

(No Model.)

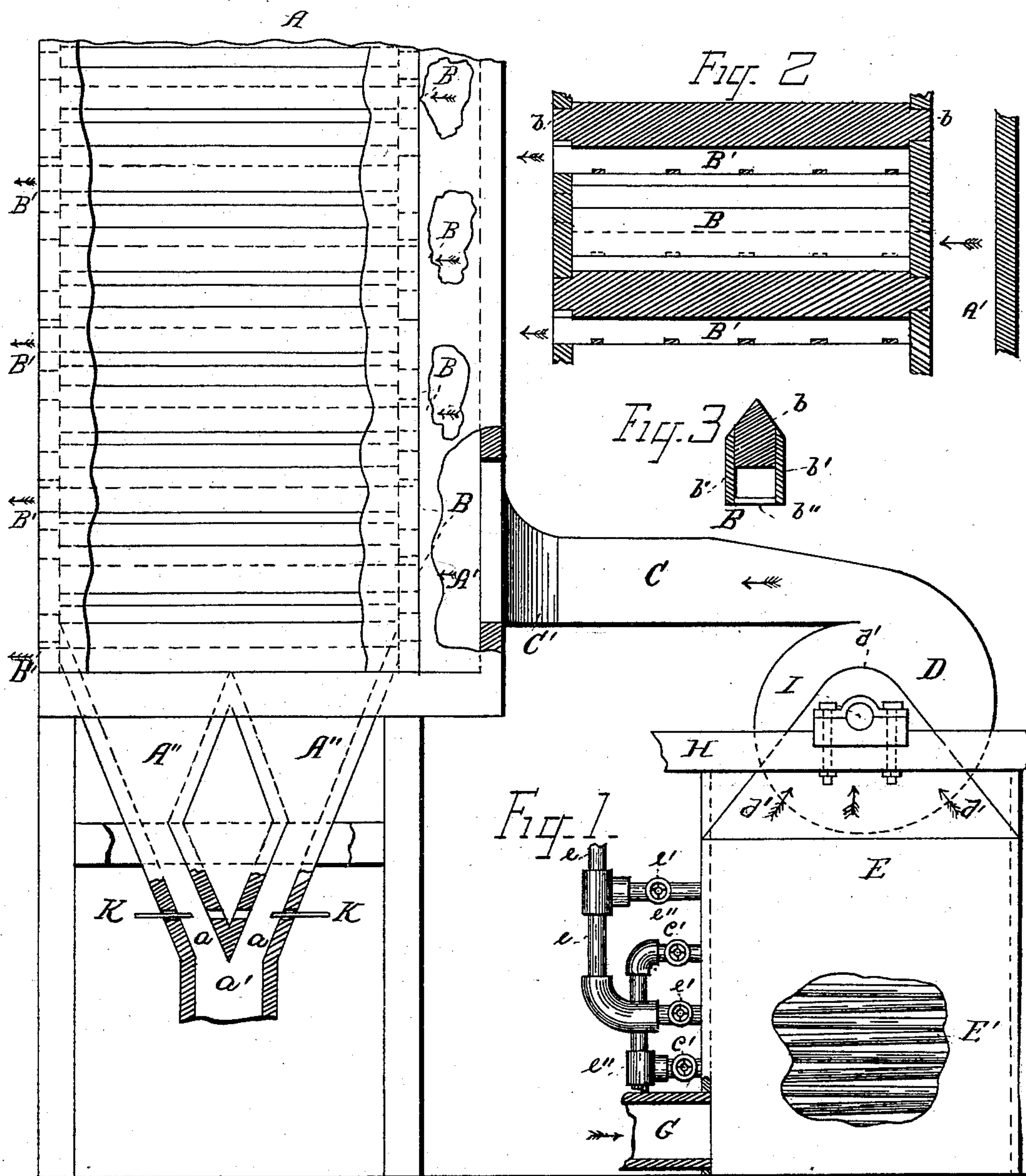
3 Sheets—Sheet 1.

E. THOMPSON.

GRAIN DRYING PROCESS AND APPLIANCE.

No. 290,719.

Patented Dec. 25, 1883.



