No. 667,431. Patented Feb. 5, 1901.

W. ESTY.

STEAM BOILER.

(Application filed Jan. 20, 1900.)

(No Model.) 2 Sheets—Sheet 1.

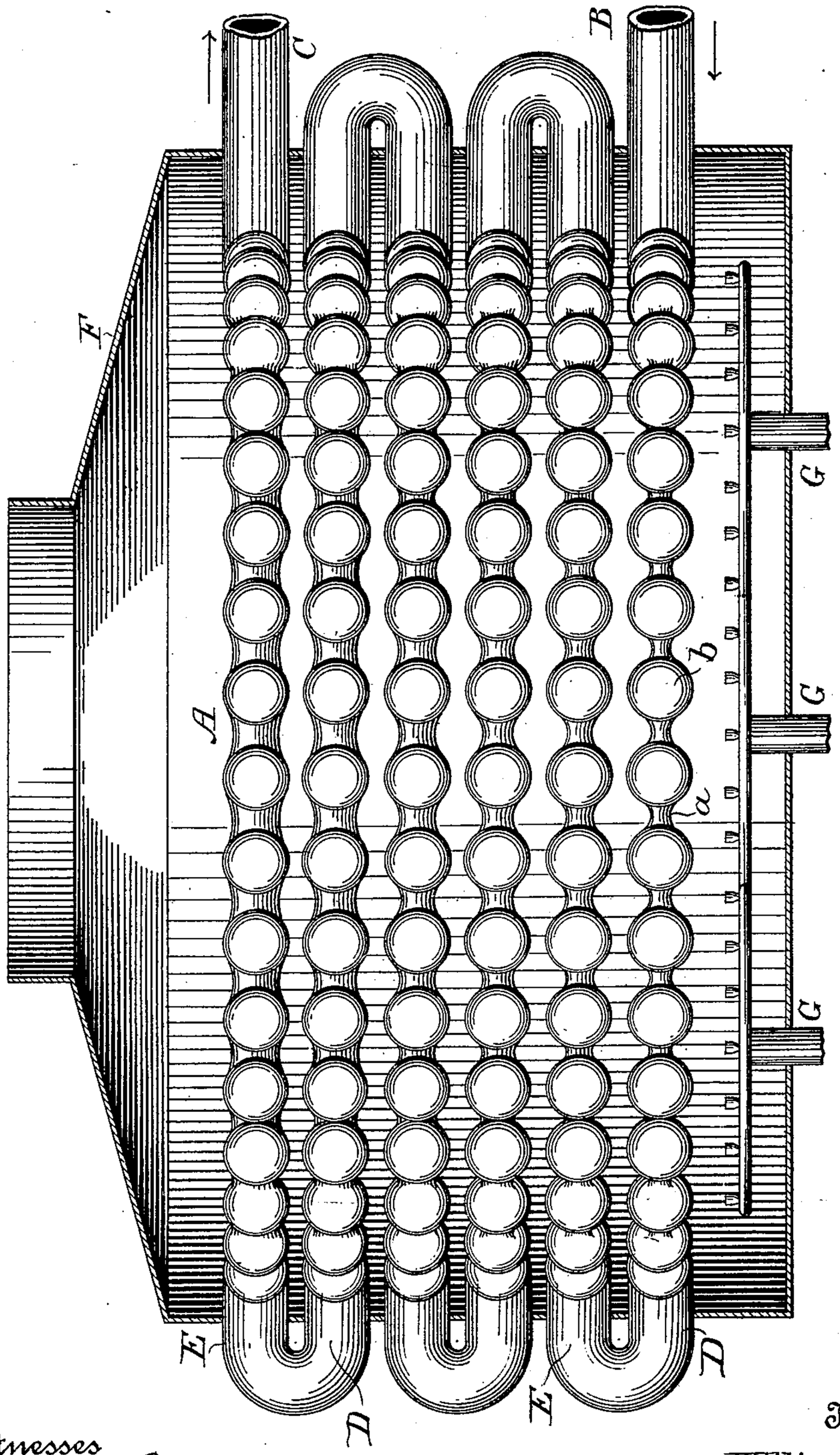

Fig. 1.

