

S. D. TILLMAN.  
STEAM HEATER.

No. 104,510.

Patented June 21, 1870.

Fig. 1.

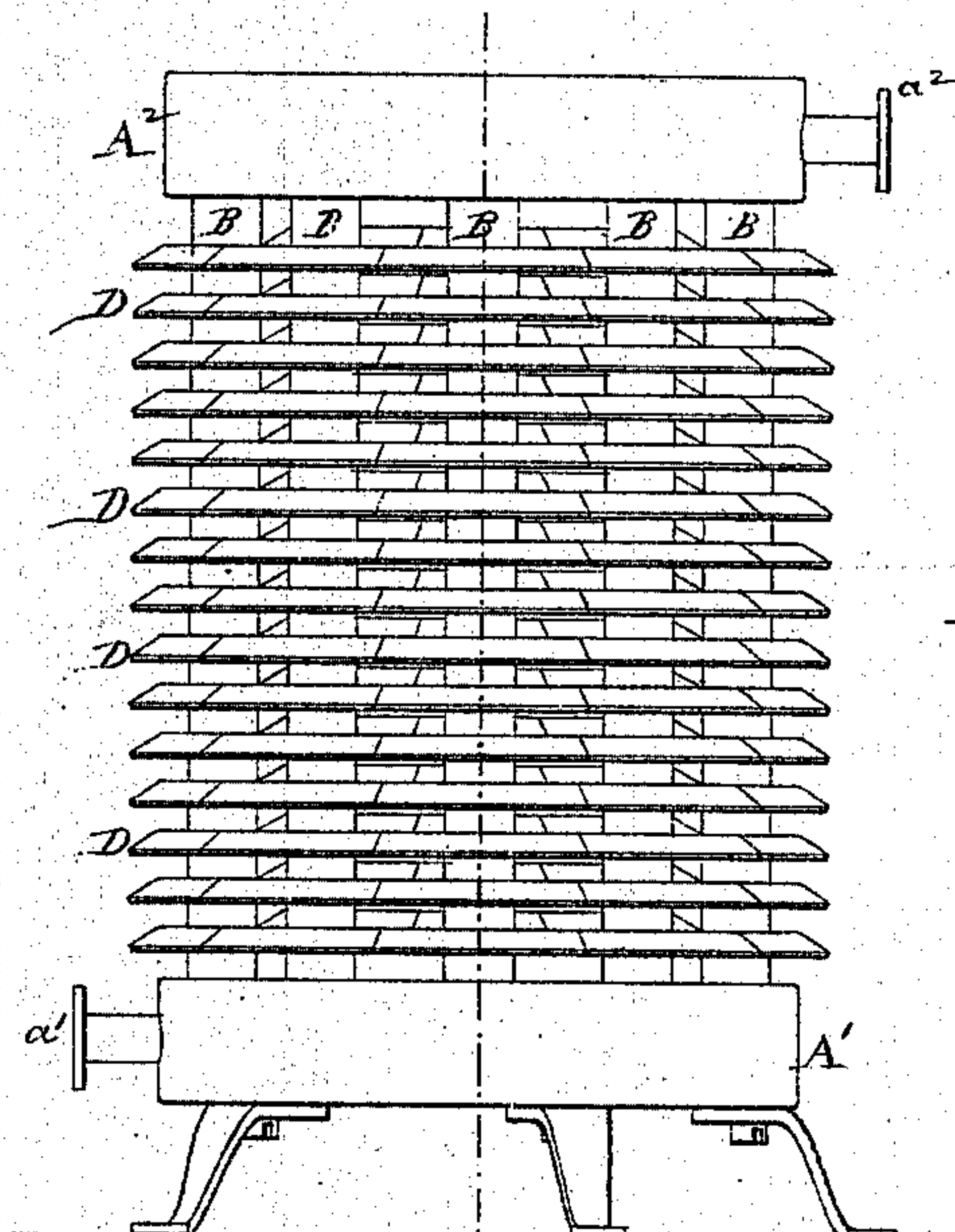


Fig. 3.

