

C. L. THUDICHUM.
STEAM GENERATOR.
APPLICATION FILED OCT. 24, 1907.

914,618.

Patented Mar. 9, 1909.
2 SHEETS—SHEET 1.

Fig. 1.

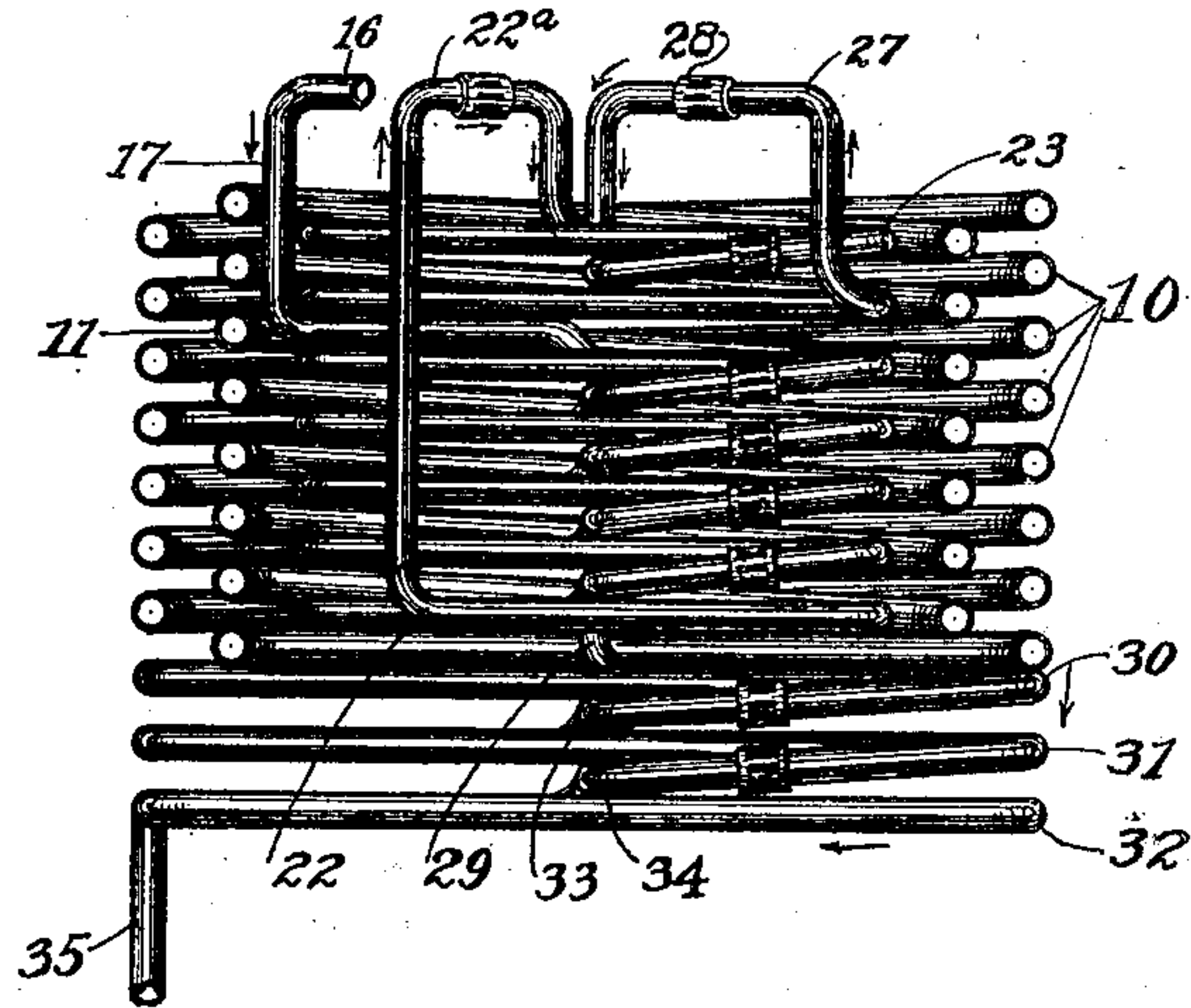
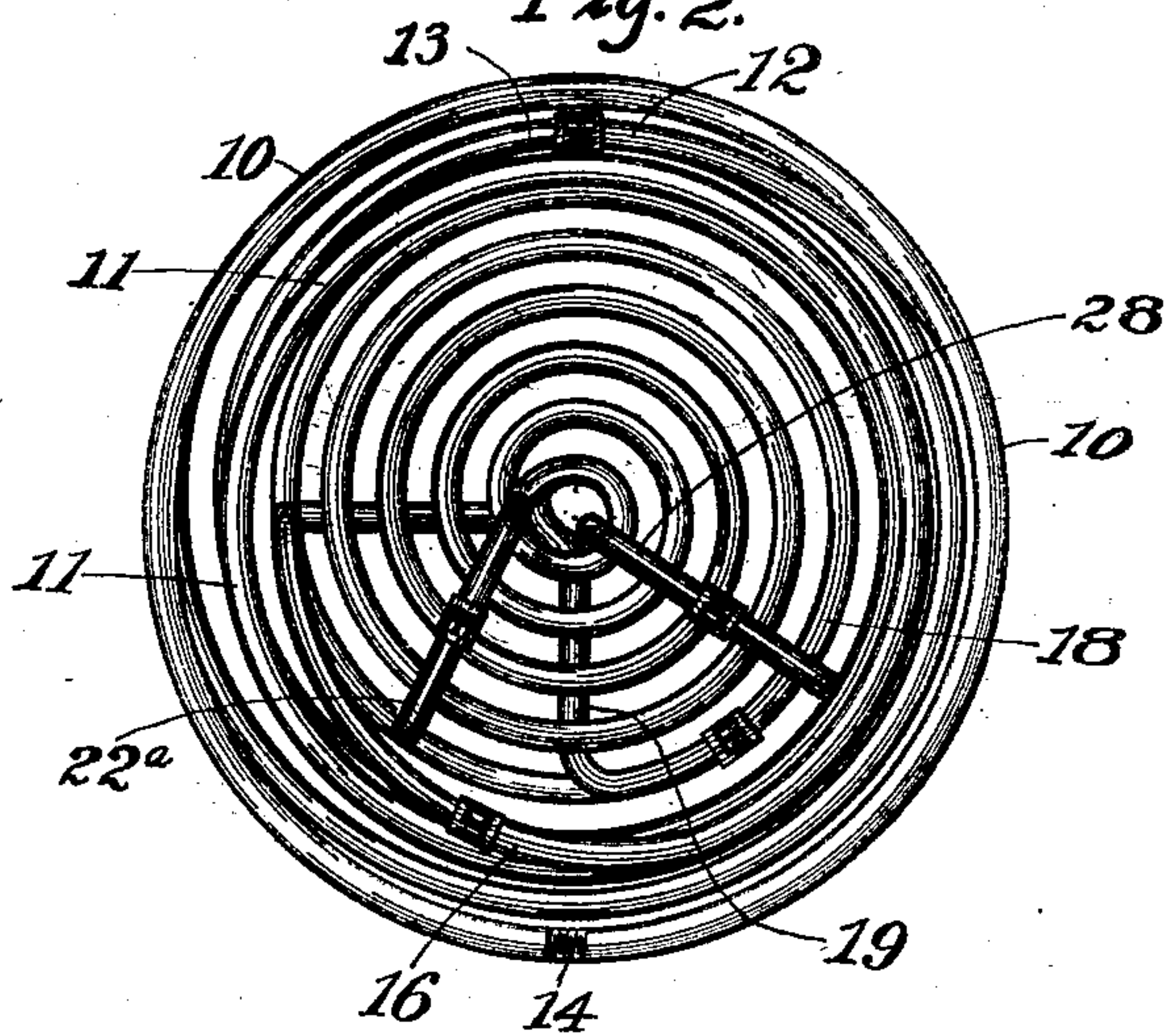


Fig. 2.



