

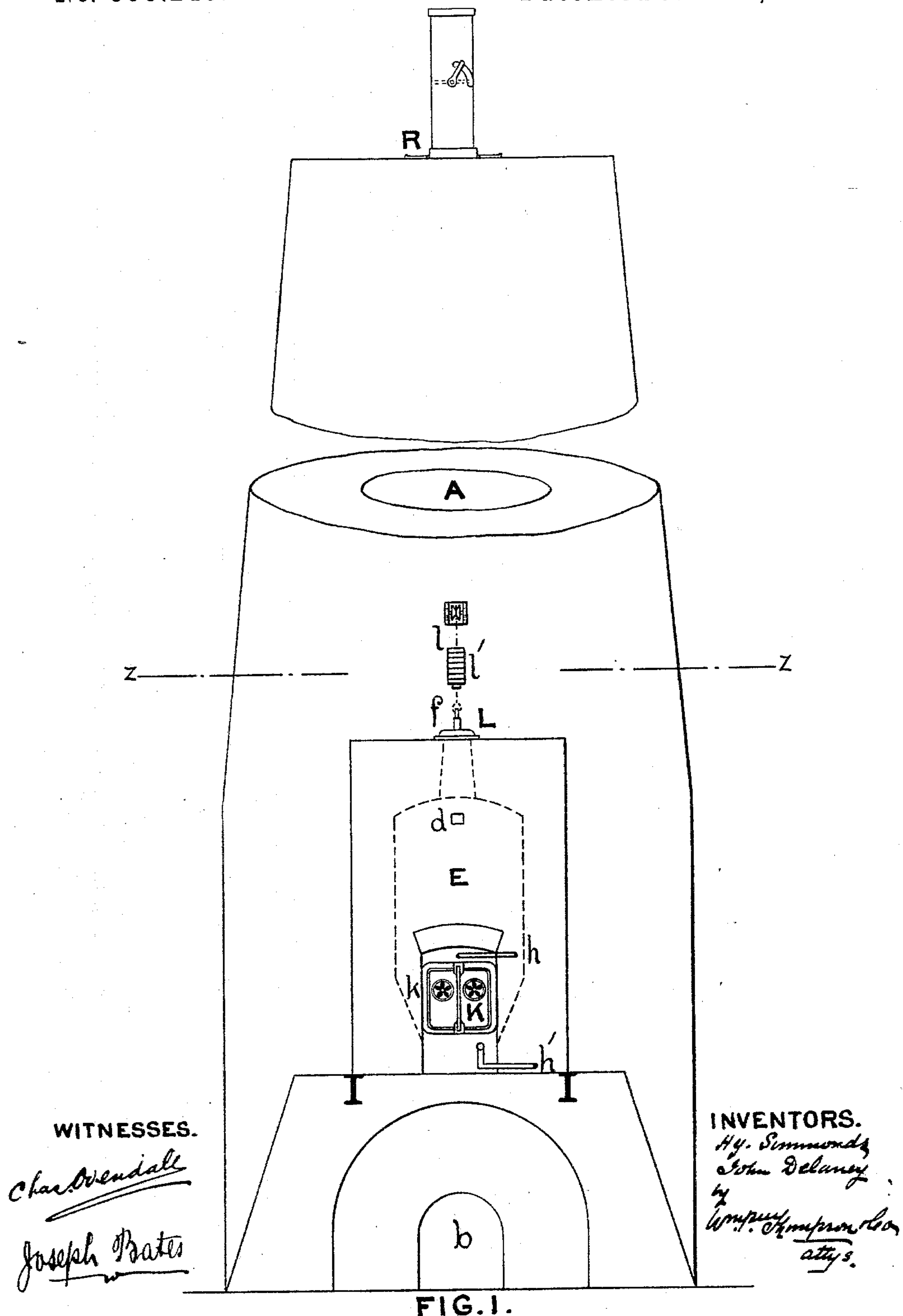
(No Model.)

4 Sheets—Sheet 1.

H. SIMMONDS & J. DELANEY.
KILN OR FURNACE FOR BURNING LIME.

No. 593,246.

Patented Nov. 9, 1897.



