(No Model.) 3 Sheets—Sheet 1.

E. HOLTHAUS.

COMBINED DRIER AND BOILER.

No. 504,269. Patented Aug. 29, 1893.

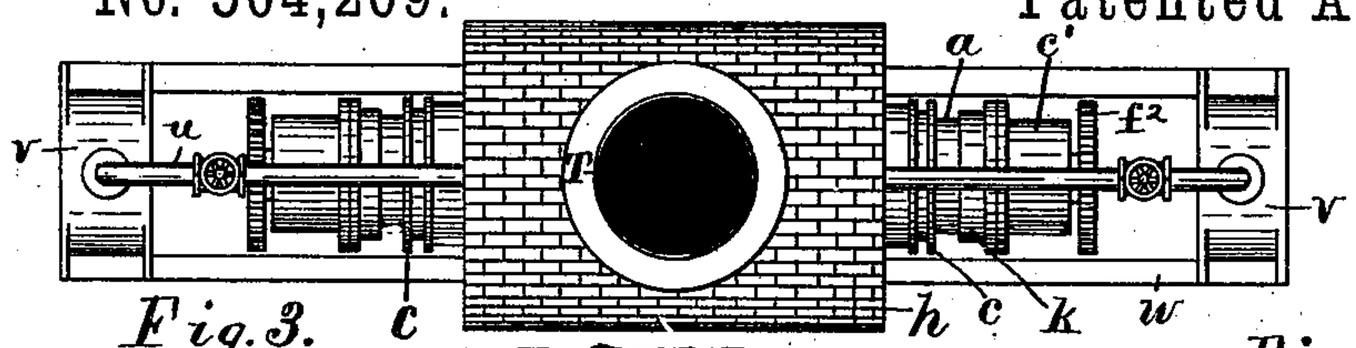

Fig. 3.

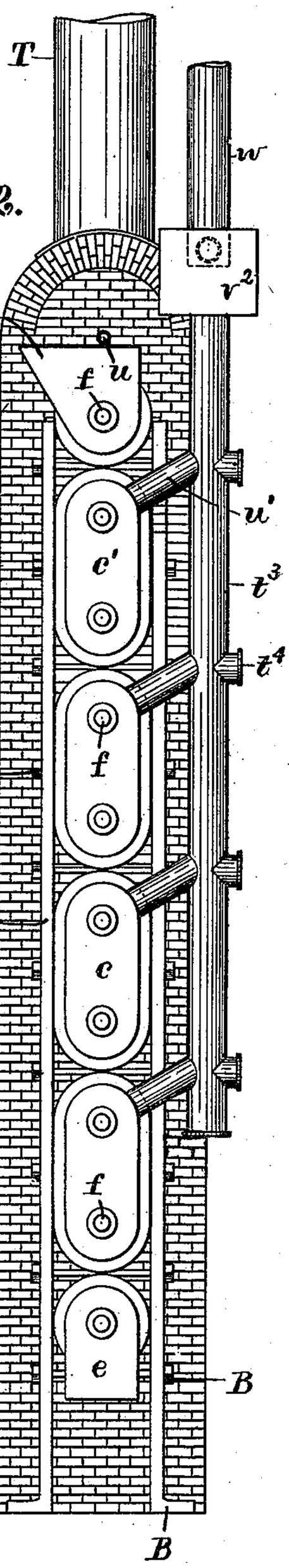

Fig. 2.

