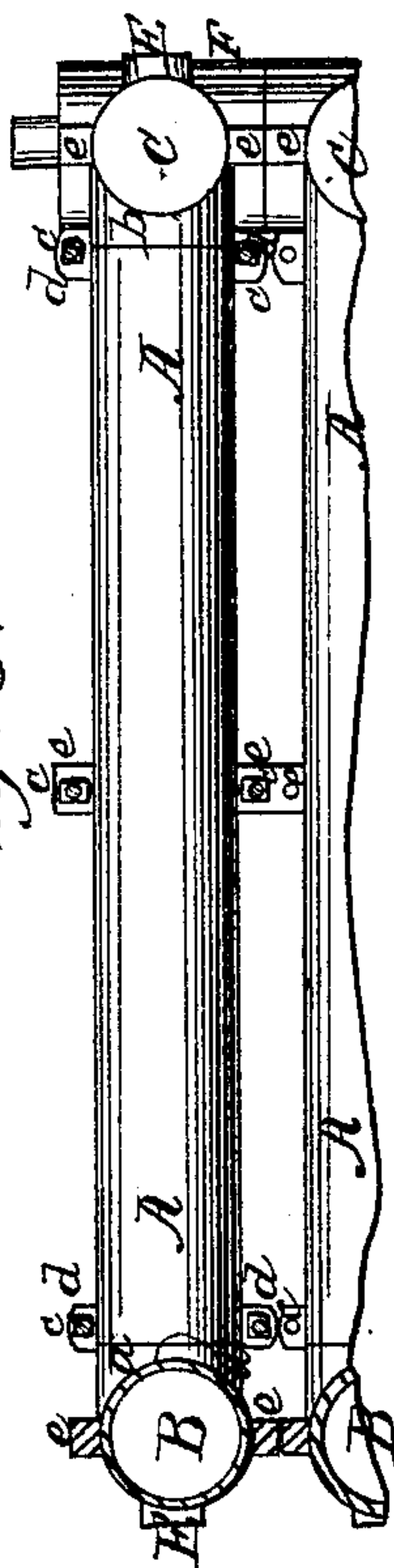
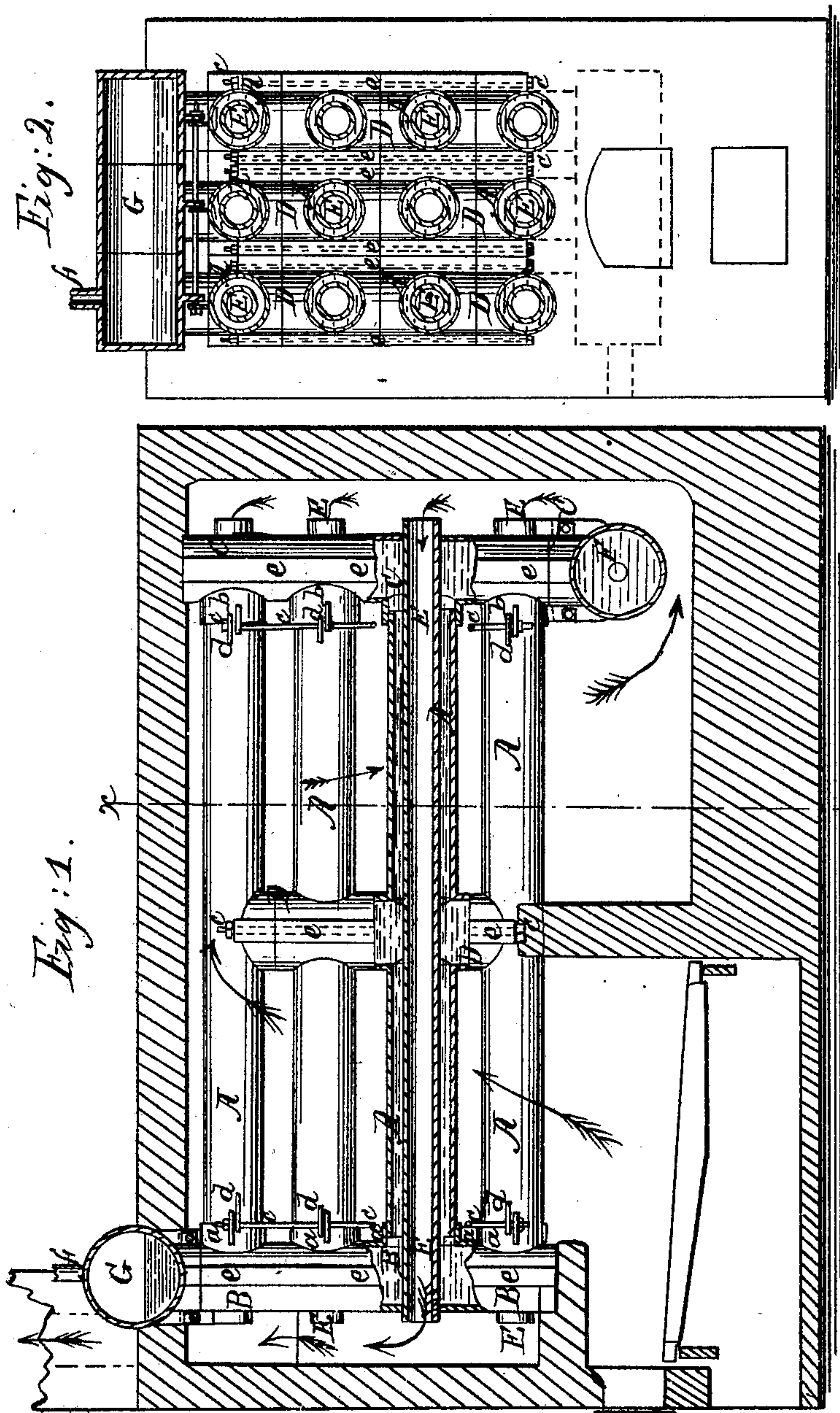


H. WHITTINGHAM.
STEAM GENERATOR.

No. 91,395.