Witnesses
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H. Y. Crocker

Inventor
William Esty
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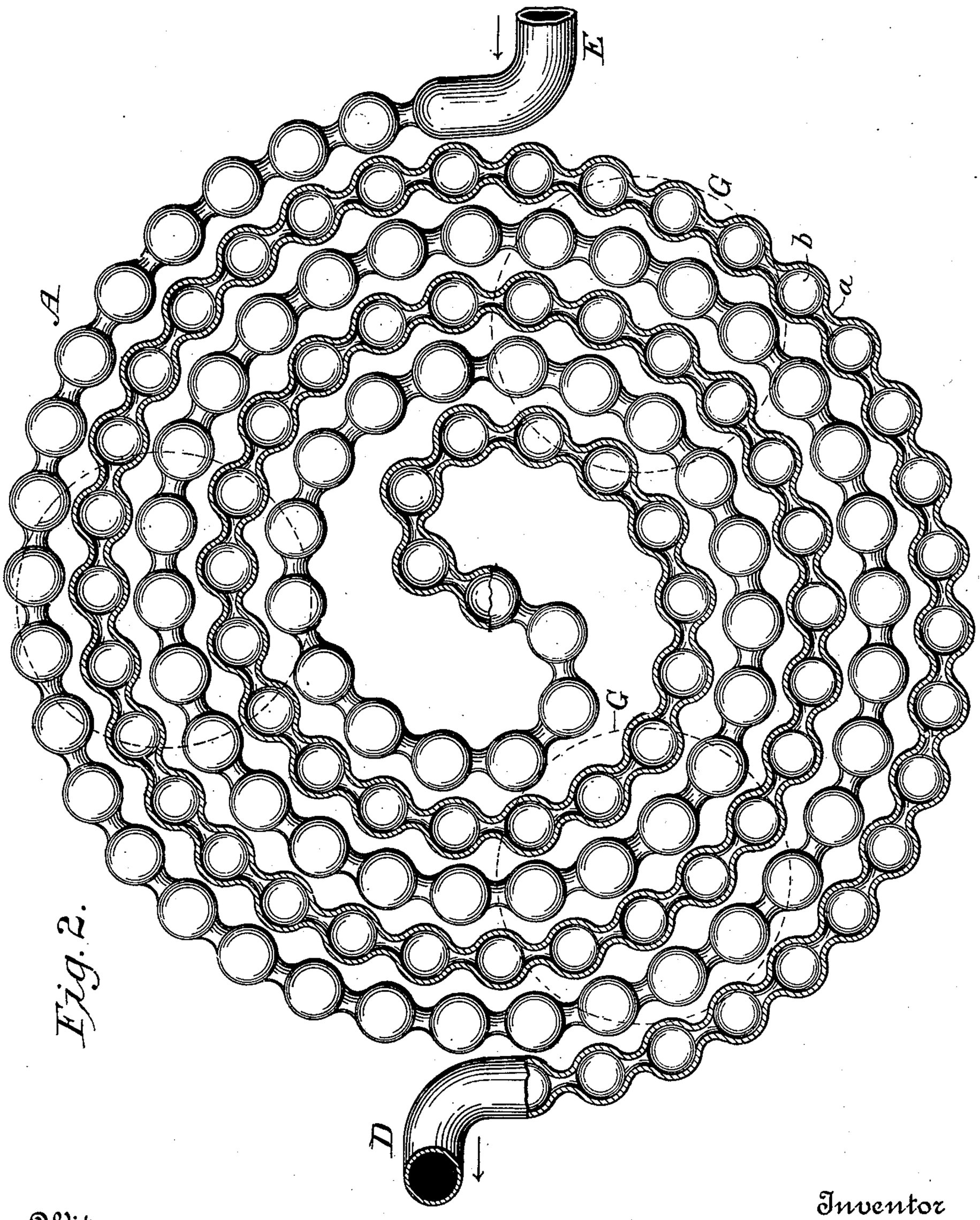

Fig. 2.

Witnesses
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UNITED STATES PATENT OFFICE.

WILLIAM ESTY, OF LACONIA, NEW HAMPSHIRE.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 667,431, dated February 5, 1901.

Application filed January 20, 1900. Serial No. 2,131. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ESTY, of Laconia, in the county of Belknap and State of New Hampshire, have invented a new and Improved Steam-Boiler, of which the following is a specification.

This invention relates to that type of steam-boilers known as "flashers," in which the water is fed to the boiler proportionately to the quantity of steam used, the boiler not having any water-storage capacity, and the feed of the water and the efficacy of the heat being definitely controllable in accordance with the steam-consuming requirements of the motor supplied by the boiler. In such flasher-boilers the boiler is maintained heated at a high temperature and the feed-water is injected or otherwise introduced in small quantities, so that the water is quickly converted into steam and is used as fast as produced. Boilers of this type are especially useful on self-propelled vehicles now known as "automobiles," and it is important that the steam-generator for such vehicle shall be both safe and light. This is of special importance, because the boilers of this type must be capable of withstanding a heavy pressure.

