

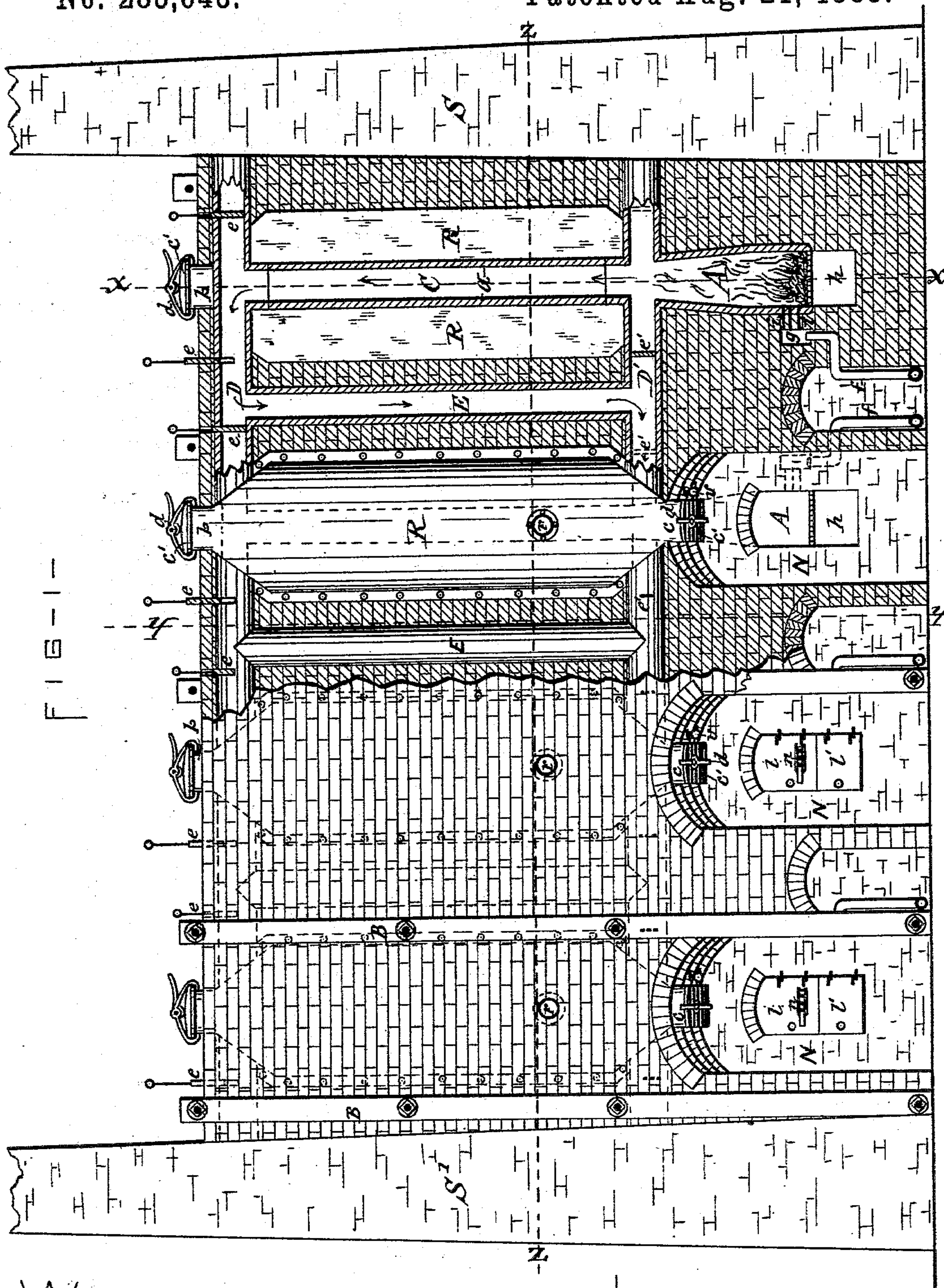
(No Model.)

3 Sheets—Sheet 1.

C. S. NELLIS.  
CHARCOAL KILN.

No. 283,643.

Patented Aug. 21, 1883.



