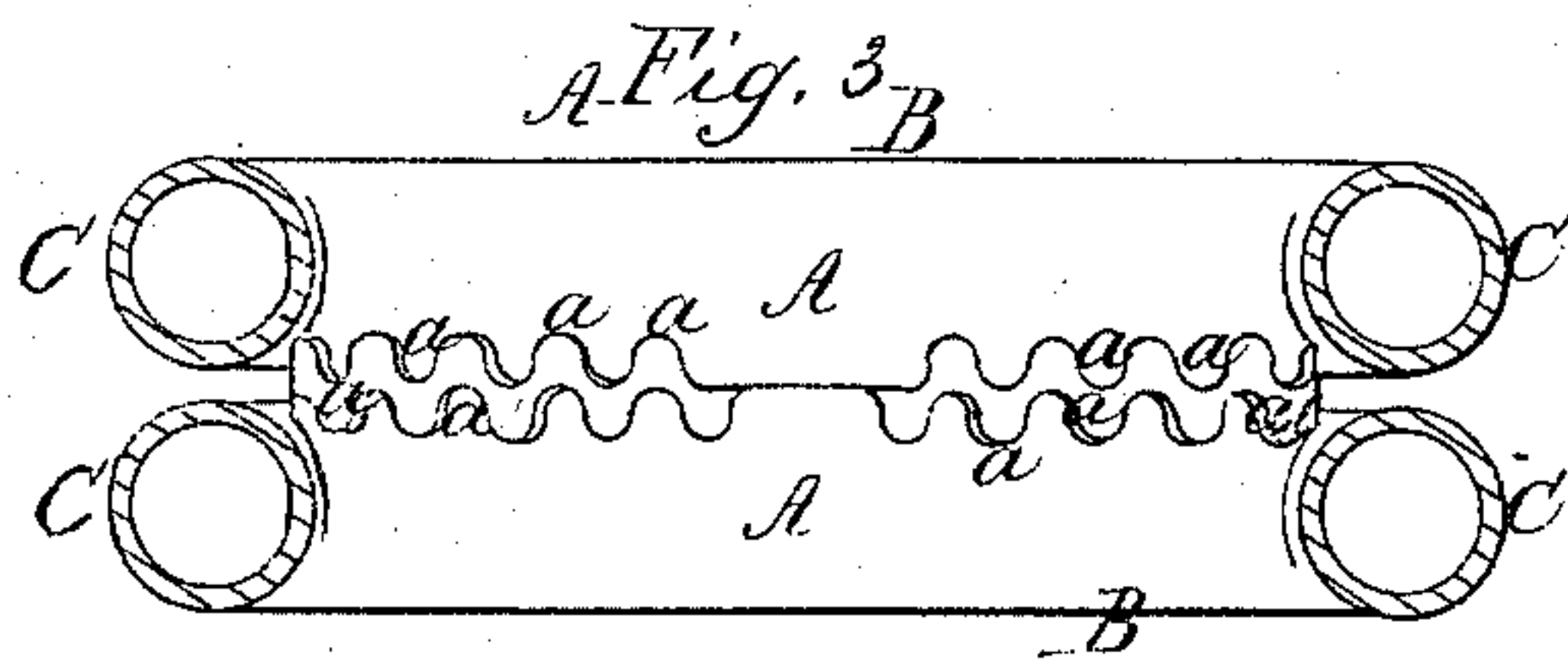
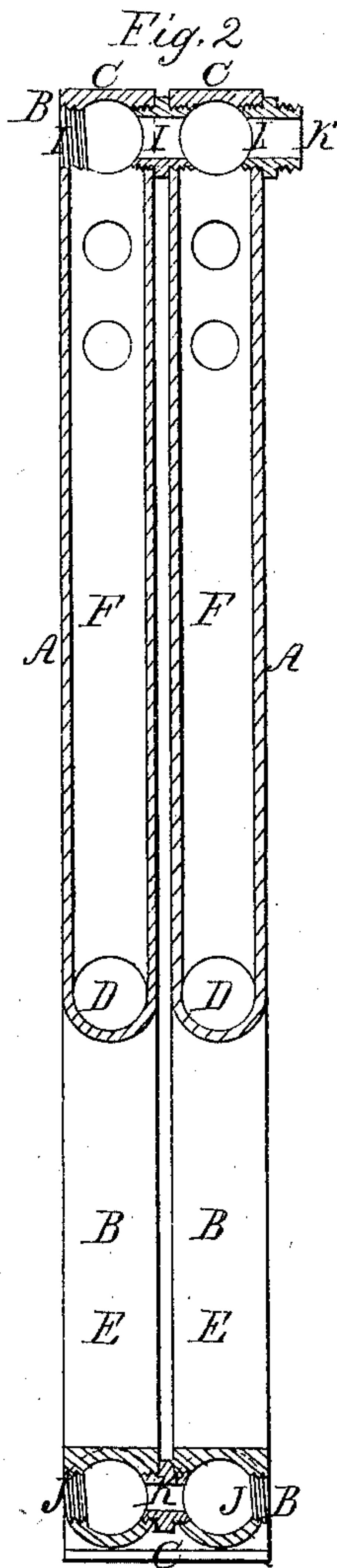