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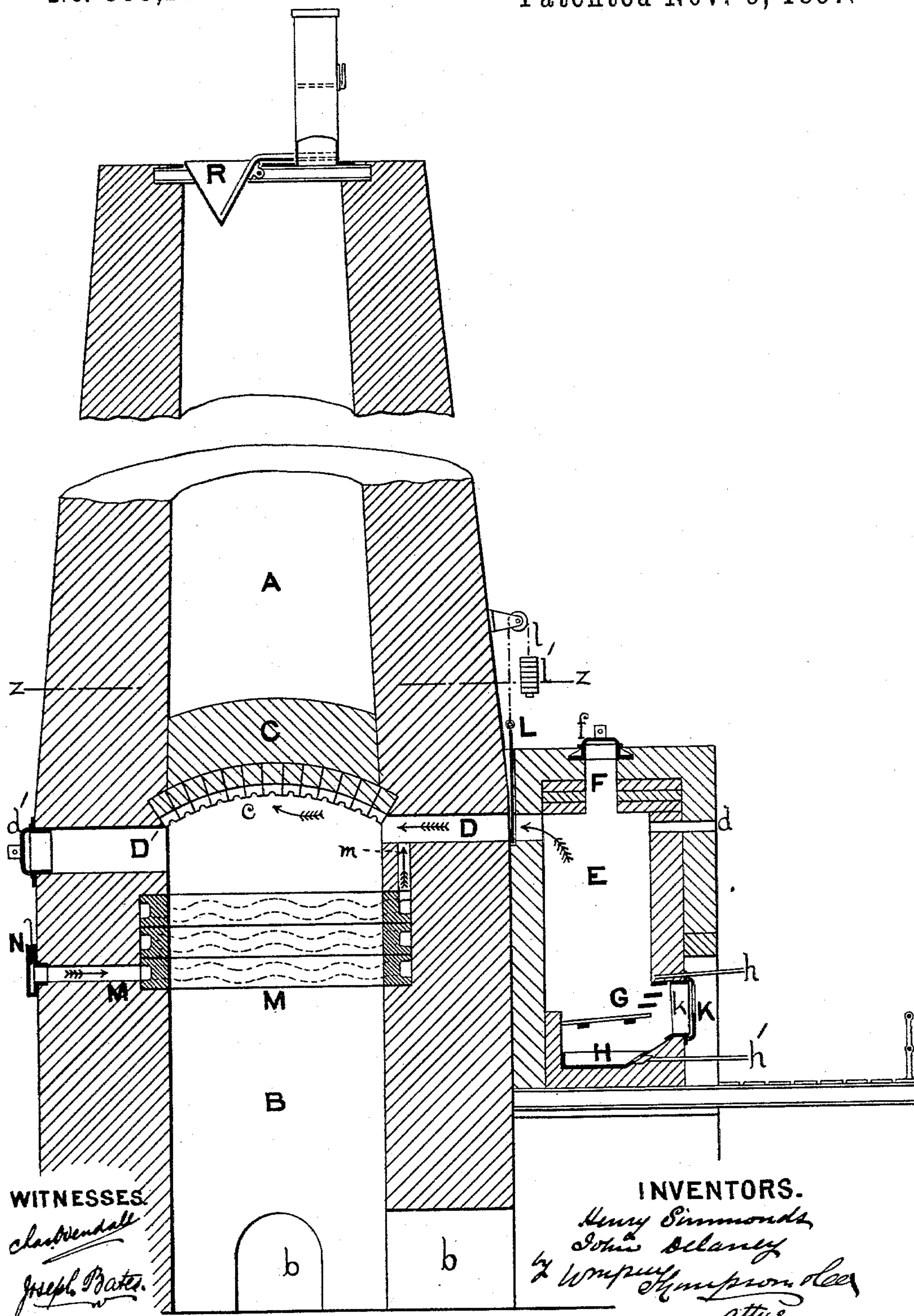


FIG. 2.

