

(No Model.)

3 Sheets—Sheet 1.

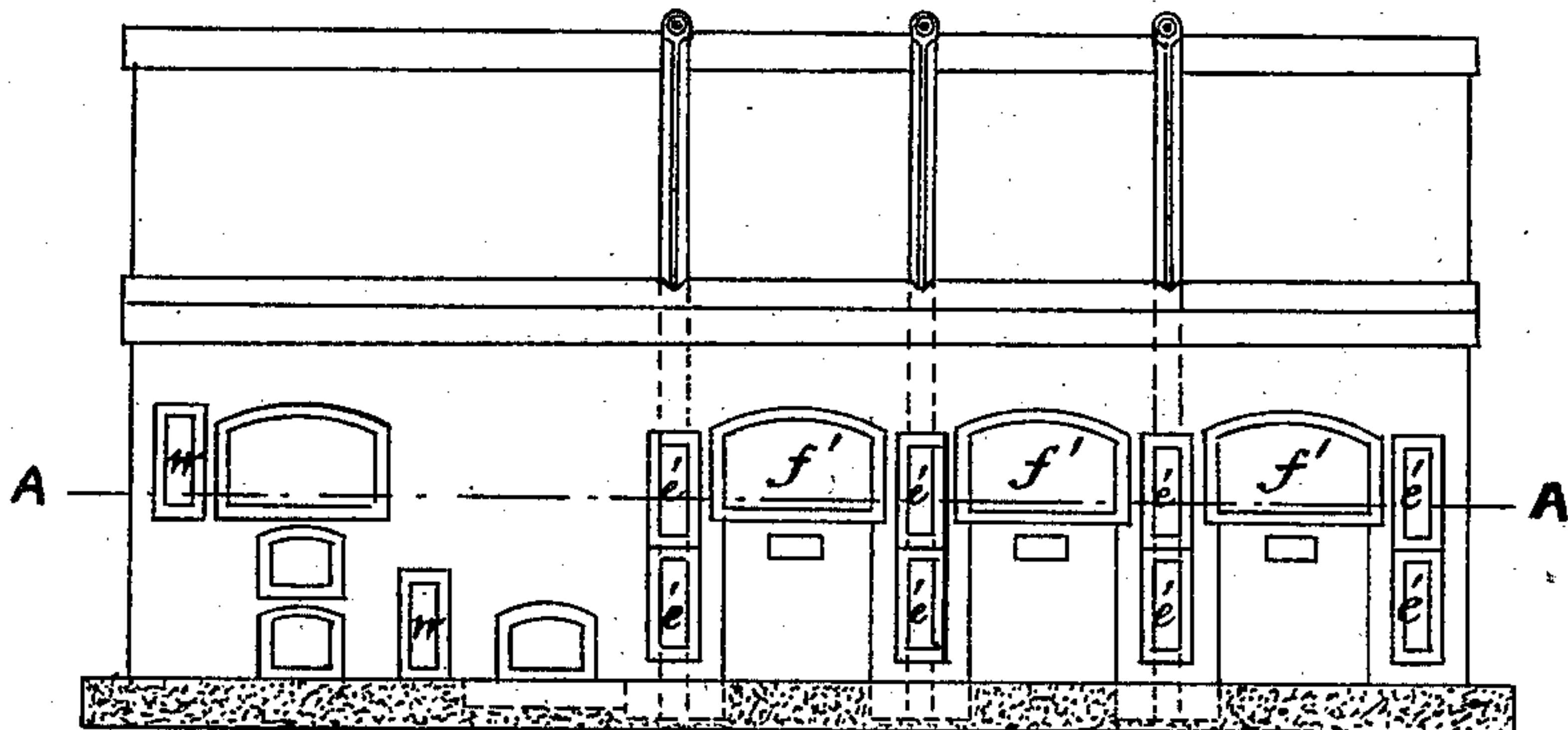
J. RICHMOND & T. BIRTWISTLE.

FURNACE FOR TREATING TOWN AND OTHER REFUSE.