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Fig. 3

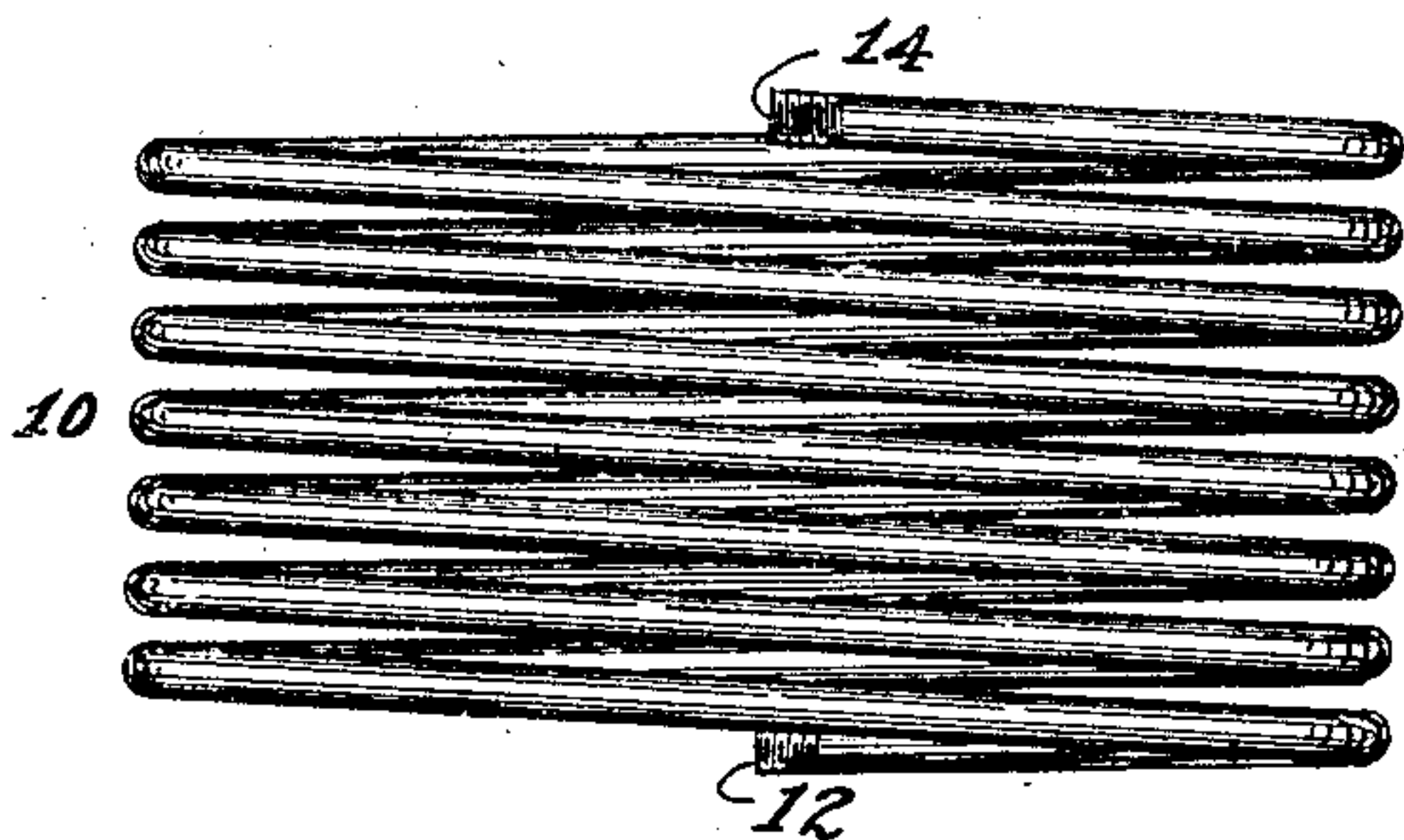


Fig. 5