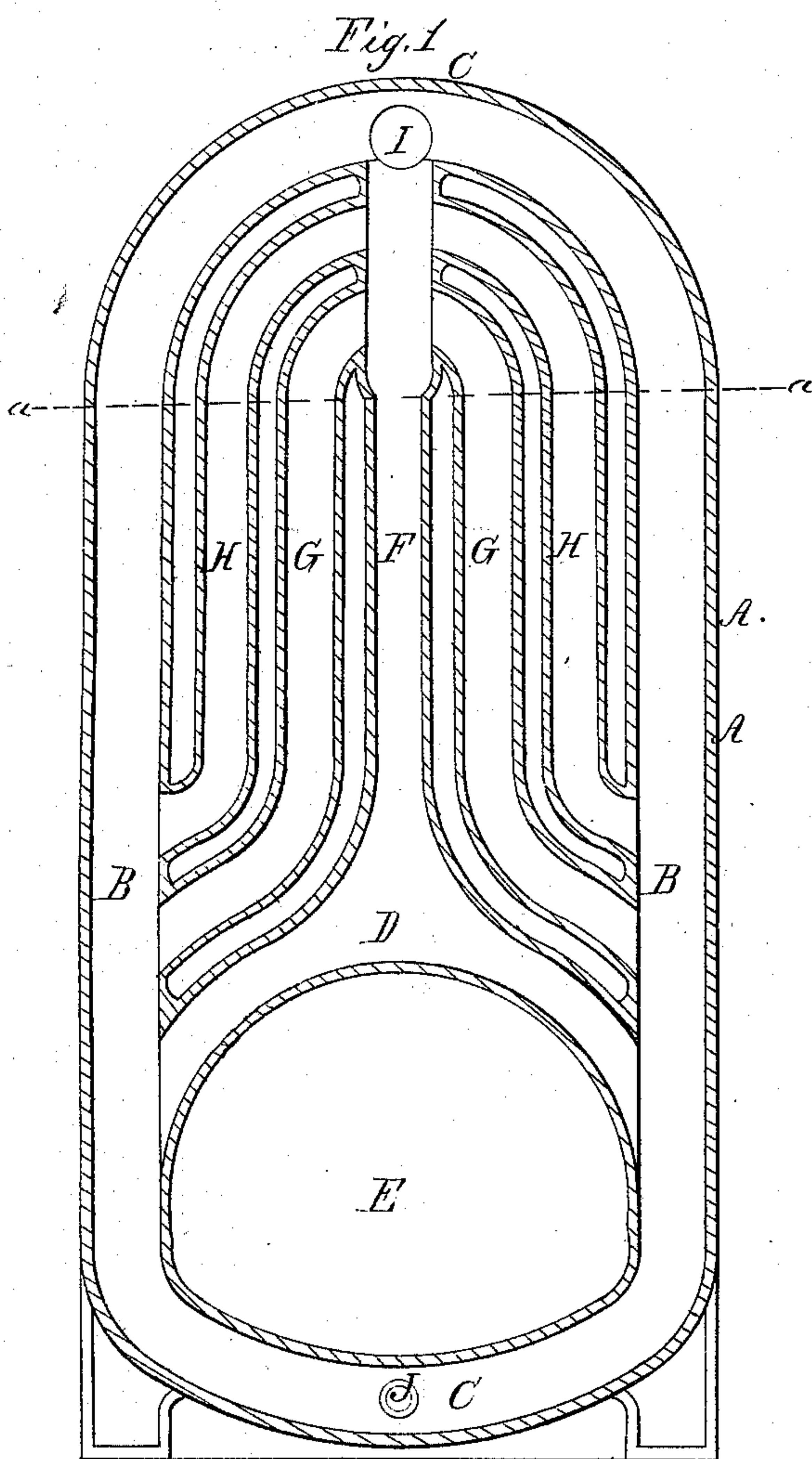