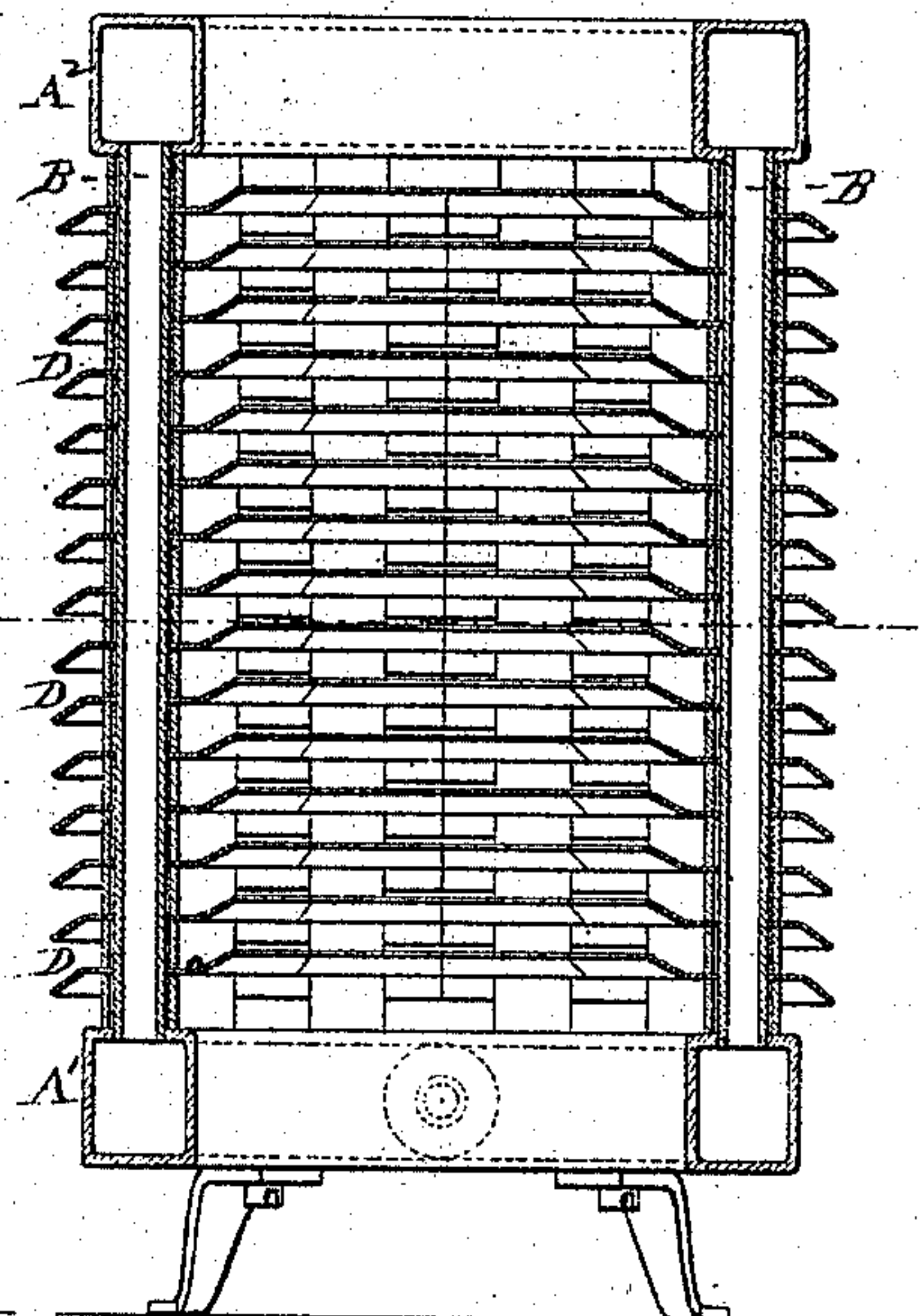


Fig. 2.

