

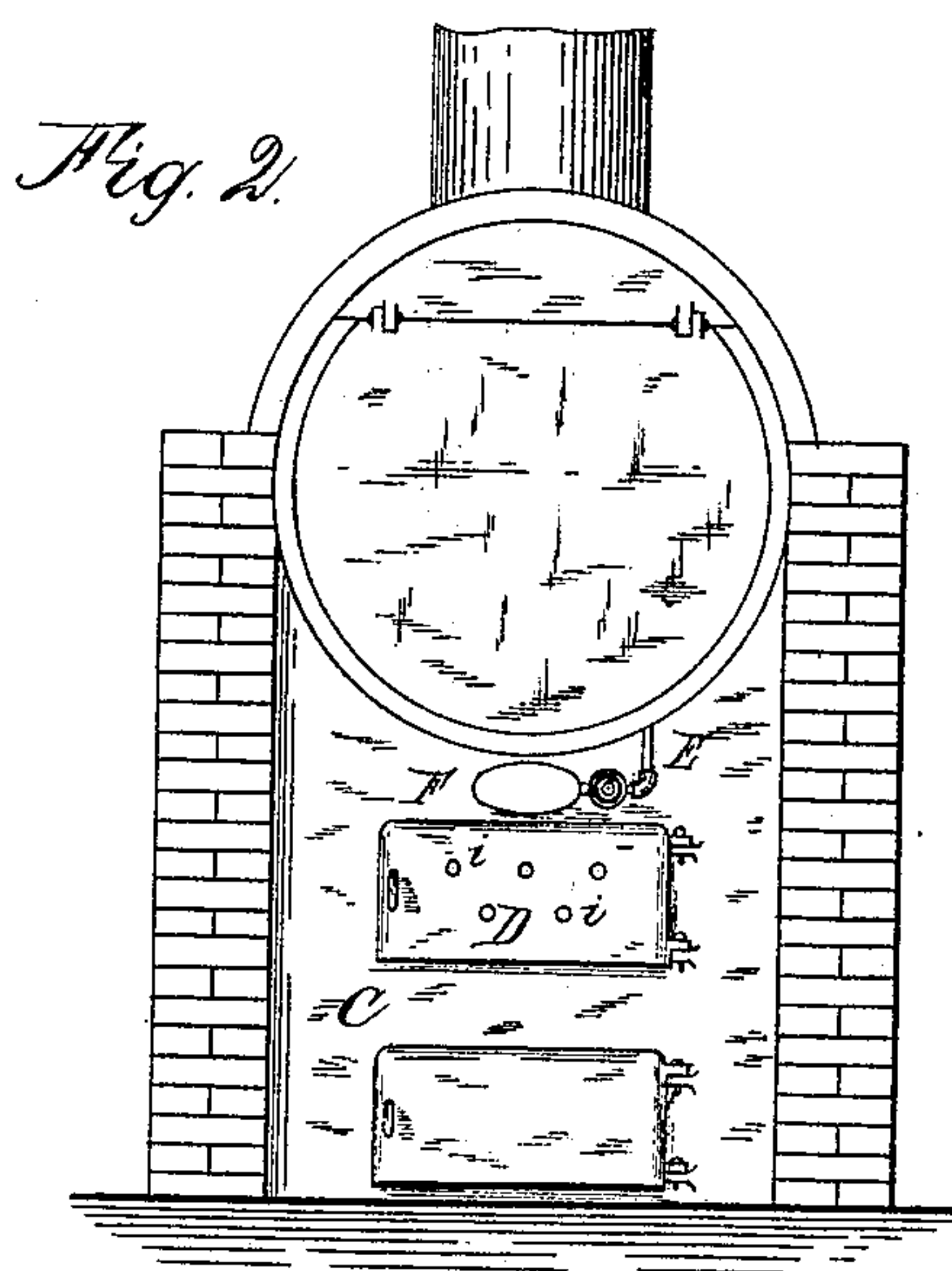
