

(No Model.)

2 Sheets—Sheet 1.

R. NEALE.

APPARATUS FOR PURIFYING VITIATED AIR.

No. 250,568.

Patented Dec. 6, 1881.

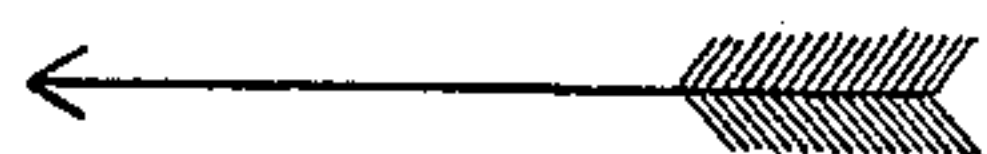


Fig. 1.

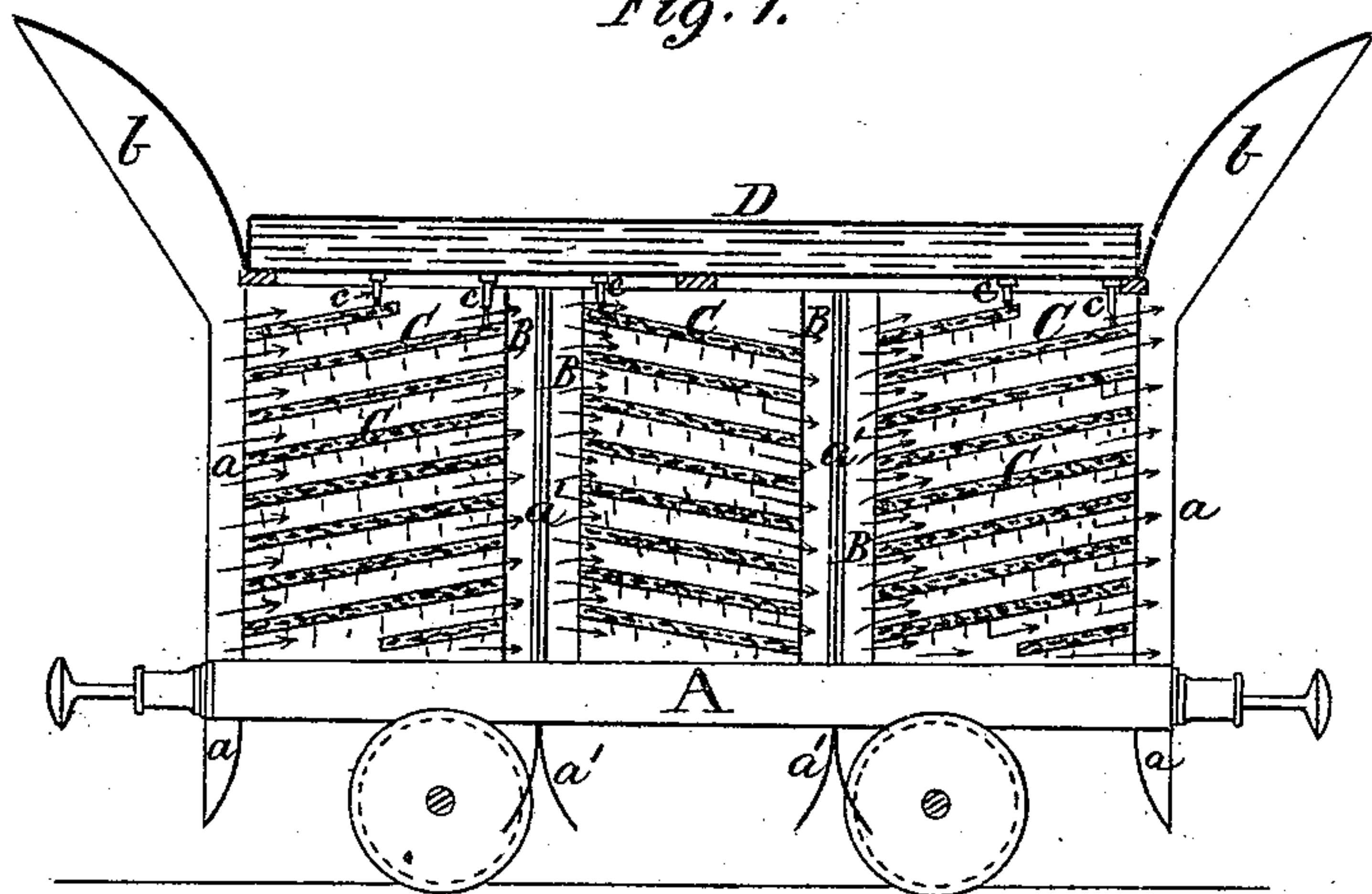


Fig. 2.

