

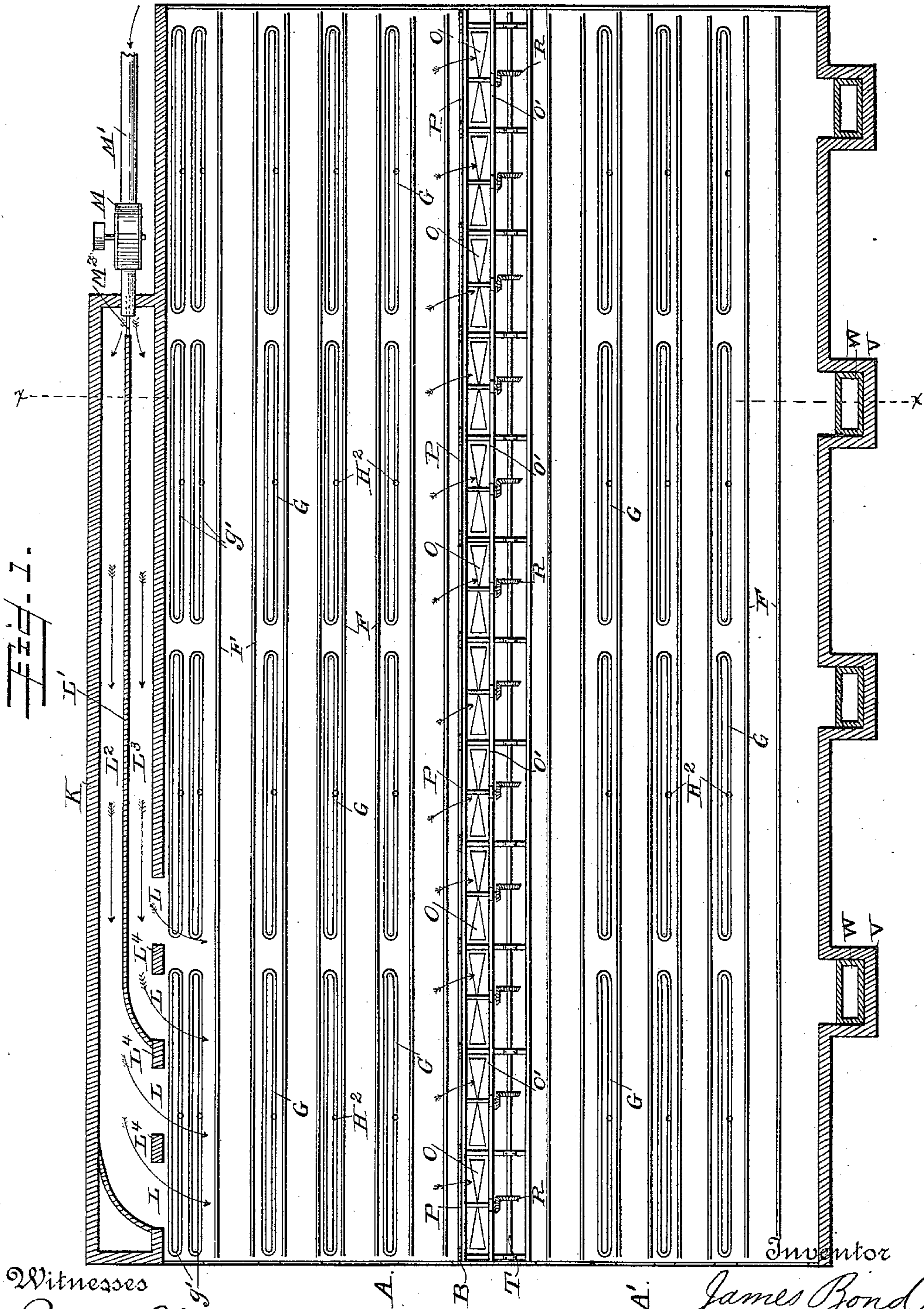
(No Model.)

4 Sheets—Sheet 1.

J. BOND.
DRIER.

No. 440,786.