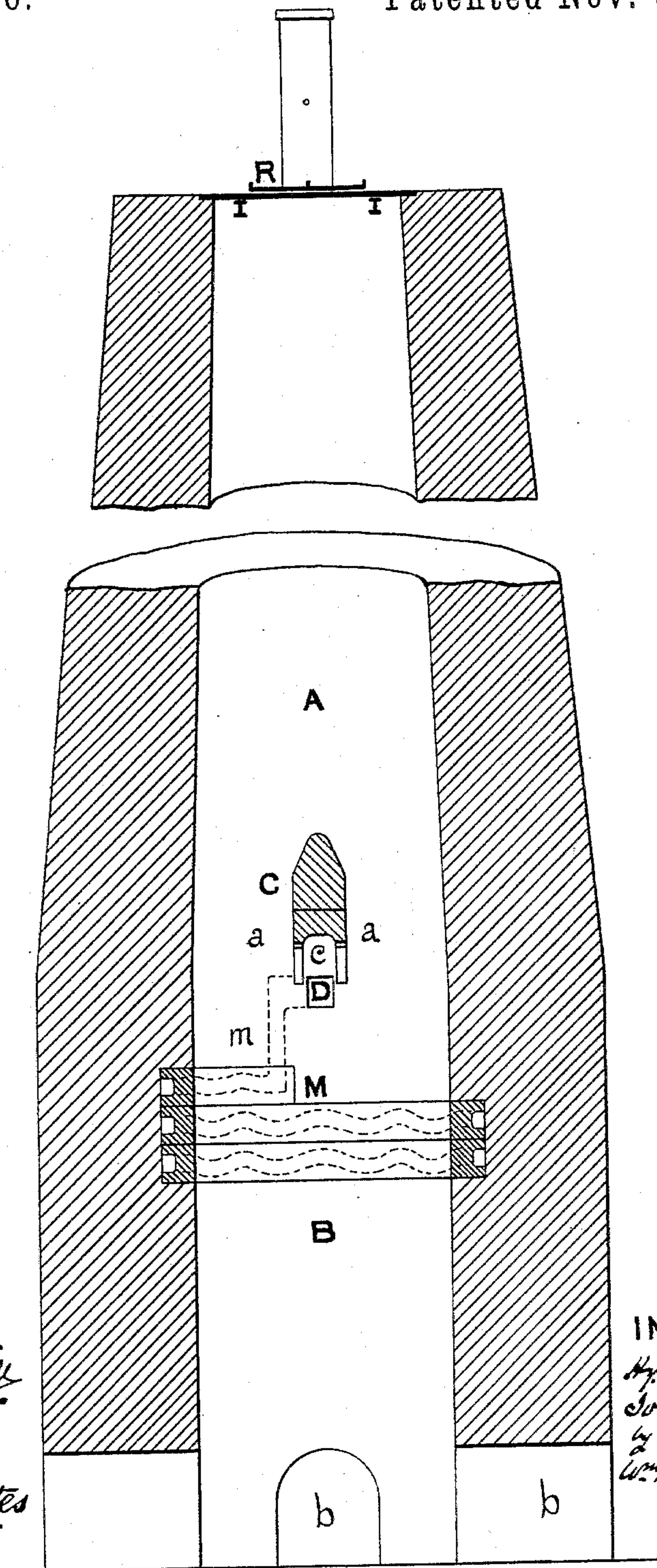
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WITNESSES.

Chas. Wendall

Joseph Prates

INVENTORS.

*H. Simmonds,
John Delaney*

*by
Wm. F. Thompson & Co.
attys.*

FIG. 3.

(No Model.)