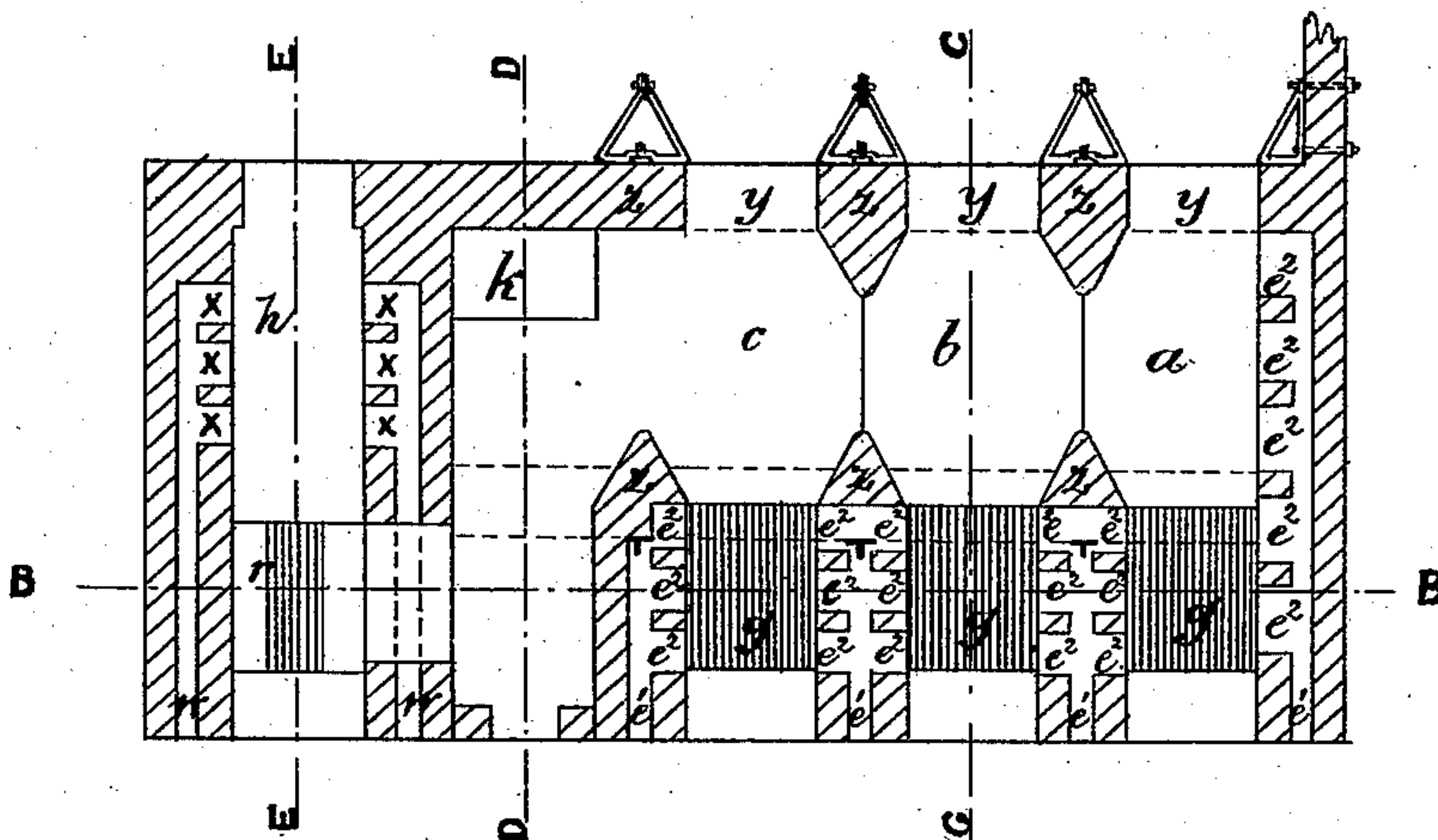
No. 372,172.

Patented Oct. 25, 1887.

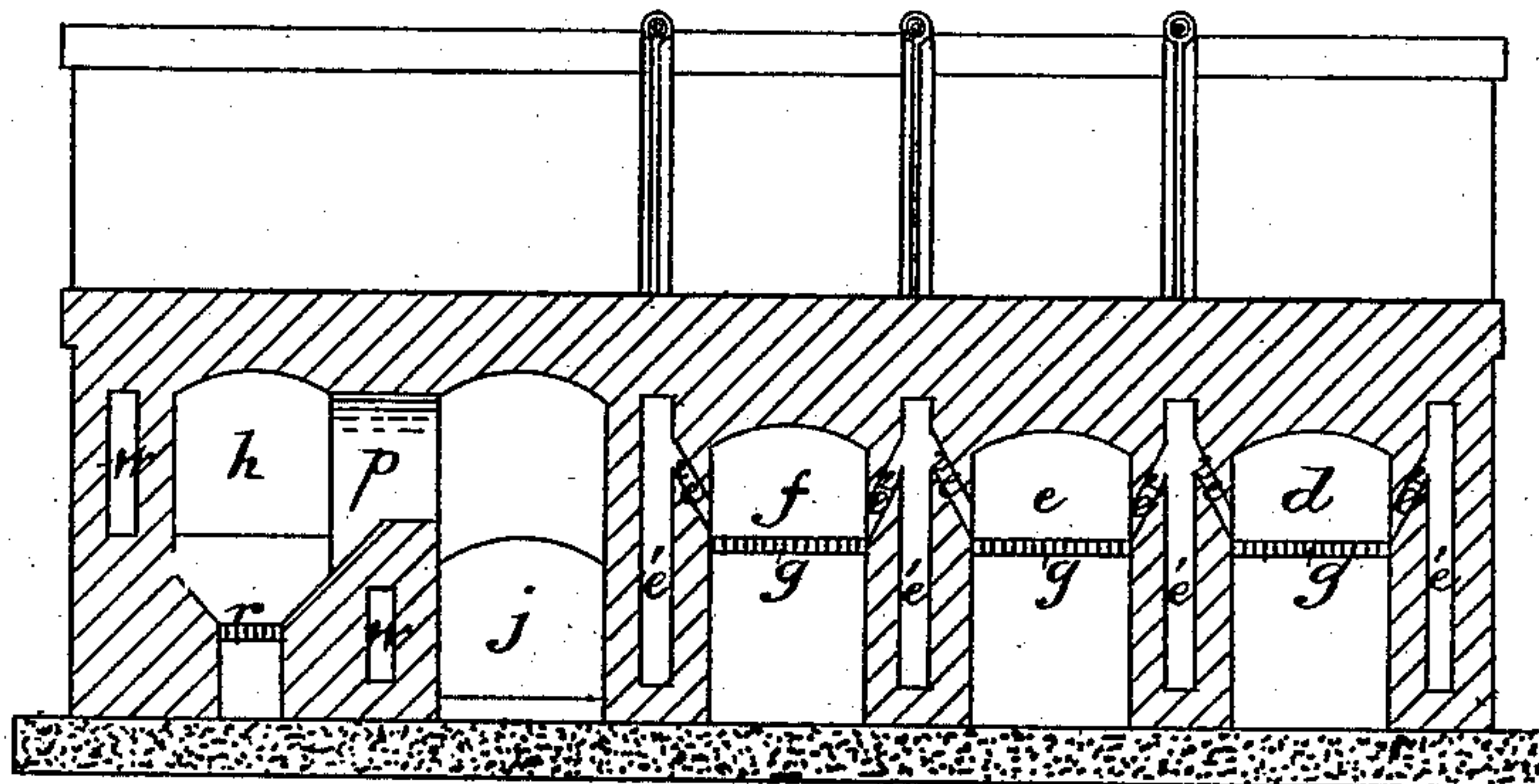
FIG. 1.