Witnesses
H. A. Jones.
John C. Miller

Inventor.
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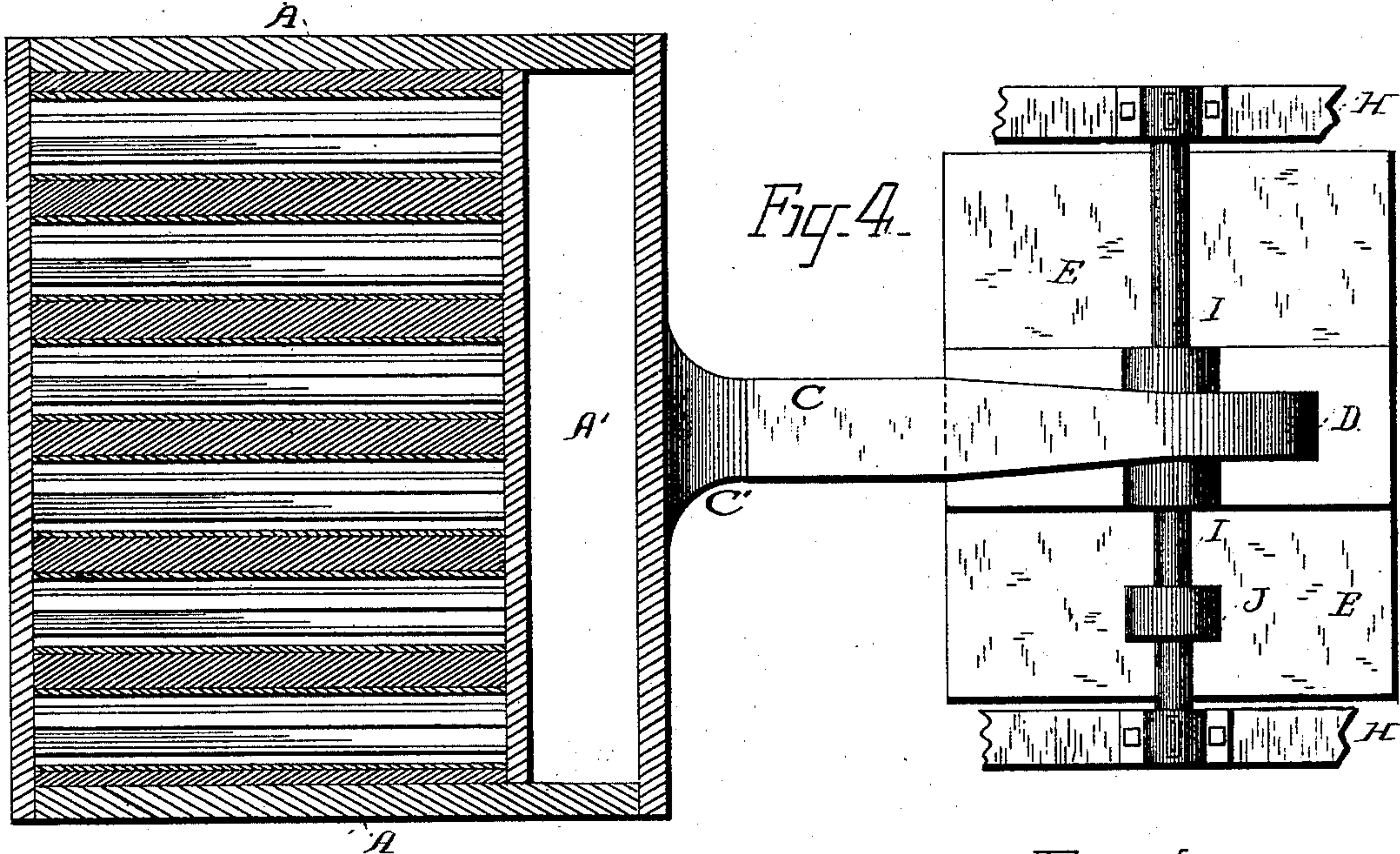


Fig 4.