4 Sheets—Sheet 4.

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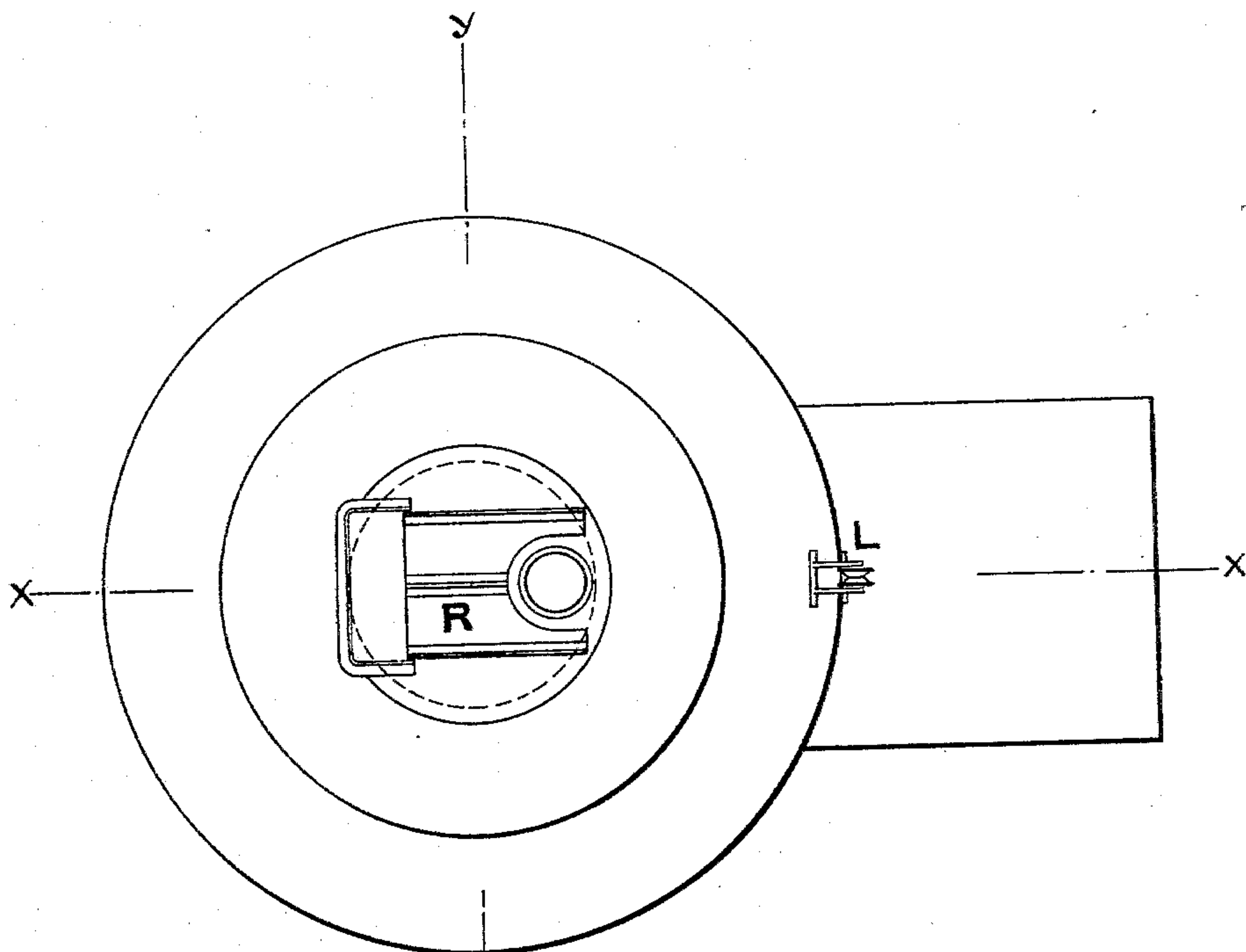


FIG. 5.