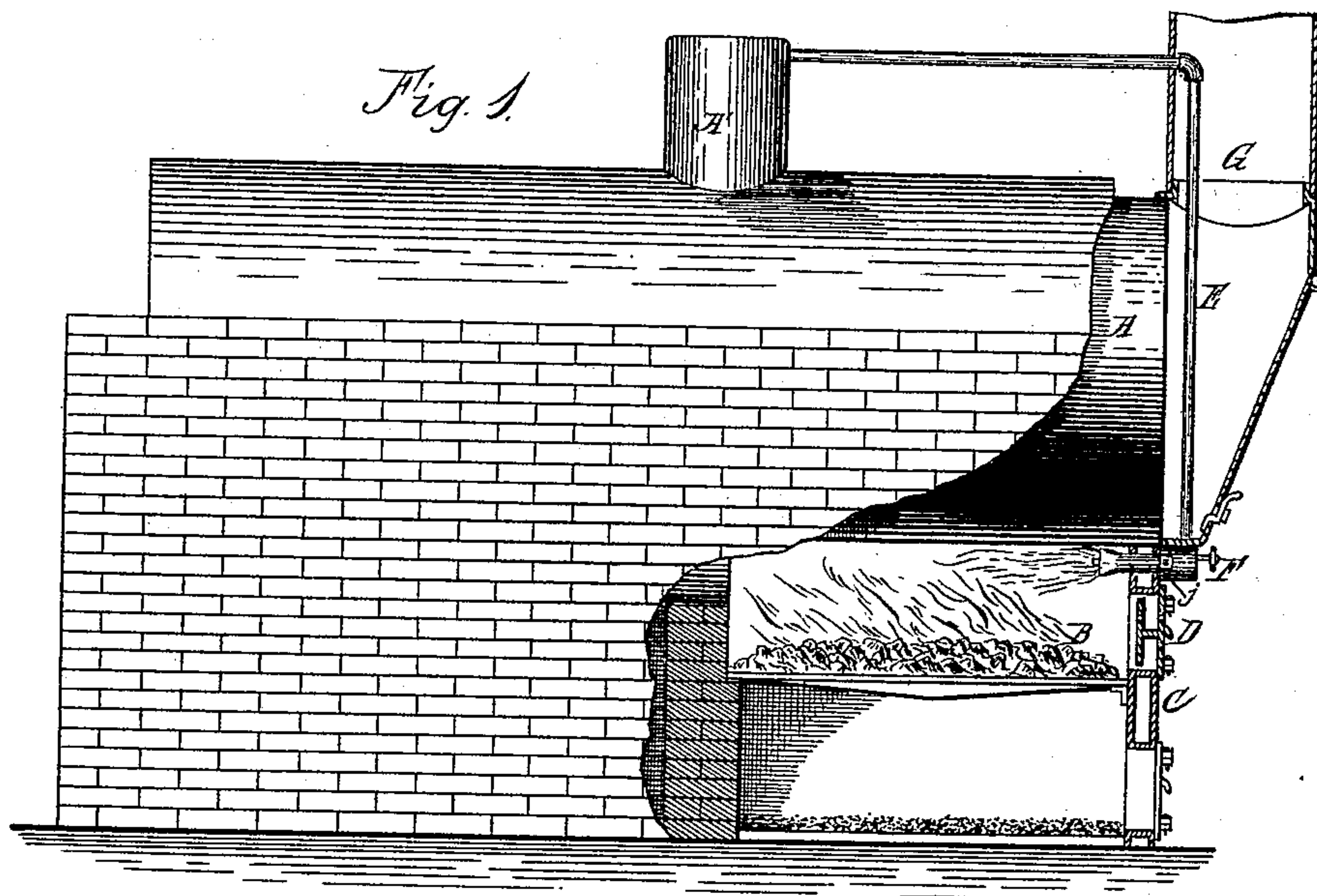
(No Model.)