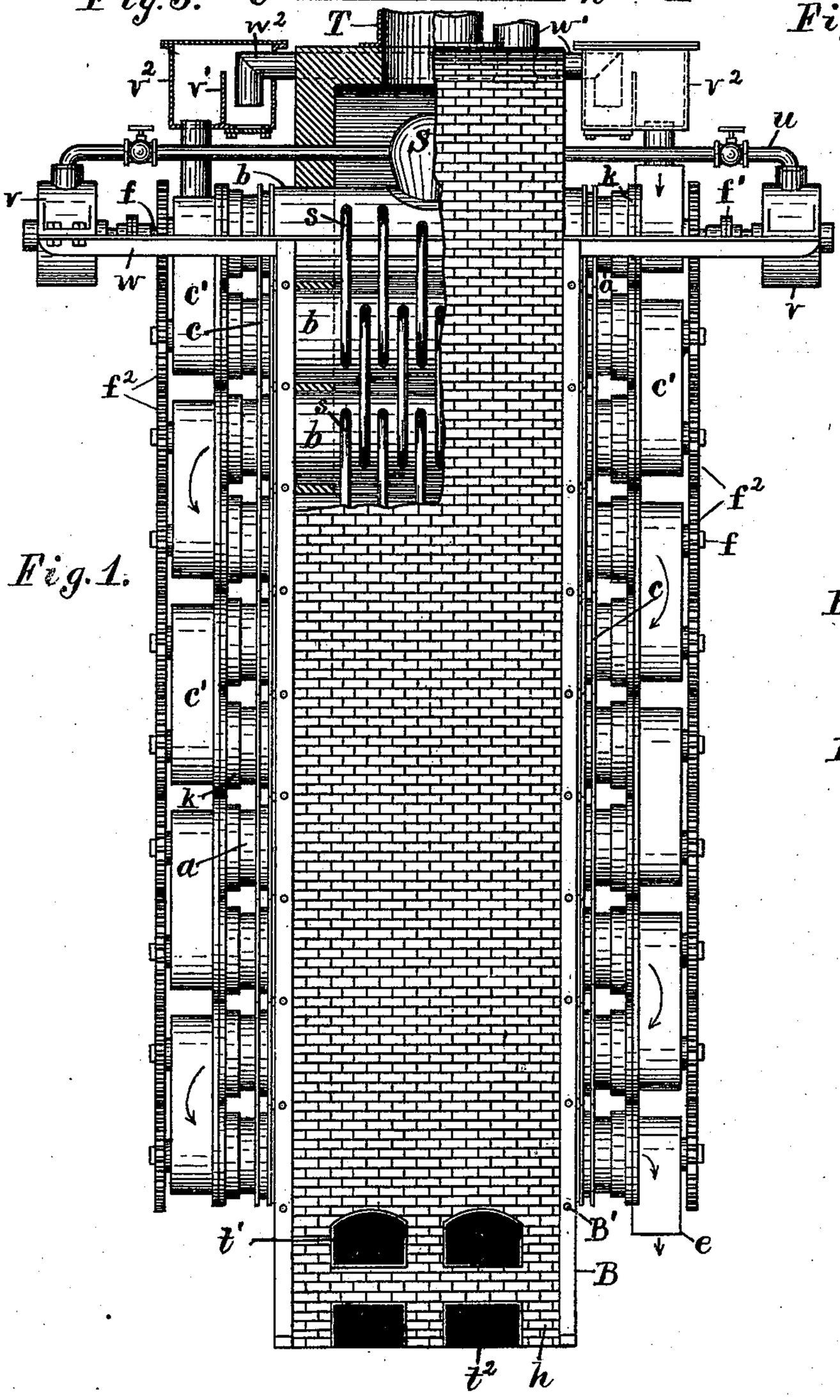

Fig. 1.

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Crane & Miller, Attys.