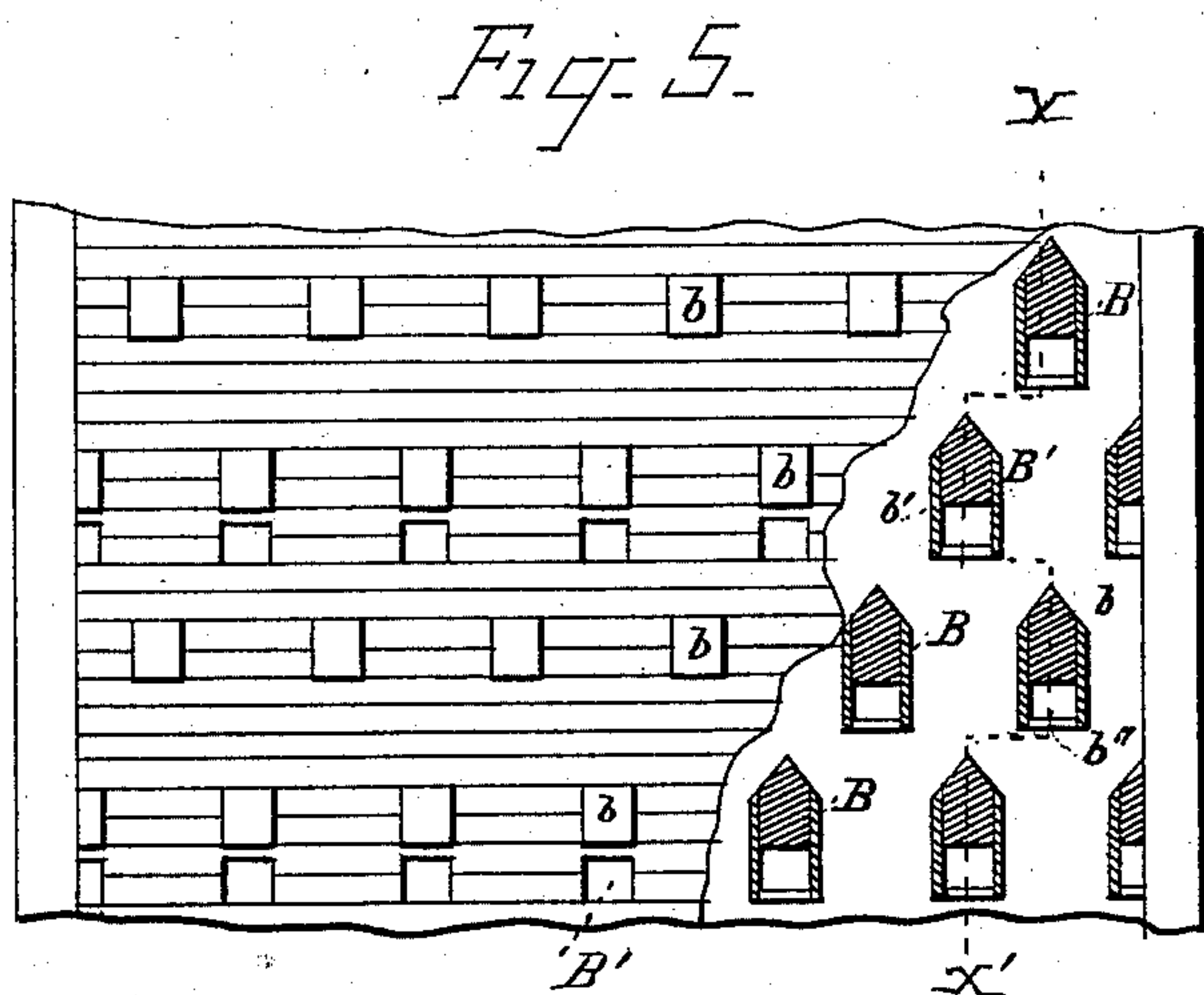


Fig. 5.

