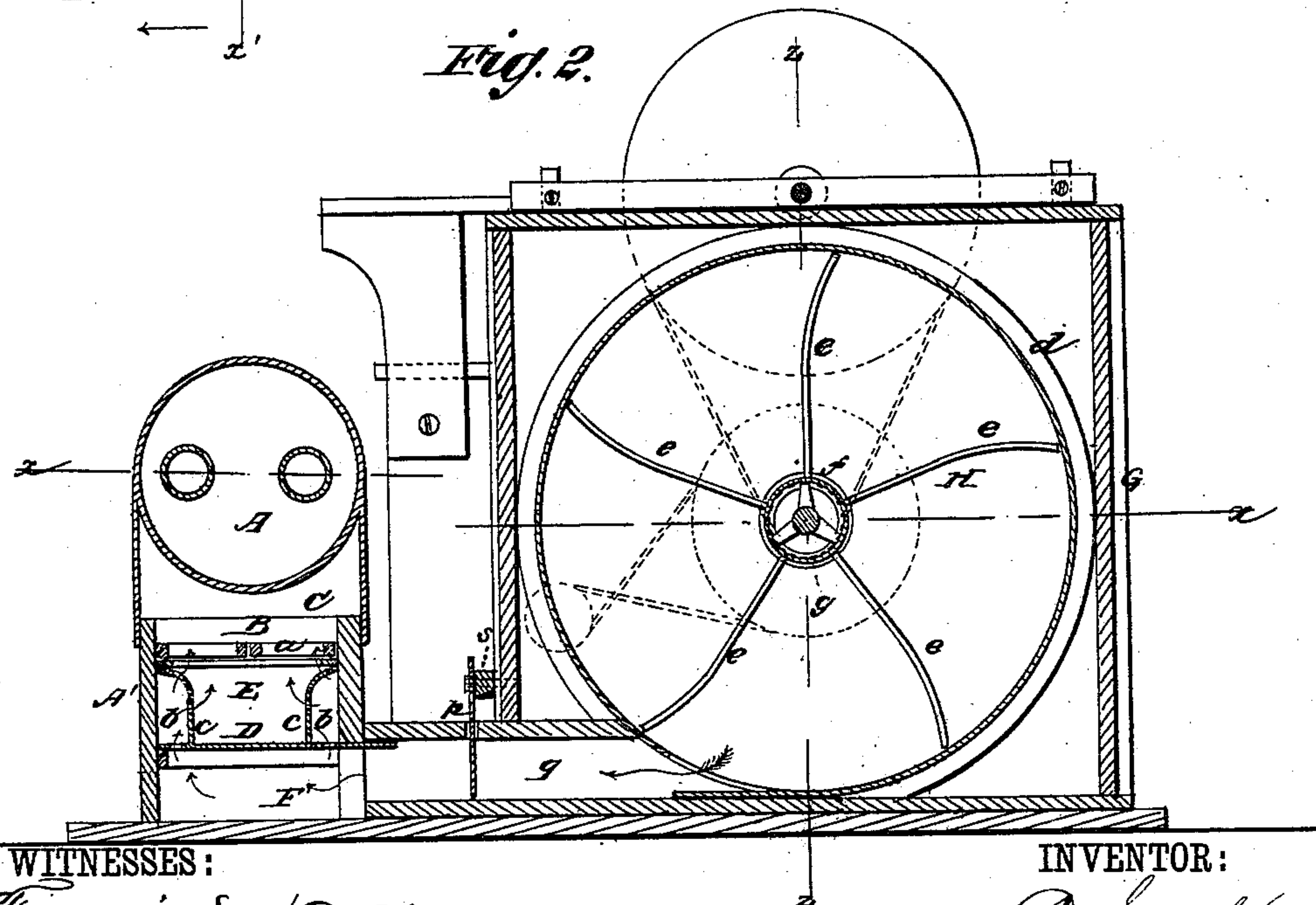
