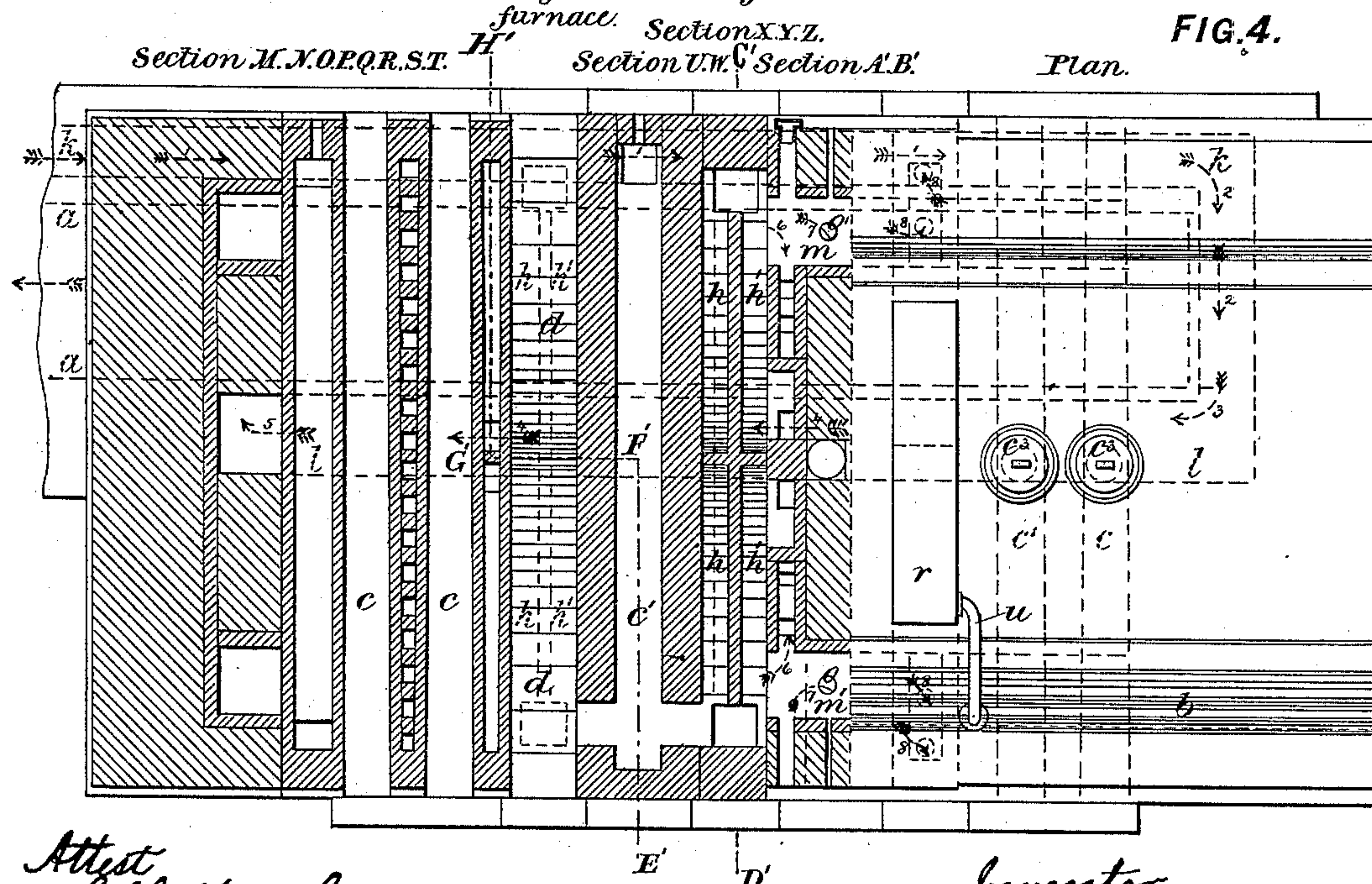
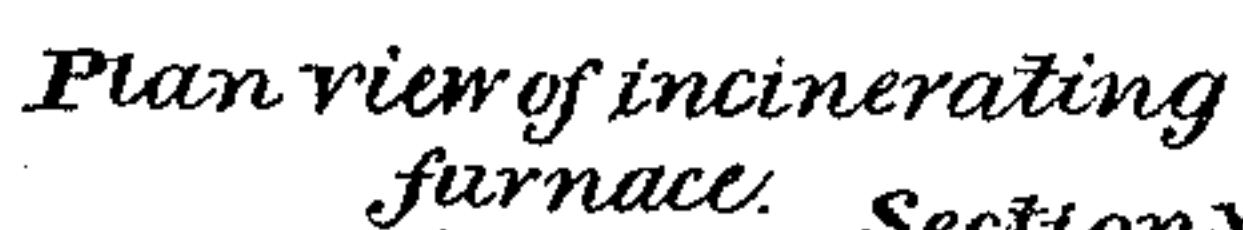