F I G . 2 .



F I G . 3 .



*Witnesses,*

J. A. Rutherford  
Robert Everett

*Inventors,*

*James Richmond,  
Thomas Birtwistle.*

By James L. Norrig  
Atty.

(No Model.)

3 Sheets—Sheet 2.

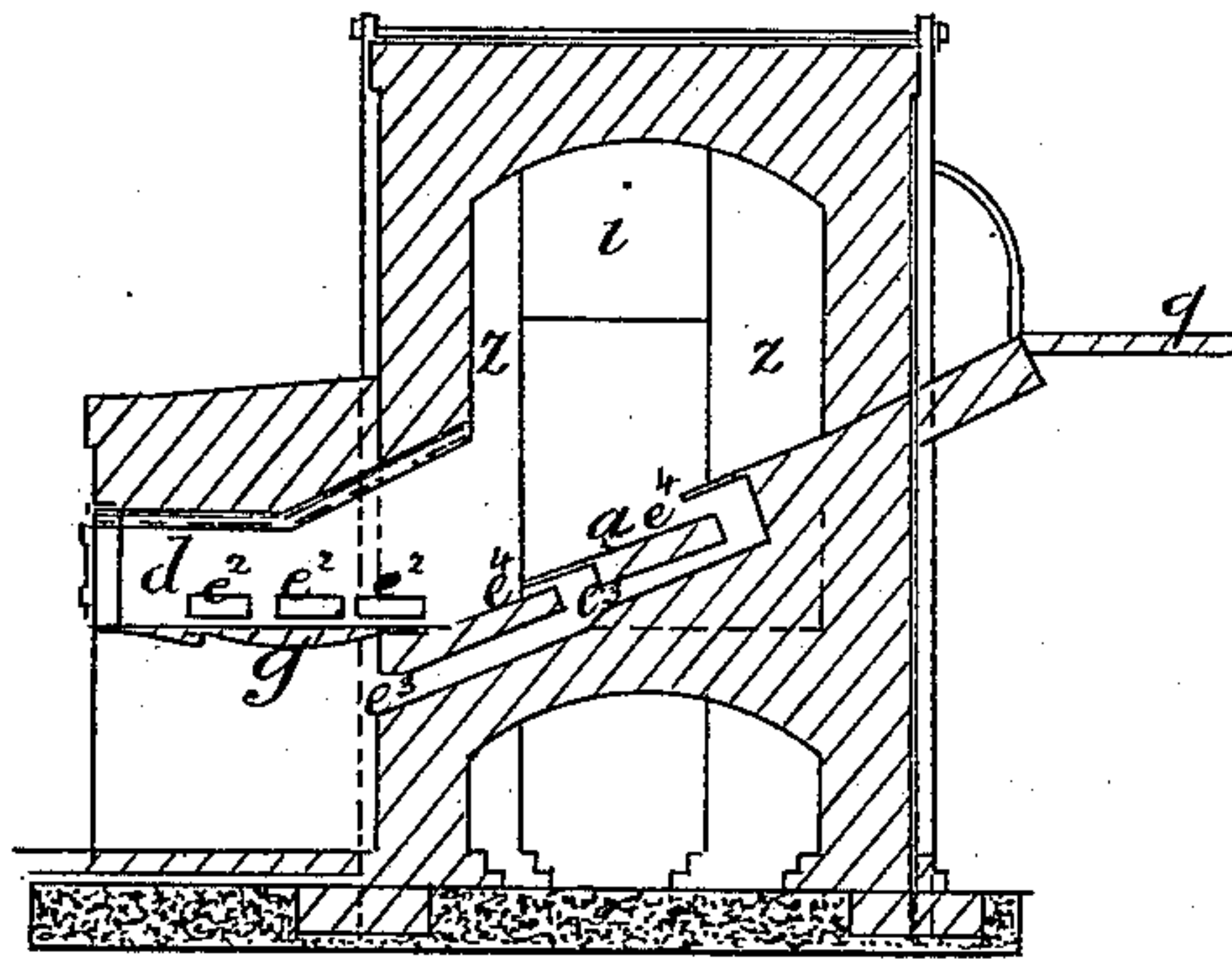
J. RICHMOND & T. BIRTWISTLE.

FURNACE FOR TREATING TOWN AND OTHER REFUSE.