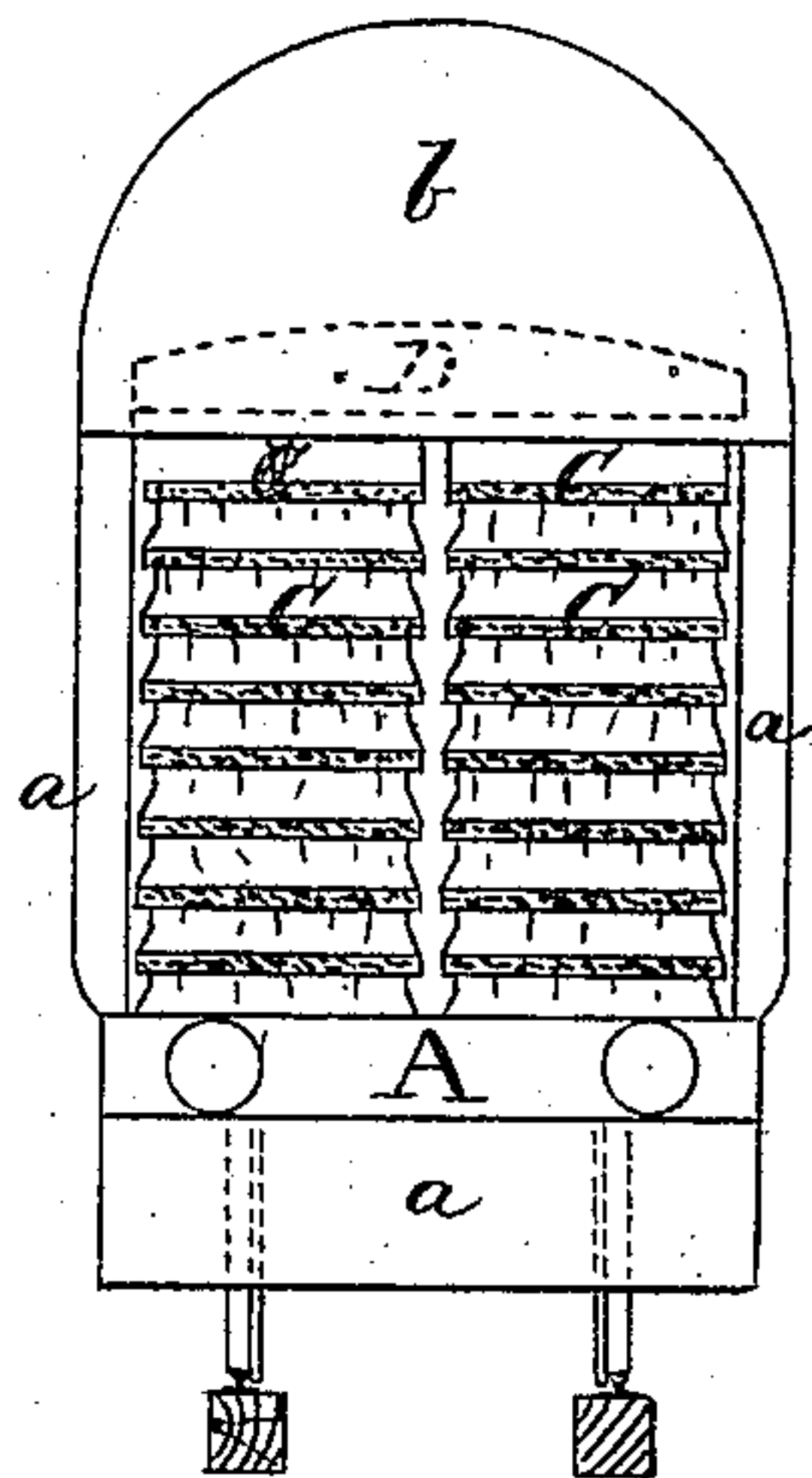


Fig. 3.