J. H. Mills.

Steam Generator.

N^o 89,786.

Patented May 4, 1869.



Witnesses
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United States Patent Office.

JOHN H. MILLS, OF BOSTON, MASSACHUSETTS.

Letters Patent No. 89,786, dated May 4, 1869.

IMPROVEMENT IN STEAM-GENERATORS.

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

To all to whom these presents shall come:

Be it known that I, JOHN H. MILLS, of Boston, in the county of Suffolk, and State of Massachusetts, have made an invention of certain new and useful improvements, having reference to Steam-Enginery; and do hereby declare the following to be a full, clear, and exact description thereof, due reference being had to the accompanying drawings, making part of this specification, and in which—

Figure 1 is a vertical and transverse section;

Figure 2, a vertical and longitudinal section; and

Figure 3, a horizontal section of one section of a cast-iron steam-generator, embodying my improvements.

The invention, comprising the subject-matter of this patent, will be found to embrace several points of practical utility and value; its object being to produce a steam-generator, which shall combine the requisites of cheapness, simplicity, durability, and effectiveness.

This invention consists in the construction and arrangement of the steam and water-pipes composing its structure, whereby all sharp, angular, and rigid connections are avoided, and liability to fracture at any point undue expansion and contraction of metal composing it is obviated; the union of the different portions or pipes of each independent section being made up of easy curves, rather than by right angles, the whole being as hereinafter explained; the construction which obtains this advantage also preventing deposit of sediment throughout its entire area.

Another point of novelty in my invention consists in prolonging the water-legs or pipes composing the sides of the section of a boiler into a homogeneous pipe, and extending it below, and so as to support the fire whereby the grate-bars are retained comparatively uninjured for a great length of time, and fuel economized; in addition to which, more steam-generating surface is produced, and the capacity of the generator greatly increased.

And this invention further consists in the grate for supporting the fuel of a fire, integral with the prolongation of the water-legs before referred to; extreme cheapness of manufacture being thereby secured, and other advantages gained, which will be duly referred to.

Still another novel feature in this invention will be seen in the devices for joining the different sections at two points only, by the employment of tubular right and left screw-plugs, as hereinafter explained.

In the drawings before mentioned as accompanying this specification, and which illustrates my invention, A denotes one section of a cast-iron steam-generator, the general structure being composed of a number of these sections properly joined together in number varying with the amount of steam to be produced.

This section is composed of an outer enclosing-pipe B, which completes the entire outline of the section; the general form of this pipe B, being oblong, with semicircular or arched ends, as shown at *c c*.

Extending across and between the two upright por-

tions or sides of the pipe B, is a curved pipe D, such pipe being disposed at about one-third the height of such pipe B; a full chamber E, being thus created between the branch-pipe D, and the lower pipe or grate-bar C.

The space intervening between the arched pipe D, and the upper end of the outer circumscribing-pipe B, is occupied by a series of upright pipes, F G H, &c.; the central one, F, of which is a perpendicular extension of the arched pipe D, the upper extremities of the side-pipes G H, being joined to and communicating with it, while the lower extremities are merged into the sides or legs of the outer pipe B.

The above-described arrangement of pipes is cast in one homogeneous piece of metal, and a general communication effected throughout the entire series.

I would call particular attention to the fact that the points of junction of the different pipes are produced from curves of easy and gradual inclination.

The upper extremities of the circumscribing-pipe B are formed upon each side with a steam-circulating orifice I, its lower extremity or grate-bar being provided in like manner with water-circulating apertures J J.