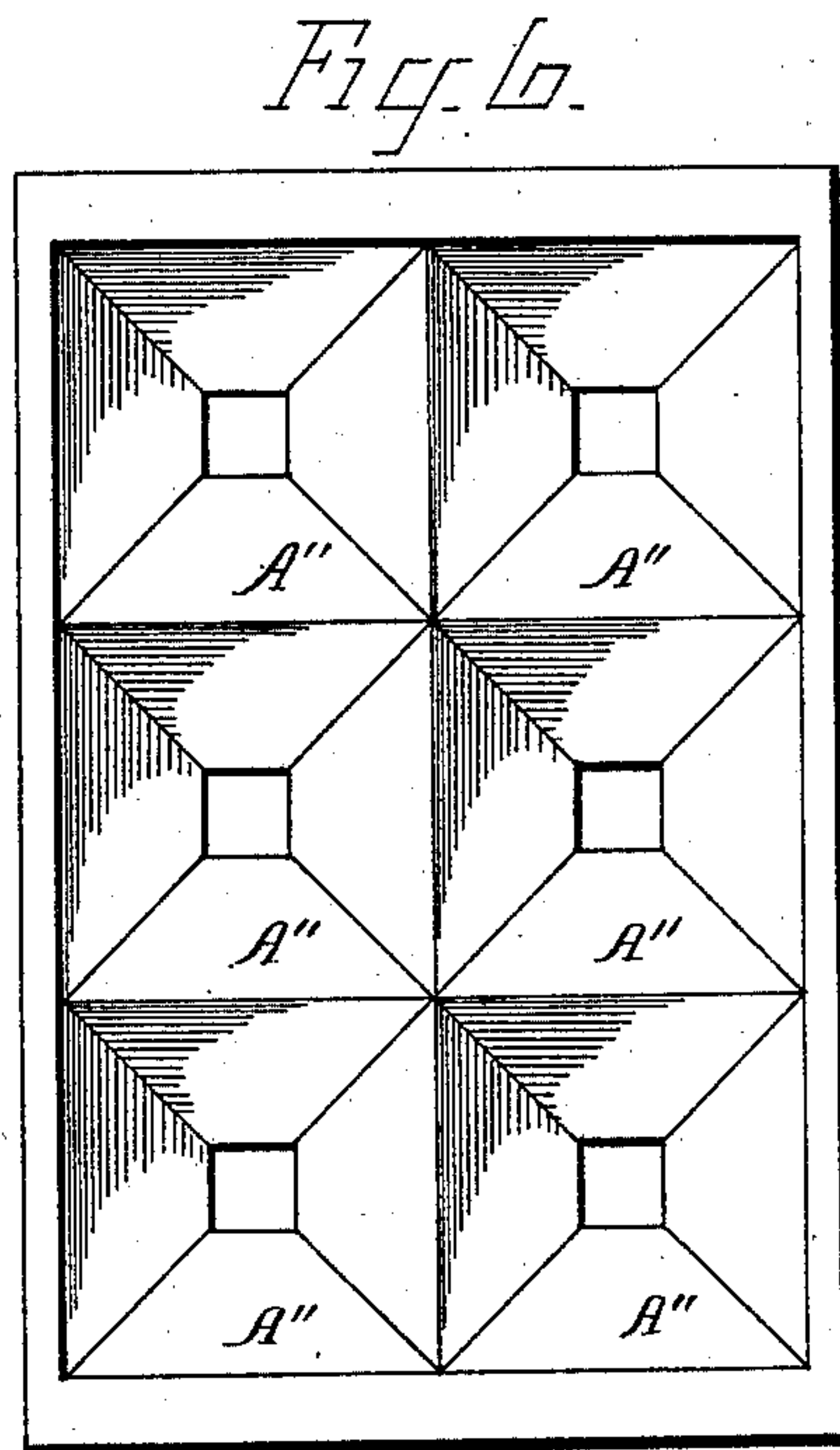


Fig. 6.