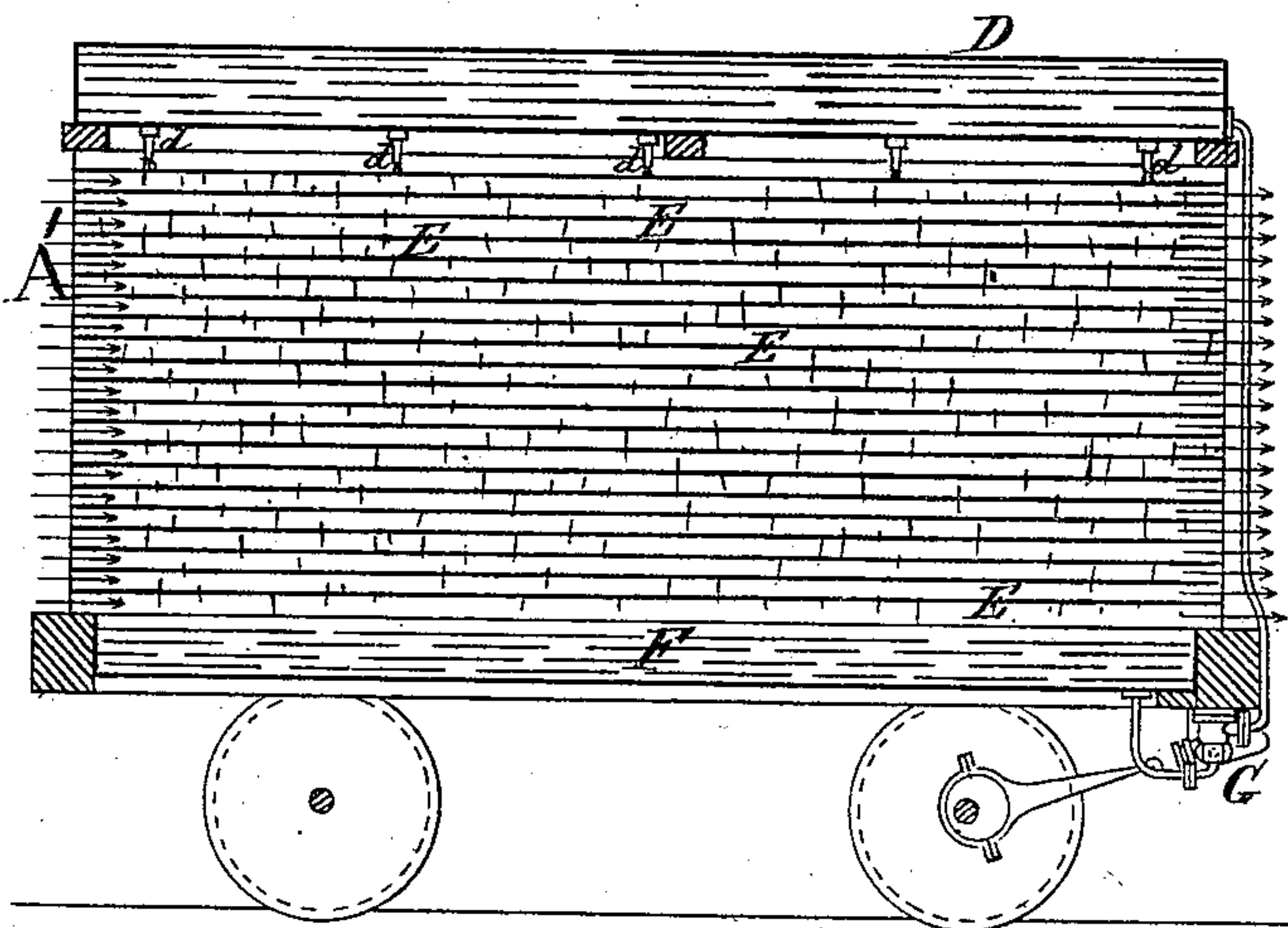