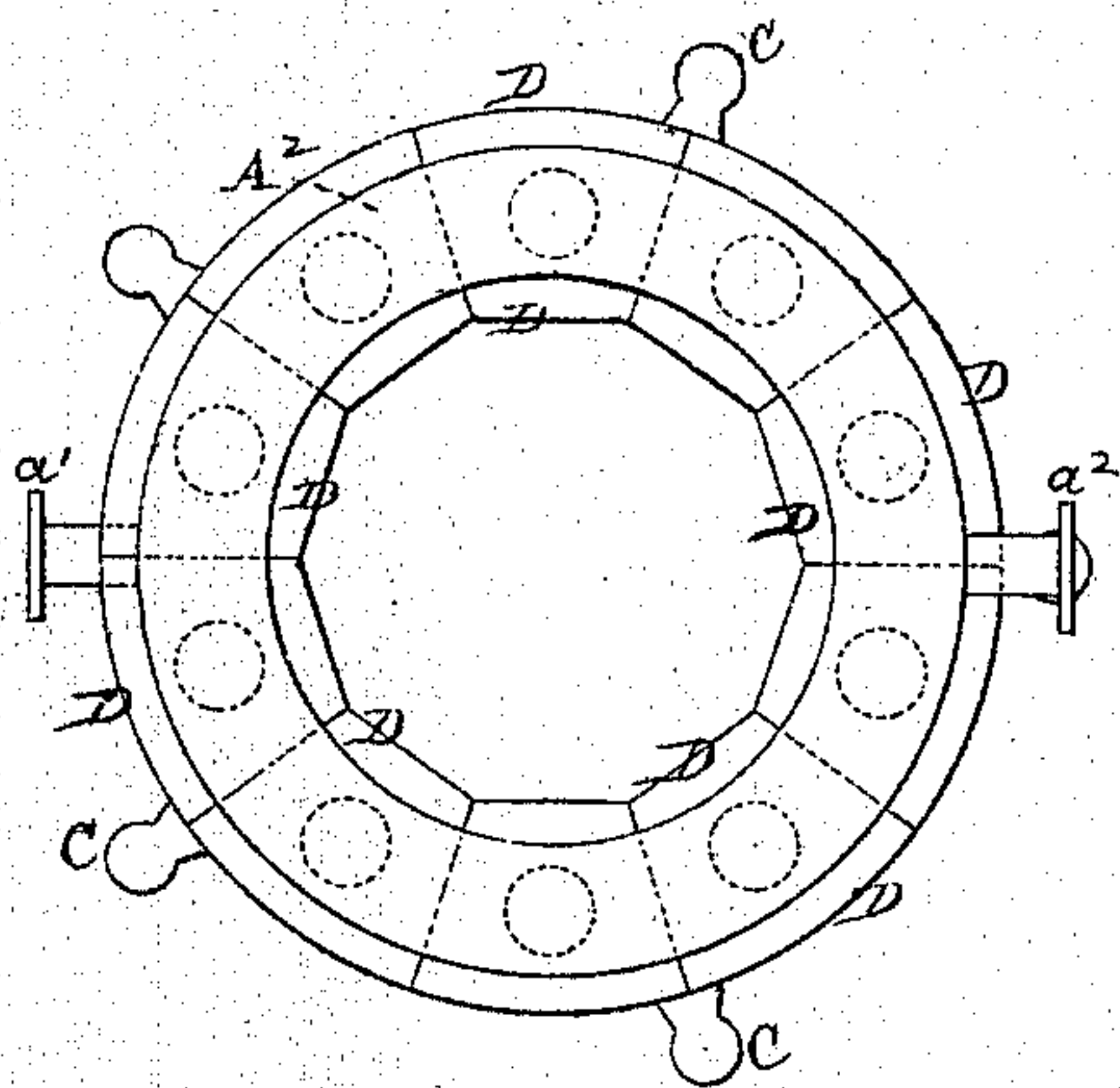
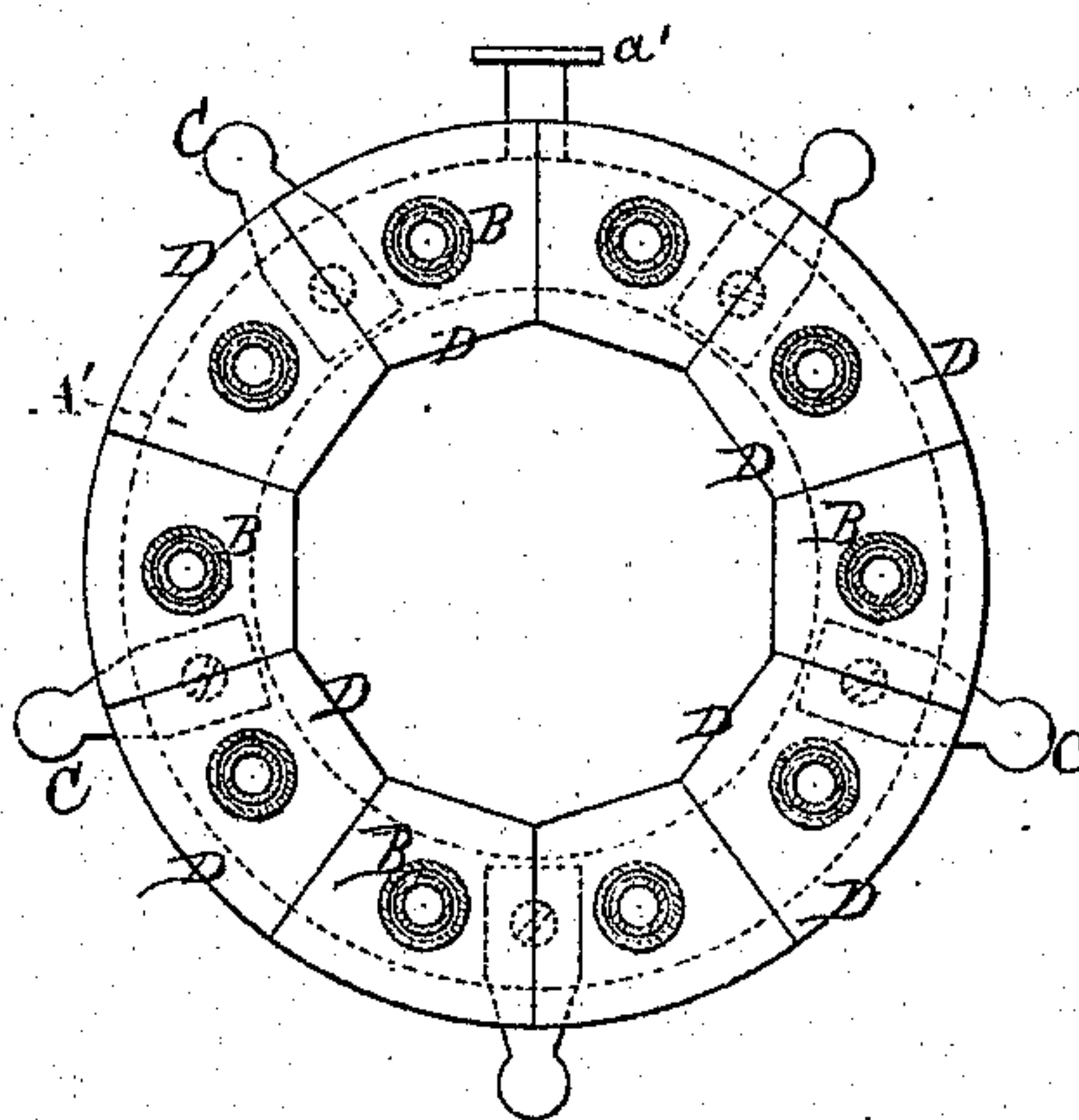


Fig. 4.



Witnesses.

A. Koermann.  
W. E. Dey

Inventor.