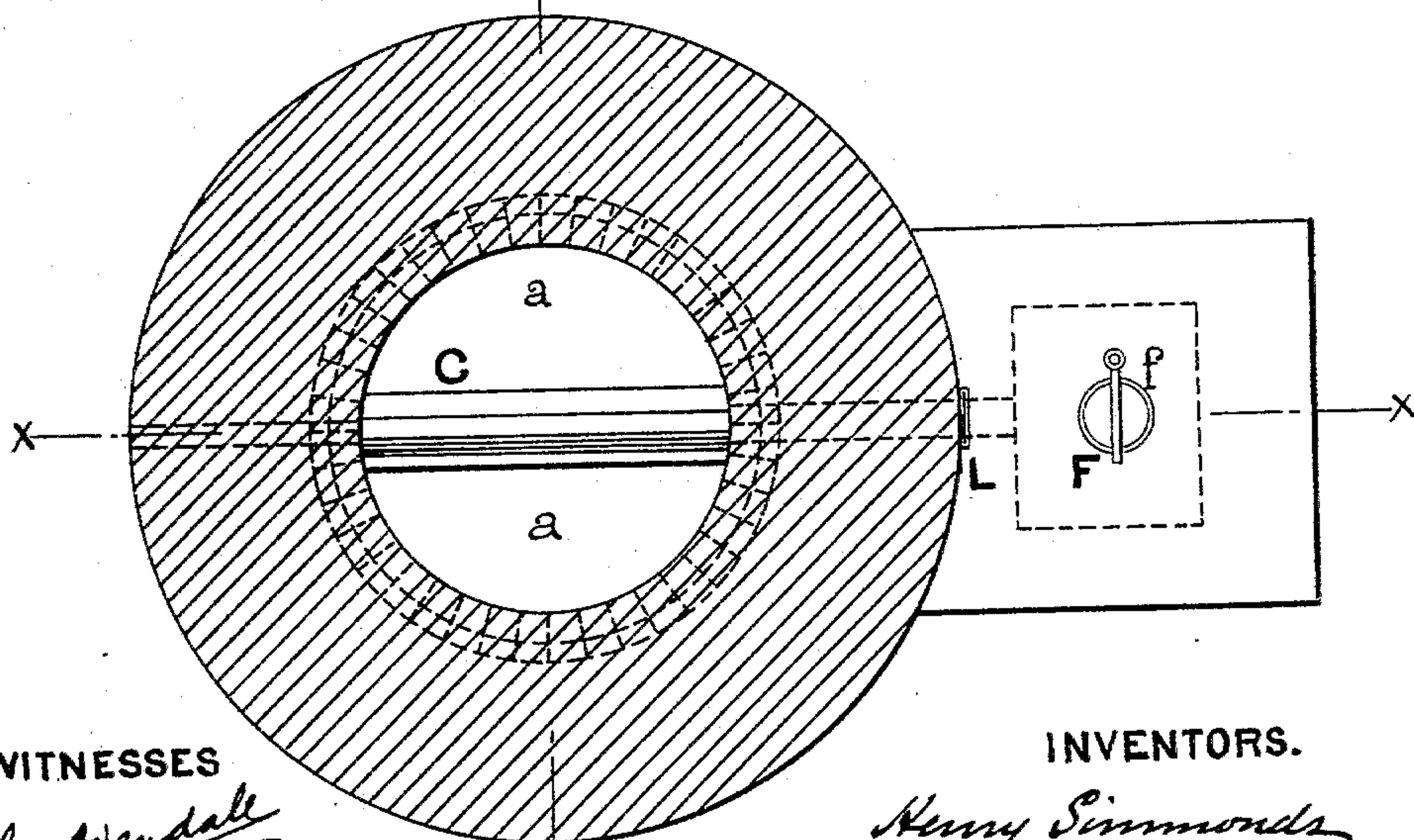


FIG. 4.

WITNESSES

Chas. Wendell

Joseph Bates

INVENTORS.

Henry Simmonds
John Delaney

by Wm. J. Thompson
attys.

UNITED STATES PATENT OFFICE.

HENRY SIMMONDS, OF COLNE, AND JOHN DELANEY, OF HORTON, ENGLAND.

KILN OR FURNACE FOR BURNING LIME.

SPECIFICATION forming part of Letters Patent No. 593,246, dated November 9, 1897.

Application filed January 21, 1896. Serial No. 576,342. (No model.) Patented in England April 11, 1895, No. 7,425, and February 7, 1896, No. 2,843.

To all whom it may concern:

Be it known that we, HENRY SIMMONDS, a resident of Colne, in the county of Lancaster, and JOHN DELANEY, a resident of Horton, in Ribblesdale, in the county of York, England, subjects of the Queen of Great Britain, have invented certain new and useful Improvements in Kilns or Furnaces for Burning Lime and other Minerals, (for which we have obtained Letters Patent in Great Britain, No. 7,425, dated April 11, 1895, and No. 2,843, dated February 7, 1896,) of which the following is a specification.

This invention is designed to provide a furnace or kiln for the burning of mineral substances—such as limestone, ironstone, chalk, cement, or the like—in which what is known as “producer-gas” or other gaseous fuel may be used instead of or in conjunction with the ordinary solid fuel.

In the burning of lime it has hitherto been generally customary to fill or charge the kiln with alternate layers or charges of limestone and coal or coke, the ash and residue or clinker from which deteriorated the quality of the lime with which they came in contact or with which they became mixed, and we consider that by the use of a gaseous fuel or a large percentage of gaseous fuel a greater percentage of first-quality lime will be produced at a much less cost and a greater output of lime per kiln per twenty-four hours, the lime containing considerably less of impurities—such as sulfur compounds, ash, and clinker, &c.

The invention refers to constructing the kiln or furnace with a chamber over the fuel-inlet formed of a hollow bridge or arch with passages at both sides or with a hollow hood extending from the sides and covering the inlet, a cooling-chamber below the combustion-chamber, gas-producers placed at the sides of the cooling-chamber, and an air-supply or air-inlet placed so that heated air is delivered close to the fuel-inlet, which has been heated by the cooling lime.

The invention will be fully described with reference to the accompanying drawings.

Figure 1 is a front elevation. Fig. 2 is a sectional elevation on lines $x x$, Figs. 4 and 5. Fig. 3 is a sectional elevation on lines $y y$,

Figs. 4 and 5. Fig. 4 is a sectional plan on lines $z z$, Figs. 1 and 2. Fig. 5 is a plan.