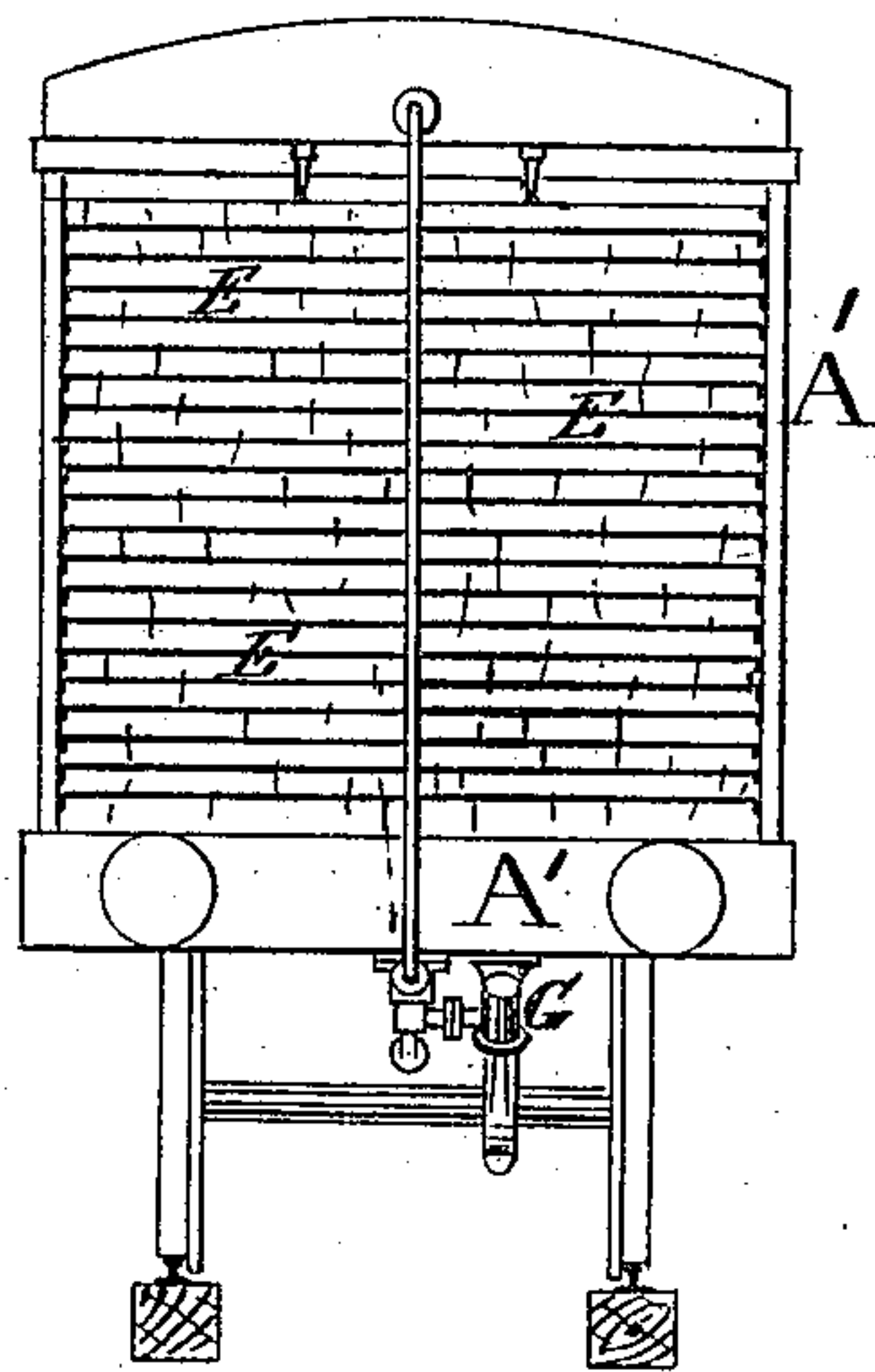


