

L. STEVENS.
Furnaces for Steam-Boilers.
No. 156,955. Patented

Patented Nov. 17, 1874.

Fig. 1.

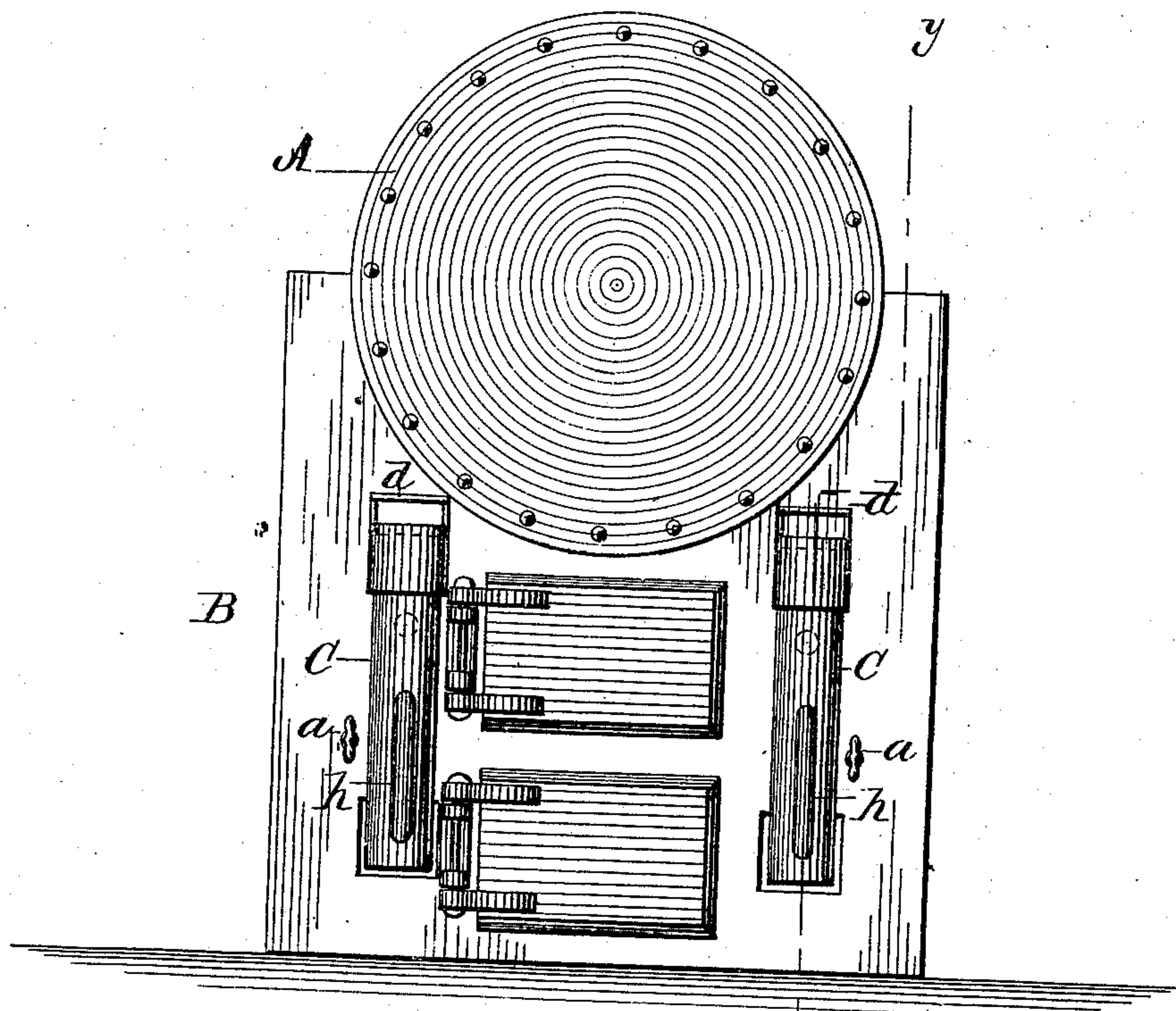
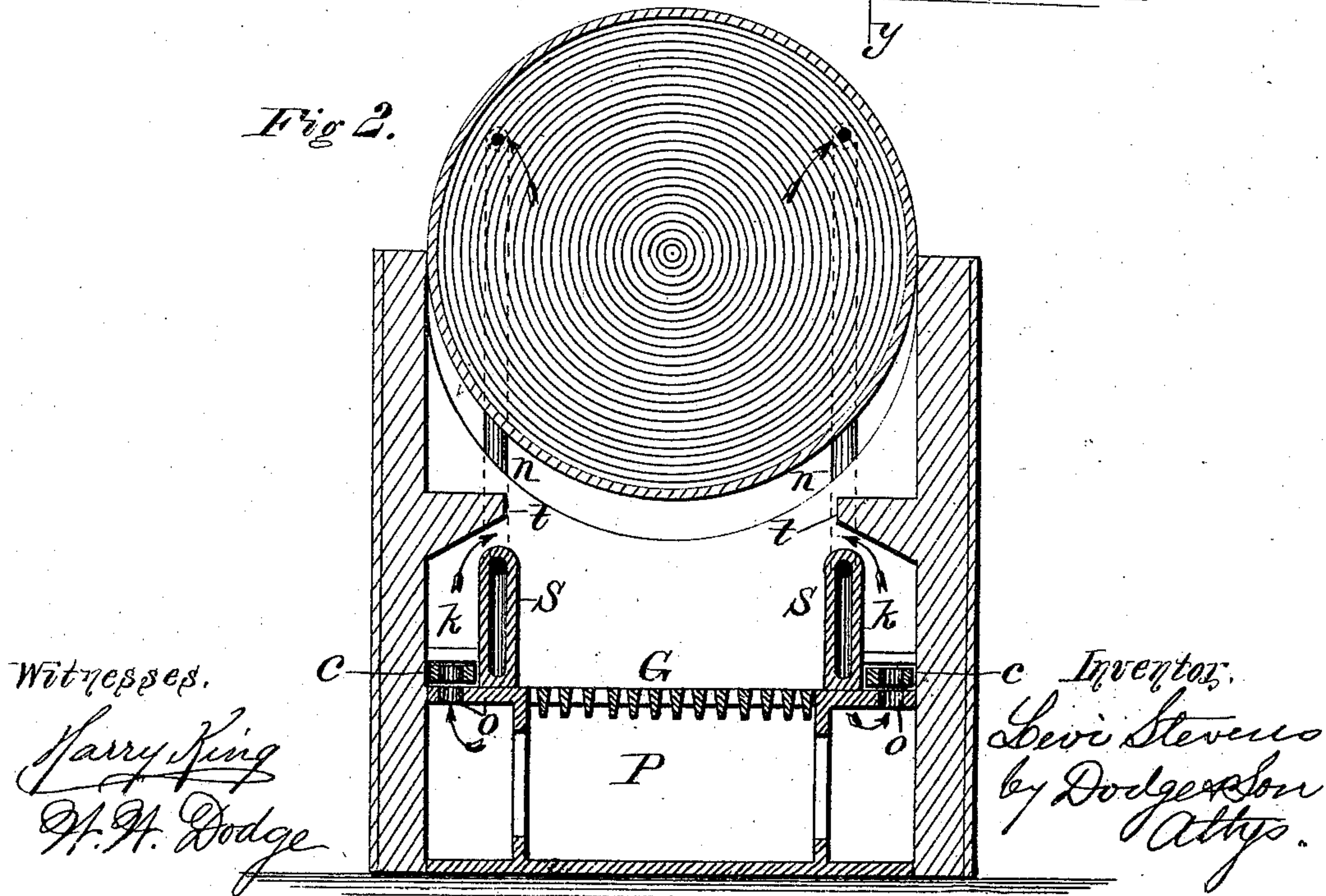