S. D. Tillman  
by his atty  
J. S. Stearns

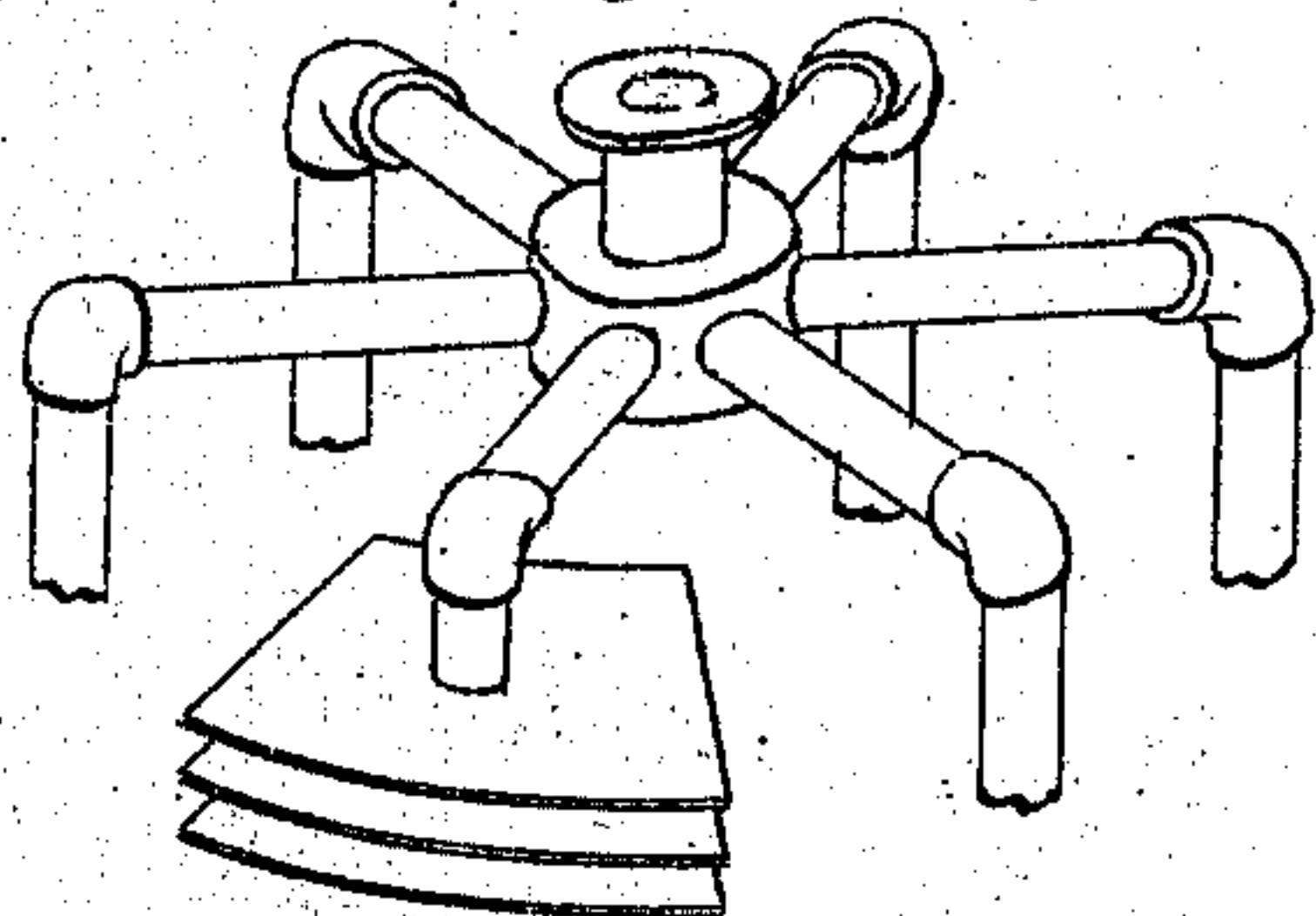


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