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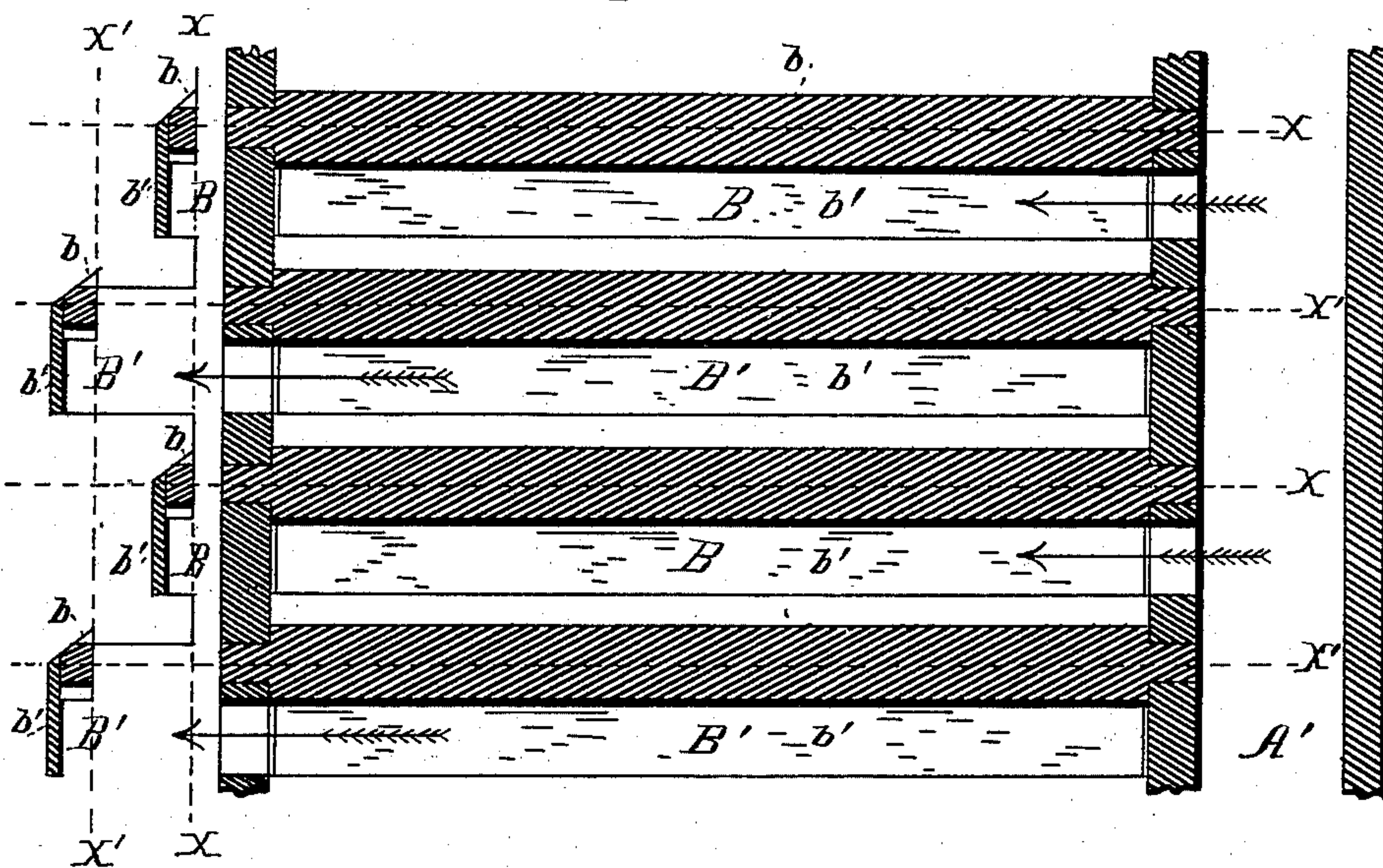
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Fig. 7.



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UNITED STATES PATENT OFFICE.

EDWARD THOMPSON, OF HOKAH, MINNESOTA.

GRAIN-DRYING PROCESS AND APPLIANCE.

SPECIFICATION forming part of Letters Patent No. 290,719, dated December 25, 1883.

Application filed September 20, 1883. (No model.)

To all whom it may concern:

Be it known that I, EDWARD THOMPSON, a citizen of the United States, residing at Hokah, in the county of Houston and State of Minnesota, have invented certain new and useful Improvements in Grain-Drying Processes and Grain-Drying Appliances; and I do hereby 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.

Heretofore grain has been dried by passing it over heated metallic plates or surfaces containing uncertain degrees of heat, by reason of which too great quantities were imparted to the grain, invariably resulting in the destruction of the germinating properties of a large proportion thereof. By the modes in present use the grain is also kept in a state of motion more or less violent during the process of drying. It is also alternately heated and cooled, thus causing it to alternately expand and contract, the natural consequence of which is the destruction of the primary formation, its natural density is destroyed, and it is moreover given an increased tendency to subsequent absorption of moisture. These characteristics are unavoidable results of grain which has been dried while in a state of motion.