2 Sheets—Sheet 1.

G. F. TINKHAM.
SMOKE CONSUMER.

No. 390,193.

Patented Sept. 25, 1888.



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Lawyer, Clerk

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(No Model.)

2 Sheets—Sheet 2.

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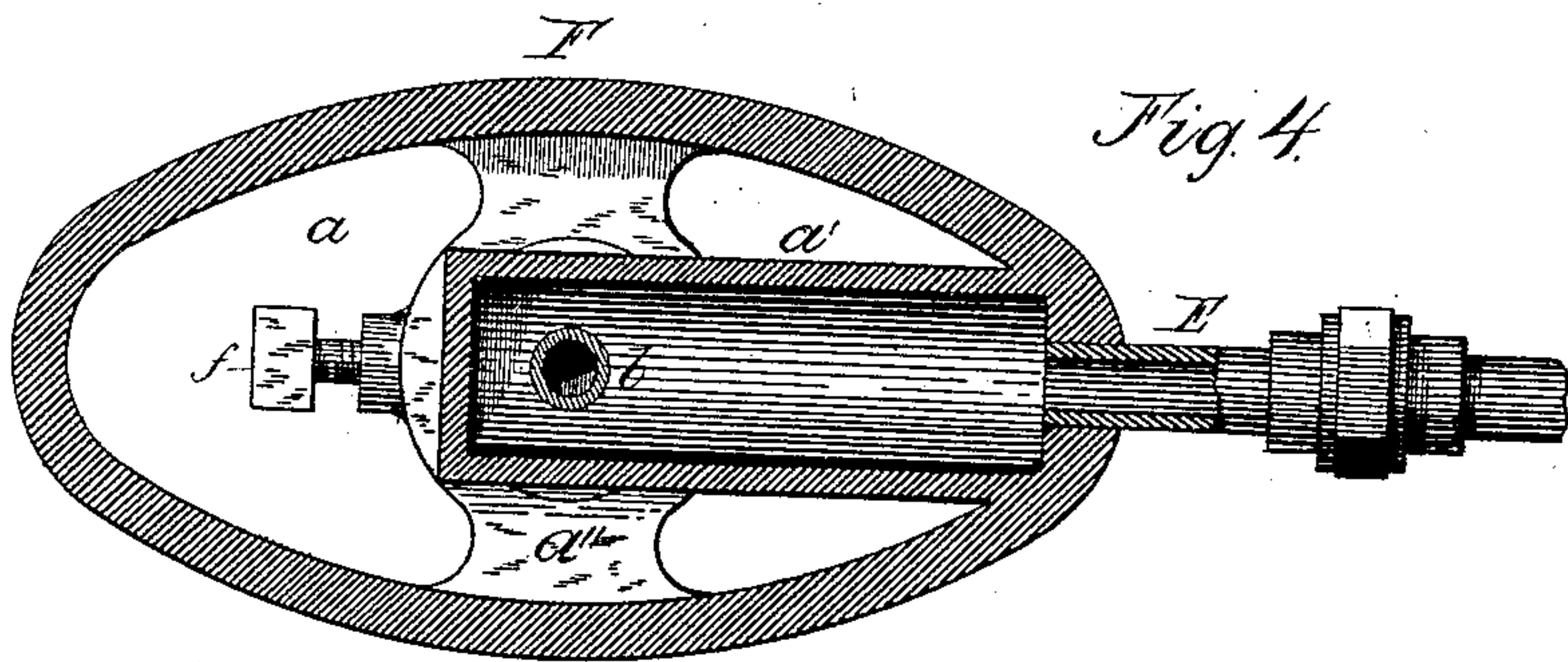
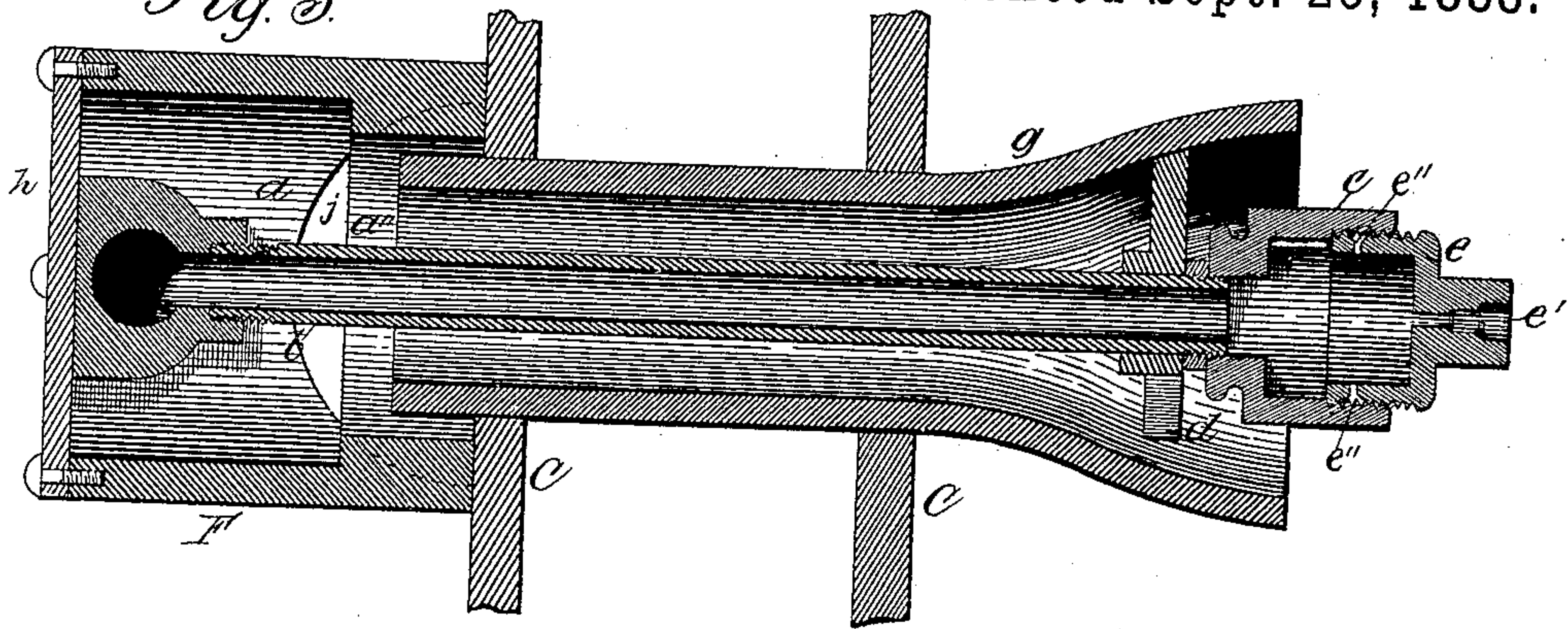