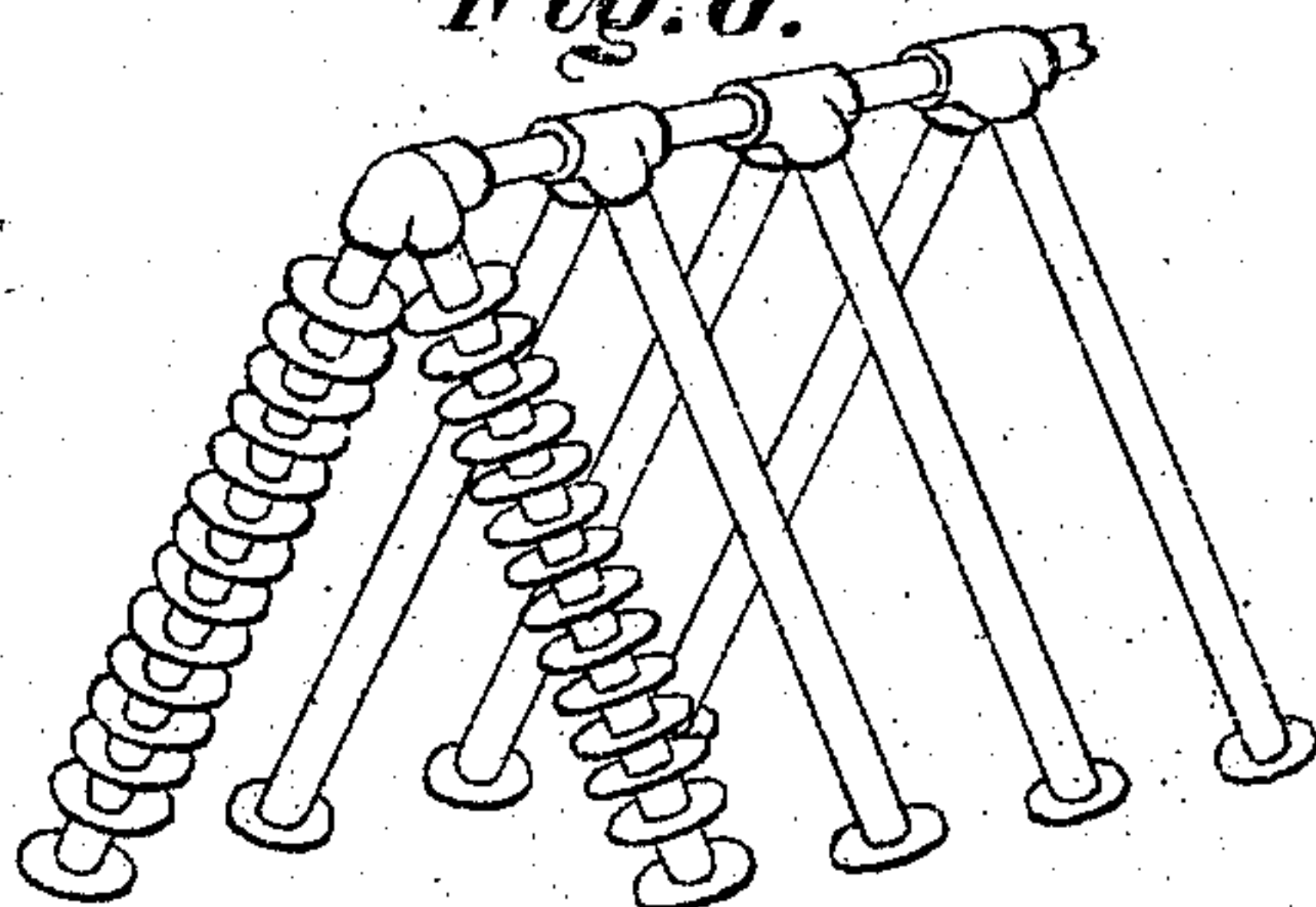
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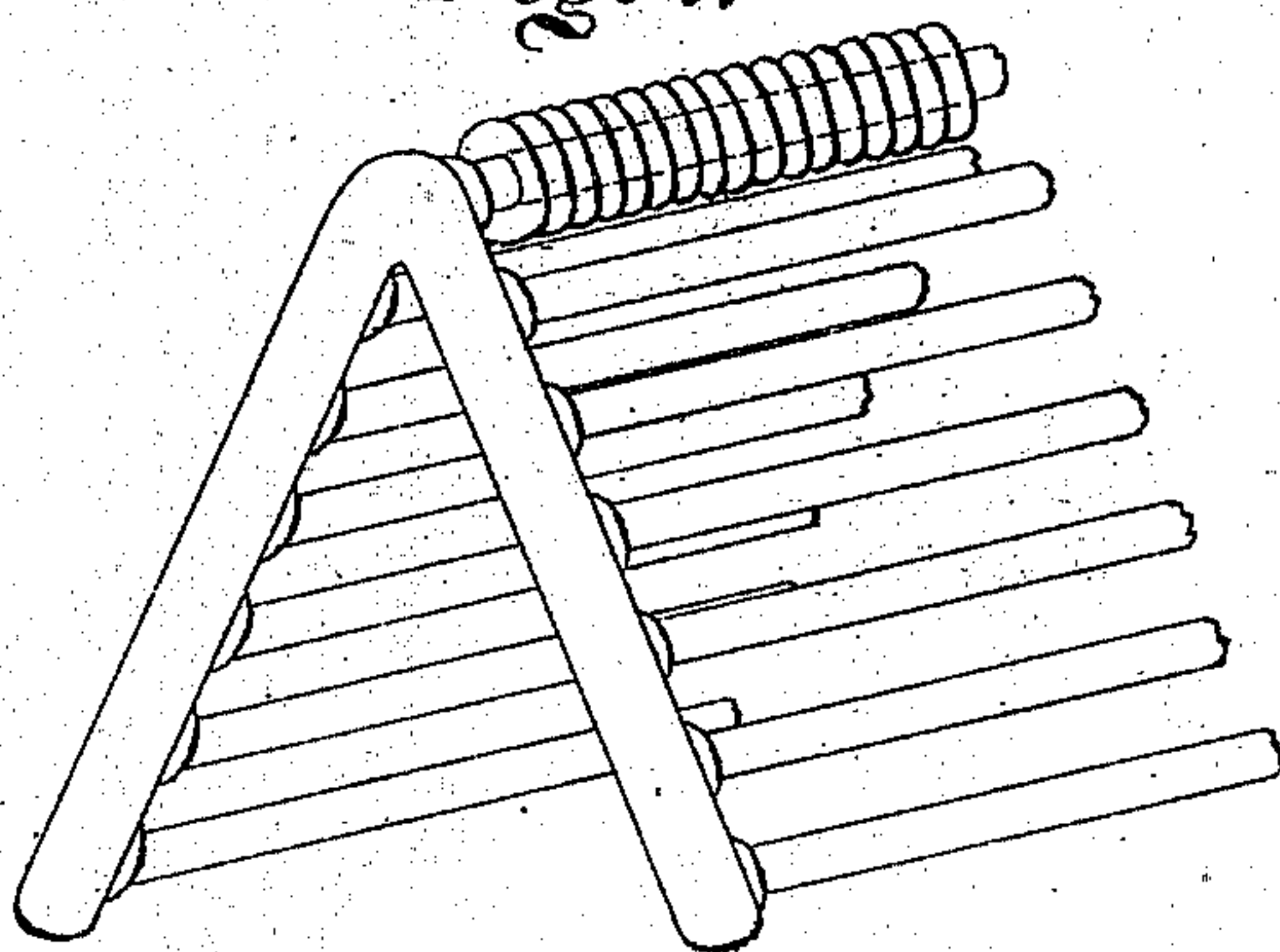
*Fig. 5.*