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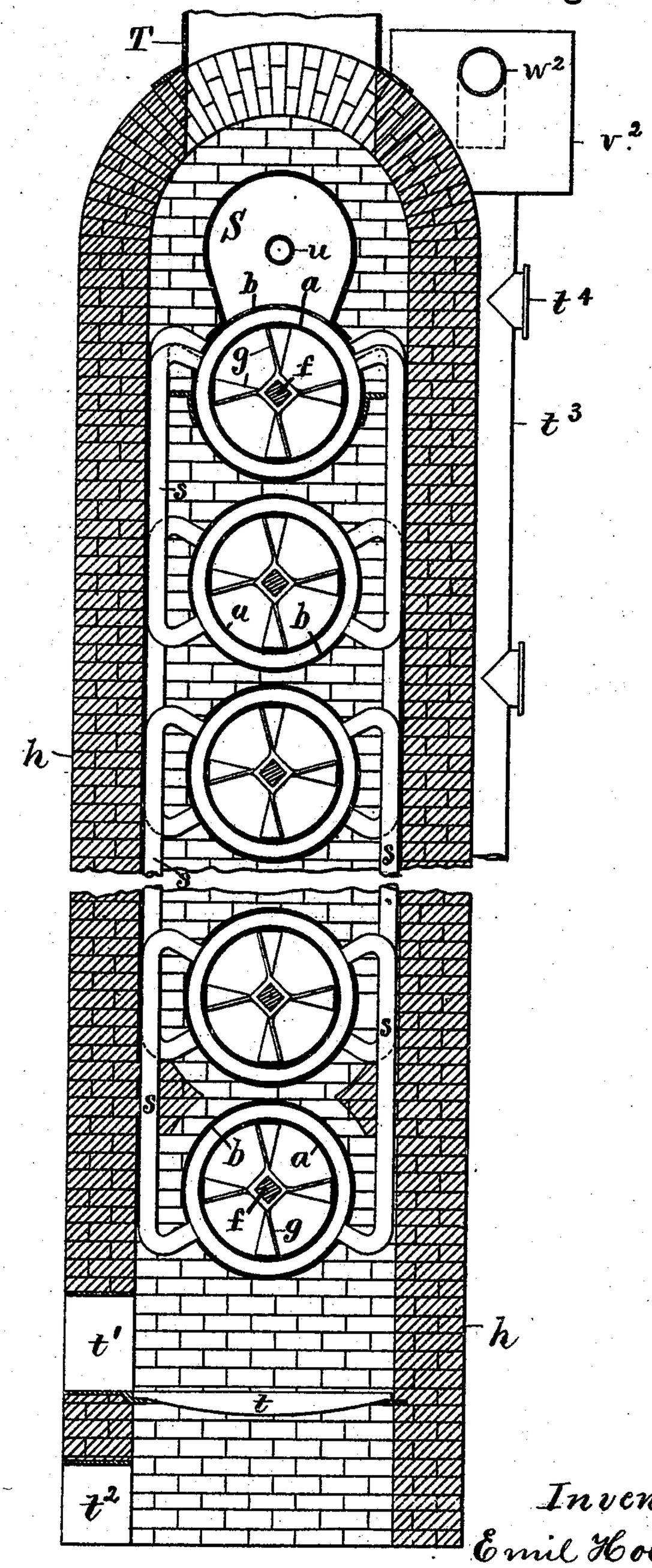

Fig. 4

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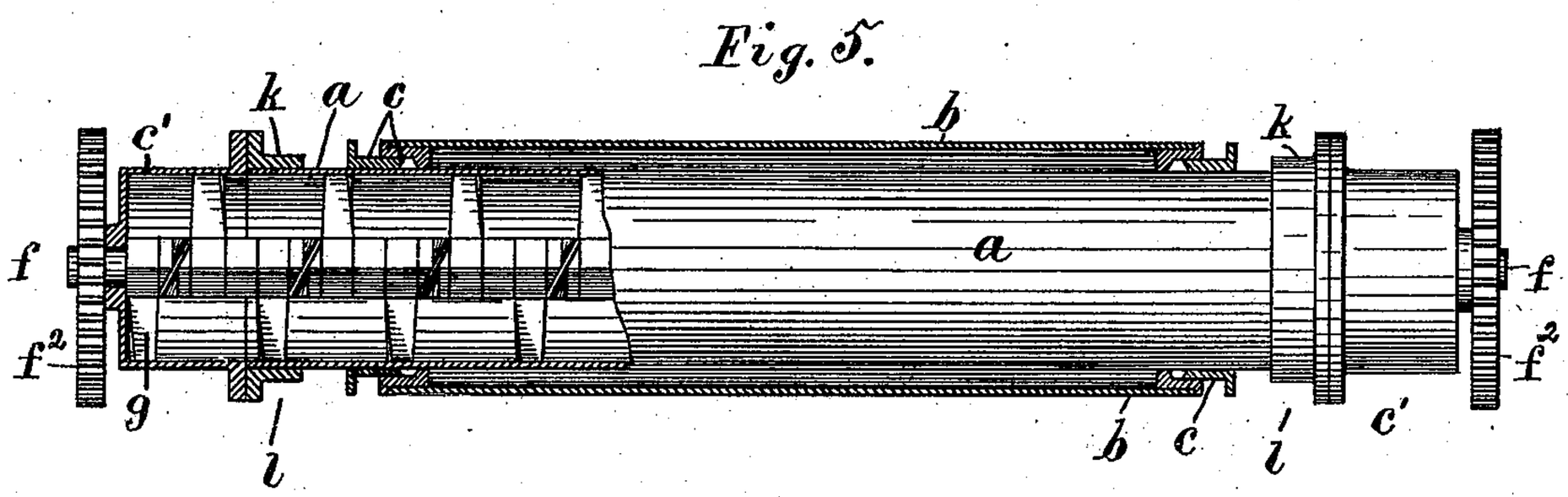
Fig. 5.