Patented Nov. 18, 1890.



Witnesses

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Albert B. Blackwood

Inventor

James Bond
By M. H. H. H. H.
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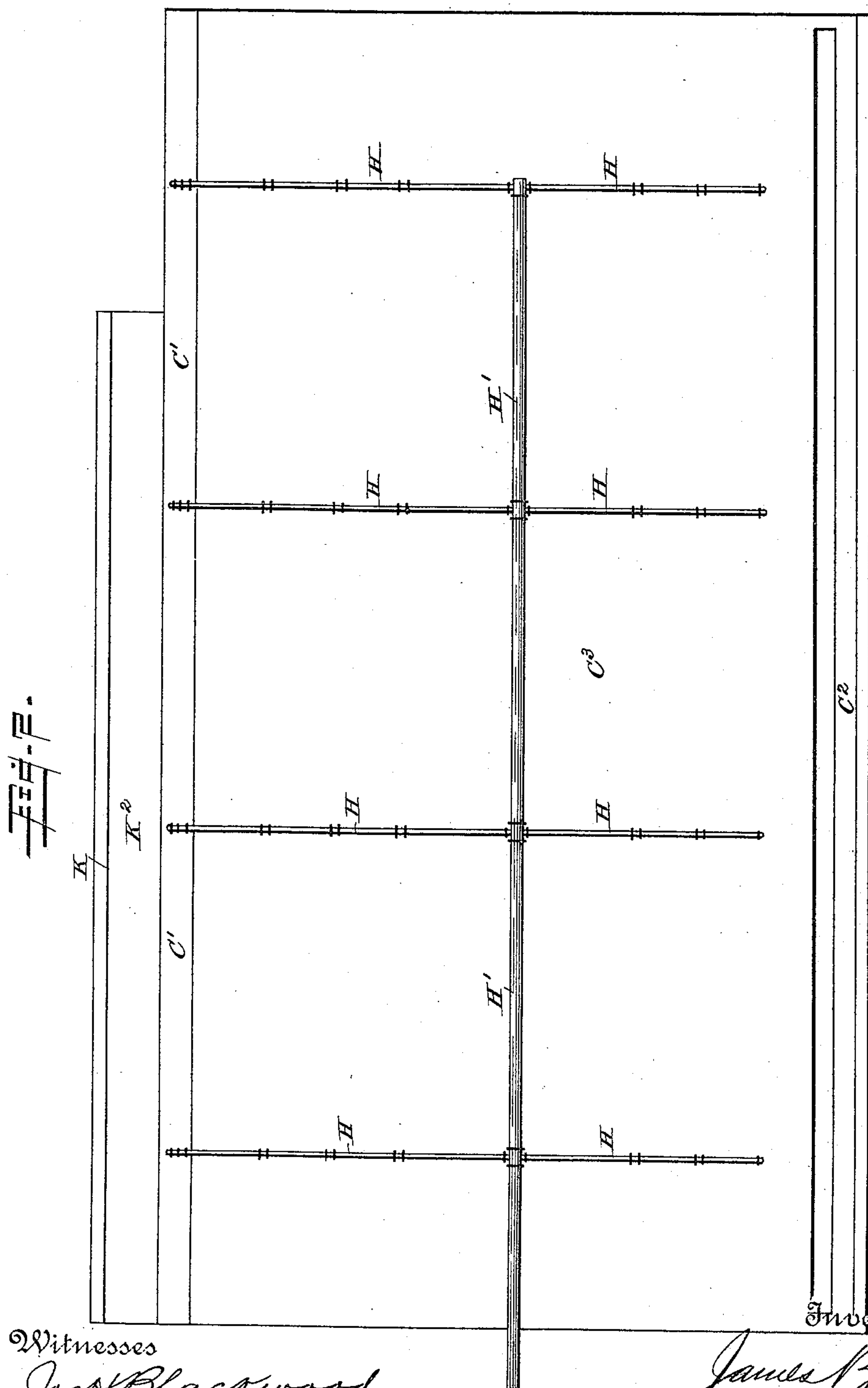
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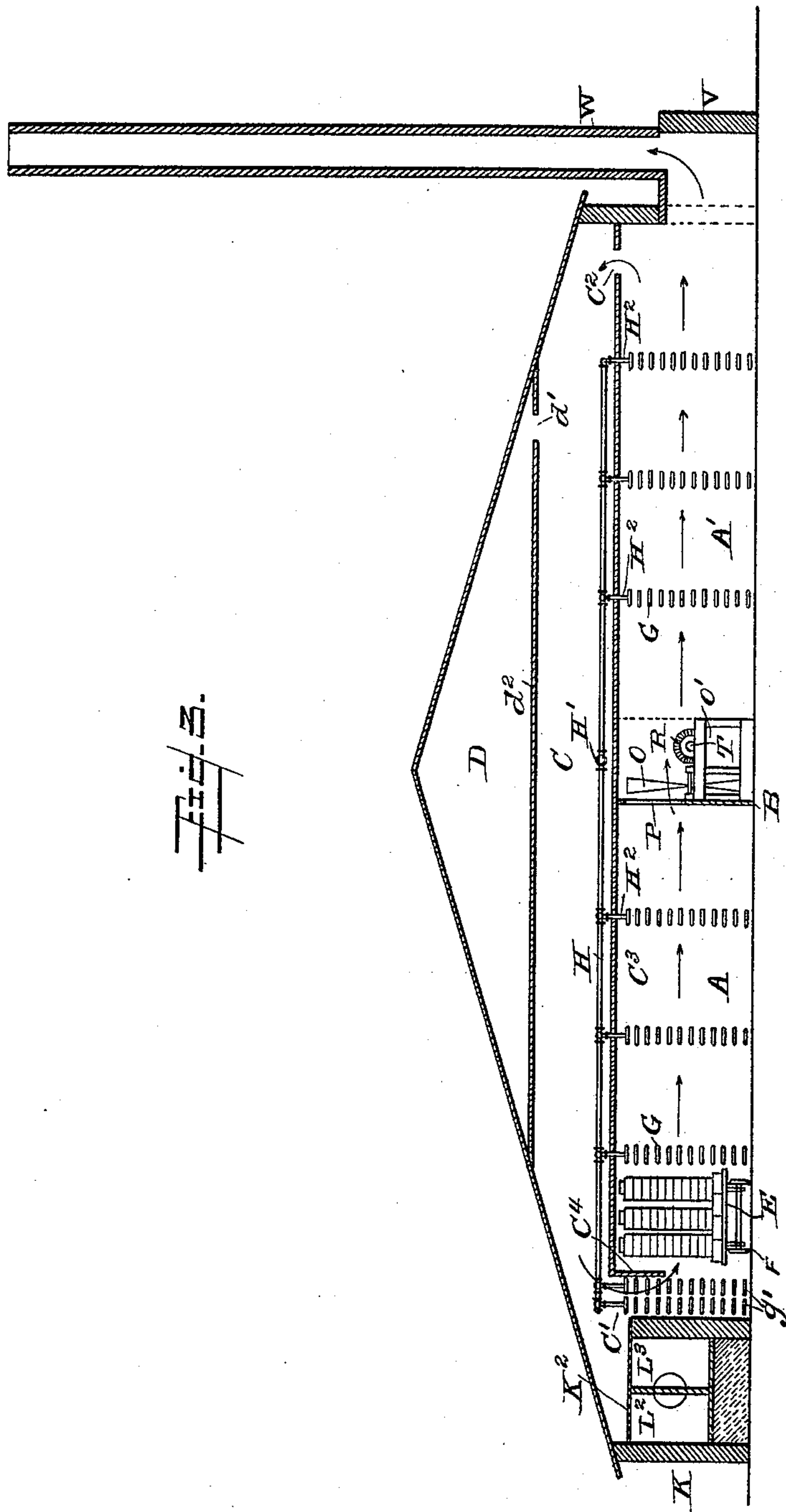
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Fig. 4.