WITNESSES —  
Wm. E. Raymond  
J. H. Gibbs

INVENTOR —  
Charles S. Nellis  
per Louis Lacroix & Co.  
Attorneys



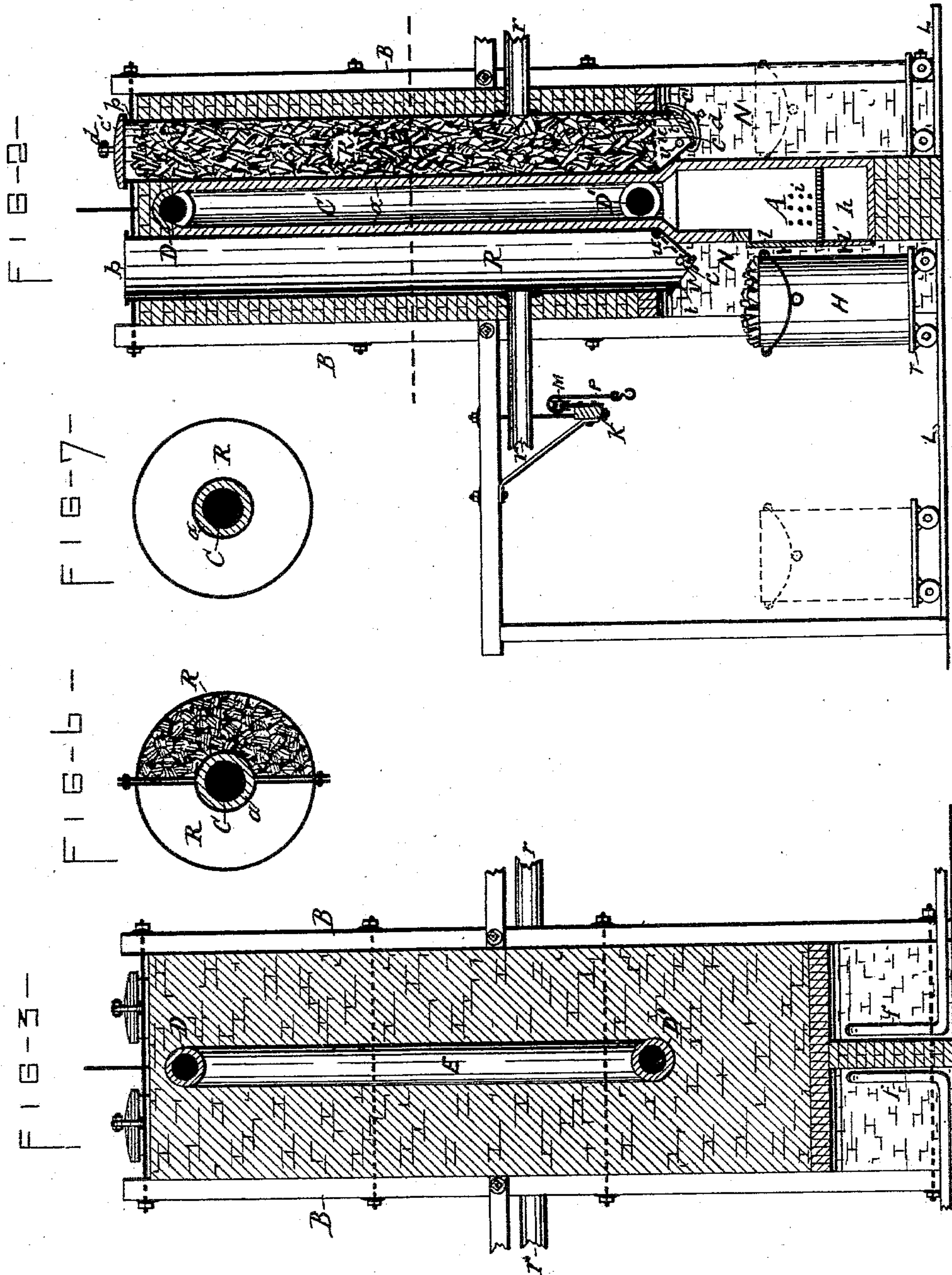
(No Model.)