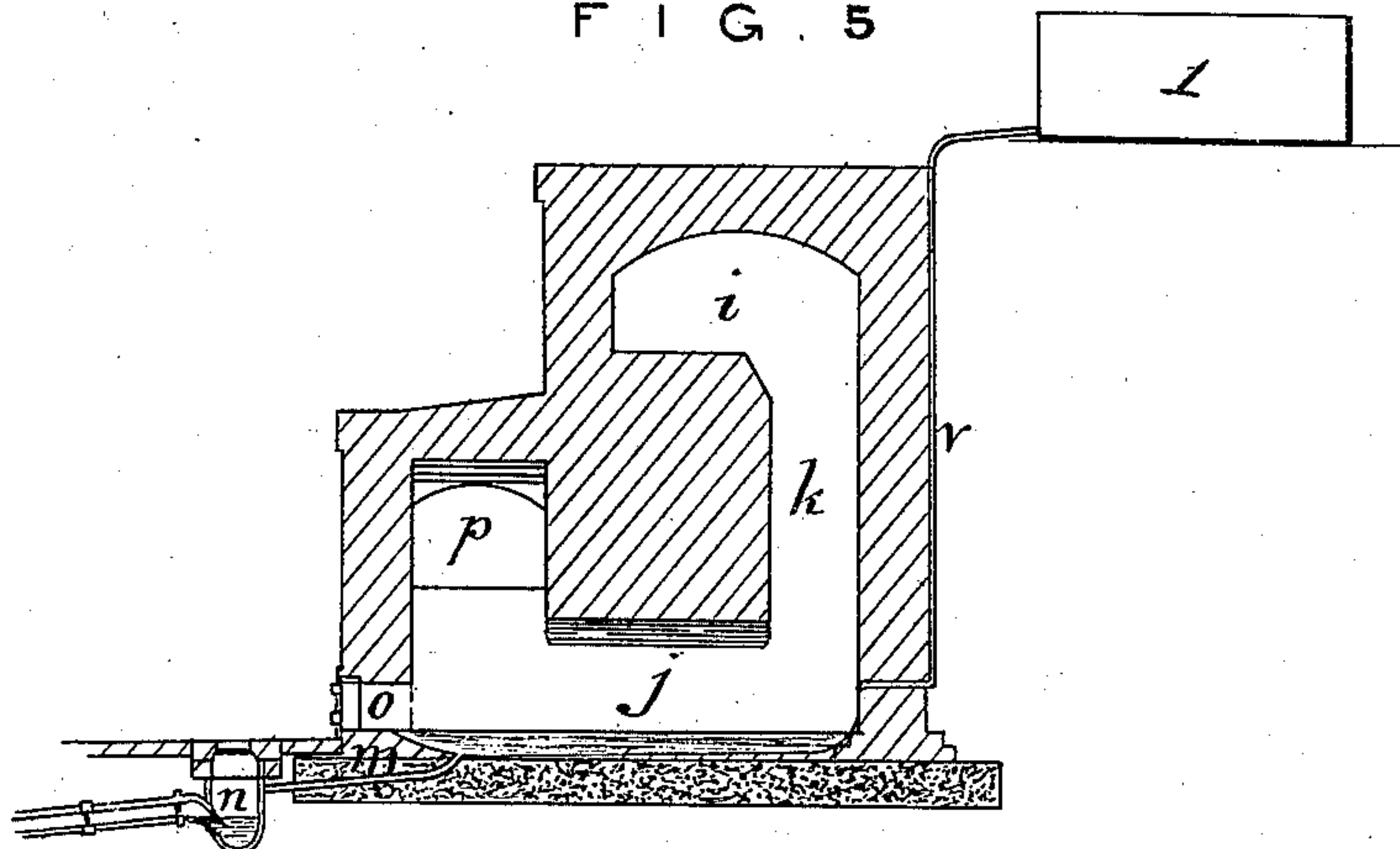
No. 372,172.

Patented Oct. 25, 1887.