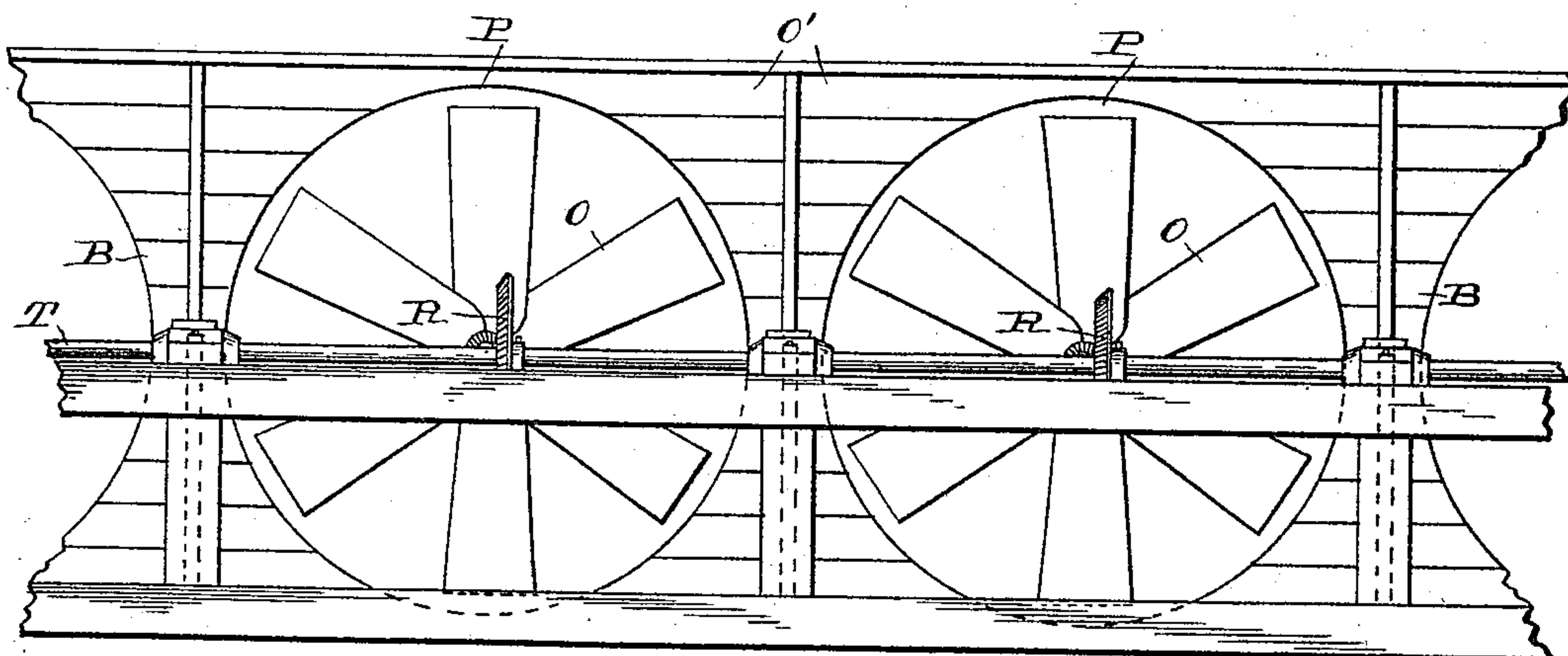
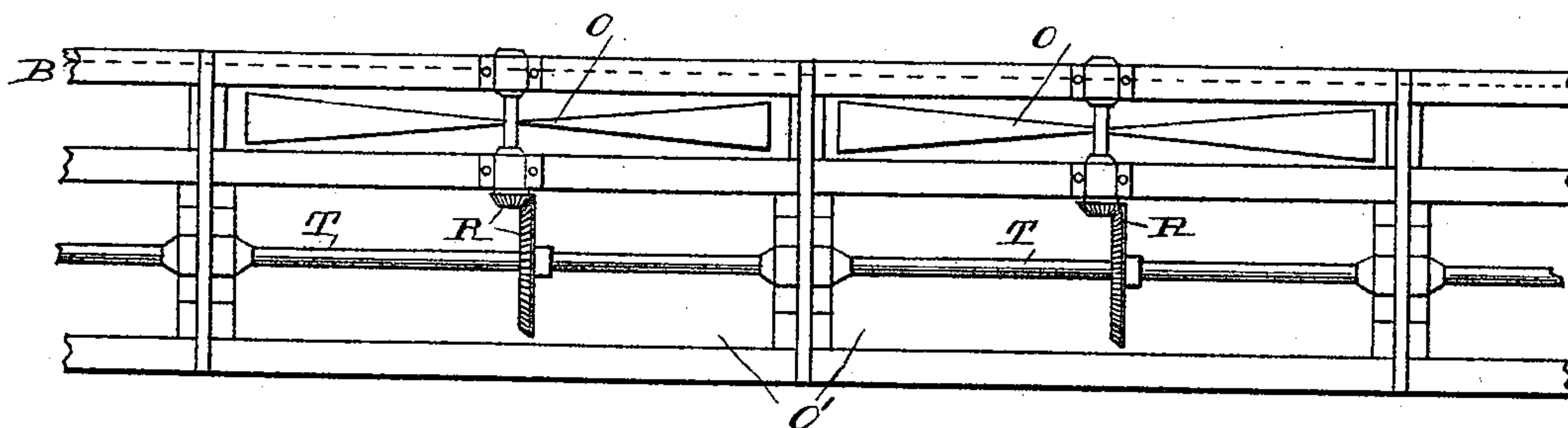


Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES BOND, OF PHILADELPHIA, PENNSYLVANIA.

DRIER.

SPECIFICATION forming part of Letters Patent No. 440,786, dated November 18, 1890.

Application filed February 21, 1890. Serial No. 341,338. (No model.)

To all whom it may concern:

Be it known that I, JAMES BOND, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Driers; 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.

My invention relates to an improved apparatus for drying brick or other products; and it has for its object a more efficient and economical method of drying by utilizing the waste heat and gases escaping from the boiler fires and the exhaust-steam from the engine, and in collecting and concentrating such supplies of heat by means of a flue and radiators, and then with great circulating force carrying the heat thus accumulated entirely through the chamber or chambers in which the brick or other material to be dried are placed, thus producing a strong and thorough circulation of the drying-heat throughout the entire apparatus, and at the same time carrying out of the drier as fast as it accumulates all steam and moisture arising from the materials being dried. The means I employ to accomplish these objects are illustrated in the accompanying drawings, in which—

Figure 1 is a plan of the interior of the drying-chamber with ceiling and roof removed; Fig. 2, a similar view of the interior of a hot-air chamber above the drying-chamber, and showing pipes by means of which the steam is distributed to the various radiators; Fig. 3, a cross-section in elevation of the drier on line *xx* in Fig. 1, and Figs. 4 and 5 details of fan mechanism.

The buildings composing the drier may be made of brick side walls and roof and ends of wood.

The drawings show the apparatus adapted to the drying of brick, and the description will hereinafter be restricted to such drier, although it is obvious that it might be used for other purposes.

The drier, as shown, is divided into four apartments—the drying-chambers *A A'*, divided by a central partition *B*, a hot-air chamber *C* above the drying-chamber, and an upper air-chamber *D* above the hot-air chamber

C. The hot-air chamber communicates with the drying-chamber through passages *C' C²* at opposite sides of the ceiling *C³*, and the top air-chamber *D* communicates with the hot-air chamber *C* by a passage *d'* at one side of the ceiling *d²*. The ceiling *C³* is provided with a return or a downwardly-extending wing *C⁴*, for the purpose of directing the heat to the center of the drying-chamber as it comes in from the hot-air chamber and through the upper portion of the first set of radiators. The brick to be dried are placed on pallets, which are then placed on cars *E*, and thus arranged for the free circulation of hot air between and around them. Separate tracks *F* are laid, which run entirely through the building, and each track-space is provided with a door at each end, all the doors being closed during the process of drying.