2 Sheets—Sheet 1.

No. 409,567.

Patented Aug. 20, 1889.



Attest  
J. H. Knight  
E. Arthur,

Inventor  
Richard de Soldenbroff  
By Knight Bros  
Attys.



(No Model.)

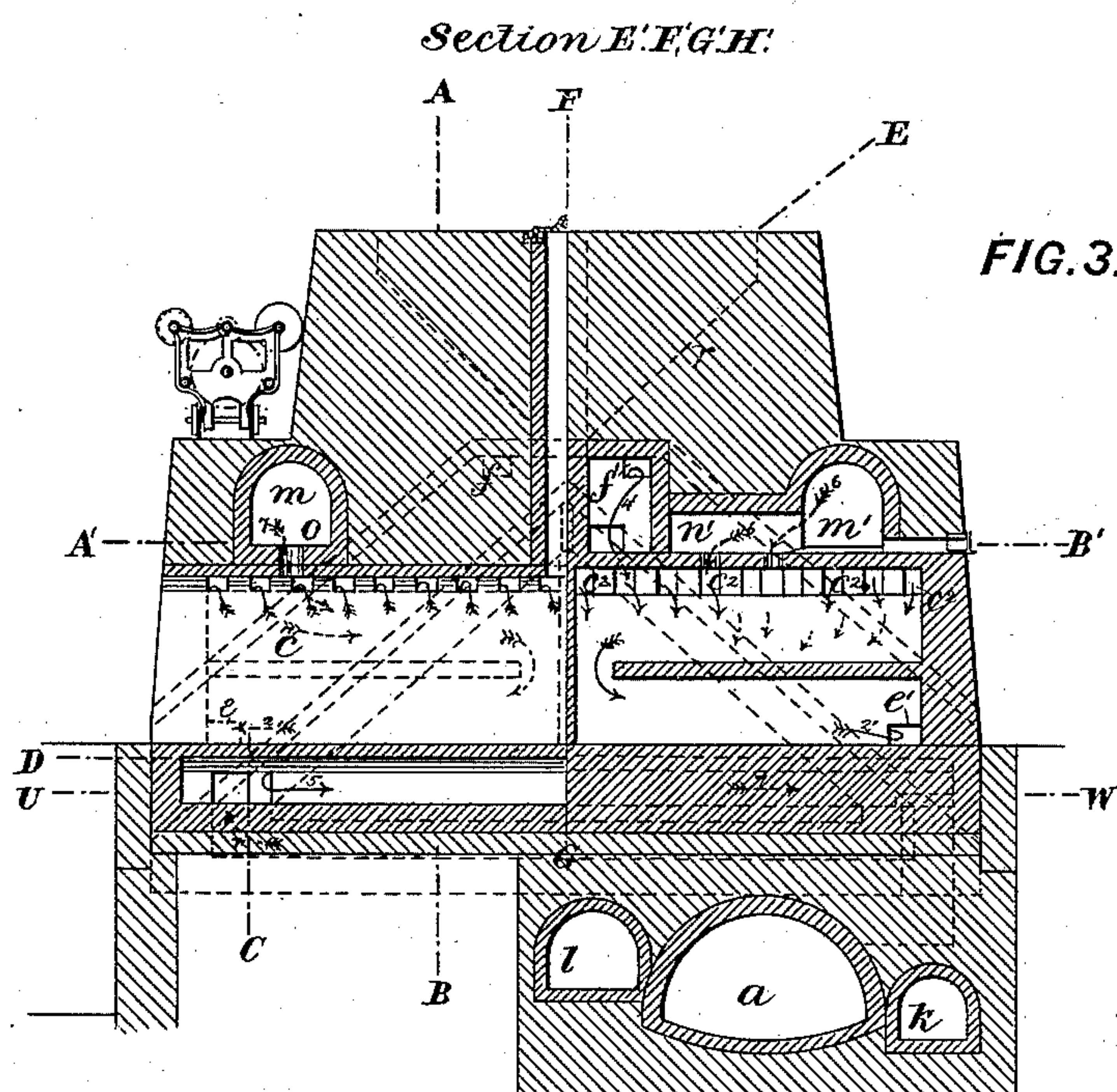
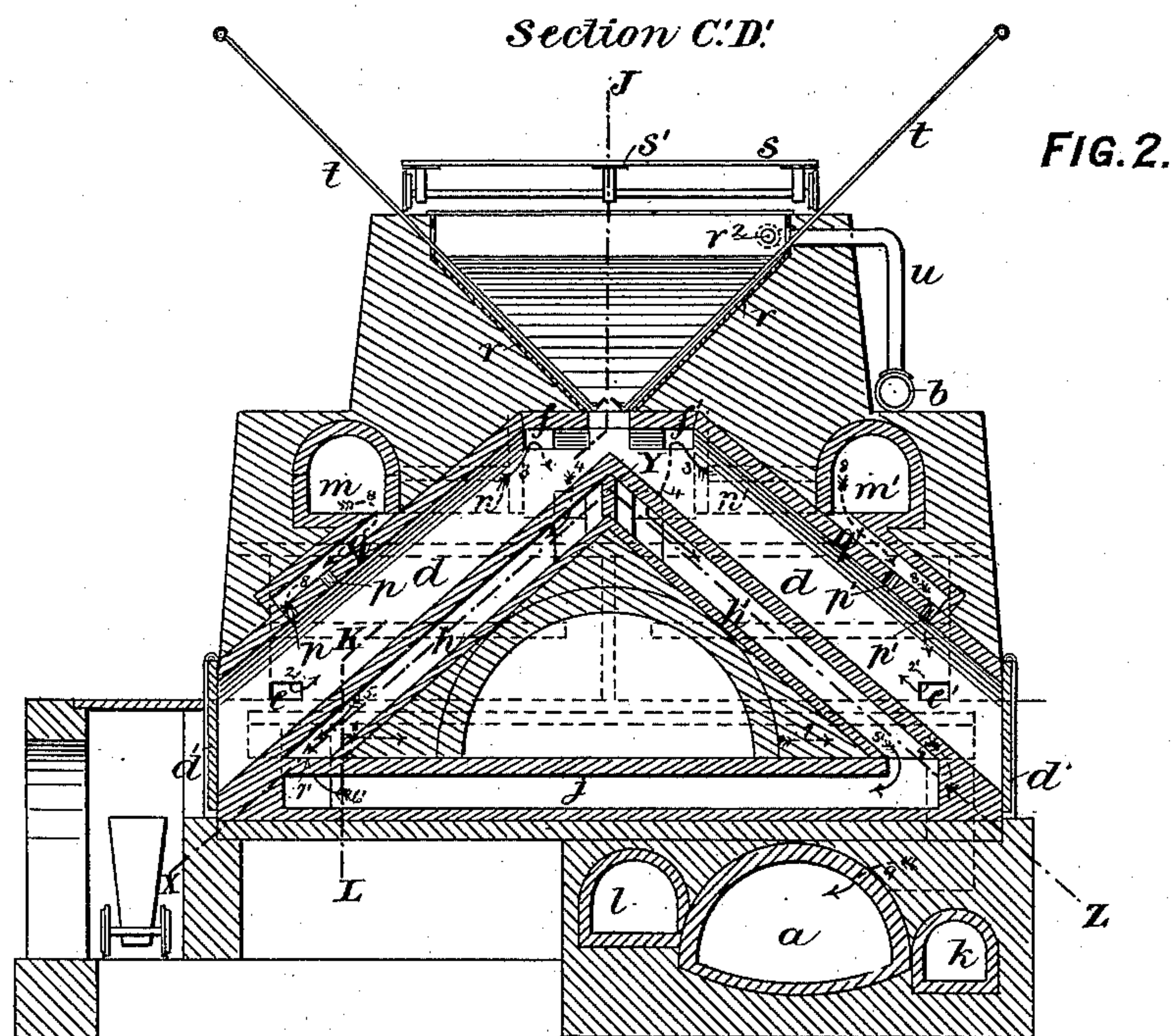
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R. DE ŠOLDENHOFF.