Fig. 4.



Attest—  
R. T. Barnes.  
Geo. B. Byington.

Richard Neale  
By his atty  
R. D. Smith

(No Model.)

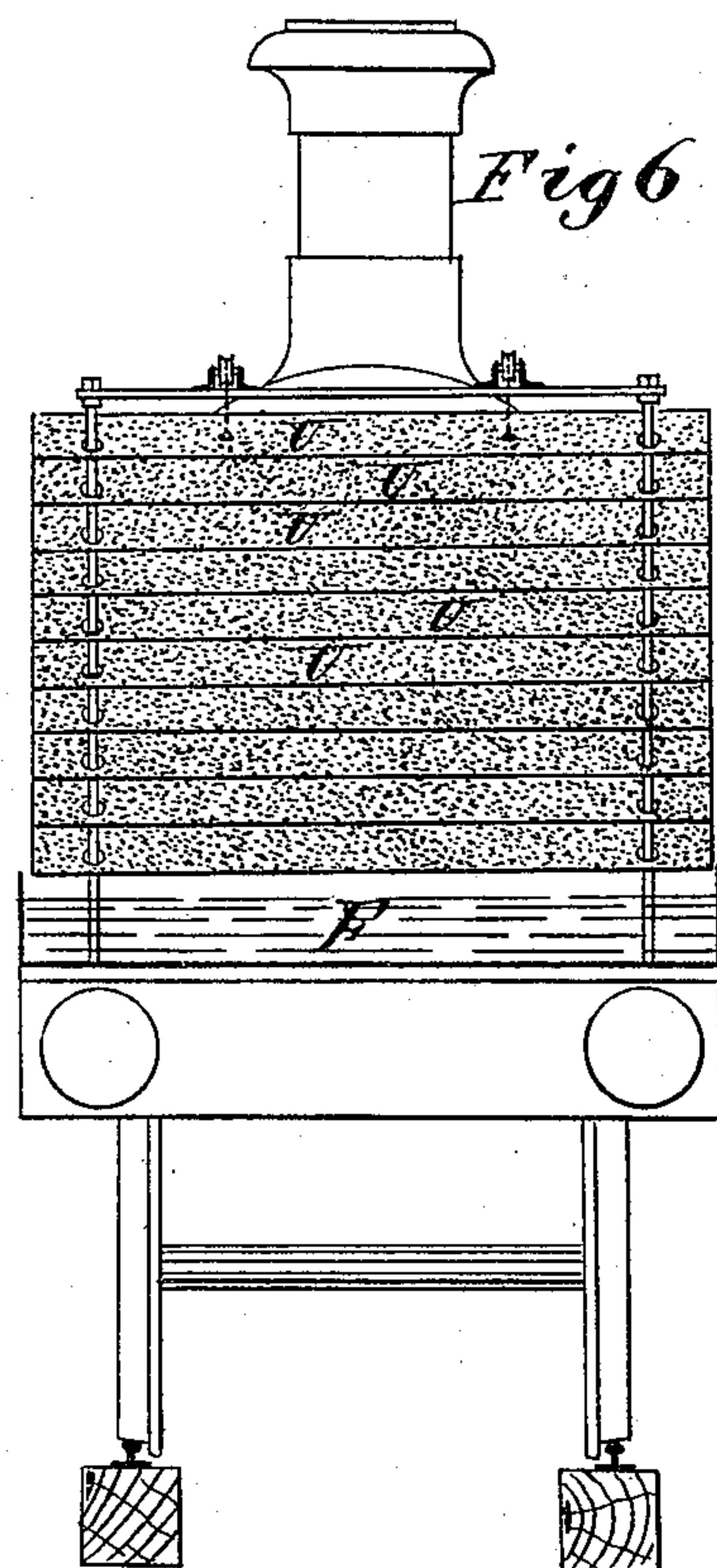
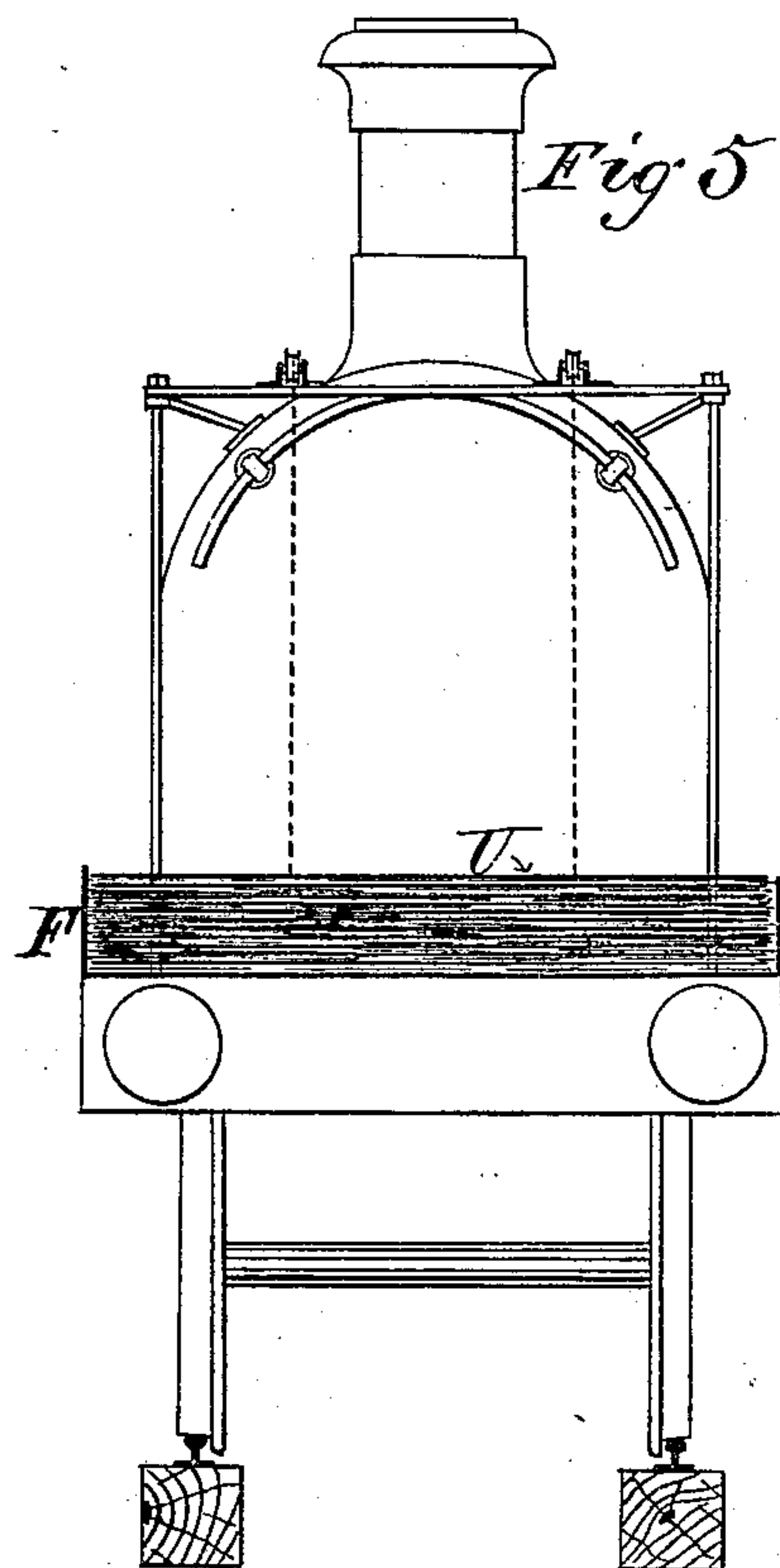
2 Sheets—Sheet 2.