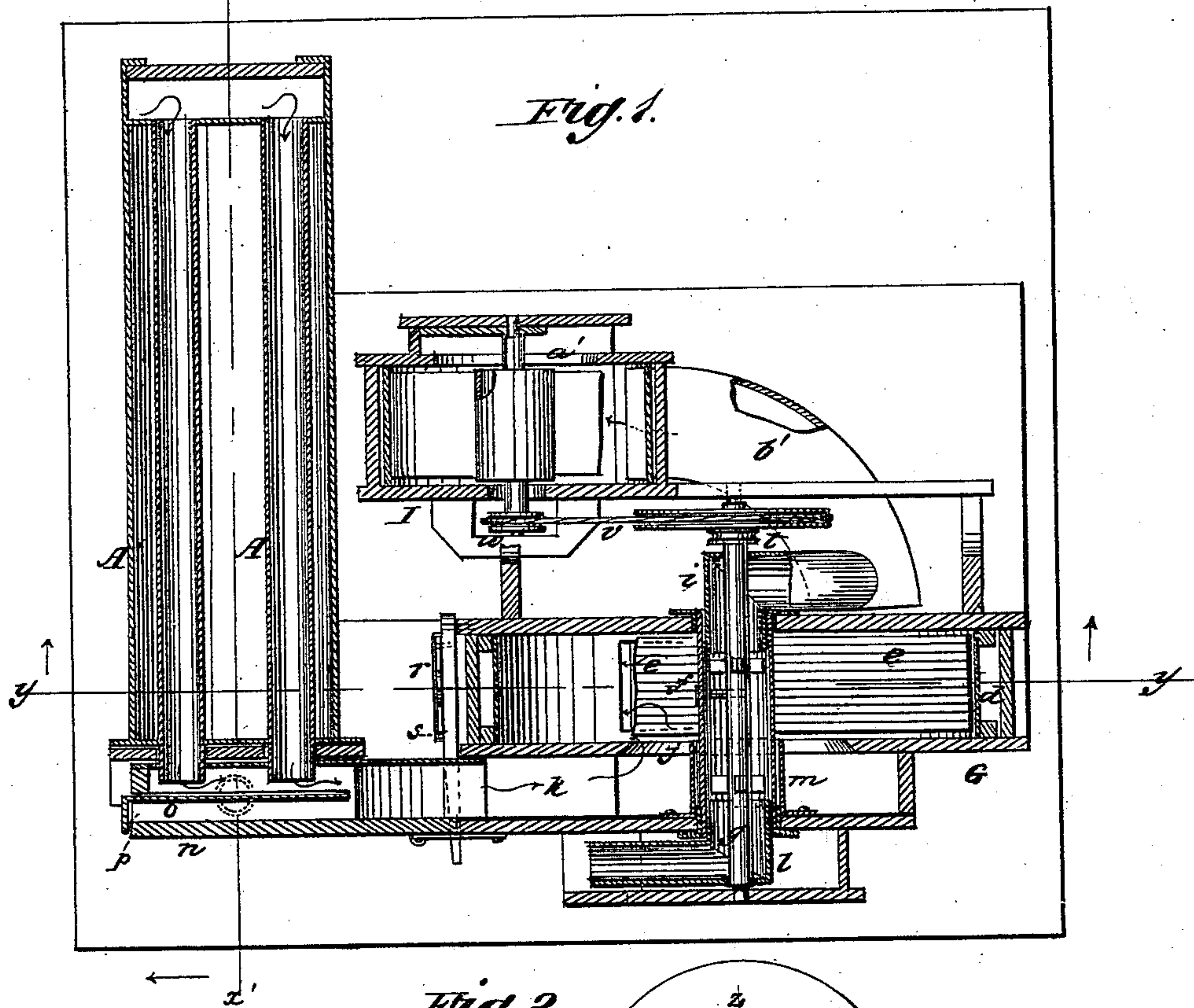