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UNITED STATES PATENT OFFICE.

EMIL HOLTHAUS, OF BARREN ISLAND, NEW YORK.

COMBINED DRIER AND BOILER.

SPECIFICATION forming part of Letters Patent No. 504,269, dated August 29, 1893.

Application filed March 13, 1893. Serial No. 465,701. (No model.)

To all whom it may concern:

Be it known that I, EMIL HOLTHAUS, a citizen of the United States, residing at Barren Island, Kings county, New York, have invented certain new and useful Improvements in a Combined Drier and Boiler, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The present invention relates to a drying machine for discharging the moisture from animal, vegetable or mineral substances of any kind.

The invention consists in the specific improvements shown and described and claimed herein and will be understood by reference to the annexed drawings, in which—

Figure 1 is a side elevation of the apparatus in section at the center line where hatched. Fig. 2 is an end elevation of the apparatus. Fig. 3 is a plan of the engine connections to the upper conveyer shaft. Fig. 4 is a cross section taken upon the middle line of Fig. 1; and Fig. 5 is a plan of one of the cylinders and jackets, the parts hatched being shown in section at the center line.

Ten drying cylinders *a* are shown with jackets *b*, having stuffing boxes *c* at their ends. The cylinders are made straight externally so as to be readily withdrawn from the jackets, and the ends of the cylinders are connected alternately by removable hoods *c'* which, with the interiors of the cylinders, form a continuous passage from the hopper *d* at the upper end to the outlet *e* at the lower end. Shafts *f* are fitted through bearings in the hoods and provided with propeller blades *g*. The shafts and the eyes of the blade are made square to hold the same removably thereon. All the shafts are connected by cog-wheels f^2. With this construction any of the propellers can be withdrawn from the shaft for replacement in case of breakage, by removing merely a single hood from the end of the shaft, and in like manner the cylinder can be removed for repairs or replacement by the removal of the hoods upon its opposite ends and the loosening of the stuffing boxes *c*.

The cylinders may be made of wrought or cast tubing as preferred, but the jackets are preferably made of boiler iron, and the adjacent jackets are thus adapted to be connected by means of tubes to furnish a common circulation through all the jackets. A brick furnace casing *h* is built around the jackets between the stuffing boxes *c* with a space between the exterior of each jacket and the wall. A steam dome S is applied to the upper jacket and the brick casing is arched over the top of the same and provided with a chimney T.

A grate *t* is provided below the bottom jacket to receive the fuel, and fuel doors *t'* and ash doors t^2 are formed through the casing. The brick casing is closed at the ends just within the stuffing boxes *c*, and the furnace formed by the same thus operates upon all the jackets while leaving the cylinders and their connections entirely accessible. The brick casing also serves as a smoke chamber or flue at each side of the jackets, and through which the smoke passes upward to the chimney T.

The tubes *s* have ends bent radially to the jackets and expanded in the shells of the same. The lower part of each jacket is connected by such tubes *s* with the upper part of the jacket above it. The holes for the tubes are made in alternate rows in the jackets, as shown in Fig. 1, where a part of the casing is broken away, and the jackets are thus connected from the top to the bottom of the series with a common circulation through the same. Ten cylinders are shown, and about seven of the jackets would be filled with water while the upper three jackets would serve as steam space in addition to the dome, which supplies dry steam to pipes *u* connected with rotary engines *v* upon the opposite ends of the upper shaft *f*. The engines are sustained by longitudinal bars *w* affixed to the opposite sides of the upper jacket, and the engine shafts are coupled to the conveyer shaft by detachable couplings *f'*. The gases from the furnace come in contact with all the tubes *s* as well as with the exterior of all the jackets, in their passage from the grate to the chimney T, and the heat is thus utilized in a very efficient manner to evaporate the water and to dry the steam generated therefrom.