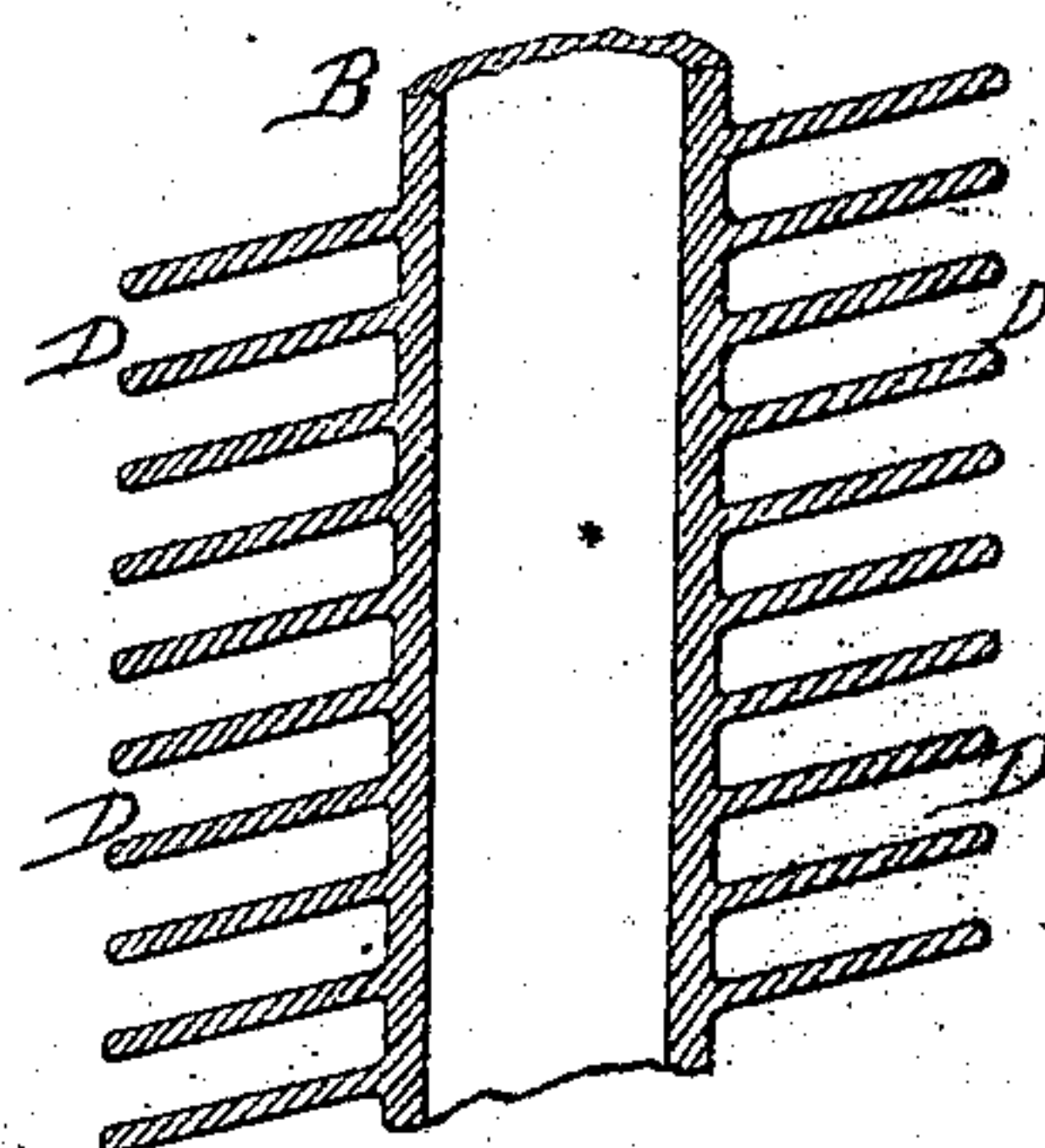
*Fig. 6.*



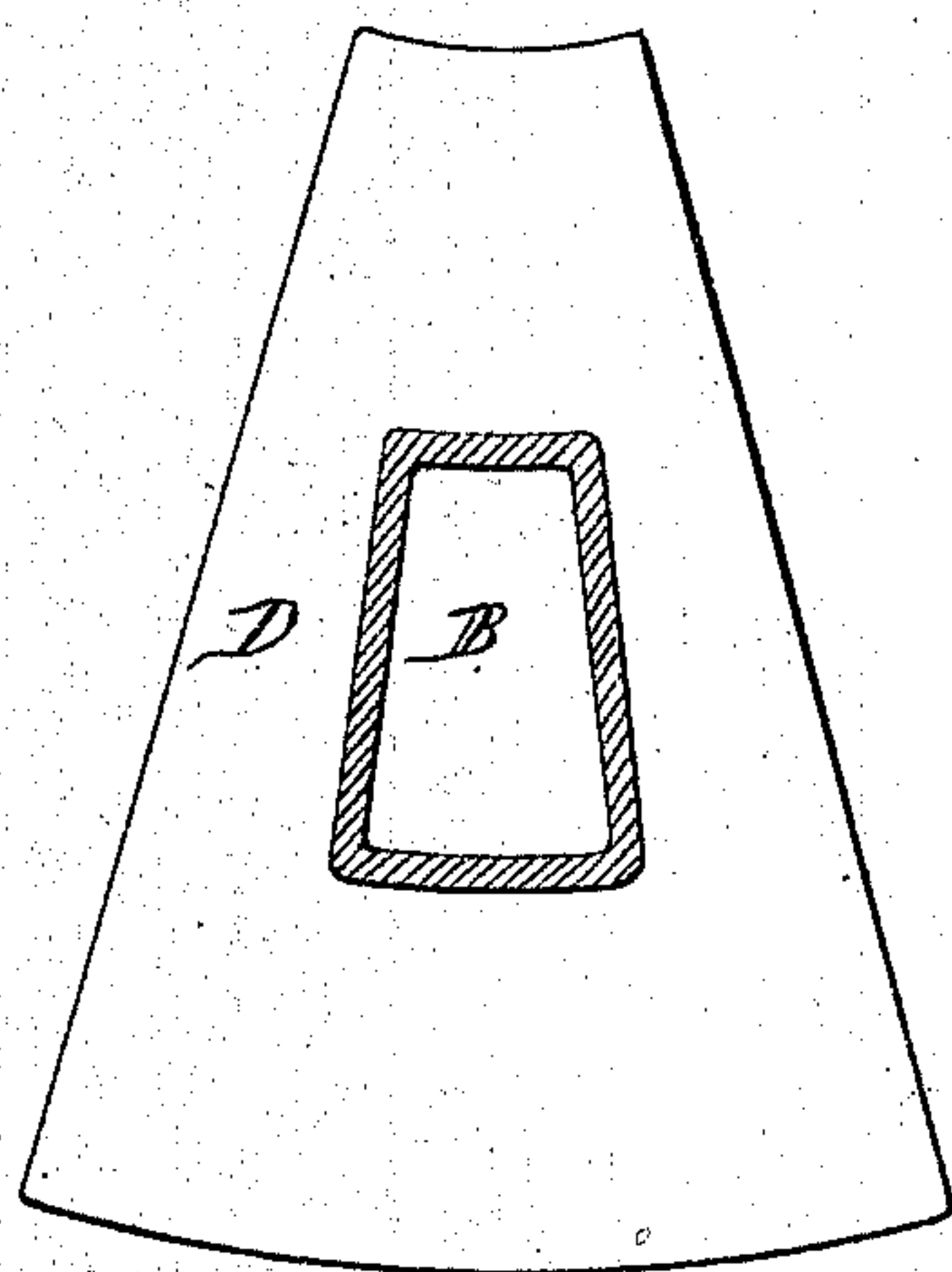
*Fig. 7.*



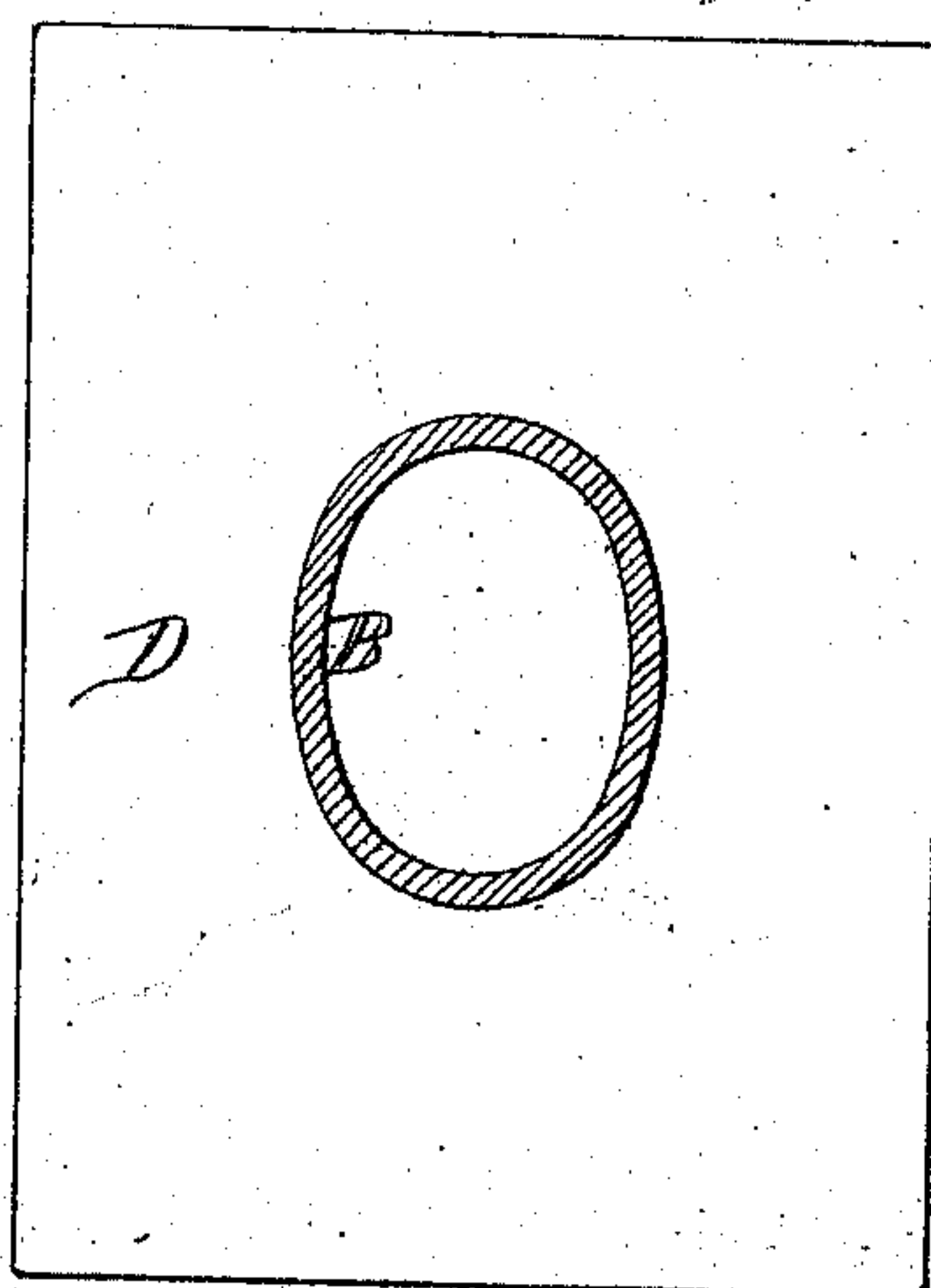
*Fig. 8.*



*Fig. 9.*



*Fig. 10.*



*Witnesses.*

*A. Hoermann*  
*M. C. Day*

*Inventor.*

*S. D. Tillman*  
*by his atty. J. S. Stetson*



# United States Patent Office.

SAMUEL D. TILLMAN, OF JERSEY CITY, NEW JERSEY.

Letters Patent No. 104,510, dated June 21, 1870.

## STEAM HEATER.

The Schedule referred to in these Letters Patent and making part of the same.

### To all whom it may concern :

Be it known that I, SAMUEL D. TILLMAN, of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Steam Heaters, which may be used also for stoves, condensers, and generally in nearly all situations where it is necessary to transfer heat from one fluid to another; and I do hereby declare that the following is a full and exact description thereof.

My invention relates to means for increasing the heating-surface, and for directing the flow of the fluids so that the fluid to which the heat is communicated will be removed entirely, and its place supplied by other fluid at the original low temperature, instead of remaining and flowing along the heating-surfaces in contact therewith.

I shall describe my invention as applied to heaters having pipes in the ordinary cylindrical form; but it will be understood that the pipes or equivalent parts may be of oval section, or of rectangular, triangular, or any other form of section, if preferred.

I will proceed to describe what I consider the best means of carrying out my invention, and will afterward designate the point which I believe to be new therein.

The accompanying drawing forms a part of this specification.

Figure 1 is a side elevation;

Figure 2 is a plan view;

Figure 3 is vertical section; and

Figure 4 is a horizontal section of my heater complete.

