

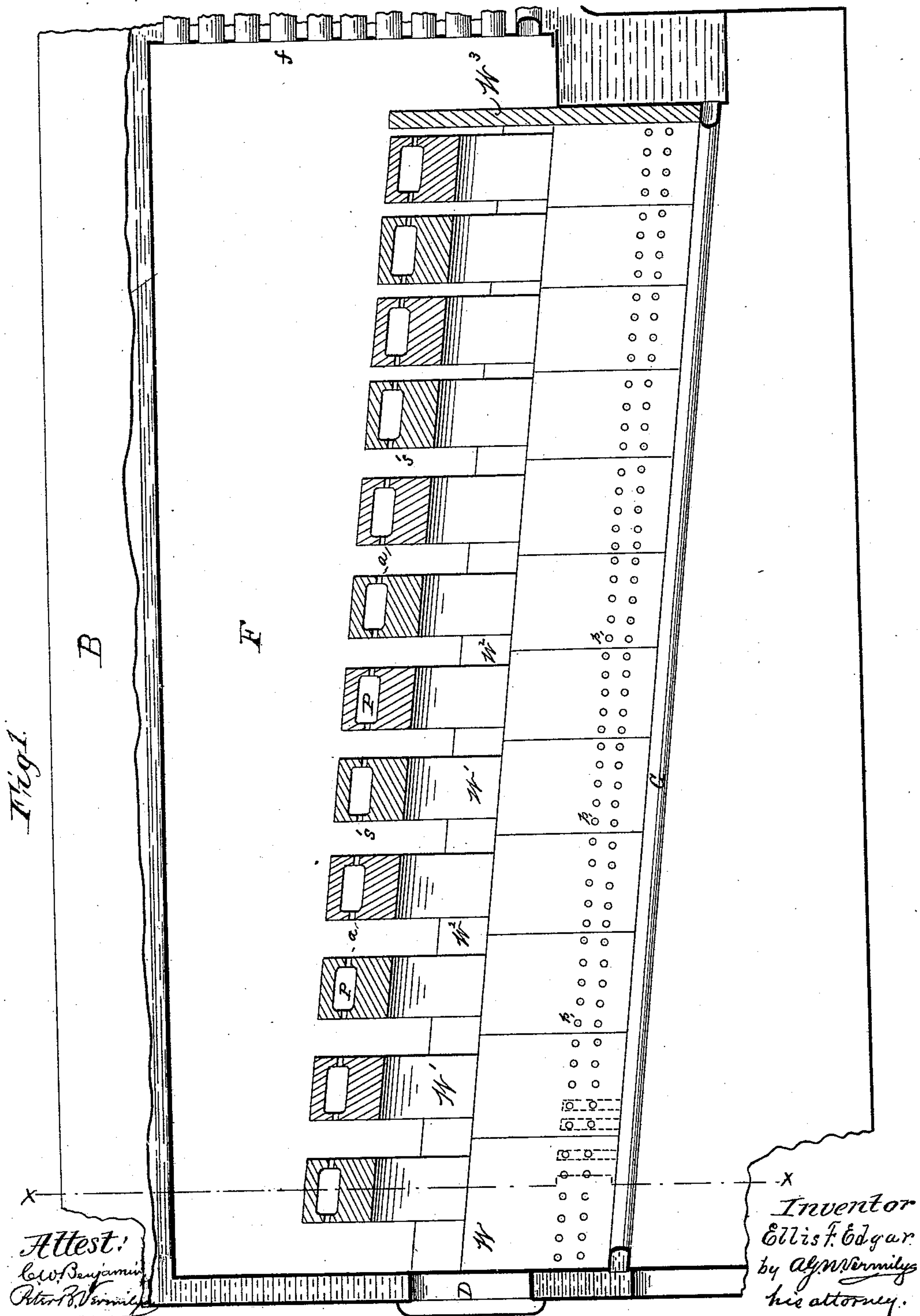
(No Model.)

2 Sheets—Sheet 1.

E. F. EDGAR.  
FURNACE.

No. 454,037.

Patented June 16, 1891.