3 Sheets—Sheet 2.

C. S. NELLIS.  
CHARCOAL KILN.

No. 283,643.

Patented Aug. 21, 1883.



WITNESSES—  
C. E. Raymond  
J. H. Gibbs

INVENTOR—  
Charles S. Nellis  
per David Laessle Hay  
Attorney



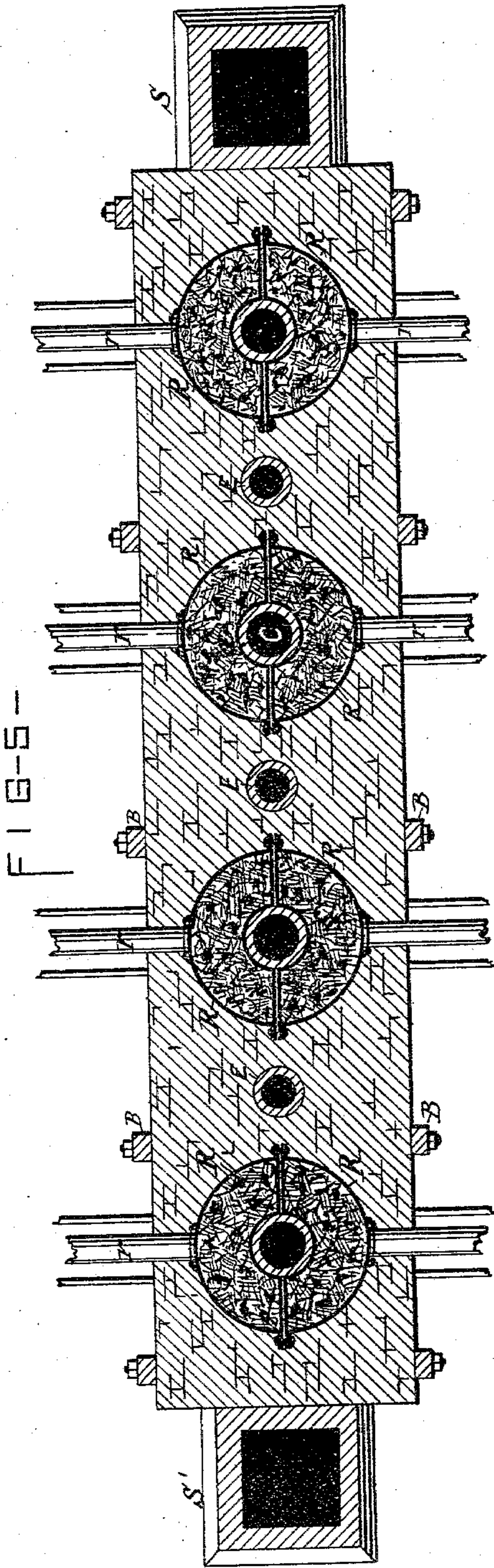
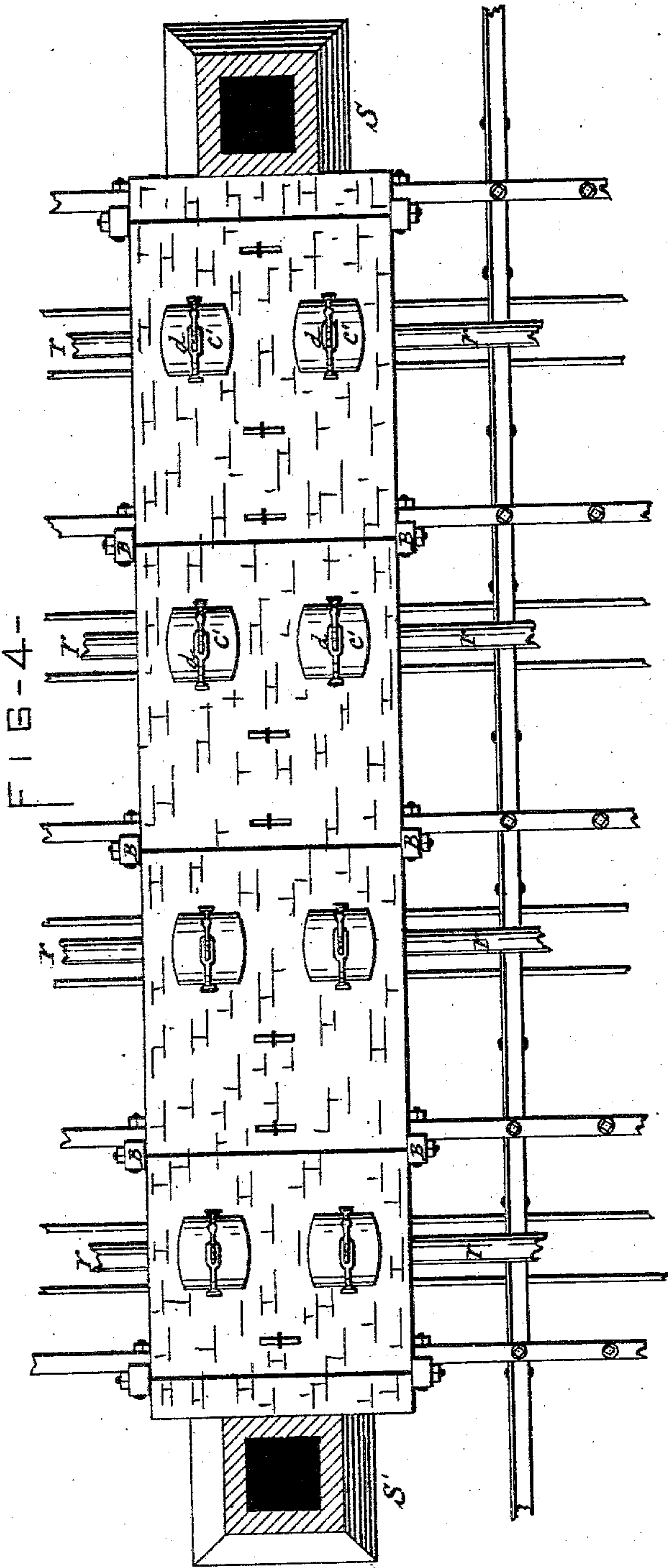
(No Model.)