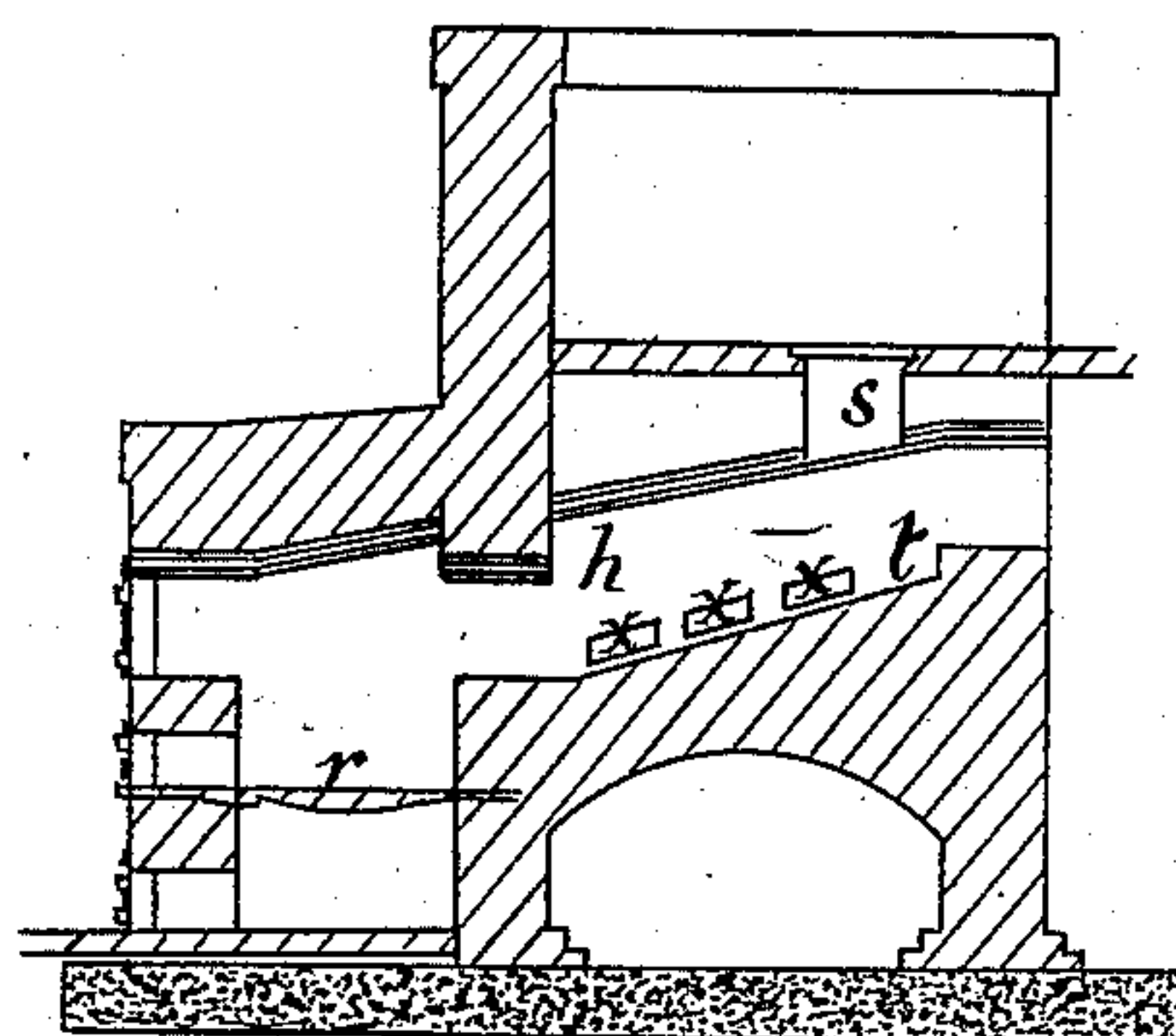
F I G . 4



F I G . 5



F I G . 6



Witnesses.

J. A. Rutherford  
Robert Everett

Inventors.

James Richmond  
Thomas Birtwistle  
By James L. Norris.  
Atty.



(No Model.)

3 Sheets—Sheet 3.

J. RICHMOND & T. BIRTWISTLE.

FURNACE FOR TREATING TOWN AND OTHER REFUSE.

No. 372,172.

Patented Oct. 25, 1887.