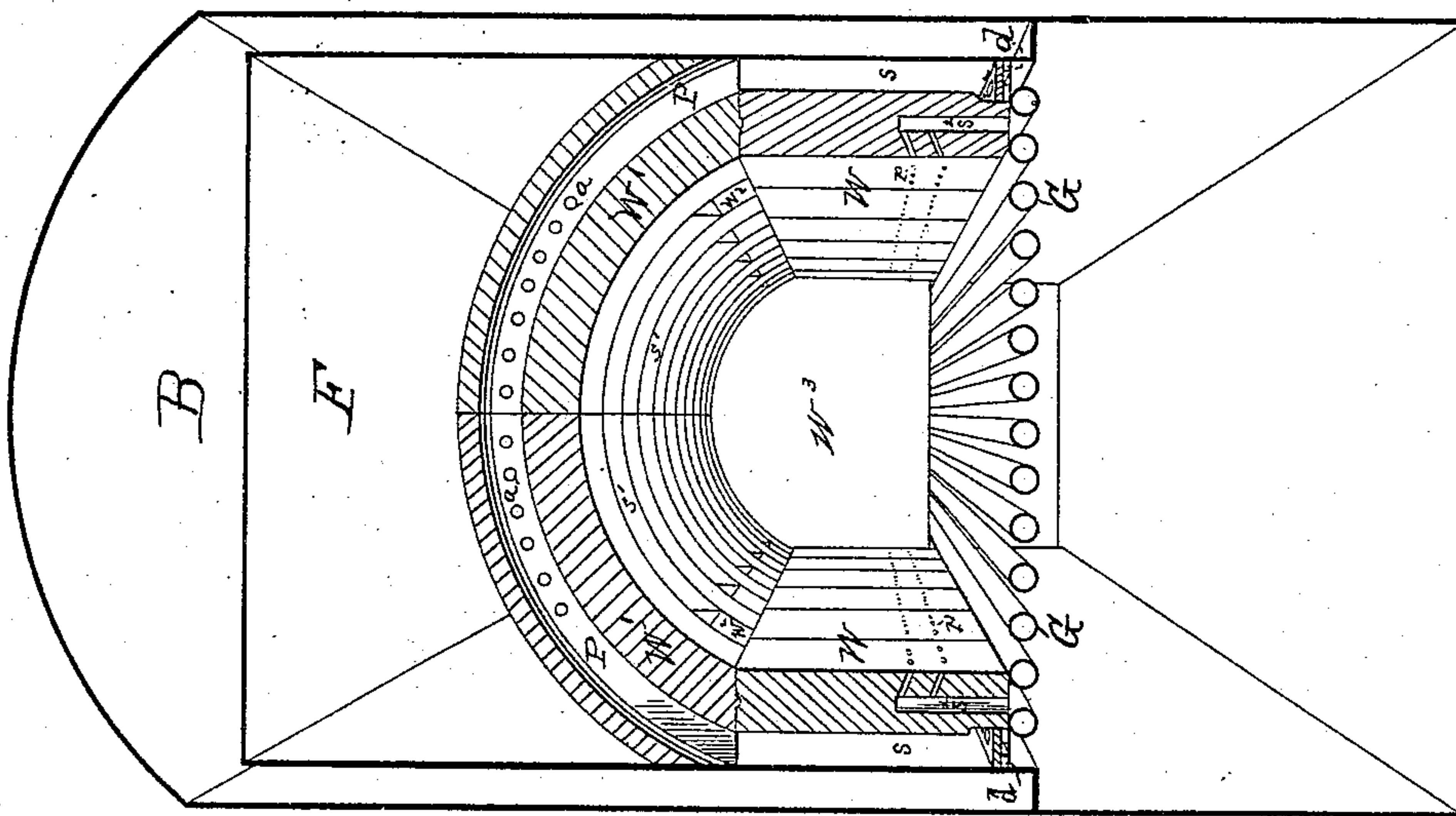
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2 Sheets—Sheet 2.