Fig. 5.

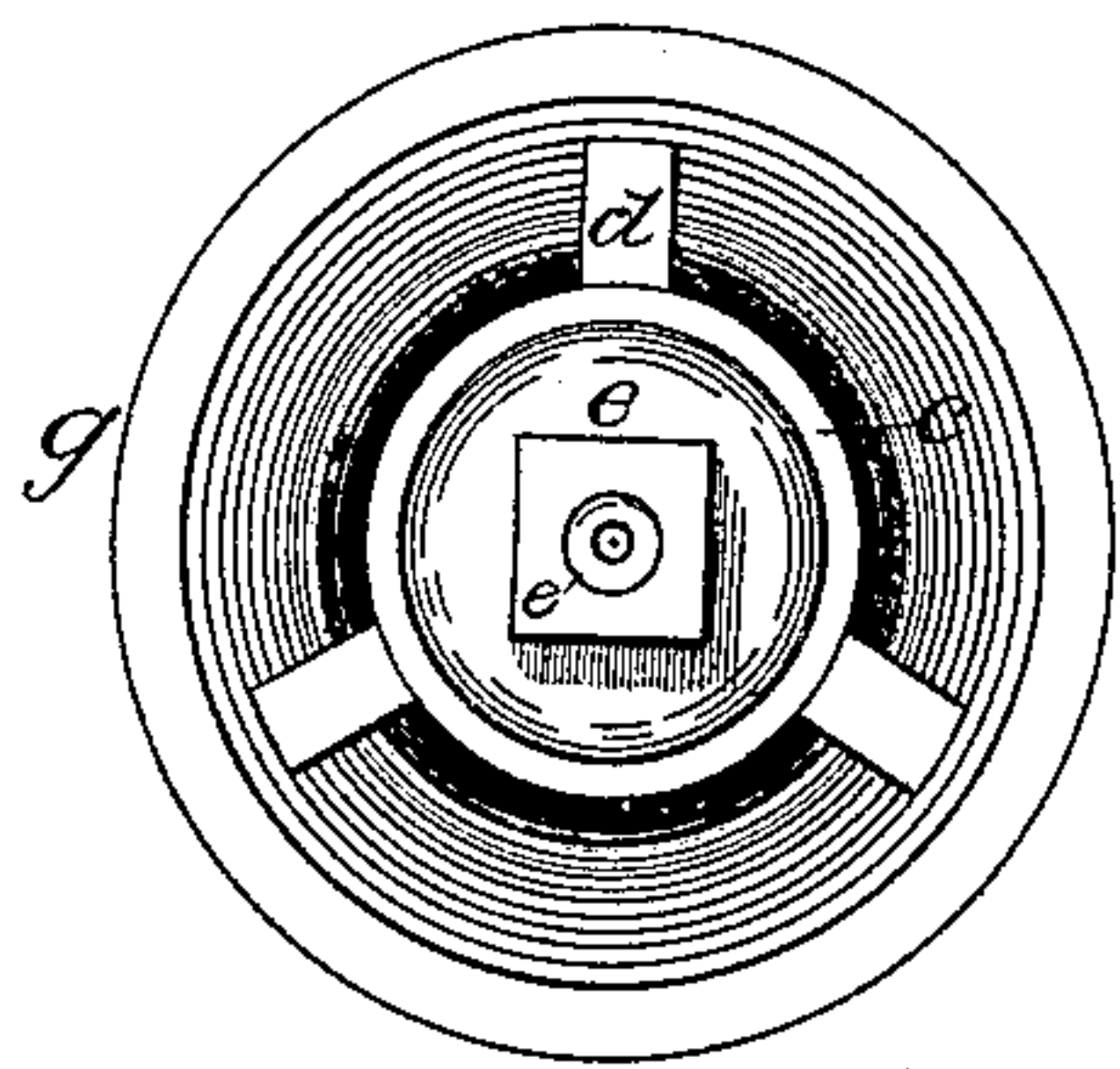