FIG. 7

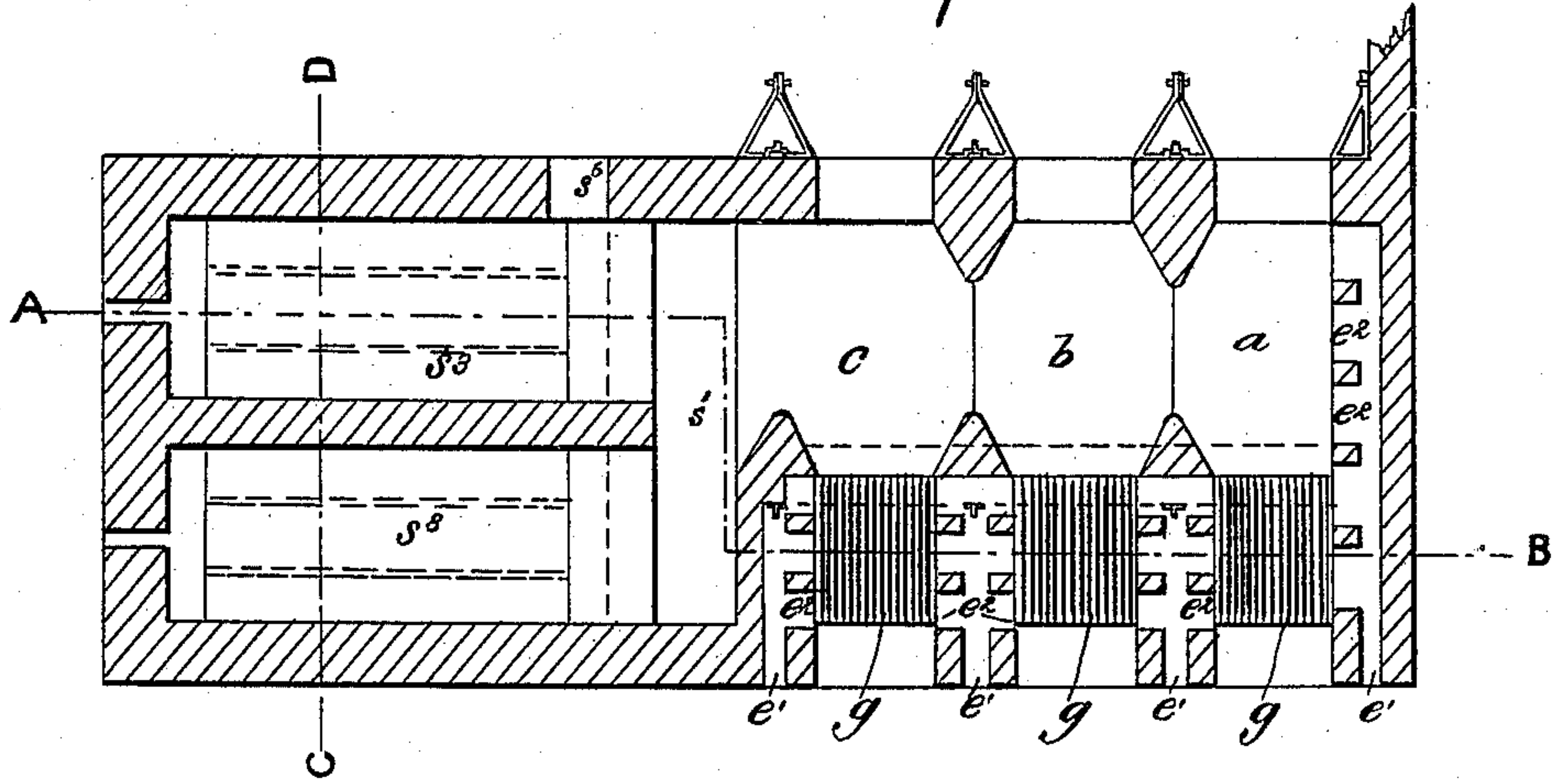


FIG. 8

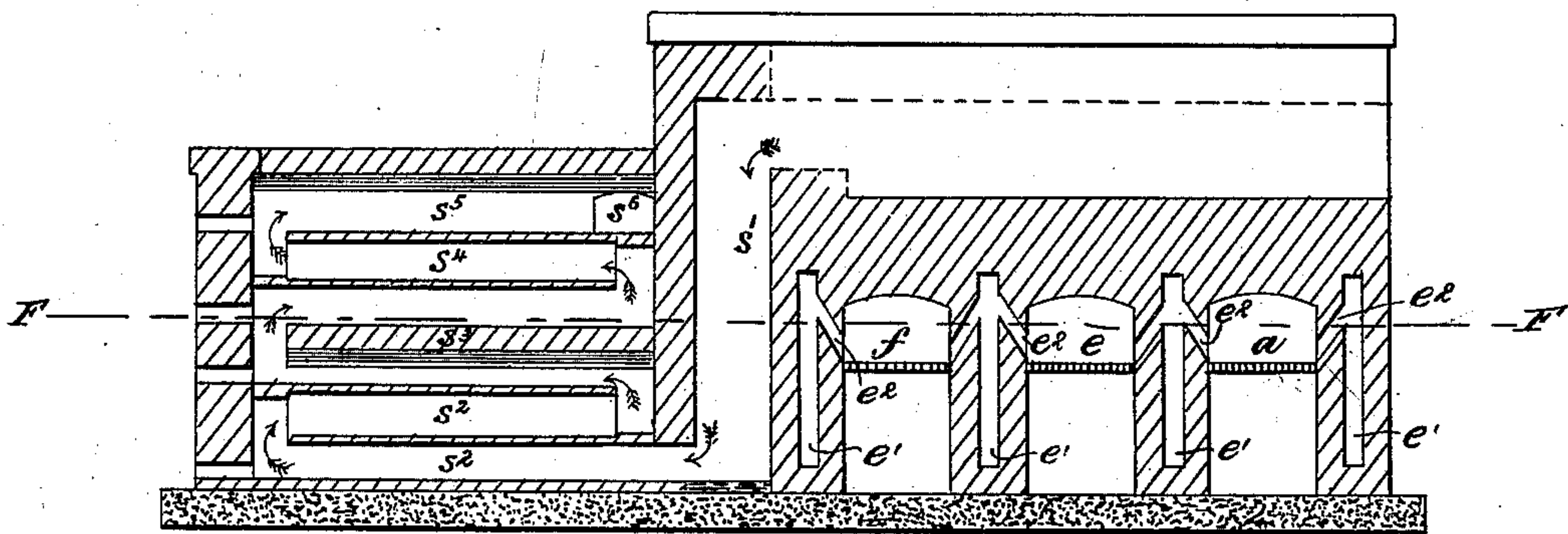
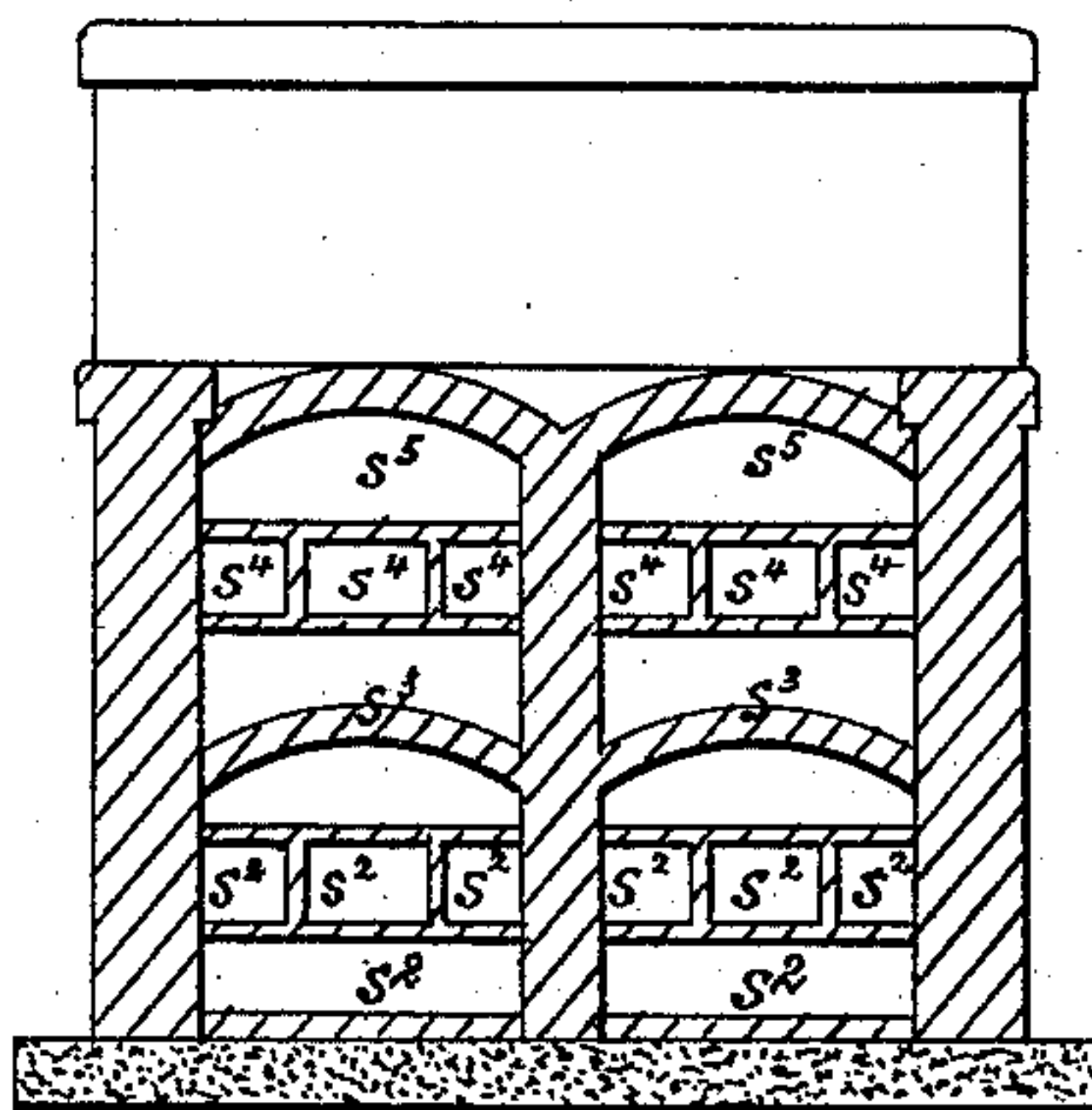