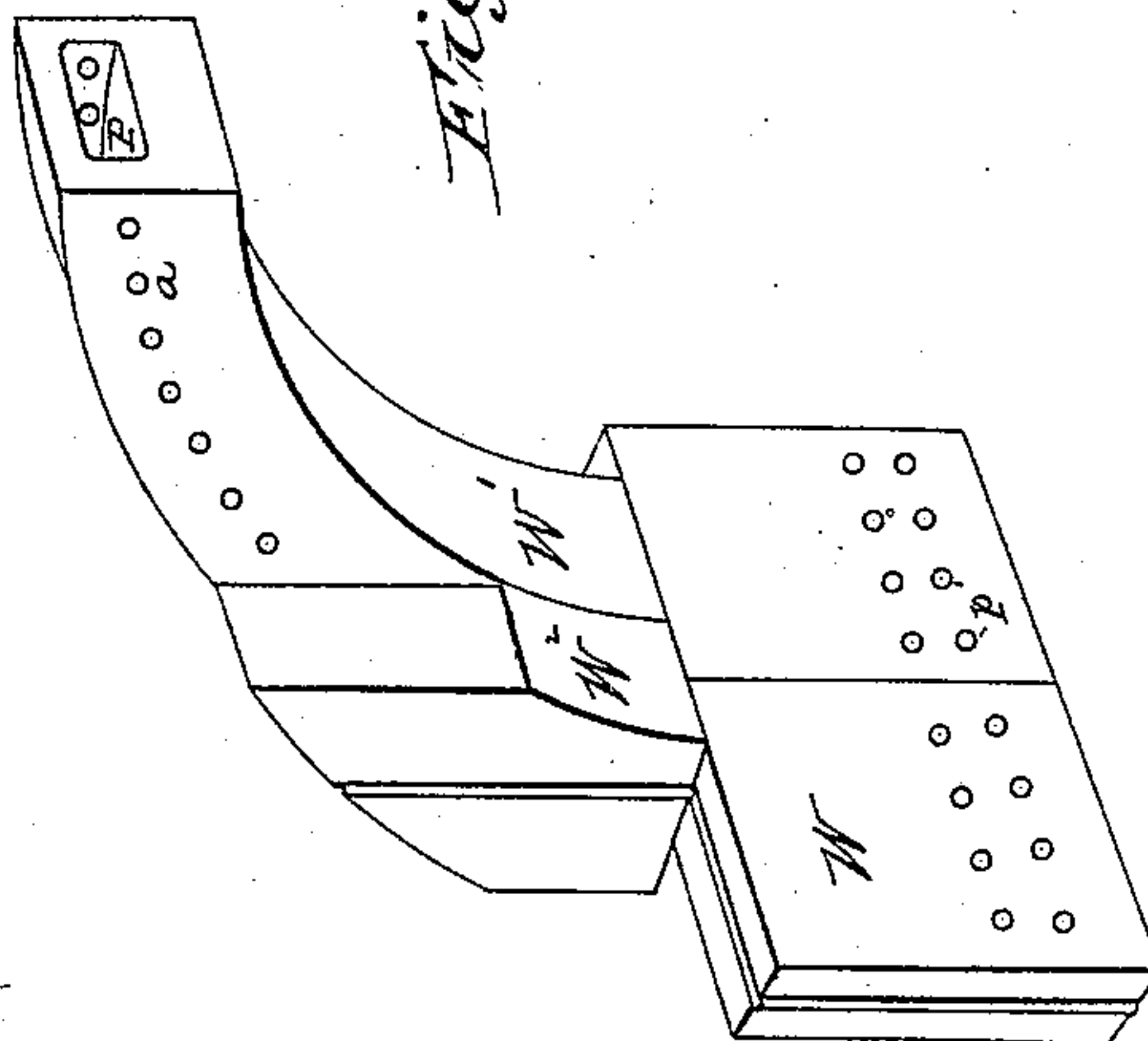
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*Fig. 2.*



*Fig. 3.*

*Attest:*  
*Geo. Benjamin*  
*Arthur D. Vermilyea*

*Inventor:*  
*Ellis F. Edgar*  
*by Arthur D. Vermilyea*  
*his atty.*



# UNITED STATES PATENT OFFICE.

ELLIS F. EDGAR, OF WOODBRIDGE, NEW JERSEY.

## FURNACE.

SPECIFICATION forming part of Letters Patent No. 454,037, dated June 16, 1891.

Application filed March 28, 1890. Renewed March 6, 1891. Serial No. 383,959. (No model.)

*To all whom it may concern:*

Be it known that I, ELLIS F. EDGAR, a citizen of the United States, and a resident of Woodbridge, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Furnaces, of which the following is a specification, reference being had to the accompanying drawings, forming a part of the same, in which—

Figure 1 is a vertical longitudinal sectional view of an apparatus embodying my invention. Fig. 2 is a vertical cross-sectional view of the same on line  $xx$ , Fig. 1, slightly perspective; and Fig. 3 is a detail view of certain parts of the attachments.

My object is to more nearly attain complete combustion, particularly in the type of furnaces embodied in locomotive-boilers. To this end I desire to introduce air at other points than through the grate or door to heat it before commingling it with the gases arising from the fire-bed, to do this without unfavorably checking the draft, and to also accomplish it in a manner that shall insure the proper working of the fire throughout the entire extent of the grate-surface, which objects are more difficult of attainment in this type of furnace than in many others, for the reason that more draft is thought to be necessary than in many other forms of apparatus.

At the sides of the furnace proper I place slabs or walls of fire-clay  $W$ , preferably leaving between them and the main walls a space  $s$  for the introduction of air. These walls  $W$  are tongued and grooved and extend upward, usually about fifteen inches, the grate being preferably set at an incline, as shown.

