machine consists of the revolving shaft D, driven by any suitable power by means of pulley E. One end of shaft E carries a rotary disk, F, of peculiar construction—that is, its grinding-face is concaved. (See Fig. 2.) The grinding-disk G is of similar construction, only it is preferably made stationary, (although it may be made to revolve,) and is also provided with central feed-orifice, communicating with the feed-hopper H. The disks F and G are inclosed by a tight casing, I, provided with a discharge-opening, O, for the pulp after it has been reduced. The shaft D has a lateral adjustment for the purpose of regulating the degree to which the pulp is to be reduced. This adjustment is effected by means of the adjusting-screw N, working in a nut L. The plate K against which the screw bears is made stationary, so as not to revolve, but has a lateral motion.

J is a loose washer free to revolve or move laterally. This construction prevents all tendency of the adjusting-screw to tighten or loosen due to the revolution of the shaft; and, further, in the event of the washer J sticking to the end of the shaft by heat, the washer would still be free to turn against the stationary plate J.

The cooked stock is fed into the machine through hopper H, the concaved confronting faces of the grinding-disks admitting of an opening into which the stock may be easily passed. Here, by the gradually-increased rapidity of the planes of the disk G from the center outward, the fiber of the stock is completely separated and torn apart, and the whole paper-stock reduced to pulp, but without destroying the fiber itself. This stock is now ready for use for the darker-colored papers. Where straw-stock is treated it will be seen that all the gluten and albumen matter is retained,

which I have found essential in order to render the paper tough and homogeneous.

In Fig. 3 a face view of the stationary grinding-disk is shown with a suitable dressing.

5 Different kinds of dressing for the disks are required, according to the nature of the stock treated, and I do not therefore limit myself to any particular form or style of dressing.

10 When it is desired to have lighter-colored paper than the natural color of the stock treated it is subjected to a bleaching process. This is illustrated in Fig. 4.

15 Represents a tank or tub, preferably of wood, in which is placed a quantity of water and chloride of lime. It is provided with a steam-pipe, R, entering the tub at the bottom, so that the entire contents may be impregnated. By this means the chlorine gas is eliminated from the solid particles, and it passes (together with a
20 quantity of vapor and water charged with said gas) into tub Q by means of pipe S where it enters at the bottom. In this tub Q the paper-stock to be bleached is placed, and the chlorine, entering the stock or pulp from the bottom, filters through to the top, where it passes
25 off. It will be seen that by this construction, no solid particles or bleaching-matter touches the pulp. Where the bleaching material itself is placed in the tub with the pulp it rots it and
30 makes it brittle when made into paper.

All straw-board heretofore made by the existing processes is extremely brittle; but by my improved process the fiber of the straw is not destroyed, nor is the pulp made brittle by
35 the introduction of solid particles of lime, caustic alkali, and the like into the bleaching-tub, thereby eliminating and destroying also the albumen and gluten properties of straw, which are essential to the proper making of straw paper.
40 per.

In old processes sixty per cent. of all albumen and gluten is lost by washing, which was necessary to remove the bleaching material. Besides, nearly all the fiber was lost in the washing,
45 whereas in my process there is no need of washing. The presence of gluten and albumen is necessary in paper, in order to hold the fiber together, making it strong and pliable.

I am well aware that stock for the manufacture of paper has been made by the use of caustic alkalis and acids, but am not aware of its being made by the process of cooking it with carbonate of soda alone, which does not destroy the fiber, and also leaves the albumen and
50 gluten in its normal condition. All the processes heretofore used have had a tendency to and do cause the fiber to become rotten and brittle, making it altogether unsatisfactory to the trade. There was also a loss of from forty to sixty per
60 cent. of the stock in washing out the alkali acids and the solid particles of lime, while the apparatus and machinery herein described submit it to no process by which the stock is injured, nor does it need washing. By preserving the gluten and albuminous substances in
65 the stock, when it is made into paper or straw

board or the like it is homogeneous, not laminated.