G are radiators, which may be of any well-known form, arranged at intervals through the drying-chambers *A A'*. A double set of radiators *g'* is placed at one side of the drying-chamber *A*, in order to give the entering air as much initial heat as possible.

H are a series of pipes placed within the hot-air chamber, a little above the ceiling which separates the hot-air chamber and the drying-chambers, into which steam is let from a suitable source of supply through a communicating pipe *H'*. The pipes *H* communicate with the radiators through short pipes *H²*. The radiators, as shown, are arranged between the tracks and reach from the floor of the drying-chambers to near the ceiling, where they connect, as before stated, to pipes *H²*. Each radiator has its own discharge-pipe leading into the outside air, by means of which an unimpeded circulation of steam is obtained.

K is a flue arranged at one side of the drier and running through it, and built to nearly the height of the radiators. It is provided with a metallic roof *K²*, which is within the building, one of the side walls of the drier forming a side wall of the flue. The other side wall of the flue, made of brick or other material, is pierced to form openings *L*, reaching from the floor of the flue to the height of the wall, or nearly so.

L' is a partition separating the flue *K* into two parts *L² L³*, but which partition does not

extend the entire length of the flue, but terminates at and connects with one of the divisions L^4 of the wall. The purpose of the partition as thus constructed is to carry heat into the drying-chamber A, both at its extreme end and also at points nearer the end from which the heat is received, so as to produce a uniform flow of heat through the drying-chambers.

M is an exhaust-blower placed in a supply-pipe M' , which leads to the boiler fires. The object of placing the blower, as shown, near one end of the flue is to draw the heat and force it into said flue, and the mouth of the blower is provided with a diaphragm or partition M^2 , connected with the partition L' in flue K, to divide the current of hot air and gases and to conduct it into the respective channels L^2 L^3 of the flue. The blower is driven, in the usual manner, by belt and pulley from any convenient shafting and engine.

The letters O represent a series of fans each mounted in a box O' , closed at its ends. The fans and their boxing are arranged in a line through the center of the drier and parallel with the tracks, and with their boxes form a partition which divides the drier into the two chambers A A'. The partition thus formed extends from the floor to the ceiling, and is provided with circular openings P to admit of the circulation of hot air from chamber A to A', and which openings constitute the only communicating passages between the two chambers.

The fans are all connected by bevel-gearing R to a main driving-shaft T, mounted in the box frame-work and driven by suitable means from an engine and are arranged, as shown, so as to all revolve in the same direction.

W are stacks built at intervals along one side of the drier. These stacks may be constructed of wood or brick, with the outer wall of the stack resting on an outside wall V and its inside wall built on or into an abutment of the side wall of the drier.

The operation is as follows: The machinery having been started, exhaust-steam is admitted into the distributing-pipes in the hot-air chamber, the air in that chamber being thus heated. At the same time steam is admitted to the radiators in the drying-chambers. At the same time, also, hot air and gases are drawn from the boiler-fires and forced into the divided flue or tunnel by the blower. Currents of heated air are drawn by means of the circulating fans from the chambers above the drying-chambers into the drying-chambers and around the return at one side of the ceiling, as indicated by the arrows, also through all the spaces between the radiating pipes, also through all the passages in the divided flue, entering first the drying-chamber A through a double bank of radiators, striking the brick on the cars and surrounding them completely, then drawn through additional series of radiators in chamber A,

then through the partition between A A', then driven by the fans through the cars of brick and radiators in chamber A', and thence into and up out of the stacks. The entrance to the stacks being constructed somewhat like a fire-place, the top of which is some distance below the ceiling, it will be seen that a large portion of the hotter and drier air remains naturally near the ceiling of the drying chamber, while the damp and heavier air is carried up the stacks. Recirculation is obtained by the return of this portion of hot dry air through the passage C^2 at one end of the ceiling into the hot-air chamber, where it mingles with the air in that chamber, and is carried along with it to the opposite end and back into the drying-chamber.