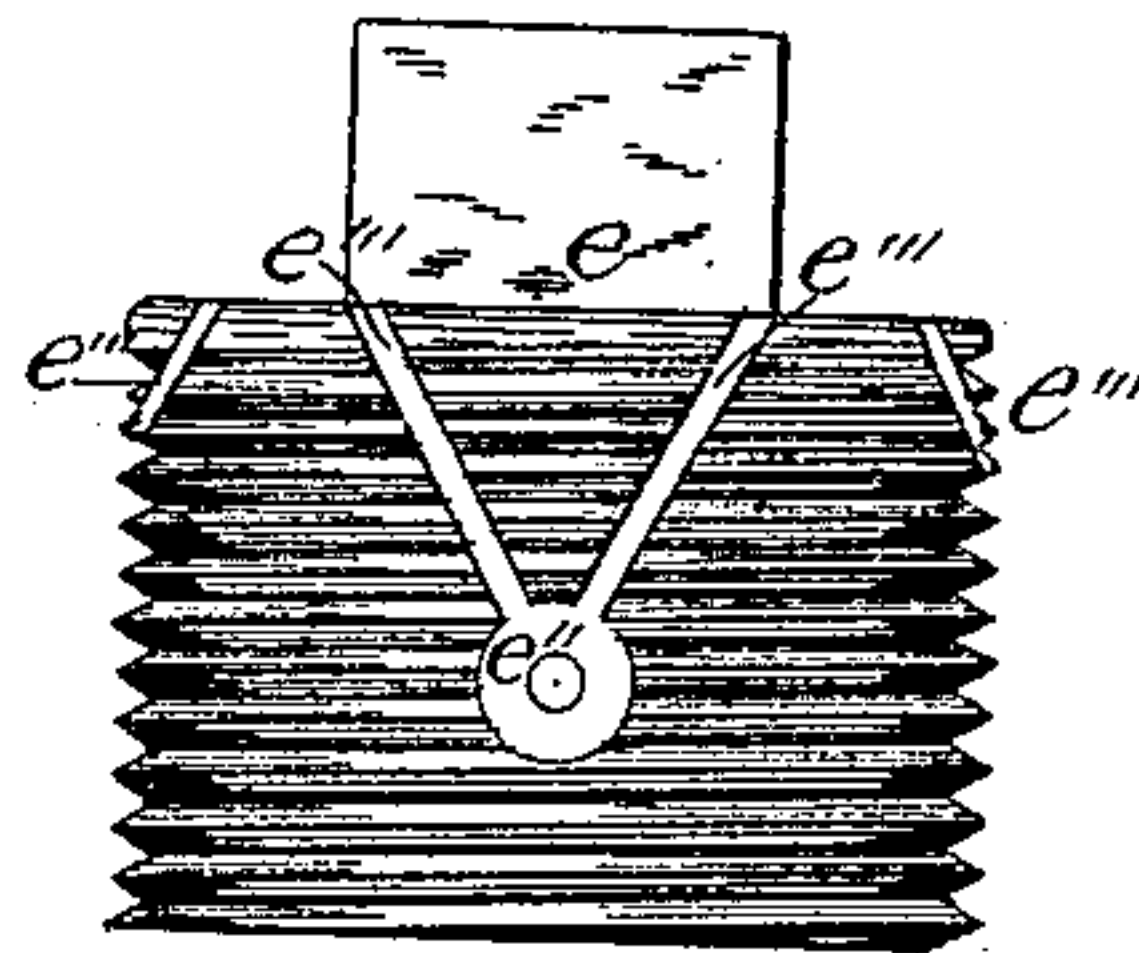