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# UNITED STATES PATENT OFFICE.

RICHARD NEALE, OF SOUTH HAMPSTEAD, COUNTY OF MIDDLESEX,  
ENGLAND.

## APPARATUS FOR PURIFYING VITIATED AIR.

SPECIFICATION forming part of Letters Patent No. 250,568, dated December 6, 1881.

Application filed September 16, 1880. (No model.) Patented in England July 15, 1880, and August 3, 1880.

*To all whom it may concern:*

Be it known that I, RICHARD NEALE, of South Hampstead, in the county of Middlesex, England, have invented new and useful Improvements in the Application and Use of Chemicals for Purifying Vitiated Air, and in Apparatus Therefor, (for which I have obtained provisional protection in Great Britain, dated respectively July 15, 1880, No. 2,914, and August 3, 1880, No. 3,710,) of which the following is a specification.

My invention relates to improvements in the application and use of chemicals for purifying the air in railway or other tunnels, hospitals, churches, factories, breweries, theaters, mines, ships, caissons, diving-bells, and other places where it is loaded with sulphur fumes, (carbonic oxide, by converting it into carbonic acid,) noxious vapors, or other impurities.

The essential feature of my invention is to cause a very large proportion of any existing volume of vitiated air to pass or be forced over and be saturated with the chemical agent employed, thereby more or less destroying or removing the impurities with which the air is loaded.

It consists in apparatus adapted in form and contrivance to the nature and requirements of the place where the air is to be purified, and by which the air is caused to pass in thin sheets or currents between horizontal wet chemical surfaces, and is constantly kept in contact with the chemical agent employed, said agent being either in a more or less solid form, or in the fluid form, as found most suitable.

My invention may be operated by moving it through the air, or by causing the air to flow through it, the effect upon the vitiated air being the same in either case.

In order that my invention may be well understood I shall now proceed more particularly to describe the same, reference being made to the accompanying drawings, like letters of reference indicating corresponding parts in the respective figures.

Figure 1 is a longitudinal section of one form of my invention for purifying the air in railway-tunnels and other places, and Fig. 2 an end view thereof.

A represents a special purifying carriage or chamber attached (in the case of railway-tun-

nels) to any or every train passing through a tunnel, and open at each end, where it is furnished with wings *a a*, curved and projecting outward, so as to cover as large a portion of the sectional area of the tunnel as practicable. Each end is also formed on its upper edge with a large wing, chute, or baffle-plate, *b*, projecting upward to within as short a distance of the crown of the tunnel as possible, for the purpose hereinafter described. In the sides and bottom of the carriage or chamber A are left any desirable number of rectangular or other openings, B, opposite and dividing which longitudinally are projecting wings *a'*, similar to *a*, arranged in pairs, so as to face each way, according to the direction in which the train is running. The several wings *a a'*, combined with the forward open end of the carriage or chamber A and the openings B, act in such a manner that as the train is passing through the tunnel the vitiated air will be caught by them and caused to enter and circulate through the body of the carriage or chamber A, the half-space of each opening B not admitting the air being closed automatically by a centrally-hinged flap swinging either way. At the same time the steam and gases escaping from the chimney of the engine will be caught by the wing or baffle-plate *b* and directed into the body of the carriage, the gases and vitiated air passing, in their transit through the latter, over a chemical substance hereinafter described, which will absorb or change the impurities—such as sulphur fumes, carbonic-acid gas, sulphurous acid, sulphureted hydrogen, or others with which the air is loaded—the air thus acted upon passing out through the opposite or rear end of the carriage or chamber A into the tunnel in a comparatively pure state; or, if desired, the several wings *a a' b* and openings B may be dispensed with, the vitiated air in that case entering the carriage or chamber A at its open end without their aid.

C C are trays or cases arranged one above the other at any desired inclination, and each composed of some non-corrosive animal, vegetable, or mineral material, such as charcoal, glass, earthenware, or any other, or of some porous material, such as canvas, on which is placed the chemical substance employed, the latter being protected or not with non-corro-



sive or porous covers. These trays or cases C C slide in grooves formed in or attached to the sides and middle partition of the carriage or chamber A; or they may be placed in movable rack-frames, and each series thereof break joint, as it were, with the succeeding series, so that the air and gases may be split up in traversing the carriage or chamber, and thereby caused to more perfectly impinge against the chemical substance, which is kept moist with water contained in an overhead tank, D, the water dripping or running through nipple or other pipes, *c c*, onto the uppermost trays or cases, C C, through which it permeates, onto the next lower trays or cases, and so on through the entire series until the chemical substance contained thereby is completely moistened; or the tank D may be dispensed with and the chemical substance moistened by steam or by a hose at the various stations on the line, as found most economical and convenient; or, in lieu of applying the chemical in a more or less solid state, as described, it may be used in a fluid form, as shown in Figs. 3 and 4, Sheet 1, where the overhead tank D contains the chemical solution, which drips or runs through the nipple or other pipes, *d*, onto and through a series of porous sheets, E, of canvas or other material, stretched tightly across the carriage or chamber A', to the sides of which they are battened or otherwise secured; or they may be carried by movable rack-frames; or, in lieu of the sheets E, the carriage or chamber A' may be packed with any non-corrosive material combined with the chemical substance or solution; or the trays or cases C C, before described, may be used moistened with the chemical solution, omitting therefrom the chemical substance in the solid form. In either case the insides and outsides of the carriage or chamber A or A' may be lined with the non-corrosive or porous material, and kept wet with the solution, if found desirable. The sheets E or non-corrosive material being thoroughly saturated with the chemical solution, the latter eventually finds its way into a lower tank, F, whence it is forced back to the overhead tank D by the pump G, worked by an eccentric from one of the running-axles of the carriage or chamber A', as shown, or otherwise. The vitiated air, entering and traversing the carriage or chamber A', impinges against the saturated sheets E or non-corrosive material, as the case may be, (and other surfaces, if any,) and the chemical solution absorbs or changes the noxious gases it contains, the air, more or less purified, passing out of the carriage or chamber A' into the tunnel, as in Figs. 1 and 2; or, in lieu of admitting the chemical solution to the sheets E by the pipes *d*, a number of thick strands of worsted or other suitable material may be passed from the overhead tank D through the series of sheets E (and along the other surfaces, if any) to the lower tank, F, the chemical solution traveling along these strands by capillary attraction, and saturating in its progress the sheets E.