FIG. 9



Witnesses.

J. A. Rutherford  
Robert Everett

Inventors  
James Richmond  
Thomas Birtwistle.

By James L. Norris.  
Atty.



# UNITED STATES PATENT OFFICE.

JAMES RICHMOND AND THOMAS BIRTWISTLE, OF BURNLEY, COUNTY OF LANCASTER, ENGLAND.

## FURNACE FOR TREATING TOWN AND OTHER REFUSE.

SPECIFICATION forming part of Letters Patent No. 372,172, dated October 25, 1887.

Application filed December 23, 1886. Serial No. 222,824. (No model.) Patented in England February 11, 1885, No. 1,891.

*To all whom it may concern:*

Be it known that we, JAMES RICHMOND, of Mosley House, Burnley, in the county of Lancaster, England, gentleman, and THOMAS BIRTWISTLE, of Belvedere Road, Burnley, aforesaid, iron-monger, have invented certain new and useful Improvements in Furnaces for Treating Town and other Refuse, (for which we have obtained a patent in Great Britain, No. 1,891, dated February 11, 1885;) and we do hereby declare that the following is a full, clear, and exact description of the same.

This invention has for its object to provide a novel furnace for drying and burning refuse or garbage and to purify the noxious gases therefrom; and to such end the invention consists in the novel construction and arrangement, hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a front elevation of a furnace embodying our invention; Fig. 2, a sectional plan view taken on the line A A, Fig. 1; Fig. 3, a vertical sectional view taken on the line B B, Fig. 2; Fig. 4, a transverse sectional view taken on the line C C, Fig. 2; Fig. 5, a similar section taken on the line D D, Fig. 2; Fig. 6, a similar view taken on the line E E, Fig. 2; Fig. 7, a sectional plan view taken on the line F F, Fig. 8, showing a modification of the invention; Fig. 8, a vertical sectional view taken on the line A B, Fig. 7, and Fig. 9 a transverse sectional view taken on the line C D, Fig. 7.

In the drawings, the letters *a*, *b*, and *c* (seen in Fig. 2) are the drying sheds and hearths, into and upon each of which refuse is deposited and consumed by the flames and heated gases evolved in the combustion chambers *d*, *e*, and *f*. (Seen in Fig. 3.)

To assist in the distillation of the refuse, a continuous current of air is conducted from the exterior through the openings or passages *e'*, (seen in Figs. 1, 2, and 3,) from which it is deflected and discharged through the deflecting-slits *e''*, formed in the sides and division-walls of the combustion-chambers and drying-hearth, into the mass of burning fuel upon the grating *g*, (seen in Figs. 2, 3, and 4,) and upon the refuse, and thereby produces an intense heat, which is most essential for the

effectual destruction of the refuse under treatment.

The drying hearths, when constructed on the incline, are preferably arranged stepwise, as seen in Fig. 4, and provided with passages or apertures *e'* and *e''*, to convey a current of air from the exterior to the refuse drying and burning on the hearths preparatory to being drawn into the combustion-chambers to be finally consumed. Fuel is fed into the furnace in the first instance, or when commencing operations for the combustion of the refuse, through doors *f'*, (seen in Fig. 1,) upon the grating *g* in each combustion-chamber until the refuse upon the hearths is sufficiently dry to serve as fuel, after which it is from time to time drawn down by a rake or other instrument upon the grating in the combustion-chambers and consumed.

The flame and heated gases evolved from the refuse in the combustion-chamber *d* (seen in Fig. 3) are conveyed over the refuse deposited upon the hearth in the drying-shed *a*, (seen in Fig. 2,) and forward over the refuse on the hearth in the shed *b*, where they mingle with the flame and heated gases proceeding from the combustion-chamber *e*. The heated gases now pass over the refuse on the hearth in the drying-shed *c*. (Seen in Fig. 2.) Where the gases from the several furnace-chambers join together at each place or shed the heat is most effective into which the refuse most difficult to burn may be deposited.