Having thus described my invention, what I claim is—

1. In a drier, the combination of a drying-chamber, a hot-air chamber above the drying-chamber, and an air-chamber above the hot-air chamber, the said air-chamber communicating with the hot-air chamber by a passage at one side, the hot-air chamber communicating with the drying-chamber by passages at both sides of the ceiling, and a stack on one side of the drying-chamber, the breast wall of the stack extending some distance below the ceiling of the drying-chamber, whereby the draft of the stack is confined to the lower portion of the drying-chamber, while the drier air passes through the passage in one side of the ceiling of the drying-chamber into the said hot-air chamber and returns to the drying-chamber through the passage in the opposite side of the said ceiling, substantially as described.

2. In a drier, in combination with a pipe leading from a suitable source of heat, a blower placed in said pipe, a flue connected with the blower, said flue built within and on one side of the drier and formed by two walls, one the side wall of the drier and the other the side wall of the drying-chamber, pierced to form long vertical openings into the drying-chamber, substantially as described.

3. In a drier, a pipe or conduit leading from a suitable source of heat, a blower placed in said conduit, said blower provided with a partition at or in its delivery end, and a flue built within and on one side of the drier, formed by two walls, one the side wall of the drier and the other the side wall of the drying-chamber, the latter pierced to form long vertical openings into the drying-chamber, and said flue divided into two channels by a central partition connected to the partition at the end of the blower, and said channels communicating with the drying-chamber through said openings, substantially as described.

4. In combination with a drying-chamber, a flue formed within the drier and on one side of said chamber between two walls, the outer wall being the side wall of the drier and the inner wall having passages through it from top to bottom, a middle partition dividing

said flue into two channels, but terminating at and connecting with one of the divisions of the inner wall, whereby heat brought into said flue is carried into the drying-chamber both at its extreme end and also at points nearer the end from which the heat is received, substantially as and for the purpose described.

5 The combination, with a drying-chamber, of a hot-air chamber above said drying-chamber, a series of steam-supply pipes running through said hot-air chamber to heat the same, the series of radiators arranged at intervals in the drying-chamber, and branch pipes extending from the hot-air chamber through the drying-chamber and connecting each of the radiators separately with the steam-supply pipe above, substantially as described.

10 6. In a drier, the series of fans, in combination with the main shaft for driving them, the separate gear-connection of each fan and said shaft, and arranged to revolve the fans in the same direction, the boxes closed at their ends, in each of which a fan is mounted, said fans and their boxes arranged in a line through the center of the drier and forming a partition dividing the drier into two chambers, and the tracks running parallel with the fans adjacent to and on both sides thereof, substantially as described.

15 7. In a drier, a series of fans extending entirely through the center of a drier, in combination with shafting and gearing by which said fans are all revolved in the same direction, and the boxing inclosing each fan separately and which extends through the said drier, forming a partition dividing the drier into two chambers, the said boxes opening

on each side of a fan to the opposite chambers, substantially as and for the purpose described.

20 8. The hot-air chamber, in combination with a main steam-supply pipe running through said chamber, branch pipes connecting with said main pipe and extending at right angles thereto through the chamber, by means of which pipes said chamber is heated, the drying-chamber provided with a ceiling having open communicating passages at both ends to said hot-air chamber, the radiators in said drying-chamber communicating with the said pipes in the hot-air chamber, and said ceiling provided at one end with a return, whereby the air in the hot-air chamber is directed toward the center of the drying-chamber, substantially as described.

25 9. The combination, with the drying-chamber, of the hot-air chamber above and connected by open passages at both sides of the ceiling, a divided hot-air flue formed at one side of the drying-chamber and throwing the heat into different portions of the same, a series of radiators placed in the drying-chamber on a line with and adjacent to said flue, a series of suction-fans in the drying-chamber next to and on a line with the radiators, and a series of discharge-stacks on the side of the drier opposite to the side having said flue, substantially as and for the purpose described.

30 In testimony whereof I affix my signature in presence of two witnesses.

JAMES BOND.

Witnesses:

ERNEST L. TUSTIN,
JOSEPH M. ELLISS.