C. SMITH.  
Smoke-Consuming Furnaces for Boilers.  
No. 212,060. Patented Feb. 4, 1879



WITNESSES:

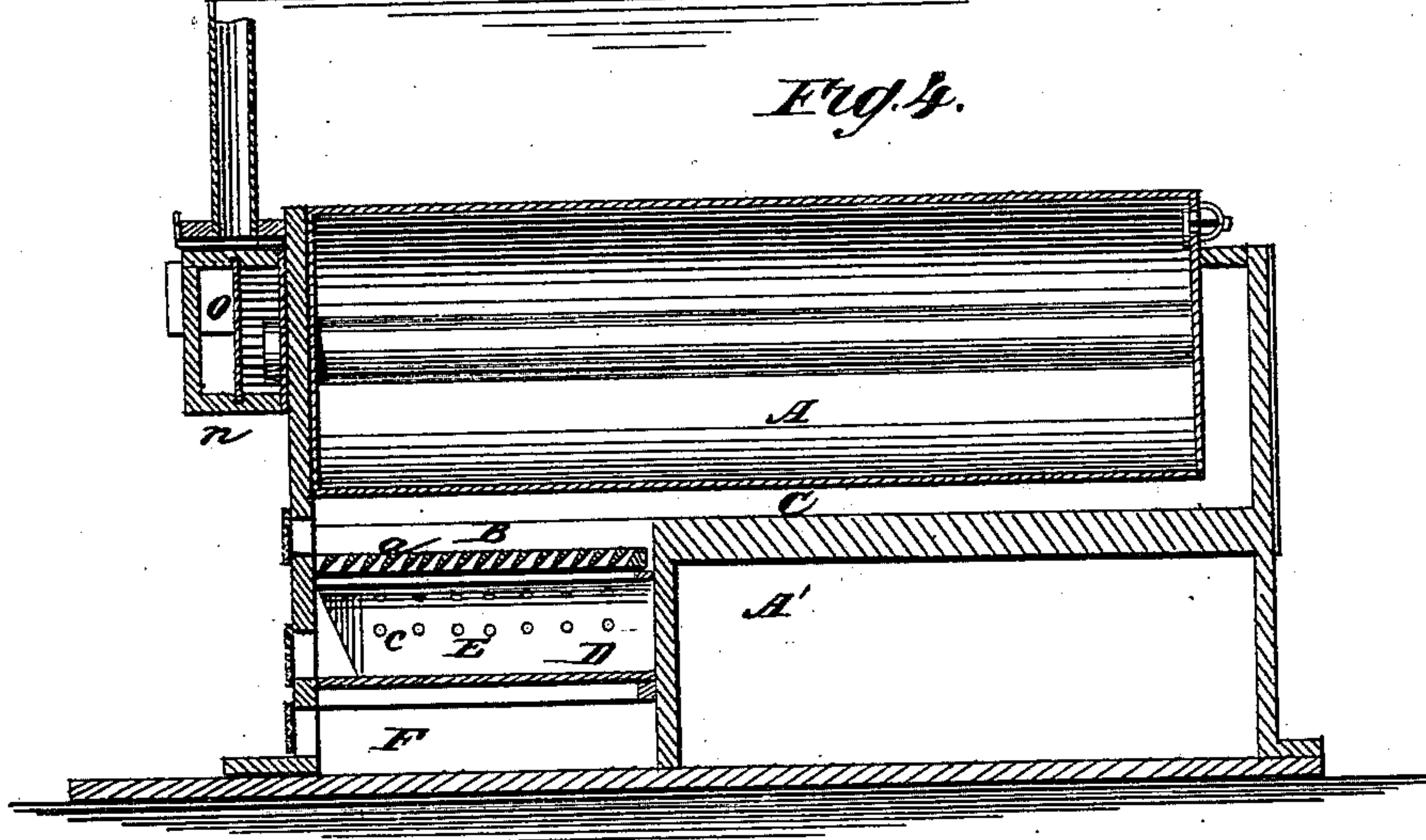
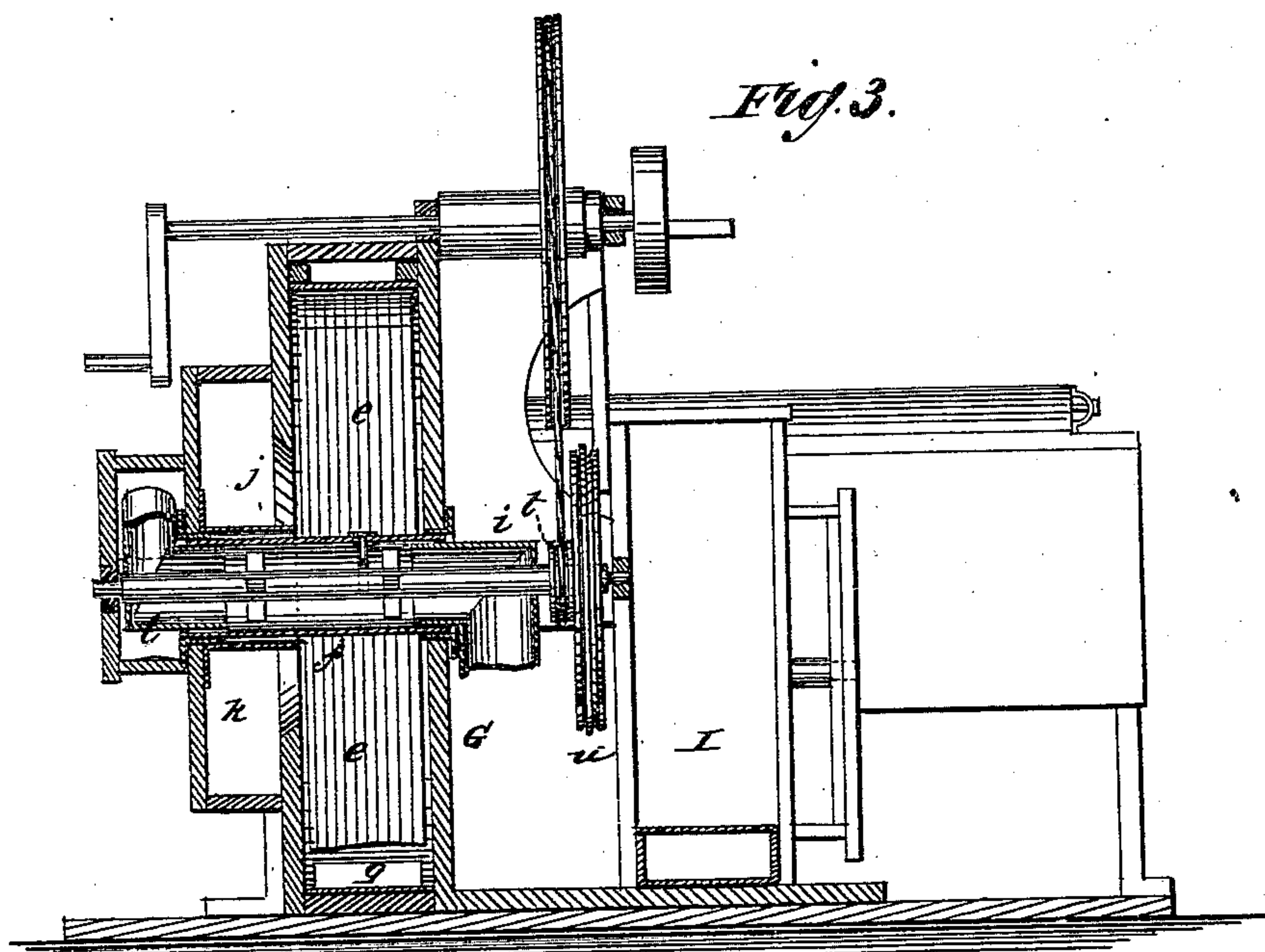
Francis McArdle.  
C. Sedgwick