In making up a steam-generator of a series of sections, constituted as above described, they are to be placed face to face together in a perpendicular position, with shallow intervening spaces, and united by tubular plugs K K, such plugs having right and left screws cut upon their extremities to screw into the orifices I J, of the annular pipe B; the central portion of the periphery of such plugs being square or polygonal, to admit of the application of a wrench by which they are screwed into the said orifices.

Fig. 2, of the accompanying drawings, shows two sections of a generator united by means of the tubular plugs, which, while effecting a rapid and perfectly secure union of the sections, also admit of the passage of steam and water, as the case may be, through their boxes; this union of the sections by means of the plugs, entirely preventing separation of the sections from contraction and expansion, now common to generators, the sections of which are united by bolts passing through the whole series.

In fig. 3, of the accompanying drawings, I have represented a novel mode of constructing the grate-bar of the furnace of the generator, which is accomplished by forming upon the upper surface of the lower boundary or branch water-pipe of the annular pipe B, a series of laterally-projecting points or studs *a a*, &c., so arranged that when two sections are united, as before explained, the interstices created by such points shall admit of the passage of a sufficient quantity of air to maintain the combustion of the fuel.

This arrangement of the branch water-pipe C, and the grate-bar cast integral with it, is productive of several advantages: first, the water contained within such pipe preserves it and the grate-bar at a comparatively low temperature, by this means greatly enhancing the durability of such parts. The low temperature of

the water-pipe and grate-bar, as explained, also prevents to a great extent the formation of slags and clinkers, which is now of common occurrence. The heat-radiating surface, and consequently the steam-producing capacity of the generator is greatly increased by the adoption of the branch water-pipe C, as much heat from the fire above it is utilized, which at present is in most cases lost.

Another advantage resulting from casting the grate-bar homogeneous with the annular pipe B, is that a section or a number of sections may be transported without the loss and leakage now attendant upon the carriage of a comparatively large number of independent grate-bars.

The level at which water should stand in the generator above described, is shown at *a a*, in fig. 1 of the drawings.

It will be thus seen that the upper portion of the section becomes a superheating-steam reservoir; the interstices between the pipes, F, G, and H, forming in aggregate a large heat-circulating area, which, while obviating the necessity of a steam-drum independent of the generator, also allows me to produce a very dry steam.

One of the advantages of the construction and arrangement of the before-described generator, is that a free circulation is permitted throughout its entire interior area, thus permitting pressure of steam to dislodge any sediment which would collect, were the union of the different pipes effected by right angles, the curved form of the lower water-bar also causing sediment to collect at one point from whence it is easily removed.

Owing to the curved outlines of the pipes composing the section, they will yield and accommodate themselves to the inevitable expansion and contraction of the metal, and render fracture at any point not liable.

It may also be found advantageous under some conditions to increase the depth of this water-pipe, and to dispose within the enclosure formed by it and the

arched bar D, a series of ordinary independent grate-bars for supporting the fuel.

With regard also to the merits of cast sectional generators, so far as they relate to safety, steam-generating capacity, economy of fuel, &c., I have not detailed upon such features, as they have already been treated in previous patents whose general operations and merits are analogous to my own.

Having thus described the nature, operation, and advantages of my present invention,

What I claim as novel and original with myself, and desire to secure by Letters Patent of the United States, is as follows:

1. I claim as my improvement in the cast sectional boiler, the construction of the sections whereby the lower arm or branch water-pipe of each section shall form the grate-bar and contain water, substantially as before explained.

2. In a steam-generator composed of cast multi-tubular sections, I claim the construction and arrangement of different pipes thereof, having gradual and easy curves, as hereinbefore set forth and explained.

3. I claim the construction of the sections of the steam-generator, whereby the union of a series of sections is effected at two points only, the upper serving as the steam-circulating passage, and the lower one as the water-passage, substantially as explained.

4. I claim the arrangement, for effecting the union of two adjacent sections of the steam-generator, of tubular plugs, having right and left screws, substantially as before explained.

5. I claim the construction and arrangement of the fuel-chamber and furnace-grate, whereby the water-legs of the outer pipe are prolonged, and the series of points, essentially as herein shown and described.

JOHN H. MILLS.

Witnesses:

EDMUND H. HEWINS,
FRED. CURTIS.