# APPARATUS FOR THE MANUFACTURE OF COKE.

No. 409,567.

Patented Aug. 20, 1889.



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# UNITED STATES PATENT OFFICE.

RICHARD DE SOLDENHOFF, OF CARDIFF, COUNTY OF GLAMORGAN, ENGLAND.

## APPARATUS FOR THE MANUFACTURE OF COKE.

SPECIFICATION forming part of Letters Patent No. 409,567, dated August 20, 1889.

Application filed October 21, 1887. Serial No. 253,025. (No model.) Patented in England May 23, 1887, No. 7,482.

*To all whom it may concern:*

Be it known that I, RICHARD DE SOLDENHOFF, engineer, a subject of the Queen of Great Britain, residing at 71 St. Mary Street, Cardiff, in the county of Glamorgan, England, have invented certain new and useful Improvements in or Additions to Means or Apparatus Employed in the Manufacture of Coke for the Desiccation and Incineration of Precipitants or Solids Resulting from Sludge or other Substances Liable to Putrefy, (for which I have received Letters Patent in Great Britain, No. 7,482, dated May 23, 1887,) of which the following is a specification.

The invention has for its object improvements in means or apparatus employed in the desiccation, incineration, and carbonization of precipitants and solids resulting from sludge or other substances liable to putrefy, and relates to improvements in that class of apparatus in which the above-mentioned process is conducted in connection with the manufacture of coke with coking-coals.

Instead of locating the incinerating-furnaces above the coke-ovens, as heretofore, I, according to my present invention, locate such incinerating-furnaces between two coke-ovens, and I locate above each of such incinerating-furnaces a hopper or chamber, in which the sludge or other material under treatment is first received from the truck or other conveyer, and is there dried previous to being passed into the incinerating-furnace.

My present invention is represented in the accompanying drawings, in which—

Figure 1 represents vertical sections on the lines A B C D E F G of Fig. 3, and J K L of Fig. 2, and a partial front elevation. Fig. 2 is a cross-section on the line C' D' of Fig. 4. Fig. 3 is a cross-section on the line E' F' G' H' of Fig. 4; and Fig. 4 represents a horizontal section on the line M N O P Q R S T of Fig. 1, a sectional plan of a pair of incinerating-furnaces, horizontal sections on the lines U W of Fig. 3, X Y Z of Fig. 2, and A' B' of Fig. 3, and a partial plan of a block of incinerating-furnaces and coke-ovens.

In carrying my present invention into effect, I prefer to employ the arrangement and combination of parts represented in the drawings; but I do not confine myself to the pre-

cise arrangement of flues and passages nor to the directions taken in the circulation of the gases and superheated air.

In arranging any number of incinerating-furnaces, I locate each of such furnaces between a pair of coke-ovens, with the exception of the first and the last of such incinerating-furnaces, on the outer side of each of which I place two coke-ovens. If desired, however, two coke-ovens may also be interposed between the incinerating-chambers. Any desired number of incinerating-furnaces, combined with coke-ovens, as above described, may compose a block; but the number of such furnaces and ovens represented in the drawings to a single block is that which I prefer. Each block is provided with a chimney, (not shown.) into which the main flue *a* leads, and each block may, if desired, be provided with a condenser communicating with the pipe *b*. The direction taken in the circulation of the gases is represented by the arrows. (Shown in full lines and numbered in such a way that the lowest number indicates the starting-point for the gas, and the highest number indicates the point where the gas reaches the main flue.)

The arrows shown by the dotted lines represent the direction of circulation of the superheated air.