The hearth in the drying-shed *c* may be on the flat instead of on the rake or incline, as seen in Fig. 4. On this hearth may be deposited ashes impregnated with night-soil, liquid excreta, pail contents, or other objectionable sloppy matter, which are evaporated by the intense heat in this compartment, when the residuum thereof is drawn with the dried ashes into the combustion-chamber *f* and consumed.

We will now describe more fully the arrangement of the well *j*, Fig. 5, coke-furnace *h*, Fig. 6, and the communicating flues which convey the gases through the same to insure a thorough purification of the gases from fumes and vapors evolved during the combustion of the refuse.



The heated gases collecting in the last compartment or shed, *c*, (seen in Fig. 2,) are conveyed through the opening *i* (seen in Fig. 4) into the diving-flue *k* (seen in Figs. 2, 4, and 5) and downward are led over combustible liquid which floats on the surface of the water contained in the well *j*, whereby a considerable reduction is insured of the noxious fumes and vapors. In close proximity to the well is a petroleum-tank, *I*, to supply the well with combustible liquid down pipe *v*, as may be required. This well is provided with a channel or gutter, *m*, and stench-trap *n*, by which means the liquid portion contained in the well may be drawn off at any time for cleaning purposes, and sundry accumulations of solid matter deposited by the currents of heated gases in the shape of ashes or refuse may be removed through the mud or man hole *o*, (seen in Fig. 5,) when deemed expedient. Having now passed over the combustible liquid in the well, the gases are from thence conveyed through the opening *p* (seen in Figs. 3 and 5) above the grating *r*, (seen in Figs. 3 and 6,) upon which the consumable portion of solid matter still suspended and carried with the currents of heated gases gradually settle and burn away by slow combustion, while the gases, continuing their course to the chimney, pass over a coke-fire burning on the inclined hearth *t* behind the grating *r*, (seen in Fig. 6,) whereby the fumes and vapors existing among the gases after traversing the combustible liquid are most thoroughly consumed.

A supply of coke or other suitable fuel is charged from time to time, to maintain the fire, through the opening *s* (seen in Fig. 6) in the roof of the furnace, and a continuous current of air enters the air-passages *x* (seen in Fig. 2) through the opening *w*, (seen in Figs. 2 and 3,) and is discharged into the burning coke in like manner as described in reference to the slits and air-passages in the side and division walls of the combustion-chambers.

In the construction shown in Figs. 7, 8, and 9 the heated gases to be purified, proceeding from the furnaces and drying-sheds, pass down the diving-flue *s'*, through channels or passages *s''*, under and over arch *s'''*, into channels or passages *s''''*, and from thence are conveyed through flue *s'''''* and outlet *s''''''* to the chimney.

The serpentine course of the gases through the passages and flues, as indicated by arrows, imparts to the surrounding material, which is of fire-clay or other suitable material, a considerable amount of heat, whereby an effective combustion of noxious fumes and vapors is insured.

An elevated roadway may be constructed, so that carts may convey the refuse to be consumed to the platform *q*, (seen in Fig. 4,) where it is tipped and discharged upon the drying-hearths through openings *y*, (seen in

Fig. 2,) formed between the projecting heads of brick-work *z*, which also separate and divide the longitudinal space behind the combustion-chambers *d*, *e*, and *f*. The openings *y* (seen in Fig. 2) may be closed by balanced-doors; or the refuse may be made to choke up the entrance to the said openings while the refuse is under combustion.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is—

1. A refuse-burning furnace having a series of grates, *g*, combustion-chambers *d e f*, drying-hearths *a b c*, behind and communicating, respectively, with the combustion-chambers, upon which grates the refuse can be drawn when dried, the vertical and lateral passages *e'* and *e''*, for delivering air to the combustion-chambers and drying-chambers, the diving-flue *k*, the well *j*, communicating with the lower end of the diving-flue, for containing water and a floating combustible liquid, the coke-chamber *h*, the grating *r*, and the passages *w* and *x*, for supplying air to the coke-chamber, substantially as described.

2. A refuse-burning furnace having a series of grates, *g*, combustion-chambers *d e f*, drying-hearths *a b c*, behind and directly communicating, respectively, with the combustion-chambers, upon which grates the refuse can be drawn when dried, the vertical and lateral passages *e'* and *e''*, for delivering air to the combustion-chambers, a diving-flue receiving the noxious gases evolved from the refuse, and a heating-chamber communicating with said diving-flue for purifying the noxious gases as they pass through said heating-chamber to the chimney, substantially as described.

3. A refuse-burning furnace having a series of grates, *g*, combustion-chambers *d e f*, drying-hearths *a b c*, behind and in communication, respectively, with the combustion-chambers, the vertical and lateral passages *e'* and *e''*, for delivering air to the combustion-chambers and drying-hearths, the diving-flue *k*, the well *j*, for containing water, the tank *I*, for containing a combustible fluid, a pipe, *v*, for delivering the said fluid to the well, the coke-chamber *h*, the grating *r*, and the vertical and lateral passages *w* and *x*, for delivering air to the coke-chamber, substantially as described.

In testimony whereof we have hereunto set our hands the 3d day of August, 1886.

JAMES RICHMOND.  
THOMAS BIRTWISTLE.

Witnesses:

WM. HULM,  
*Clerk with Messrs. Ormerod & Allen, Solicitors,*  
*Manchester.*

THOS. RICHMOND,  
*Patent Agent, Burnley.*