In carrying out the invention we construct the kiln either vertical throughout its whole length or inclined for part of its length, with two parts or chambers—a burning-chamber A and a cooling-chamber B.

At the bottom of the burning-chamber A we place a bridge or arch C, extending across the center of the kiln with a space or passage a at either side, and below this are placed the inlets D for the gaseous fuel.

The arch or bridge C is constructed with a cavity c on its underside which forms a chamber beneath the arch into which the solid material as it passes down through the kiln cannot enter. In this chamber the combustible gases are mixed with a sufficient quantity of air to promote vigorous combustion, and the heated products in an incandescent state spread out and pass up at both sides of the arch, there encountering the limestone as it passes down through the passages a .

Below the hollow arch or bridge C is the cooling-chamber B, into which the lime at a white heat falls from the burning-chamber and gradually cools, being removed through apertures or openings b at the bottom.

One, two, or more gas-producers E are affixed or built to the side of the cooling-chamber B of the kiln, being connected thereto by the inlet D, which opens into the chamber c below the hollow arch C. The producer E is formed with a charging-orifice F at the top, closed by a door or lid f , and with a grate G at the bottom upon which coal, coke, or other fuel capable of producing or generating combustible gases is heated. Below the grate is an ash-pan H, provided with a water-supply pipe h and a water-overflow pipe h' . A supply of water is thereby kept in the ash-pan H, from which steam is generated and passes up with the gases produced in the chamber of the producer through the inlet D into the combustion-chamber. The steam generated in the ash-pan is converted into carbonic-oxid gas while passing through the incandescent coke and passes up with the gases, &c. A door K is placed in front of the grate G, through which the clinkers and ashes may be removed. This door is provided with aper-

tures *k*, through which the primary air-supply is admitted to the producer.

In the wall of the producer E and opposite the inlet D is formed a sight-hole or rake-hole *d*, and in the opposite wall of the kiln, facing the inlet D, is an auxiliary inlet D', closed by a door *d'*, through which a small quantity of solid fuel may from time to time be supplied to the chamber *c* to assist or augment the combustion of the gaseous fuel supplied through the inlet D from the producer E. By the use of solid fuel along with gaseous fuel we find that the output of lime per ton of coal used is greatly increased.

The inlet D is regulated or opened or closed by a damper L, suspended by a chain *l* and balance-weight *l'*.

Air-inlet passages M are formed in the walls of the cooling-chamber B, through which a secondary supply of air is admitted to promote the combustion of the gaseous fuel entering the kiln through the inlet D. The air-passages M are built into the walls of the kiln and follow a zigzag or sinuous course to allow of the air being heated to a high temperature before entering the kiln. The air is delivered through an aperture *m* at the mouth of the inlet D, thereby becoming thoroughly mixed with the gases as they enter the chamber *c*. The mouth or inlet to the air-passage M is provided with a regulating door or damper N, by which the quantity of air entering can be regulated and controlled.

Additional air may be admitted, if required, through the cooling-chamber B at the openings *b*.

What we claim as our invention, and desire to protect by Letters Patent, is—

1. In a kiln for burning limestone by gas-

eous fuel the combination with the combustion-chamber A, arch C therein, chamber *c* beneath the arch and gas-fuel inlets D, the gas-producer E in which the gaseous fuel is generated connected to the combustion-chamber A by the fuel-inlets D, of the solid-fuel inlets D the sinuous air-passages M, the aperture *m* from the same into the inlets D to supply air to promote combustion before entering the kiln, the regulating-door N at the mouth of the air-passage M, and the sight-hole *d* in the producer, as described and shown.

2. In a kiln for burning limestone by means of gaseous fuel the combination with the combustion-chamber A, the arch C thrown across it, the chamber *c* formed beneath the arch, the gas-fuel inlets D leading from the gas-producer and opening into the chamber *c*, the sinuous air-passages M opening into the inlets D to supply heated air to promote combustion before entering the kiln and the regulating-door N at the mouth of the air-passage M of the gas-producer E connected to the kiln by means of the inlets D, a grate G to receive the coke, an ash-pan H in which water is evaporated to supply vapor to the coke, the water-supply pipe *h* and overflow-pipe *h'* connected to the ash-pan and the orifice F for charging the apparatus with coke substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY SIMMONDS.
JOHN DELANEY.

Witnesses:

IOWDEN O'BRIEN,
CHAS. OVENDALE.