3 Sheets—Sheet 3.

C. S. NELLIS.  
CHARCOAL KILN.

No. 283,643.

Patented Aug. 21, 1883.



WITNESSES—  
Geo. C. Raymond.  
J. H. Gibbs

INVENTOR—  
Charles S. Nellis  
per Geo. C. Raymond & J. H. Gibbs



# UNITED STATES PATENT OFFICE.

CHARLES S. NELLIS, OF CHITTENANGO, NEW YORK, ASSIGNOR OF ONE-FOURTH TO THOMAS P. HULL, OF SAME PLACE.

## CHARCOAL-KILN.

SPECIFICATION forming part of Letters Patent No. 283,643, dated August 21, 1883.

Application filed June 2, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES S. NELLIS, of Chittenango, in the county of Madison, in the State of New York, have invented new and useful Improvements in Charcoal-Kilns, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention has special reference to retorts employed for charring and distilling wood.

The object of my invention is to effect the aforesaid charring and distillation in a more expeditious and at the same time more economical, convenient, and perfect manner; and to that end my invention consists in the novel construction and combination of the retort and the appliances for heating the same, as hereinafter fully described, and set forth in the claims.

In the annexed drawings, Figure 1 is an elevation of a wood-distilling apparatus embodying my invention, portions of the front being broken away to show vertical sections thereof respectively around the exterior of one of the retorts and through the center of another, for the purpose of more fully illustrating the invention. Figs. 2 and 3 are vertical transverse sections, respectively, on lines *x x* and *y y* in Fig. 1. Fig. 4 is a top view of the apparatus. Fig. 5 is a horizontal transverse section on line *z z*; and Figs. 6 and 7 are horizontal transverse sections of the retort, illustrating modifications in the detail construction thereof.

Similar letters of reference indicate corresponding parts.