Fig. 6.



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UNITED STATES PATENT OFFICE.

GEORGE F. TINKHAM, OF CEDAR RAPIDS, IOWA, ASSIGNOR TO THE
TINKHAM SMOKE CONSUMER COMPANY, OF SAME PLACE.

SMOKE-CONSUMER.

SPECIFICATION forming part of Letters Patent No. 390,193, dated September 25, 1888.

Application filed July 2, 1888. Serial No. 278,811. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. TINKHAM, a citizen of the United States, residing at Cedar Rapids, in the county of Linn and State of Iowa, have invented certain new and useful Improvements in Smoke-Consumers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to that class of smoke-consumers in which steam from a boiler is introduced into the combustion-chamber of the furnace; and my object is to so improve the construction of the steam-nozzle as to secure a more perfect distribution and superheating of the steam, to facilitate the attachment and adjustment of the nozzle, and to improve its appearance.

In the accompanying drawings, forming a part of this specification, Figure 1, Sheet 1, represents a steam-boiler with the consumer attached, a portion of the brick-work of the furnace being removed to show a central vertical section of the combustion-chamber and boiler-front, and Fig. 2 a front elevation of the same. In Sheet 2, Fig. 3 is a central longitudinal section of the nozzle; Fig. 4, a transverse section of the same in the line *ab* of Fig. 3, looking toward the inner end, which is the right in Fig. 3; Fig. 5, an elevation of the same as seen from the inner end, and Fig. 6 a plan view of the plug at the inner end of the nozzle.

Similar letters of reference indicate corresponding parts.

In the application of my invention to a steam-boiler substantially the same arrangement is made use of as in the case of a former invention for which Letters Patent were granted to me and A. M. Phelps and George B. Peck, on the 18th day of October, 1887, and are numbered 371,804. The improvements herein relate more particularly to the nozzle and its connections.

Referring to the drawings, A is the boiler, having the usual steam-dome, A'.

B is the combustion-chamber of the furnace.

C is the furnace-front; D, the door; E, a pipe leading from the steam-dome to the nozzle F, and through the smoke stack G. The door D is provided with a number of holes, *i i*, for the admission of air to the combustion-chamber.