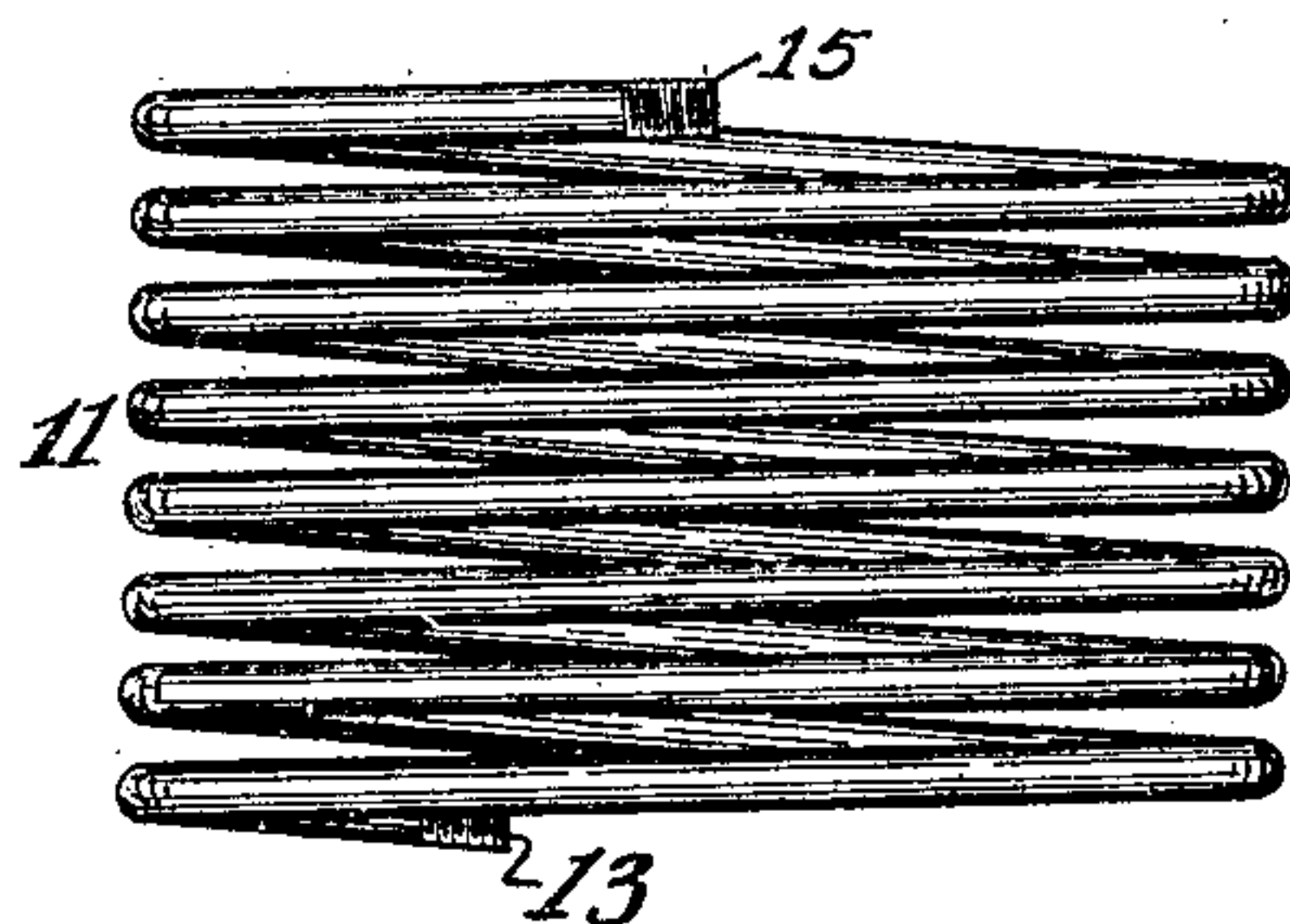


Fig. 4

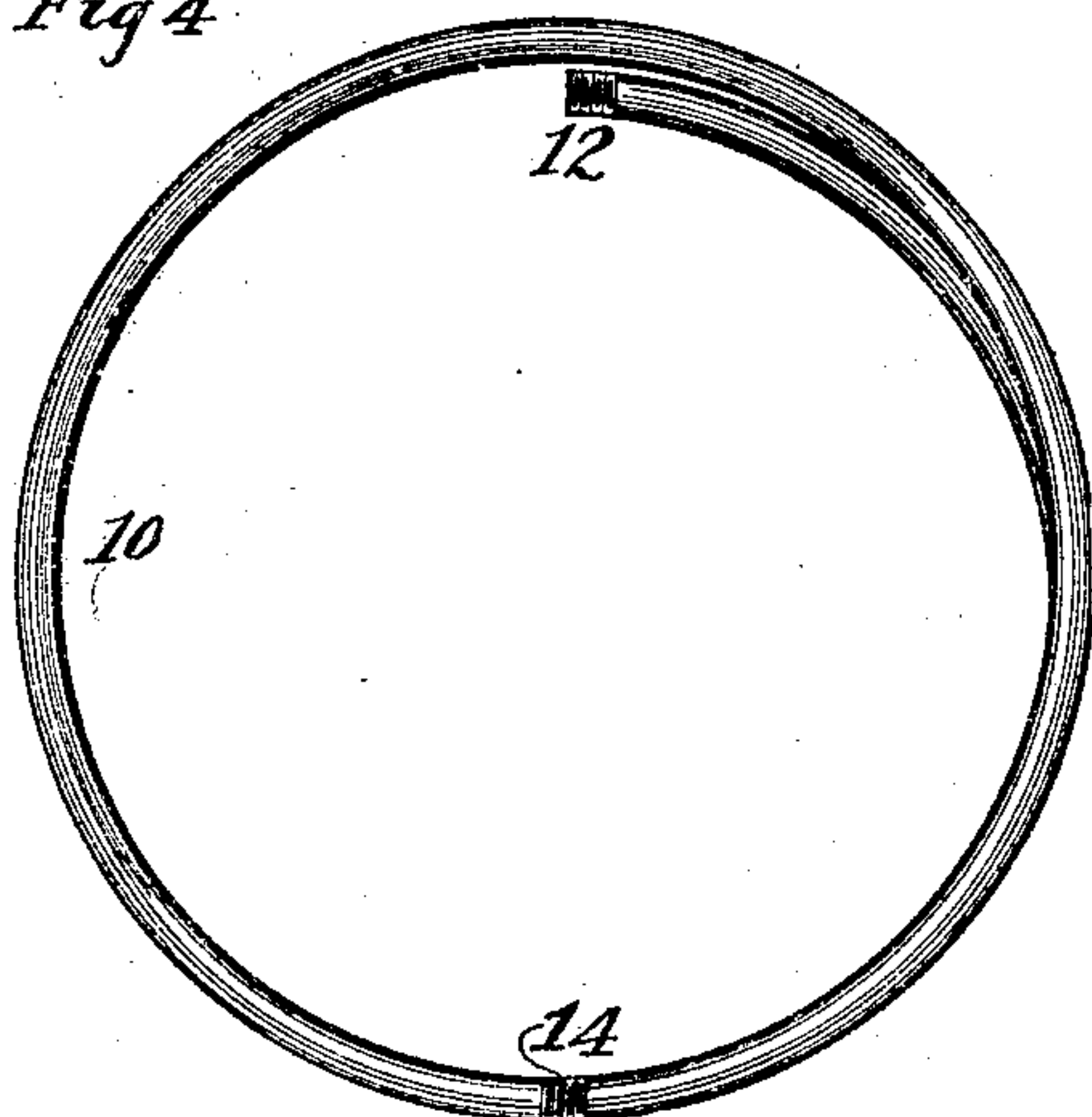