I am well aware that bleaching has been accomplished by the manufacture of chlorine gas 7c from the black oxide of manganese and the like; but I am not aware that chlorine gas has been extracted from the chloride of lime by heat without bringing some of the lime in contact with the stock. 75

The reason it has been necessary heretofore to use caustic-alkali acids and the high degree of heat is that there was no machinery heretofore used that would disintegrate it and reduce it to pulp without being so treated, while 80 my machine herein described is driven, so that the disk has a velocity (the outside traveling at the rate of five thousand feet per minute) which reduces the stock with great rapidity to pulp without injuring the fiber. 85

I will now proceed to describe the process and manner of treating the stock when introduced into vessel A. (See Fig. 1.) To every one hundred gallons of water is added twenty pounds of carbonate of soda, which is not raised 90 above the temperature of 212° Fahrenheit at any time during the process. The stock is introduced when the water is cold, and the heat is gradually raised to the above point—212° Fahrenheit. In most cases it is ready to be 95 delivered from the boiling-tub when it has obtained the boiling-point, (212° Fahrenheit.) To ascertain if it is sufficiently cooked, a small sample is taken from the tub, and if the knots on the straw, hay, grasses, &c., can be easily 100 crushed under the fingers by a slight pressure, it is ready to be delivered from the tub. If not, the boiling must be continued. This is intended for stock to be bleached white.

For stock which is to contain the natural 105 color, or not beyond a buff, there is introduced into the water ten pounds of extract of hemlock or oak bark to every one hundred gallons of water, and the same amount of carbonate of soda as above, (twenty pounds,) and dissolved. The liquid now is the tannate of soda. 110 The stock is now introduced as before, when the water is about 60° Fahrenheit. The tannic acid now unites with the gluten and albuminous properties of the stock and converts it 115 into the properties of leather, the same as on hides or skins in tanning, which preserves it from the action of the water. The soda acts upon the wood fiber, softening and disintegrating it, so as to make it useful for paper-stock. 120 This gives to the darker color of stock, paper, straw-board, &c., a greater amount of tenacity and strength than has heretofore been obtained by any other process.

The straw-board resulting from this process, 125 if treated with water containing about ten per cent. glycerine before it is calendered, serves to convert it into parchment.

Having described my invention, what I claim, and desire to secure by Letters Patent, is— 130

1. The herein-described process of manufacturing paper, which consists in first cooking

the stock, then reducing it to pulp, and, finally, in bleaching it in a separate vessel, substantially as described.

2. The process of manufacturing straw board and paper, which consists in first cooking the stock and then reducing it to pulp, whereby the fiber is separated, but not destroyed, and all the albumen and gluten of the straw preserved, in the manner substantially as set forth.

3. The process of manufacturing paper, which consists in first cooking the stock, then reducing it to pulp, and finally subjecting it to a bleaching process, which consists in eliminating chlorine gas from chloride of lime by heat and passing the same through the material to be bleached in a separate vessel, substantially as set forth.

4. The process of cooking, disintegrating, and bleaching paper-stock whereby all the gluten and albumen are retained and the bleaching is effected without the introduction into the stock of any of the solid particles of chloride of lime, caustic alkali, or the like, substantially as herein described.

5. A cooking-vessel having a central upright perforated steam-pipe provided with a deflecting-cap, substantially as herein shown and described.

6. A grinding-disk having a concave face, substantially as set forth.

7. A grinding-disk having a concave face and central feed-orifice, substantially as set forth.

8. The shaft A, having the washer B, stationary plate C, and adjusting-screw E, substantially as set forth.

9. The process of treating the stock and fiber with carbonate of soda and tannic acid, substantially as described and set forth.

10. The process of treating the stock and fiber with carbonate of soda, substantially as described and set forth.

11. The herein-described tub P, containing the chloride of lime, provided with steam-pipe R, and tub Q, containing the stock to be treated, provided with gas-pipe S, substantially as described and set forth.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

DANIEL R. BURNS.

Witnesses:

A. L. JACKSON,
H. C. HUNTEMANN.