In order to facilitate my description of the construction of the incinerating-furnaces and coke-ovens, together with their mode of working, I will describe two coke-ovens *c c'* and one incinerating-furnace *d*. I will assume that the two coke-ovens *c c'* have been charged with coal for some few hours, and that the gases generated in them are inflamed and escape through openings *c<sup>2</sup>*. There are eighteen of these openings shown on each side of the ovens, but other suitable numbers of such openings may be employed. These openings *c<sup>2</sup>* are situated just at the spring of the arches or crowns of the coke-ovens. The gases escaping from the coke-ovens through these openings *c<sup>2</sup>* at first circulate in the side walls situated between the furnace *d* and the coke-ovens *c c'*, in the manner represented by the sectional view Fig. 3. The gases leave these two said side walls through the openings *e e'*, and by such openings enter the incinerating-furnace *d*, as represented by the sectional view shown at



Fig. 2. I assume that the furnace  $d$  is already charged with sludge-cake or other material to be treated, and that the gases entering such furnace are compelled to travel up the double incline of the furnace. I would here observe that each incinerating-furnace  $d$  is a double furnace, the floor of which inclines downward at a convenient angle on each side of the center. The incline of the said floor is such as to permit the sludge-cake or other material, or the ash resulting from it through the incineration process, to slide upon it, but not without a slight assistance. The furnace  $d$  is charged through the top from the hopper  $r$  with comparatively dry sludge-cake or other material to be incinerated, while the lowest parts of the incinerating-furnace—that is to say, those parts next the doors  $d'$ —will contain almost completely incinerated material. The gases entering the furnace  $d$  are very hot, and the entrances being next the doors, the hottest gases meet with the sludge-cake or other material in the most advanced stage of incineration. The gases leave the furnace  $d$  through the openings  $ff'$ , whence they are directed into the flues  $h h'$ , situated under the floor of the furnace  $d$ . Each part of the floor is provided with two flues  $h h'$  underneath the same. The gases leaving the two flues  $h$  are directed immediately into the flues situated under the ovens  $c c'$ , while the gases leaving the two flues  $h'$  pass first into the flue  $j$ , and from thence into the flues of the two ovens  $c c'$ . (See Fig. 2 and sections C D E and F G, Fig. 1.) The gases having performed their work then pass away from the flues under the ovens  $c c'$  into the main flue  $a$ . The cold air enters by the end opening of the flue  $k$ , which is parallel to the main flue  $a$ . The air in traversing the flue  $k$  becomes warm, and thence passes into the flue  $l$ , which is also parallel to the main flue  $a$ , but on the other side of it. The air becomes hot in the flue  $l$ , and in that condition reaches the two horizontal flues  $m m'$ , situated just above the incinerating-furnace  $d$  through the vertical flue  $m^2$ . The flues  $m$  and  $m'$  are provided with flues  $q q'$ , which communicate by openings  $p$  or  $p'$  with the furnaces  $d$ . They are also in connection with flues  $n n'$ , connecting them with the side walls of each coke-oven, and are provided with openings  $o o'$ , connecting them with the coke-ovens. (See Figs. 2 and 3 and section A' B' of Fig. 4.)

The incinerating-furnaces and the coke-ovens are worked in the following manner: The coke-ovens are first charged, and when the coking process is in full operation, but not till then, the incinerating-furnaces are to be charged. The sludge-cake from the presses or other material to be treated is brought to the furnaces on a platform-truck  $s$ , (see Fig. 1,) provided with a hole  $s'$  in the middle of its platform. When the truck  $s$  is over the hopper  $r$ , the door  $r'$  of the latter is opened, and the sludge-cake or other material in the truck  $s$  is pushed into the hopper  $r$ , and when the said hopper is fully charged the door  $r'$

is closed. The sludge-cake or other material so charged into the hopper  $r$  in a few hours becomes nearly dry at the lower part. The opening in the bottom of the hopper  $r$ , which communicates with the incinerating-furnace  $d$ , may be closed by an arrangement of cup and cone or other suitable valve or door, or by an arrangement of two rabblers  $tt'$ , as shown at Fig. 2. When the lowest part of the sludge-cake or other material in the hopper  $r$  is dry, a slight motion of one of the rabblers at a time will deliver some of such material into the incinerating-furnace, and by means of the same rabblers the sludge-cake or other material so delivered to the incinerating-furnace may be pushed farther down the floor of the said furnace  $d$ . The capacity of the hopper  $r$  is preferably equal to that required for the charge for the incinerating-furnace. The hopper  $r$  is also provided with an opening  $r^2$ , communicating with the main pipe  $b$  by means of a short pipe  $u$ , so that all the steam and vapors generated during the process of drying the sludge-cake or other material contained in the hopper  $r$  will pass into the main pipe  $b$  and thence into the condenser, if such is used, or into the chimney. As soon as some of the sludge-cake or other material is charged into the incinerating-furnace  $d$  some new sludge-cake or other material is charged into the hopper  $r$  in order to keep it always full. The incinerating-furnace  $d$  is also to be kept fully charged, and this is easily done by pushing the charge, with one of the rabblers  $t$  or  $t'$ , down the floor of the furnace  $d$ . The sludge-cake or other material having passed from the highest point of the furnace  $d$  to its lowest point—that is to say, down to the door—gets reduced to ash. At this time the door  $d'$  is to be opened and the ash dropped into a tram-car or hopper, or onto a revolving table, or onto a transporter or elevator, by which it may be ultimately delivered to the stores. The gases circulating in the furnaces, as described above, inflame the dry sludge-cake or other material, and the combined heat of the gases from the coke-ovens and of those from the sludge-cake or other material being treated makes the incineration proceed very rapidly. The incineration proceeds all the more quickly on account of the hot air being constantly supplied to the incinerating-furnaces.