Fig 2.



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Fig 3.

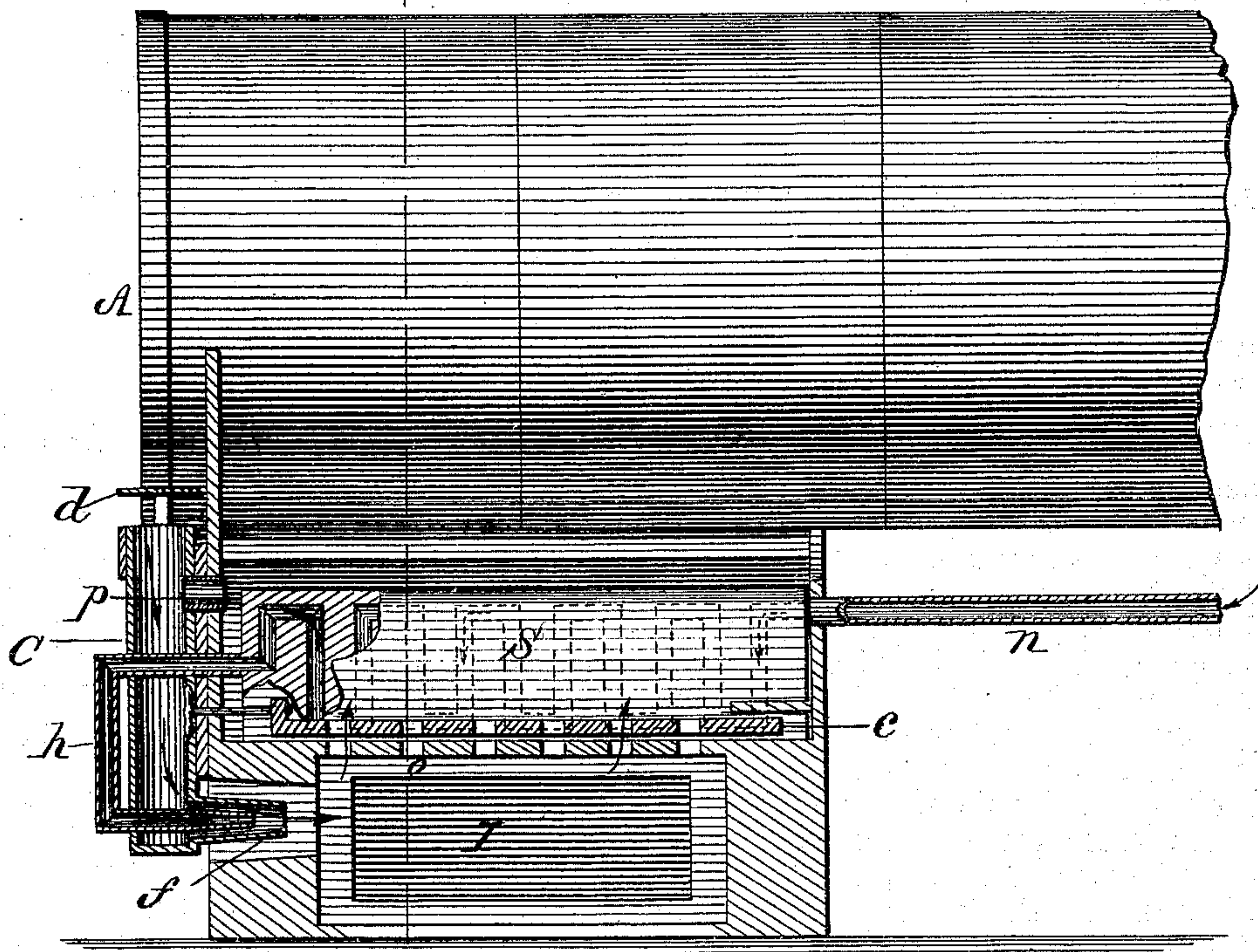
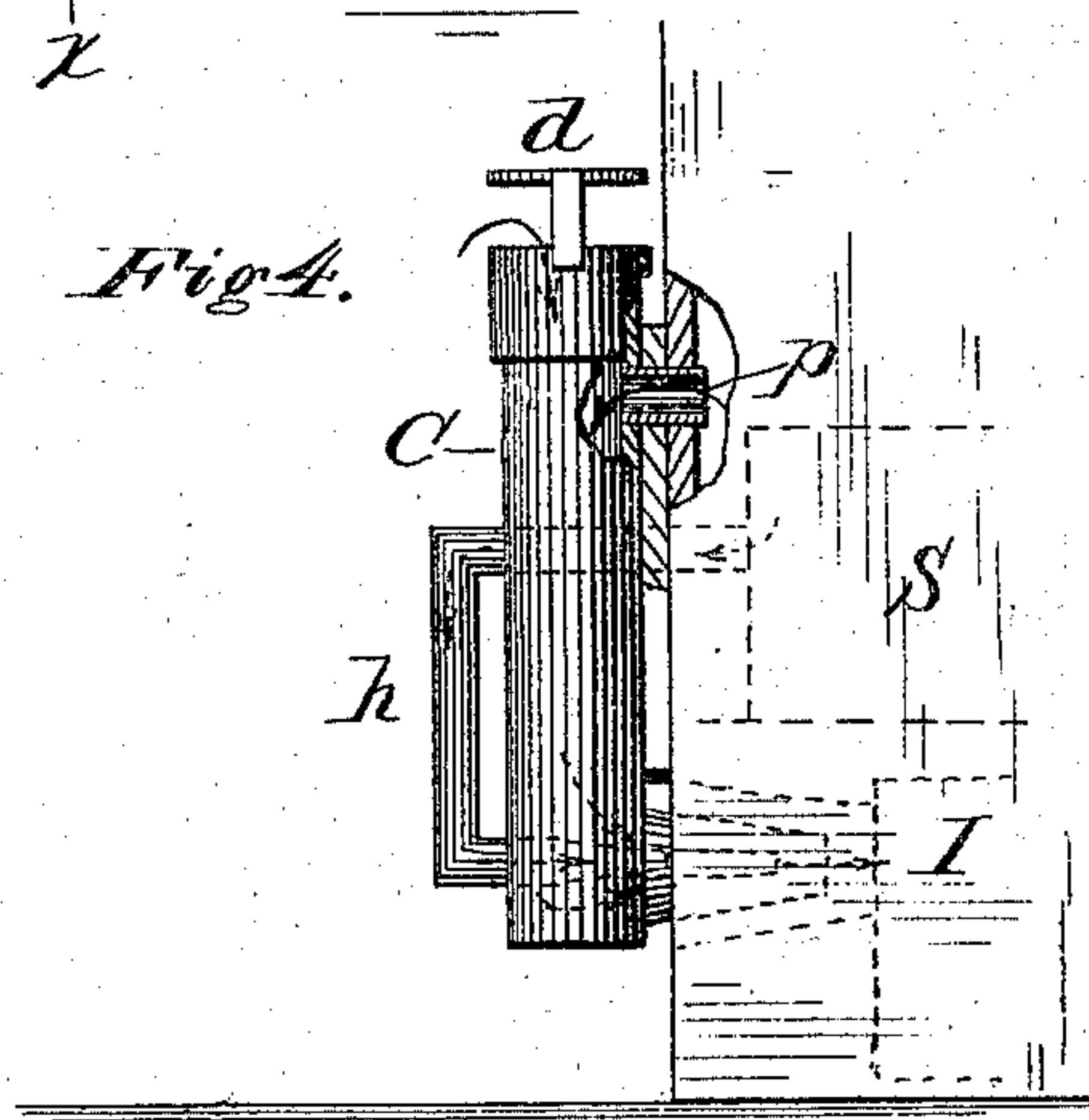


