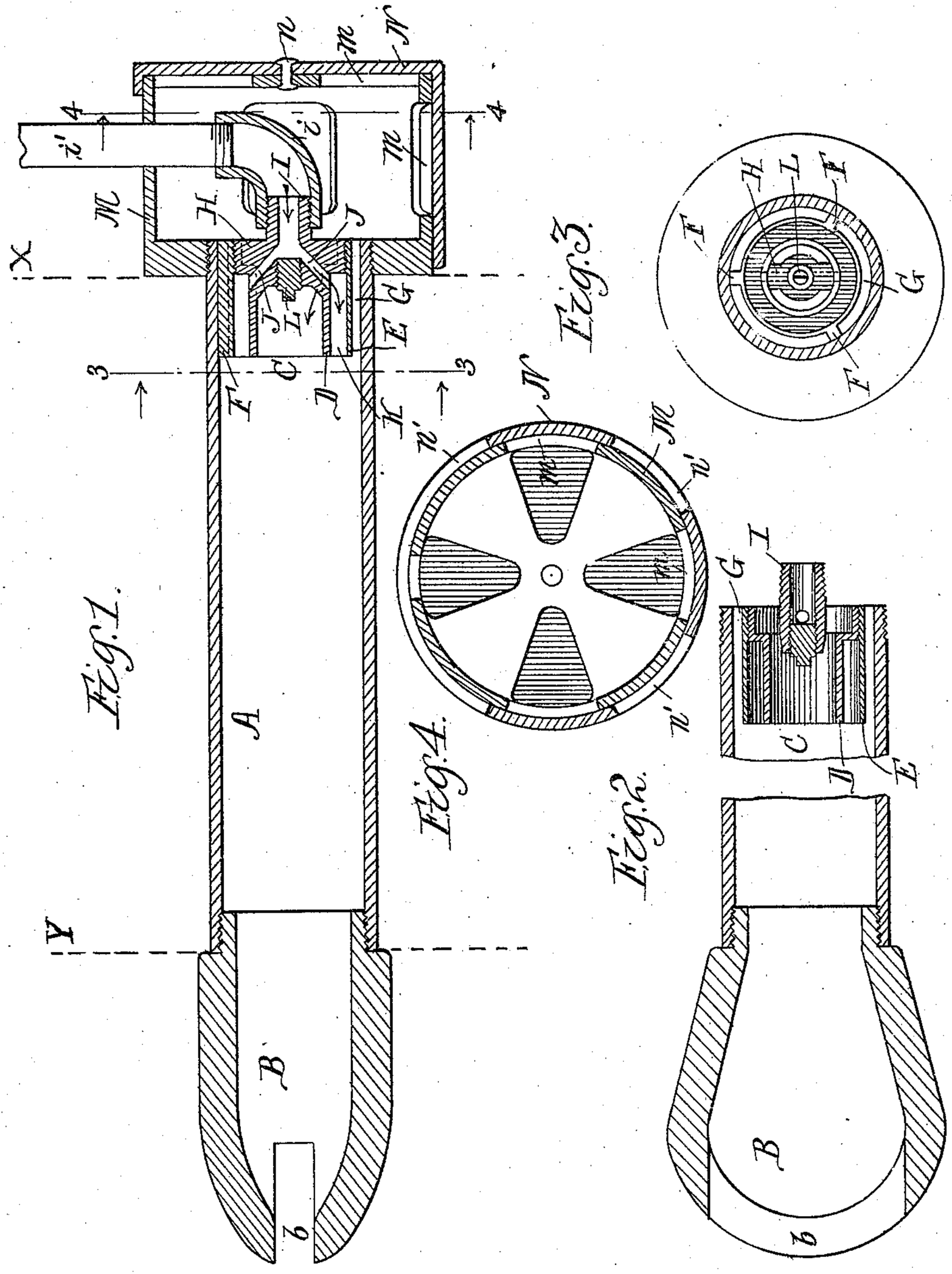
(No Model.)

C. C. BRUCKNER.

SMOKE CONSUMER.

No. 575,873. Patented Jan. 26, 1897.