A A represent fire-arches built in firm and substantial masonry, which is extended above the fire-arches to support and inclose the retorts R R and fire-flues, hereinafter described. The retort consists of a stout metal cylinder placed in an erect position, and having a combustion-chamber or fire-flue, C, extended longitudinally through it and communicating at its base with the fire-arch A, said combustion-chamber being protected by a fire-brick lining, *a*, as shown. This feature of passing the products of combustion through the retort without bringing them in contact with the wood to be charred in the retort I deem as one

of the most essential parts of my improvements, in that I effect a more rapid penetration and more thorough and uniform distribution of heat through the retort; and since it is obvious that the aforesaid feature admits of many variations in the detail construction and form of the retort and its internal heating apparatus, I do not limit myself in that respect.

The retort R, I prefer to construct cylindrical, with the combustion-chamber or fire-flue C arranged concentric therein, as illustrated in Fig. 7 of the drawings; and in order to admit of drawing the charcoal from the retort at one side of the combustion-chamber without disturbing the remainder of the wood under treatment, when found necessary, I form the retort of two semi-cylindrical, separate and distinct compartments joined at their straight or diametrical sides, as shown more particularly in Figs. 5 and 6 of the drawings, and provided in their adjacent sides with coinciding semi-cylindrical channels, which conjointly form the central longitudinal combustion-chamber C, each of said compartments being provided with an inlet, *b*, for the wood at the top and an outlet, *c*, for the charcoal at the bottom, both of which are closed by removable air-tight covers *c'*, secured in their position by clamps *d* during the operation of the retort, thus making the said compartments serve as separate and distinct retorts surrounding the combustion-chamber C.

D and D' represent two fire-flues, one of which connects the combustion-chambers of the several retorts at their upper end, and the other flue connects said combustion-chambers at the base of the retorts. Both of these flues communicate at each end with a smoke-stack, S, so that they are enabled to carry the products of combustion in either direction. Between the retorts are vertical flues E, by which the two flues D and D' communicate with each other.

The transmission of the products of combustion through the aforesaid flues is controlled and regulated by the following arrangement of dampers or valves: In both the upper and lower flue, D and D', are movable or adjustable dampers *e e'*, arranged between the com-



bustion-chamber C and the vertical flues E E at each side thereof. By this arrangement of flues and dampers I am enabled to either convey the products of combustion from the combustion-chamber C direct to the chimney or stack S, or conduct them successively from the top of one combustion-chamber to the foot of another, the latter allowing me to operate the entire set of retorts with the utmost economy in the application of the heat, and the former enabling me to isolate either of the retorts from the source of heat, and cool the said retort for the purpose of recharging it, or repairing or renewing the same, without interfering with the operation of the remainder of the set of retorts.

The operation of the aforesaid arrangement of flues and dampers in connection with the retorts is as follows: For a more comprehensible explanation of the operation of my invention I have shown in the annexed drawings two chimneys, (designated S and S',) connected with opposite ends of the apparatus. Such arrangement, however, is not necessary, as the two horizontal flues D D' can easily be made to communicate at opposite ends with one and the same chimney, assuming the retort next to the chimney S to be the first of the set. Then if all the retorts are charged with wood to be charred and distilled, fire is applied to the respective fire-arches A A, and in the upper flue, D, the damper *e* between the first retort and chimney S and the damper *e* between each vertical flue E and succeeding retort are closed. So are also the dampers *e'* in the lower flue, D', between the vertical flues and preceding retort, as illustrated in Fig. 7 of the drawings. The remainder of the dampers being open, causes the products of combustion to rise in the first retort, thence proceed, as indicated by arrows, through the upper flue, D, down through the first vertical flue E, thence through the lower flue, D', into the combustion-chamber C of the second retort, where it unites with the products of combustion from the fire-box A underneath said second retort, and proceeds with the same to the succeeding flues and retorts in the order aforesaid, as represented. The repeated subjection of the products of combustion to a fresh source of heat promotes combustion and enhances the utilization of the same. When it is found that the last retort receives excessive heat, or a much greater heat than the first retort, then the direction of the heat can be reversed by opening the closed dampers *e e'*, before described, and closing the other dampers. In case it is desired to isolate one of the retorts from the source of heat, or to cool said retort for the purpose of recharging the same, or repairing or renewing that section of the apparatus, the fire in its respective fire-arch is to be extinguished, and both dampers *e e'* in the lower flue at opposite sides of the retort are to be closed, and those in the upper flue to be opened to allow the products of combustion to

pass directly from the preceding retort to the downward flue E succeeding the retort which is to be isolated. It will thus be observed that I have perfect control of the application of the heat.