Fig 4.



Witnesses.

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UNITED STATES PATENT OFFICE.

LEVI STEVENS, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN FURNACES FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **156,955**, dated November 17, 1874; application filed October 28, 1873.

To all whom it may concern:

Be it known that I, LEVI STEVENS, of Washington, in the county of Washington and District of Columbia, have invented certain Improvements in Furnaces for Steam-Boilers, &c., of which the following is a specification:

My present invention relates to an improvement in furnaces for carrying out a process or method heretofore invented by me for utilizing fuel, and for which method I filed an application for a patent July 15, 1873; and it consists in a novel construction and arrangement of the furnace, with superheaters, chambers, valves, tubes, &c., for mixing and feeding to the fire the gases generated in the furnace with air and steam, for the purpose of more effectually utilizing the fuel and its products, as hereinafter more fully explained.

Figure 1 is a front elevation of my improved apparatus. Fig. 2 is a transverse section of the same on the line *x x* of Fig. 3. Fig. 3 is a longitudinal section on the line *y y* of Fig. 1. Fig. 4 is a view of a portion shown in detail.

This invention is intended for the same purpose as that for which I have heretofore filed an application for a patent; and this may properly be termed an improvement thereon.

In constructing my present apparatus, I arrange the boiler *A* and the grate *G* in the usual manner, *B* representing the brick-work supporting the same. The fire-chamber I make wider than the grate, and locate a superheater, *S*, at each side, in such a manner as to leave a narrow chamber or passage, *k*, at each side between the superheater and the walls, as shown in Fig. 2, these chambers having a perforated bottom, *o*, with a slide or damper, *c*, arranged to open or close the holes therein at pleasure, the handle *a* of the slides *c* extending out through the front wall, as shown in Figs. 1 and 3. Above the superheaters *S* a projecting ledge or plate, *t*, is arranged, as shown in Fig. 2, to deflect the inflowing gases and throw them directly over or onto the burning fuel on the grate. At the front, and outside of the wall, I locate, at each side of the grate, a vertical tube, *C*, the upper end of which is provided with a sliding valve, *d*, or with any equivalent valve or damper, for regulating the amount of air admitted to said tube. From this tube *C* I extend a pipe or tube, *p*, through

the wall, with its open end terminating in the shoulder *k*, as shown in Fig. 3, so as to take gases from said chamber into the tube *C*. I have represented the tube *p* as terminating at the front end of the chamber *k*; but it may be extended the whole length thereof, or any portion of it, as may be desired, in which case it will be provided with openings all along for the gases to enter. At their lower ends the tubes *C* are provided with nozzles *f*, which enter through openings in the front wall, directly under the perforated bottoms *o* of the chambers *k*, as shown in Fig. 3. A pipe connects the boiler with the rear end of the superheater on each side, and from their front ends the steam is conveyed by a pipe, *h*, which passes through the tube *C*, and has its end terminating in a nozzle arranged concentrically within the nozzle *f*, as shown in Fig. 3. It is, however, obvious that the pipe *h*, instead of extending through and outside of the tube *C*, may extend down inside thereof, or be arranged in any other way, so that its end delivers the superheated steam through the nozzle *f*, so as to create a strong draft within the tube *C*, and thereby draw air through its upper end, and also draw the gases from within the furnace through the pipe *p*, and then deliver them, all mingled together, through the nozzle *f* into the furnace. The superheaters *S*, in this as in my former case, consist of a cast-iron plate, having a zigzag passage extending through it from end to end, as shown in Fig. 3; and being arranged as represented in Fig. 2, it is not only subjected to a high heat, but at the same time serves to form the inner wall of the chamber *k*.

The apparatus, being thus constructed, operates as follows: Fuel being applied in the usual manner and the fire kindled, the holes *o* are closed by shoving in the slides *c* until the fire is well started, after which they are opened, the steam being admitted through the pipe *h* into the nozzle *f*. This causes a strong draft through the tubes *C*, which draws the gases thrown off by the burning fuel within the fire-chamber, through the pipes *p*, into the tubes *C*, where they are mingled with the air that is drawn in at the top of said tubes *C*, and both are injected together, with the superheated steam from the pipe *h*, into the spaces under-

neath the chambers *k*, from whence they pass up through the openings *o* into said chambers *k* in contact with the superheaters, by which they are heated still more, and then pass over the top of the superheaters, being deflected and heated by the ledges or projections *t*, and are then thrown directly over or upon the burning fuel, where they act to produce a most perfect combustion of the smoke and gases, and create an intense heat. When the slides *c* are shoved in so as to prevent the gases from passing up through the chambers *k*, they will pass into the ash-pit *P*, and thence up through the grate *G* to the fire, thus supplying the necessary draft, and also the requisite amount of oxygen to support combustion.

It will be observed that the openings through which the nozzles *f* enter are larger than the nozzles, so that air is also drawn in through said openings more or less; and I propose to provide these openings also with registers or dampers, by which they can be opened or closed at pleasure, and thus, by these, together with the valves *d* in the tubes *C*, I am enabled to regulate at will the exact amount of air admitted to the furnace. By these means I am enabled to produce so nearly a perfect

combustion of the fuel and its products that there is no perceptible escape of smoke or gas from the furnace; and the fuel and its products are so effectually utilized that the same amount of steam can be generated with a much less amount of fuel than has heretofore been practicable.

Although this invention is particularly adapted to coal furnaces, it is obvious that it may be used with other fuel, and that it is applicable to other purposes as well as to the generation of steam.

Having thus described my invention, what I claim is—

1. The tube *C*, provided with a valve, *d*, and connected with the fire-chamber by the tube *p* and nozzle *f*, in combination with the steam-pipe *h* and chamber *k*, having a ledge, *t*, and perforated bottom *o*, regulated by a damper, *c*, substantially as described, and for the purposes set forth.

2. The arrangement of a gas-chamber, *k*, at the side of the grate, as described.

LEVI STEVENS.

Witnesses:

J. MCKENNEY,

WM. A. MCKENNEY.