Patented June 15, 1869.



Witnesses.
Jas. A. Brooks
Geo. W. Mable

Inventor.
H. Whittingham
Per *[Signature]* Attys.

United States Patent Office.

H. WHITTINGHAM, OF NEW YORK, N. Y.

Letters Patent No. 91,395, dated June 17, 1900.

IMPROVEMENT IN STEAM-GENERATORS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, H. WHITTINGHAM, of the city, county, and State of New York, have invented a new and improved Steam-Generator; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

Figure 1 represents a sectional side elevation of my improved steam-generator.

Figure 2 is a vertical transverse section of the same, the plane of section being indicated by the line *x x*, fig. 1.

Figure 3 is a plan or top view, partly in section, of the same.

Similar letters of reference indicate corresponding parts.

This invention relates to a new sectional steam-generator, which is so constructed that it will provide a very large heating-surface, so as to produce steam with great rapidity, and with a considerable saving of fuel.

The invention consists—

First, in forming a boiler of sections of horizontal tubes, connected by vertical tubes, the horizontal tubes containing smoke-flues, so that the water in them will be heated from the outer as well as from the inner side.

The invention consists, also, in forming narrow projecting strips on the sides of the vertical tubes of each section, whereby, when a number of sections is put side by side, transverse partitions are formed, to confine the products of combustion in certain desired channels.

The invention also consists in a new manner of connecting the tubes of one section with each other all as hereinafter more fully described.

Each section of the boiler consists of a series of horizontal longitudinal tubes, *A A*, connected by a vertical tube, *B*, at their front ends, by a vertical tube, *C*, at their rear ends, and by one or more vertical tubes, *D*, between the front and rear ends, as shown in fig. 1.

As the tubes *A* of one section are all vertically above each other, it is evident that each section will have the width of one tube, as shown in fig. 2, in which three sections are illustrated.

The front tube *B* has elbows, *a a*, formed on it, to receive the tubes *A*, and in the same manner has the rear pipe *C* formed elbows *b* on it, to receive the rear ends of the pipes *A*.

The pipes *A* are then, by bolts *c c*, passing through ears *d d*, that project from the sides of the said elbows and from those of the pipes *A*, connected with

the said end-tubes, so as to form a rigid tubular frame-work, as shown.

On the sides of the tubes *B* and *C*, are formed projecting ribs, *e e*, which, when two sections are placed side by side, form, in connection with the said end-tubes, transverse partitions, through which the products of combustion cannot pass.

Through the tubes *A* are fitted smaller pipes, *E*, which are open at both ends.

A series of such sections being put together within a suitable fire-proof structure, will form a complete boiler, when connected with each other by transverse pipes, *F* and *G*.

The transverse pipe *F* is arranged in the rear part of the boiler, and is connected with the tubes *C*, and receives water by suitable means, so as to supply all the tubes of all sections with the requisite amount of water.

The transverse pipe *G* is arranged in the front part of the boiler, and connected with the upper parts of the front pipes *B*, to receive the steam from the various tubes.

From it extends a pipe, *f*, to the machinery or apparatus to be supplied with such steam.

The products of combustion from the furnace pass up, between the pipes *B* and *C*, through all the sections, enveloping all the horizontal tubes *A*, and pass then over the front or rear partition, formed by the vertical pipes and their ribs, to one end of the structure, and thence backward or forward through the pipes *E*.

The water in the tubes *A* is thus heated from the outside and inside.

The inner vertical tube *D* of each section is made in pieces, to connect with the tubes *A*, or the latter may be made sectional to enter the tube *D*, as may be desired.

The fastening is here also produced, by means of bolts, *c*, and ears, *d*, or the bolts may pass through the sectional ribs *e*, as shown.

The tube *D* may also have side-ribs, *e*, as shown, to form a central transverse partition, if another passage for the smoke is still desired. In this case, the smoke may pass up between the middle and front partition, down between the middle and rear partition, and then through the pipes *E* into a suitable chimney.

However, this middle partition may merely be used to brace the tubes *A*, and not to form a separate smoke-channel.

Having thus described my invention,

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

1. A sectional steam-generator, in which each section consists of a series of horizontal tubes *A*, con-

ected in front and rear by vertical tubes B C, and in the middle by a tube, or tubes, D, and provided with smoke-flues E, that pass through the tubes A, substantially as herein shown and described.

2. The ribs *e e*, formed on the sides of the vertical pipes of each section, to form transverse partitions, substantially as herein shown and described.

3. The ears *d d*, formed on the tubes A, B, and C,

when arranged as described, to admit bolts *c*, for securely connecting the tubes of one section, substantially as herein shown and described.

H. WHITTINGHAM.

Witnesses:

FRANK BLOCKLEY,
ALEX. F. ROBERTS.