Upon walls  $W$ , I seat arch blocks or walls  $W'$  and  $W^2$ , the first hollow, as shown in Fig. 3, and of such form and size as to form a complete arch. They are usually about six and a half inches wide by seven inches through, and the flue or passage  $P$  within them is about three inches long by two wide. Their side walls are perforated, as shown, by apertures  $a$ , about five-eighths of an inch in diameter, and they are set at varying distances apart, gradually decreasing from about four inches at the front of the furnace (usually called the "rear" in a locomotive) to about one and a half inch at the rear, (usually

called the "front" in a locomotive,) their positions being preserved by the stay-blocks  $W^2$ , interposed between them and extending fully to the main wall of the furnace, but leaving open slots  $s'$  between  $W'$  about thirty inches long over the grate-surface, all being preferably tongued and grooved. In order that the fuel lying against the lower part of  $W$  may not clinker, I slot said blocks, as seen at  $s^2$ , and from those slots cut passages  $p$ , leading into the fire-space near the grate-level. A cross-wall  $W^3$  serves to deflect the draft-currents and cause them to pass through slots  $s'$ . At the lower end of walls  $W$  dampers  $d$  are placed to regulate the admission of air into  $s$ .

The operation is as follows: Fuel being placed upon the grate-bars  $G$  and fired, the gases generated and particles of unconsumed fuel rising therefrom are by the draft-currents carried through  $s'$ , causing additional air to be drawn in through  $s$ ,  $P$ , and  $a$ , which is thoroughly commingled with said gases by reason of its division by the number of slots and the multitude of the apertures  $a$ , of small diameter, through which it enters. Walls  $W'$  have meanwhile become very highly heated and of themselves ignite the combined gases and particles of fuel passing between them, the additional air here furnished greatly assisting a complete combustion, the result being that before the flues are passed the fuel has been completely utilized and all possible combustion accomplished. As the draft would naturally work the fire more toward the rear of the fire-box than the front, I have provided against this by increasing the width of slots  $s'$  toward said front.

Of course form and proportions may be varied to accommodate different furnaces without departing from the spirit of the invention set forth, which accomplishes better results, particularly in the combustion of bituminous coal than any to me hitherto shown.

What I claim, and desire to secure by Letters Patent, is—

1. The combination, with a furnace, of an inclosing wall with slots leading through said wall from the fire-space to the draft-space, which slots increase in capacity from the rear toward the front of the fire-space, and passages leading through said inclosing wall from without the fire-space and opening through nu-



merous apertures into said slots, substantially as set forth.

2. The combination, with a furnace, of an inclosing wall solid at the front and with slots leading through said wall from the fire-space to the draft-space, which slots increase in capacity from the rear toward the front of the fire-space, and passages leading through said inclosing wall from without the fire-space and opening through numerous apertures into said slots, substantially as set forth.

3. The combination, with a furnace, of an inclosing wall with slots leading through said wall from the fire-space to the draft-space, which slots increase in capacity from the rear toward the front of the fire-space, passages leading through said inclosing wall from without the fire-space and opening through numerous apertures into said slots, and a damper controlling the entrance to said passages, substantially as set forth.

4. The combination, with a furnace, of an inclosing wall with slots leading through said wall from the fire-space to the draft-space, which slots increase in capacity from the rear toward the front of the fire-space, passages leading through said inclosing wall from without the fire-space and opening through numerous apertures into said slots, and other passages leading from without said fire-space through numerous apertures near the grate-level into said fire-space, substantially as set forth.

5. The combination, with a furnace provided with a grate set on an incline from front to rear, of an inclosing wall also set on an incline from front to rear and with slots lead-

ing through said wall from the fire-space to the draft-space, which slots increase in capacity from the rear toward the front of the fire-space, and passages leading through said wall from without the fire-space and opening into said slots through numerous apertures, substantially as set forth.

6. The combination, with a furnace, as F, provided with grate-bars, as G, of an inclosing wall composed of side pieces, as W, arch-pieces, as W', intermediate pieces, as W<sup>2</sup>, and end pieces, as W<sup>3</sup>, said side pieces having a space behind them, as s, and provided with slots, as s<sup>2</sup>, and passages, as p, said intermediate pieces being of increasing width from rear to front of said inclosing wall, extending beyond pieces W to the main furnace-wall and interposed between the arch-pieces, as shown, whereby slots, as s', also varying in width, are formed between said arch-pieces, and said arch-pieces being provided with interior passages, as P, and apertures, as a, opening into said slots s', all combined to operate as and for the purpose set forth.

7. The combination, with a furnace, of an inclosing wall with openings leading through said wall from the fire-space to the draft-space, which said openings increase in capacity from the rear toward the front of the fire-space, all substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 27th day of March, A. D. 1890.

ELLIS F. EDGAR.

Witnesses:

PETER B. VERMILYA,  
A. G. N. VERMILYA.