It is to be understood that I do not confine myself to the use or particular arrangement of the trays or cases C C, Figs. 1 and 2, Sheet 1, or porous sheets E, Figs. 3 and 4, as it is evident that any surface capable of containing the chemical substance in a solid state, or of being saturated and transmitting it in a fluid form, may be used, such surface or surfaces being constructed of any suitable material and arranged vertically, inclined, or otherwise.

When either of the above-described arrangements for purifying vitiated air in railway-tunnels is used for purifying purposes in any other places, the several carriages or chambers may be fixed in any convenient position, the running-wheels and other traveling appendages being dispensed with and the vitiated air forced through the carriage or chamber or into contact with the various disks by mechanical means, such as by centrifugal fans or blowing-engines driven by steam, hydraulic, wind, clock-work, hand, or other motive power.

Figs. 5 and 6 illustrate another form or modification of my invention for purifying the air in railway-tunnels, to be used or not in combination with the special carriages or chambers before described. It consists of a trough, F, mounted in front of the engine and containing the chemical solution, in which are immersed a series of sheets, trays, or cases, U, made of some non-corrosive or porous material, connected with each other and arranged to run upon vertical rods, on the principle of a Venetian window-blind, so that when pulled up out of the trough F, in which they have become saturated with the chemical solution, they spread out, as seen in Fig. 6, and form chemical screens or surfaces, against which the vitiated air impinges, and is purified as the train passes through the tunnel. As soon as the chemical solution has evaporated from the sheets U, or on the train passing out into the open air, they are lowered into the trough F, to be resaturated and pulled up again on entering a tunnel.

For use in apartments of houses and other confined spaces the sets of trays U, Figs. 5 and 6, may be suspended from above, so as to swing like a punka or fan, and in that case the trays may be resupplied with chemical solution, being from time to time lowered into the trough F at the bottom of the suspending-rods, or by solution supplied from a trough above said trays by capillary action, through cords or fibrous material hanging over the edge of said upper trough, or by some other form of drip. The surplus solution which finally reaches the lower trough may be returned to the upper trough by means of bulb-pump and flexible tube attached to the apparatus.

I claim—

1. The combination of the horizontal trays, or their equivalents, adapted to hold or contain chemical substances moistened by water, with the carriage or chamber A, provided with wings *a a'*, and side openings, B, substantially as and for the purpose described and shown.



2. The combination of the horizontal trays, or their equivalents, adapted to hold or contain chemical solutions, the supply-tank D, and the carriage or chamber A, substantially  
5 as and for the purpose described.

3. The combination of the horizontal trays, or their equivalents, adapted to hold or contain chemical solutions, with the tank D, tank F, and pump G, all mounted on a moving carriage, and said pump operated by the wheels  
10 of the same, substantially as and for the purpose set forth.

4. The horizontal sheets, trays, or cases U, arranged to move upon vertical rods, so as to operate in the manner of a Venetian blind, 15 combined with a trough, F, adapted to contain chemical solution, into which all of said slats may be immersed, substantially as and for the purpose described.

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Witnesses:

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