The object of the present invention is to produce a boiler of the flasher type which will possess great strength and at the same time shall be light and capable of rapidly and efficiently converting water into steam.

The improved construction of boiler constituting the present invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a side view of the improved boiler, partly in vertical section. Fig. 2 is a plan view, partly in section, of one of the coils employed.

The boiler proper is composed of a series of superposed and connected coils A, which are connected together in series. The fluid traverses the entire length of all of the coils in succession in passing from the inlet B to the outlet C. As shown and as preferred, the inlet B communicates with the lowest coil, and the outlet C communicates with the uppermost coil. The feed-water is introduced at the inlet in any manner which enables it to be introduced in a definite and controllable quantity. There are many ways of so introducing the feed-water now known that the illustration and description of any means for this purpose are here unnecessary. The outlet C leads in any convenient manner to the engine or motor which utilizes the steam.

Each of the several coils is arranged horizontally and is or may be coiled in the same manner. Fig. 2 illustrates the preferred method of forming the coil. As shown in this figure, the coil is a double spiral, the outgoing spirals alternating with the incoming spirals. This arrangement secures a more uniform distribution of the heat with relation to the condition of the fluid traversing the coil. This double spiral also possesses the further advantage that the discharge end D thereof is at the outside of the coil, as well as the inlet end E. While this formation of the coil is preferred, it is not essential, since any other form of coil would suffice, such as a single spiral or a zigzag composed of straight sections united by either straight or curved elbows. The several superposed coils are connected together, the outlet D of each lower coil being connected directly with the inlet E of the coil just above.

The several coils are inclosed in a suitable casing F. As shown, the bends which unite the inlets and outlets of the several coils pass through and beyond the side walls of the casing, thereby enabling the side walls of the casing to be brought close to the peripheries of the coils. The coils may be heated in any suitable manner. There are indicated in the drawings three burners G, disposed at regular intervals within the lower part of the casing and beneath the lowermost coil A. These burners may be of any form suitable for burning liquid or gaseous fuel. The manner and means for heating the boiler constitute no part of the present invention.

Each coil is composed of a series of connected spherical bulbs *b*. Preferably each coil is made from a tube of steel which is forged so as to produce the spherical bulbs connected together by narrow necks *a*. Each of the coils may be made of an independent tube shaped with the bulbs, the several coils being connected together, or all of the coils may be made from a single tube. The spherical form of the bulbs gives great strength, so

that the boiler can withstand very high pressure. At the same time extended heating-surface is secured.

On account of the horizontal disposition of each coil its several bulbs constitute chambers for holding water in small separated quantities by reason of the circumstance that each bulb has a portion which extends below the level of its two necks which connect it with the preceding and succeeding bulbs, respectively. The necks of the bulbs are successively larger in the several coils, being largest in the last coil and smallest in the first coil. Consequently the necks are smallest where the water enters and are largest near the outlet C, so that the necks form successively less obstruction to the steam as it is generated. In fact, in the last portion of the last coil the necks may be of the same diameter as the bulbs themselves—that is to say, the last portion of the last coil may be cylindrical.

The water which is introduced into the coil is retarded along its course by the bulbs which catch the water. As the steam is formed it passes successively through the necks of the several bulbs, and any water carried with it is separated out and drops into the bottoms of the bulbs. As the steam is heated and dried, and consequently occupies more space and moves with greater velocity, it meets with less and less resistance to its passage by reason of the increasing size of the connecting-necks. By the time the steam reaches the last coil it is dry, the top coil serving as a superheater.

I claim as my invention—

1. A steam-generator composed of a succession of communicating hollow bulbs arranged in series and connected together, substantially as set forth.

2. A steam-generator composed of a succession of communicating hollow bulbs connected by necks which increase in size, being larger at the outlet than at the inlet, substantially as set forth.

3. A steam-generator composed of a series of connecting-coils, the water being introduced at one end of the series and the steam being discharged at the other end of the series, each coil comprising a series of communicating hollow bulbs, substantially as set forth.

4. A steam-generator composed of a series of communicating coils connected together so that the fluid traverses in succession all of the coils in passing from the inlet to the outlet, each coil comprising a series of connected hollow bulbs, the necks which connect the hollow bulbs increasing in size from the inlet to the outlet end of the series of coils, substantially as set forth.

5. A steam-generator composed of a succession of communicating hollow bulbs arranged in series and connected together, the water being introduced at one end of the series and the steam being discharged at the other end of the series, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

WILLIAM ESTY.

Witnesses:
GEO. W. SHERWELL,
F. A. PHELPS.