The lower end of the pipe E connects with a casting, F, having an air-chamber, *a*, therein, and a hollow elbow, *a'*, to the inner end of which is connected a pipe, *b*. The air-chamber communicates with an air-tube, *g*, surrounding the pipe *b*. Air is admitted to this chamber through openings *j*, formed by hollowing out the inner sides of the casting F. This chamber being close to the furnace-front, and the air passing into it in a circuitous course and next to said furnace-front, is so far heated before it reaches the combustion-chamber as to greatly facilitate combustion. On the inner end of the pipe *b* is screwed the nozzle. This consists of the part *c*, similar to the pipe-coupling known as a "reducer," and the hollow plug *e*, screwed into the larger end of the coupling. Through the center of this plug is a hole, *e'*. An improvement in the formation of this hole consists in making it with different sizes of bore, as shown in Fig. 3. The effect of this is to cause superheating and expansion of the steam in its exit from the nozzle, the heat of the combustion-chamber, into which the nozzle projects, operating to this end, as the steam in its passage through the nozzle reaches the successively-enlarged portions of said hole. In addition to the central hole, *e'*, provision is made for the escape of steam around the plug *e*. The improvement herein consists in providing the plug with holes *e''*, leading from the interior to the exterior thereof, and with grooves *e''' e'''*, leading from the outer termini of these holes in diverging angles to the end of the larger portion of the plug. The effect of this construction is to project the steam from the nozzle in a somewhat spiral course, or, more strictly speaking, in oppositely-spiral courses. It is evident that these diverging jets of steam are so projected as to intersect each other at some distance from the end of the nozzle, and this tends to break up the jets and spread the steam widely over the fuel, insuring a more perfect distribution of the steam than where the jets are projected in one general direction. As

the combustion of the unconsumed atoms of carbon usually escaping in the smoke depends in this case upon the action of the constituent gases in the steam, the importance of a wide
5 and even distribution of the same over the surface of the burning fuel will be readily understood.

As in my former invention referred to, I surround the steam-pipe of the nozzle with a
10 bell-mouthed tube, *g*, passing through the boiler-front *C*, and extending into the combustion-chamber to near the end of the nozzle. Air is thus admitted immediately around the steam, and its oxygen aids in the combustion
15 of both the carbon of the fuel and the hydrogen of the steam. This tube is secured in a bridge, *a''*, of the casting *a* by a set-screw, *f*, and may be adjusted endwise somewhat according to the thickness of the boiler front.
20 Its forward or inner end is held central with respect to the steam-pipe by means of a spider, *d*, the outer points of which bear against the inner face of the flaring mouth, the spider being held in position by the shoulder of the
25 coupling *c*.

The casting *a* is preferably made oval in form, as shown, and to the outer side may be attached a suitable name-plate, *h*.

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

1. In a smoke-consumer, the herein-described nozzle, consisting of the hollow plug *e*, having a central hole therein, radial holes *e''*, extending through the shell of said plug, and grooves
35 on the exterior of said plug leading from said holes *e''* to the forward end of the plug in diverging angles, and a chambered coupling, *c*, adapted to connect with a suitable steam-pipe,
40 *b*, substantially as and for the purpose set forth.

2. In a smoke-consumer, the combination of the steam-pipe *b*, coupling *c*, and hollow plug *e*, having central hole, *e'*, with successive enlargements therein, radial holes *e''*, and outer grooves, *e'''* *e'''*, leading from said radial holes
45 in diverging angles, substantially as and for the purpose set forth.

3. In a smoke-consumer, the combination of a steam-pipe having a nozzle, substantially as described, longitudinally-adjustable inclosing-
50 tube with a flaring mouth surrounding said pipe and adapted to admit air around it and its nozzle, and a spider, through the center of which the said steam-pipe passes, its legs bearing in the flaring mouth of said tube, whereby
55 said steam-pipe and nozzle are centralized with respect to said tube by the longitudinal adjustment thereof.

4. In a smoke-consumer, the combination, with a steam-pipe and its nozzle, substantially
60 as specified, of the casting *F*, having the air-chamber *a*, with its inlet *j* contiguous to the furnace-front when in normal position, the elbow *a'*, forming a part of the steam-pipe connection, and the air-tube *g*, communicating
65 with said air-chamber, substantially as and for the purpose set forth.

5. In a smoke-consumer, the combination, with a steam-pipe and its nozzle, substantially
70 as specified, of the casting *F*, having the air-chamber *a*, with its inlet *j*, the bridge *a''*, set-screw *f*, and tube *g*, all substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE F. TINKHAM.

Witnesses:

GEO. W. BLACK,
LEWIS GUSTAFSON.