I am also aware that grain has been dried and cooled, while in a state of rest, by forcing hot and normal air through it by means of a blast acting through a hollow vertical shaft extending up the center of the bin, and diversified by numerous perforated metallic pipes radially projecting from different parts of said hollow shaft throughout the bin, having openings for the escape of the hot air and vapors; but such process and means of appliance differ largely from that herein described in several important respects, as the air used is fire-heated, and by reason of the radial distribution it is unequally distributed through the bin, unavoidably resulting in either overheating the grain nearest the central shaft, or insufficiently drying that farthest therefrom; whereas by my improvement the air is steam-heated, and by reason of being distributed in numerous small parallel currents by means of transverse air-ducts entirely open at the bottom, and arranged in alternate courses and in-

intermediate positions, thereby causing the warm and normal air to evenly permeate the whole quantity of the grain, thus avoiding the injurious results above mentioned.

The object of this improvement is to avoid these injurious consequences by providing a process of drying grain as nearly as possible in conformity to ways and action of nature, by sending a powerful blast of warm air through the grain while it is in a state of rest, to dry the grain more perfectly and more rapidly or in greater quantities in the time required than by the processes in common use. By keeping the grain in a state of rest while it is being dried, and gradually cooling it before it is exposed to the light, its color is improved, it is prevented from bleaching, and thus injuring its market value, and its natural density is preserved.

Another object and result of the within-described process is to relieve the grain of bad odors, which frequently accrue by reason of heating and molding from lying in a bin, and, furthermore, to provide appropriate mechanical means for the application of the process. This result is attained by the mechanism illustrated in the accompanying drawings, making part hereof, and in which similar letters denote corresponding parts.

Figure 1 is a side elevation, partly in section. Fig. 2 is a longitudinal vertical section. Fig. 3 is a sectional end elevation of the air-duct detached from the bin for special illustration of its construction. Fig. 4 is a plan view with the top cut away, showing the interior of the bin and the alternate courses and positions of the air-ducts in their relation to each other. Fig. 5 is a longitudinal vertical section, further illustrating the arrangement of the air-ducts in alternate courses and positions, as seen from the escape side, and showing the openings through which the warm air passes out of the bin. Fig. 6 is a top view of the hoppers through which the grain is drawn out of the bin after it has been dried. Fig. 7 is a longitudinal vertical section taken on the lines xx and $x'x'$ of Fig. 5.

Referring to Fig. 1, A is the grain-bin, which is provided with transverse air-ducts B and B', arranged in alternate courses and positions and opening on opposite sides of the bin. The air-ducts B open into the warm-air

chamber A', located at the side of the bin. Into this chamber large quantities of warm air are forced by means of the pressure-fan D, which connects with the warm-air chamber A' by blast-pipe C, and with air-heating chamber E by suitable suction-ways located at the top of the air-chamber E, forming part thereof, and inclosing the airways of the fan, as referred to by the letters *d' d' d'* and arrows showing the direction of the suction. The air-heating chamber E incloses a series of coiled pipes, E', heated by steam, by which means the air entering the chamber E at the opening G is heated, preparatory to being forced through the blast-pipe C by the fan D into the warm-air chamber A', and from thence into the bin by means of the receiving-ducts B; from thence through the grain, after which it passes out of the bin through the exhaust-ducts B', opening on the side of the bin opposite to the warm-air chamber A', but having no connection therewith except through the grain, which fills the bin around and between the alternate courses of the air-ducts B and B'. When a supply of normal air is necessary to cool the grain, the steam is shut off from the coiled pipes E' in the air-chamber E by means of the valves *e'* in the steam-inlet pipes *e*, the outlet-valves *e'* in the outlet-pipes *e''* are opened, the steam which heats the air is passed out, and the air is drawn into the chamber E through the opening G in a normal condition, and into the suction-ways *d' d' d'* at the top of the chamber E, which connect with the airways at the sides of the fan, and is forced thence through the blast-pipe C into the air-chamber A', from whence it is forced in diversified currents through the grain by means of the air-ducts B and B', as stated. The sides of the bin A are laid up with plank or strips in the ordinary elevator style. The air-ducts B and B' are formed in three parts. The center piece is a beam, *b*, of suitable size and beveled at each side from the center at the top. To each side of the beveled beam are firmly secured boards or planks *b'*, having their top edges beveled to correspond to the bevel of the beam *b*. The lower edges of the side pieces, *b'*, extend below the lower surface of the beam *b* sufficiently to form air-passages into the grain. These side extensions, *b'*, are provided with transverse braces *b''*, for the purpose of preventing the pressure of the grain from forcing them inwardly, and thus curtailing the area of or destroying the air-ducts formed by such extensions, which are open at the bottom, for the purpose of allowing the warm air to communicate directly with and pass through the grain from the initial or receiving air-ducts B, and thence through the exhaust-air ducts B', and out of the bin entirely. The ends of the transverse beams *b*, forming the center pieces of the air-ducts, are provided with tenons which pass through and are attached to the side walls of the bin, and thus prevent them from spreading. The extensions *b'* of the transverse beams forming the air-ducts reach en-