Figures 5, 6, and 7 show parts of constructions which involve some of the novel features of my invention, but not in what I consider the best form.

Figure 8 is a cross-section of a single pipe, with its oblique transverse plates cast in one piece therewith.

Figures 9 and 10 are cross-sections of such pipe, or a corresponding pipe, showing different forms of the cross-section of the pipes, and different outlines for the plates.

Similar letters of reference indicate corresponding parts in all the figures.

The drawing represents the novel parts, with so much of the ordinary parts as is necessary to indicate their relation thereto.

Referring to figs. 1, 2, 3, and 4—

A<sup>1</sup> is a hollow ring forming the base of my apparatus.

A<sup>2</sup> is a corresponding ring, forming the upper portion of my apparatus.

B B, &c., are tubes extending from the lower ring A<sup>1</sup> to the upper ring A<sup>2</sup>.

A pipe, a<sup>1</sup> conducts steam, highly heated air, or the

like, into the upper ring A<sup>2</sup>; and a pipe, a<sup>1</sup>, allows the same to flow out, in a partially cooled condition, from the lower ring A<sup>1</sup>.

The direction of the current may be reversed, or, in the case of a steam heating apparatus, it will be readily understood that a large proportion of the escaping matter will ordinarily be in the condensed form, as water.

C O are legs or supporting-arms, which hold the whole a little up from the floor or other support.

So far as has been yet described, the apparatus is believed to involve nothing materially new.

The several rings, as also the tubes, may be of cast-iron, cast together by skillful coring, or the parts may be made separately, and joined by screwing or other suitable means.

D D, &c., are plates of thin metal, cast, welded, or otherwise formed on the tubes B, and stand nearly or quite at right angles thereto. They perform the double function of conducting the heat from the pipes B outward, and present a great extent of heating surface to warm the air on the exterior, and to deflect the current of air and compel it to flow crosswise of the tubes.

The arrangement here represented provides for a current of air to flow inward in all directions, and to rise in the central space within the rings A<sup>1</sup> A<sup>2</sup>.

Some of the air will flow in under the ring A<sup>1</sup>, and will rise directly upward through the clear and unobstructed space in the center. This quantity may be limited by reducing the height or increasing the width of the legs C, or there may be a special valve or regulating device, not represented, by which such passage may be adjusted at will. In any event a large quantity of air will flow in radially between the pipes B, and will become heated by the contact, not only with the pipes themselves, but also with the plates D.

As ordinarily arranged, the particles of air heated by contact with the lower part of each pipe B rises and envelopes the upper part of the same pipe in a stream of warm air, so that the upper part of each pipe is only slightly efficient as heating-surface. It is not exposed to a direct current of cool air. But my plates D completely guard against such an upward flow along the pipes, and they compel the air warmed at any given point on the exterior of a pipe to move inward out of the way, and to leave the spaces above entirely unaffected thereby. In other words, the space below each plate D is isolated by the plate from the space above it, and each performs its heating function independently.

I can provide any height of chimney above the top of my apparatus to inclose the current of air heated thereby, and to thus create a strong upward draught, and a powerful suction inward, through the space be-



tween the plates D. This action, resulting from well-known laws, may be modified at will by removing such chimney, raising it above the top of my apparatus, perforating it, or providing it with a damper, or otherwise.

When my apparatus is used as a condenser it will be understood that the steam is thrown into the pipes B from the engine, and the current of cold air conducts away the heat, in the same manner as has been before described. For such a purpose it may be of particular service to place the apparatus at the bottom of a tall chimney. The effect may be still further increased, in some instances, by heating such chimney with the products of combustion from the furnace, or increasing the draught by a blower, a steam-jet, or other approved means. I can also increase the draught, or the circulation of the air, by artificial means, in using the apparatus as a steam heater or stove. In this case the condenser will be most effective if both the tubes B and the plates D are made of thin copper, and it is evident that the strength of the plates D will allow the use of extremely thin copper tubes B.

I do not confine myself to the precise degree of curvature, or the precise distance apart of the plates D D. I have represented them as being matched together, edge to edge, so that the plates D on one tube coincide with the corresponding plates on the adjacent tube on each side. I prefer this arrangement; but a part of the advantages of my invention may be secured by allowing the plates to interlock or lap on each other; or, again, if of insufficient size to meet. In case the plates are plain, I esteem it important to mount them at a considerable inclination, so as to favor the motion of the air in the desired direction by the tendency of the warmed air to rise, but a portion of the advantage may be secured by mounting such plates in planes at right angles to the axes of the tubes.

The plates may be made of wrought iron, struck out by dies or the like, and secured by welding, brazing, soft-soldering, or other suitable means. In order to allow for the inclination, the hole which receives the tube should be made correspondingly elliptical. I can modify the effects by varying the thickness and substituting other materials, as brass for iron. I propose, for cheap work, casting the tubes B, with the plates D thereon, in a single piece.

The effect may, in some cases, be modified with advantage by inclining the plates D in the opposite direction, and blowing the cold air into the center of a series of pipes, arranged as represented. In such case the interior of the upper ring A<sup>2</sup> may be wholly or partially closed with advantage.

Any tasteful scroll-work, or other open-work protection, may be mounted on the exterior of my heater when used for warming apartments.

I claim—

1. The pipes B extending up and down, and the bent or inclined plates D, when so constructed and arranged that the plates completely encircle the pipes and deflect the rising current of heated air, which tends to flow along the pipe, and cause it to make way constantly for fresh cold air to be heated, and in turn to be immediately removed, as herein set forth.

2. The within-described heater and condenser, composed of a collection of such pipes and inclined plates, arranged in the form of a hollow cylinder or inclosure, with means for supplying steam or other heating fluid thereto, as herein set forth.

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

SAML. D. TILLMAN.

Witnesses:

W. C. DEY,  
C. C. LIVINGSTON.