In addition to the rapidity of incineration which is obtained by the introduction of gases from the coke-ovens into the furnaces  $d$ , another advantage is obtained, namely, the perfect combustion of some of the gases, some of the greasy and heavy gases given off from the sludge-cake or other material possessing very nasty and disagreeable smell. The coke-ovens are charged through two openings  $c^3$  situated on their top. The coal is brought to them by small tram-cars, carried on the platform-truck  $s$ , and provided, as already stated, with a hole  $s'$  in the middle of the platform. The tram-cars are emptied through said hole  $s'$  into the ovens  $c c'$ . The coals are leveled in the



ovens in the usual manner. The ovens are then closed and the coking process takes place in the usual way. The arrangement of the ovens and furnaces is such that the ash is delivered onto a lower level than the coke-bank in such manner that the manufacture of the ash does not interfere with the manufacture of coke.

The arrangement of incinerating-furnaces may be used with other constructions and arrangements of coke-ovens.

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

1. The combination, with two or more coke-ovens and flues under said ovens, of an incinerating-furnace situated between said ovens and consisting of two inclined chambers communicating at their upper ends, flues connecting the upper portions of said ovens with the lower ends of said inclined chambers, and flues under said inclined chambers connected with the upper ends thereof and with the flues under the ovens, substantially as set forth.

2. The combination, with two or more coke-ovens, flues under said ovens, the main flue *a* connected with said flues under the ovens, and a hopper, of an incinerating-furnace, having its floor inclined downwardly from its mid-length, interposed between said coke-ovens under said hopper, flues leading from said ovens to the furnace at the lower ends of said inclined floors, and flues under said furnace connected therewith and with the flues under the ovens, substantially as set forth.

3. The combination, with two or more coke-ovens, of an incinerating-furnace interposed between said ovens and connected therewith, and having its floor inclined downwardly from its mid-length, a hopper arranged above the upper ends of such inclines, the doors *d'*,

and the rabblers *t*, projecting in the direction of the inclines of the floor and forming a valve for said hopper, as set forth.

4. The combination, with the coke-ovens *cc'*, of the incinerating-furnace interposed between said ovens and having an inclined floor, flues *h h'*, arranged under said incinerating-furnace, said furnace having communication with said oven at the lower end of its incline and with said flues at the upper end of its incline, and the flue *j* and flues under said ovens connected with the flues *h h'*, substantially as set forth.

5. The combination, with the coke-ovens and the main flue *a*, of the horizontal flues *m m'*, air-flues *k l*, arranged in juxtaposition to flue *a* and communicating with flues *m m'*, and an incinerating-furnace arranged between said ovens and communicating therewith and with the flues *m m'*, substantially as set forth.

6. The combination, with the coke-ovens and the main flue *a*, of an incinerating-furnace *d*, having its floor inclined downwardly from the center on each side, interposed between and connected at its lower ends with said ovens, a hopper arranged above the center of said floor, flues extending under said ovens and connecting with flue *a*, the flue *h* under the furnace *d*, connected with the upper end thereof and with the said oven-flues, the flue *h'* under the furnace *d*, connected with the upper end thereof, the flue *j*, connected with the flue *h'* and with said oven-flues, and the horizontal flues *m m'*, communicating with the atmospheric air and leading to furnace *d*, as set forth.

R. DE SOLDENHOFF.

Witnesses:

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