tirely across the inside of the bin and abut against the side walls. The bin A is provided at its lower part with six hoppers, A'', for drawing off the grain after it has been dried. The hoppers are divided into such number, in order that they may be of the smallest practicable dimensions, for the purpose of having the smallest possible quantity of grain below the air-ducts, at which location the grain cannot be thoroughly subjected to the action of the warm air which is forced through the air-ducts. The hoppers A'' are located alongside of each other in pairs, and connect by means of outlet-passages *a* with discharging-spout *a'*. The outlet-passages of the hoppers are provided with gates K, which are opened to let the grain pass out of the bin.

The pressure-fan D should be made of metal, and should be of large size. A bin holding two thousand bushels of grain should have a fan of sufficient size to furnish twenty thousand cubic feet of warm air per minute, which will dry the quantity of grain mentioned in from one hour and three-quarters to three hours, according to dampness.

The fan-shaft I rests on and is supported by beams H. (More fully illustrated in Fig. 4.) These beams are part of the frame-work of the building.

The blast-pipe connection C, between the fan D and the warm-air chamber A', may be made of wood and lined with sheet metal.

In order to facilitate the passage of the blast into the warm-air chamber, the pipe C is enlarged at its entrance thereto, as referred to at C'.

The arrows located in the air-chamber A' indicate where the air-ducts B open into the chamber A', and the course of the blast through said openings into the bin, from thence through the grain into the air-ducts B', and out of the bin, as indicated by the arrows on the left margins of the Figs. 1 and 2.

The bin A may be of any convenient size. It may be a common elevator-bin provided with air-ducts, as shown. The size should be governed by the quantity of grain to be dried; but for drying quantities greater than fifteen hundred bushels per hour two bins will give better results than one of double size, because of less time being required to fill and empty them.

As indicated by experience in testing the operation of my improved process of drying grain, as herein described, 150° Fahrenheit is the extreme temperature to be given to the warm-air blast.

I am aware that grain-drying bins have heretofore been constructed having alternate series of air-ducts composed of metallic plates opening on opposite sides of the bin, and acting as conduits of heated air and smoke through the grain while it was in a state of motion; and I therefore do not broadly claim such construction.

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

1. The method of drying grain, which consists in forcing a powerful blast of warm air, divided into numerous small parallel currents, through a quantity of grain while in a state of
5 rest, and, when sufficiently dry, cooling the grain by means of a blast of normal air applied in the same manner before removing the grain, substantially as set forth.

2. The peculiar construction of the air-ducts,
10 composed of the beveled beams having perpendicular side extensions, said beams being provided with tenons at their ends for the purpose of supporting the air-ducts and laterally strengthening the walls of the bin against the
15 pressure of the grain, substantially as set forth.

3. The air-ducts composed of the tenoned and beveled beams having perpendicular side extensions, in combination with the bin having a single air-chamber connecting therewith, substantially as specified, for the purpose set forth. 20

In testimony whereof I have affixed my signature, in presence of two witnesses, this the 19th day of September, 1883.

EDWARD THOMPSON.

Witnesses:

D. C. HANSON,
W. A. SMITH.