INVENTOR:

C. Smith  
BY *Mumford*

ATTORNEYS.

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# UNITED STATES PATENT OFFICE.

CYRUS SMITH, OF IRWIN'S STATION, PENNSYLVANIA.

## IMPROVEMENT IN SMOKE-CONSUMING FURNACES FOR BOILERS.

Specification forming part of Letters Patent No. **212,060**, dated February 4, 1879; application filed June 18, 1878.

*To all whom it may concern:*

Be it known that I, CYRUS SMITH, of Irwin's Station, in the county of Westmoreland and State of Pennsylvania, have invented a new and Improved Smoke-Consuming Furnace for Boilers, of which the following is a specification:

Figure 1 is a horizontal section taken on line *x x* in Fig. 2. Fig. 2 is a vertical section taken on line *y y* in Fig. 1. Fig. 3 is a vertical section taken on line *z z* in Fig. 2. Fig. 4 is a longitudinal section of the boiler and furnace, taken on line *x' x'* in Fig. 1.

Similar letters of reference indicate corresponding parts.

The object of my invention is to provide a furnace for boilers which is capable of consuming the gas and smoke evolved from the burning fuel, so as to utilize all of the fuel and the heat generated therefrom.

The invention consists in a boiler-furnace of peculiar construction, and in the combination therewith of an exhaust-fan for drawing away the gas and smoke from the boiler-flues and returning the same to the fire.

In the drawings, A is the boiler, and A' the boiler-furnace, having the fire-place B and flue C leading to the rear end of the boiler. The fire-place contains the grates *a*, which are arranged transversely, and their upper edges are inclined toward the bridge-wall to facilitate the draft. Below the grate there is a plate, D, which separates the ash-pit E from the air-chamber F. At the sides of the ash-pit air-passages *b* are formed between the side walls of the furnace and the inner metallic partitions, *c*. In the upper surface of these partitions there are perforations, and the passages *b* communicate with the air-chamber F through holes in the plate D.

At the side of the boiler is placed a fan-casing, G, containing the fan H. The fan-casing consists of a square box having a circular sheet-metal lining, *d*. The fan H is composed of five or more vanes, *e*, having their outer ends slightly curved in the direction in which the fan revolves. These vanes are secured to a sleeve, *f*, that is supported by a shaft, *g*, by means of spiders attached to the shaft. This sleeve passes through one side of the fan-casing to receive the elbow *i*, and at the opposite

side of the casing it projects through the induction-opening *j* of the fan-casing and through the gas and smoke conduit *k* to receive the elbow *l*. A short sleeve, *m*, projects inward from the outer wall of the conduit *k* and surrounds the sleeve *f*. The conduit *k* communicates with the smoke-box *n* of the boiler. The smoke-box *n* is provided with an adjustable slide, *o*, that divides it vertically, and is bent over at its outer end to cover a cold-air opening, *p*. This slide prevents the admixture of the cold with the heated air and gas until after they pass the front of the boiler. In this way the air becomes heated before becoming mixed with the gas.

A trunk, *q*, leads from the discharge-opening of the fan H to the air-chamber F under the grate, and is provided with a sliding cut-off, *r*, which is operated by the lever *s*.

The fan-shaft *g* is journaled in boxes outside of the elbows *i l*, and is provided with a pulley, *t*, by which it receives power from any suitable motor. It is also provided with a wheel, *u*, which imparts motion, through a belt, *v*, to a wheel, *w*, on the shaft of the fan-blower I. This blower is smaller than the fan, and is designed solely for keeping the journals of the fan H cool. This fan-blower has a supply-opening, *a'*, in one of its sides, and is provided with a discharge-pipe, *b'*, which communicates with the elbow *i*.

The two fans may be driven by a small independent steam-engine, or they may be driven by hand or other power until steam is raised in the boiler, when it may be driven by the engine that receives steam from the boiler.

If desired, steam may first be raised by allowing the products of combustion to pass up the smoke-stack by the natural draft. After the fire is once thoroughly in operation then close the smoke-stack by the cut-off F at the base of the smoke-stack. The products of combustion are drawn from the boiler-flues and delivered to the fire with the admixture of a greater or less quantity of air, as may be required. In this manner the heat that has heretofore passed up the smoke-stack is utilized, and the gas and particles of carbon that are unconsumed as they pass from the fire are utilized as a source of heat.

Having thus described my invention, I claim

as new and desire to secure by Letters Patent—

1. The slide *o*, in combination with the smoke-box *n* for covering the air-opening *p* and separating the air from the gas until the air is heated, substantially as herein shown and described.

2. The fan *H*, having the sleeve *f*, and the fan *I*, in combination, substantially as herein shown and described.

3. The combination of the fan *H*, the conduit *k*, and trunk *q*, having the gate *r*, with a

boiler-furnace having an air-chamber, *F*, and divided smoke-box *n*, as herein shown and described.

4. The combination, with fan *H*, of the perforated plate *D*, ash-pit having air-passages *b* at the sides, and the air-chamber *F*, as and for the purpose specified.

CYRUS SMITH.

Witnesses:

J. I. MARCHAND,  
N. MARCHAND.