*r* represents the pipe or duct which conveys the vapors from the interior of the retort to a suitable condenser, (not necessary to be here shown,) in which condenser the gases become liberated from the pyroligneous acid in a manner well understood by all persons conversant with the art to which my invention relates.

*f* denotes a pipe extended from the aforesaid condenser to a small chamber, *g*, at the side of the fire-box A, with which said chamber communicates by perforations or ducts *i i*, as shown in the sectional view in Fig. 1 of the drawings. The gases conducted to the fire-box by the pipe *g* and ducts *i i* serve to sustain the fire in the fire-box. The fire-box and subjacent ash-pit *h* are both closed by doors *l l'*, the upper of which is provided with a suitable valve or damper, *n*, by which to admit the requisite amount of oxygen into the fire-box to promote combustion therein.

The base of the respective retorts I provide with a trap in the form of a diaphragm, *u*, hinged to the interior of the retort, some distance above the discharge-port *c* thereof, and preferably on the farther side from the front, so that when the retort is opened and the diaphragm dropped to allow the charcoal to escape through the discharge-port *c* the said diaphragm will lie close to the rear side of the spout or discharge-opening, as shown in Fig. 2 of the drawings, and thus allow the charcoal to freely escape from the retort. When the retort is closed and in operation, the diaphragm *u* is sustained in a horizontal position across the retort to support the wood above it. Such of the moisture which is expelled from the wood in the process of charring and not vaporized precipitates and passes through suitable openings or perforations in the diaphragm into the space underneath it, where it can be drawn off by a suitable outlet, *v*, and collected in a suitable receptacle by which to convey it to a distilling apparatus. Under the discharge-opening of the retort is a niche, N, formed in the masonry to admit the usual cooler, H, for the reception of the charcoal from the retort, said coolers being transported on suitable trucks, T, mounted on tracks L, extended from the interior of the niche outward a sufficient distance to allow two coolers to stand outside of the niche.

An elevated track, K, is arranged along the front of the apparatus, and on said track is mounted a sheave or carrier, M, from which depends an arm, P, provided with a hook on which to hang the cooler H. The loaded cooler is thereby carried in a suspended position to the place where the charcoal is to be deposited. An empty cooler having previously been brought by the aforesaid conveyance to the track L in front of the retort to be discharged,



said cooler is carried into the niche N by the truck T, to receive the succeeding delivery from the retort.

The whole apparatus is properly stayed by 5 timbers B B, placed against opposite sides thereof, and tie-rods extended across and through the timbers at different points in the height of the apparatus, and provided at their extremities with nuts in the usual manner.

10 Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of retorts fitted side to side, and provided in their adjacent sides with 15 ducts communicating with each other and with the source of heat, substantially as set forth.

2. The combination of two air-tight semi-cylindrical retorts joined at their straight or diametrical sides, and provided in the center 20 of their adjacent sides with coinciding longitudinal channels, substantially as described and shown.

3. In combination with two or more retorts and fire-arches for heating the same, combustion-chambers extended through the retorts, 25 flues connecting the combustion-chambers at

each end of the retorts, intermediate flues connecting the aforesaid flues, and dampers for controlling the communication between said flues, substantially as and for the purpose 30 set forth.

4. The combination of the retorts having the combustion-chamber extending through it, horizontal flues communicating at each end with the chimney and connected with the combustion-chambers, respectively, at the upper 35 and lower end of the retorts, vertical flues connecting the horizontal flues intermediately between the retorts, and dampers in the horizontal flues intermediately between the vertical 40 flues and the combustion-chambers at each side thereof, substantially as described and shown.

In testimony whereof I have hereunto signed my name and affixed my seal, in the presence of two attesting witnesses, at Syracuse, in the 45 county of Onondaga, in the State of New York, this 29th day of May, 1883.

CHAS. S. NELLIS. [L. S.]

Witnesses:

FREDERICK H. GIBBS,  
WM. C. RAYMOND.