The material to be dried is fed into the hopper *d* and propelled back and forth in the alternate cylinders, shifting downward from one to the other through the hoods *c*, and finally emerging at the outlet *e*. Consider-

able power is required to actuate the propeller blades G in all the cylinders simultaneously, and it has been customary heretofore to erect a detached engine and boiler to furnish the necessary power. In such case the jackets have been filled with steam from such boiler, whereas in my construction I make them operate as a substitute for the power boiler itself. During the erection of the brick work, the cylinders are tied together by posts B and bolts B′, such posts being made of bar iron and adapted to sustain the weight until supported by the bricks.

By applying a furnace casing to the jackets and attaching the engines directly to one of the jackets, I dispense with all external framing, and also avoid the necessity of providing a detached engine and boiler to actuate the drier.

Suction pipes t^3 are shown adjacent to the hoods at each end of the cylinders, and connected with the hoods (above the bottom cylinder) by branches u'. The suction pipes are preferably extended upward, to prevent, by the action of gravity, the withdrawal of the powdered material from the hoods, and a dust trap is shown upon the top of each of the suction pipes, consisting in a box v^2 having a partition v' extended upward from the bottom, with the suction pipe admitted at one side of its base. Covers t^4 are provided to clean the branches u'.

The exhaust pipe w^2, which is adapted to connect the trap with an exhaust blower, is extended through the side of the trap and downward toward the bottom, upon the opposite side of the partition from the suction pipe t^3, thus withdrawing the air by a tortuous passage which operates to arrest the powdered material in a great degree. The exhaust pipes from the two traps are united to a common pipe w' which would be extended to a suitable suction blower. The suction pipes are not shown connected with the lower cylinders in the series; as the material, if powdered by the action of the conveyers, is reduced to much finer particles in the lower cylinders of the series than in the upper ones, where the material is first introduced.

This apparatus is especially useful in drying and pulverizing fish-scraps, and the waste material from slaughter houses, to fit the same for use as a fertilizer, with a speed of three hundred and fifty revolutions per minute; but the apparatus may be used for drying beer grains and similar soft substances, by reducing the speed of the conveyer shafts to fifty revolutions per minute, or such other speed as may be found suitable.

To facilitate the renewal of the cylinders, the hoods are fastened thereto by flanges k which are attached to the cylinders by set screws l, thus permitting the hood and flanges to be readily removed from the cylinder.

The cylinders are made in practice about eighteen inches in diameter and from ten to fifteen feet in length. The jackets are about twenty-two inches in internal diameter, which size permits the ready introduction of expanding tools to secure the tubes in the shells.

Any form of gearing may be used in place of the cog-wheels f^2 to rotate the shafts f.

The casing extended upward from the furnace to inclose the jackets may be made of metal if preferred, and it is obvious that the jackets may be utilized to form a boiler, and used with an engine supported independently of the jackets.

Having thus set forth the nature of my invention, what I claim herein is—

1. In a drier, the combination, with a vertical casing, of a series of jackets sustained one above another with their ends projected beyond the casing, a series of drying cylinders fitted removably to the jackets with stuffing boxes at both ends of the jackets, removable hoods connected to the ends of the cylinders alternately, and shafts extended through the cylinders with conveyers to propel the material, as and for the purpose set forth.

2. A drier comprising the vertical series of straight drying cylinders and removable hoods connecting the ends of the cylinders alternately, tubular jackets provided with stuffing boxes at the ends fitted removably to the cylinders, bent pipes having their ends secured by expansion, respectively, within the adjacent jackets, the vertical bars B clamped upon the opposite sides of the jackets by means of the bolts B′ intermediate to the jackets to support the jackets and cylinders, and shafts with conveyers for propelling the material through the cylinders, as and for the purpose set forth.

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

EMIL HOLTHAUS.

Witnesses:
THOMAS S. CRANE,
HENRY J. MILLER.