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UNITED STATES PATENT OFFICE.

CHARLES C. BRUCKNER, OF CHICAGO, ILLINOIS.

SMOKE-CONSUMER.

SPECIFICATION forming part of Letters Patent No. 575,873, dated January 26, 1897.

Application filed June 20, 1896. Serial No. 596,243. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. BRUCKNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Smoke-Consumers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to certain new and useful improvements in smoke-consumers; and its primary object is to effect a thorough mixing and intermingling of air and steam, which, after being superheated, is discharged into the fire-chamber, thereby supplying heated oxygen and effecting a complete combustion.

Another object of the invention is to introduce the steam to the mixing-tube of the smoke-consumer in the form of a cylindrical body surrounded by an induced volume of air and also having a body of air within said cylindrical body of steam; and a further object of the invention is to introduce air and steam in proportionate quantities, whereby the mixing is effected in a thorough and desirable manner.

With these and other ends in view the invention consists in the construction, combination, and arrangement of parts hereinafter described, and shown in the accompanying drawings, in which—

Figure 1 is a vertical sectional view of my improved smoke-consumer. Fig. 2 is a horizontal sectional view with the cap and steam-pipe removed. Fig. 3 is a transverse sectional view on the line 3 3 of Fig. 1, and Fig. 4 is a sectional view on the line 4 4 of Fig. 1.

Referring particularly to the drawings, in which like letters of reference denote corresponding parts in all the figures, X and Y designate, respectively, the outer and inner faces of the front wall of a furnace, my improved smoke-consumer being located in the front wall and preferably above the grate-door of the furnace, so that the superheated mixture of air and steam may be discharged from the nozzle of the smoke-consumer into the combustion-chamber of the furnace at the most desirable point to supply sufficient oxygen and hydrogen to effect a perfect combustion.

The mixing-tube A is of suitable size and preferably long enough to extend through the front wall of the furnace, being provided on its inner end with a superheating-nozzle B, having an opening *b* therein designed and adapted to distribute the mingled steam and air over a comparatively wide area. A steam-nozzle C is secured in the front end of the mixing-tube, and it consists of an inner tube D and an outer tube E, said tubes being preferably cylindrical in form. Ribs F are arranged on the outer tube E, so that said tube and the entire steam-nozzle will fit snugly in the end of the mixing-tube and provide a space G around the steam-nozzle and between the ribs for the entrance of air.

A bridge H extends entirely across one end of the inner tube D and supports the outer tube E, which is screwed thereon, said bridge being provided with a hollow extension I to receive the elbow *i* of a steam-pipe *i'*, which connects with the boiler or other generator. The bridge is provided with downwardly-extending ports J, which lead from the hollow extension I to the space K between the inner and outer tubes D E. A plug L closes the inner end of the extension I, and the ports J are so located and arranged that the plug may be adjusted to vary and control the amount of steam admitted from the steam-pipe to the mixing-tube. A cap M, provided with openings *m*, is secured on the outer end of the mixing-tube, and it is adapted to form a protection for the steam-nozzle, said cap being removable from the mixing-tube, so that the steam-nozzle can be withdrawn from the said tube at any time for the purpose of cleaning or repairing any of its parts. A damper-plate N is pivotally secured to the cap M by a pin *n*, and it is provided with openings *n'* on its top and sides adapted to register with similar openings *m* in the cap. This damper-plate may be adjusted so as to open or close the openings in the cap, and thereby increase or decrease the draft of air.

In the operation of my improved smoke-consumer steam is admitted through the steam-pipe into the hollow extension I, and it passes through the ports in the bridge to the space K between the inner and outer tube. Any number of ports may be provided; but I have found that two ports, located on opposite sides of the nozzle, will discharge steam into the cylindrical space between the inner and outer tubes D E, which steam is immediately di-

rected upon the cylindrical tubes which form the walls of said space and is discharged from the nozzle in the form of a cylindrical body or volume of steam, which preserves its shape until it has reached that point in the mixing-tube where the mixing with the air will be most effectually accomplished, which depends in a large measure upon the proportion of air and steam in the tube. While the steam is being introduced in the manner just described, a current of air will enter the mixing-tube around the steam-nozzle in the space formed between the outer tube E of said nozzle and the mixing-tube, said current of air being in the form of a cylindrical body which surrounds the cylindrical volume of steam until the mixing of air and steam has caused said cylindrical bodies to lose their shape and integrity. Another current of air also enters the mixing-tube with the outer current of air and the volume of steam; but this latter current of air enters through the inner tube D and fills the space within the cylindrical volume or body of steam. It will thus be observed that the cylindrical body of steam incloses a current or body of hot air, and is itself surrounded by a current or body of air after it enters the steam-nozzle and is discharged into the mixing-tube. These bodies of air within and without the cylindrical body of steam will mix and mingle with the steam as it passes through the mixing-tube and form a mixture with the most desirable proportions of parts. The mixed steam and air passes into the superheating-nozzle and is discharged therefrom into the combustion-chamber. The damper-plate is adjusted, as occasion requires, for the purpose of regulating the amount of air admitted to the tube.

I am aware that it is not new to promote the combustion in furnaces by the introduction of steam and air through the front wall of a furnace, but my invention relates particularly to the manner of introducing the air and gas and mixing the same and the means employed for this purpose.

By my construction and arrangement of parts a thorough mixing of the air and steam in the most desirable proportions is accomplished, which thereby promotes the efficiency of the consumer and produces superior results.

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

1. In a smoke-consumer, the combination with a mixing-tube, a superheating-nozzle on one end of said tube, of a steam-nozzle in the other end of said tube, comprising an outer tube arranged in the mixing-tube to provide a space between said tube and the mixing-tube, an inner tube leaving a space between itself and the outer tube, a bridge-wall provided with a hollow extension and ports leading from said hollow extension to the space between the inner and outer tubes, and a steam-pipe communicating with said extension, substantially as described.

2. In a smoke-consumer, the combination with a mixing-tube, having a superheating-nozzle on one end thereof, of a steam-nozzle adapted to be arranged in the other end of said mixing-tube, and comprising a bridge-wall having a hollow extension, an inner tube and an outer tube connected to said bridge-wall, and having a space between them, ports leading from the hollow extension to said space between the tubes, a steam-pipe communicating with said hollow extension, and ribs on the outer side of the outer tube adapted to fit snugly within the end of the mixing-tube, and thereby provide a space between the outer tube and the mixing-tube, substantially as described.

3. In a smoke-consumer, the combination with a mixing-tube, having a superheating-nozzle on one end thereof, of a steam-nozzle secured in the other end of said tube, and consisting of an outer tube, the ribs on said outer tube adapted to fit between said tube and the mixing-tube, thereby providing a space between said tubes, an inner tube arranged within the outer tube and providing space between said inner and outer tubes, a bridge-wall, a hollow extension on said bridge-wall, ports in the bridge-wall leading from the hollow extension and opening in the space between the inner and outer tubes and on opposite sides of the nozzle, a steam-pipe communicating with said hollow extension, a plug closing the inner end of said extension, and adapted to be adjusted to control the amount of steam passing into the ports, and a perforated cap removably secured on the outer end of said mixing-tube, substantially as described.

4. In a smoke-consumer, the combination with a mixing-tube, a superheating-nozzle on one end of said tube, a steam-nozzle fitted in the other end of the tube and comprising an outer tube, an inner tube, a bridge-wall having a hollow extension and ports leading from said extension to a space between the tubes, a steam-pipe communicating with said extension, of a cap, arranged on the tube and over the steam-nozzle and provided with openings therein and a damper-plate pivotally secured on the cap and provided with openings to register with the openings in the cap, substantially as described.

5. In a smoke-consumer, the combination with a mixing-tube, a superheating-nozzle on one end thereof, of a steam-nozzle in the other end of the tube provided with a hollow extension, an elbow secured on the extension, a steam-pipe on the elbow, a cap provided with top and side openings and secured to the tube, and a damper-plate pivotally secured on the cap and provided with openings to register with the openings in the cap, substantially as described.

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