Fig. 6

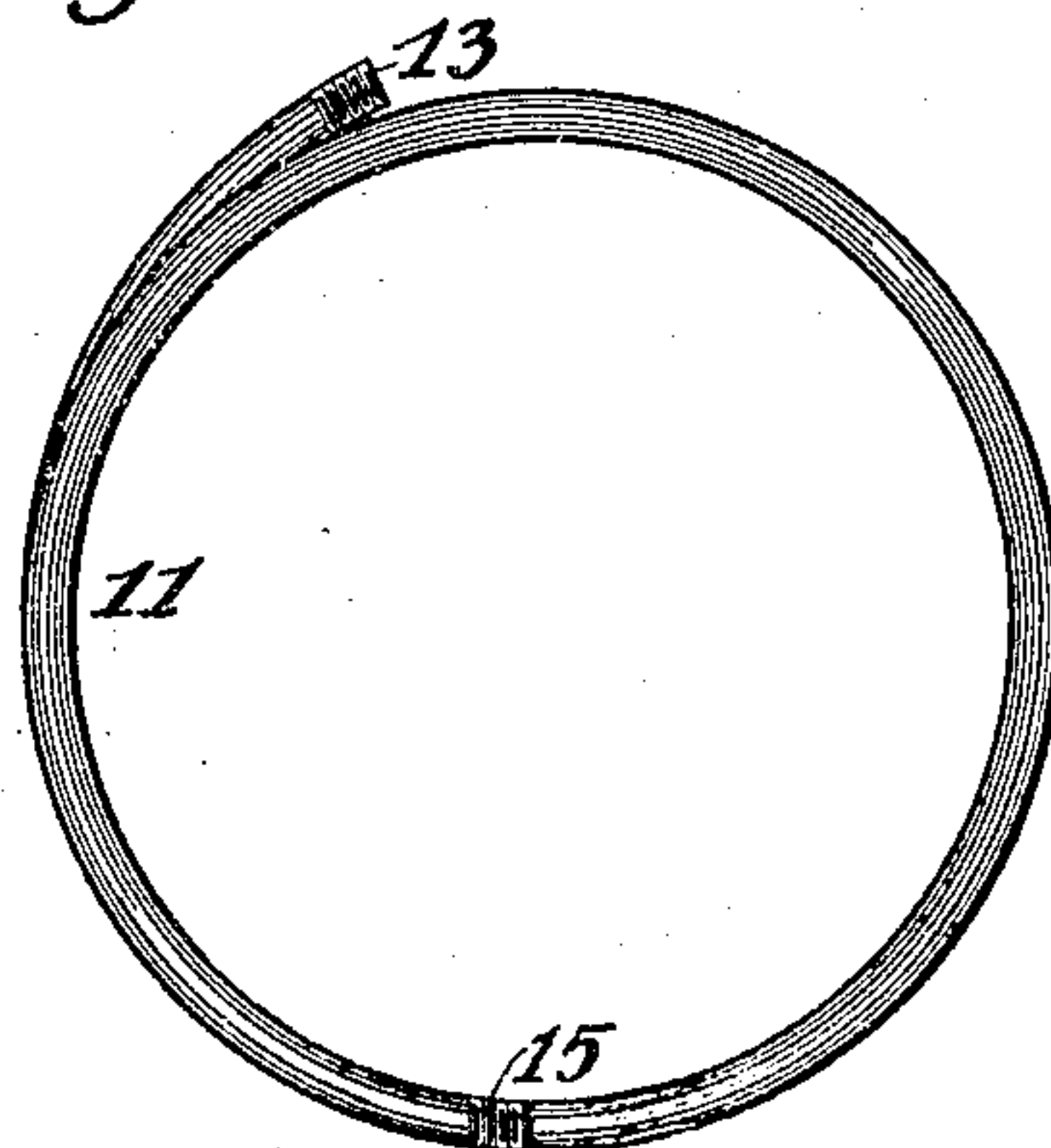


Fig. 7

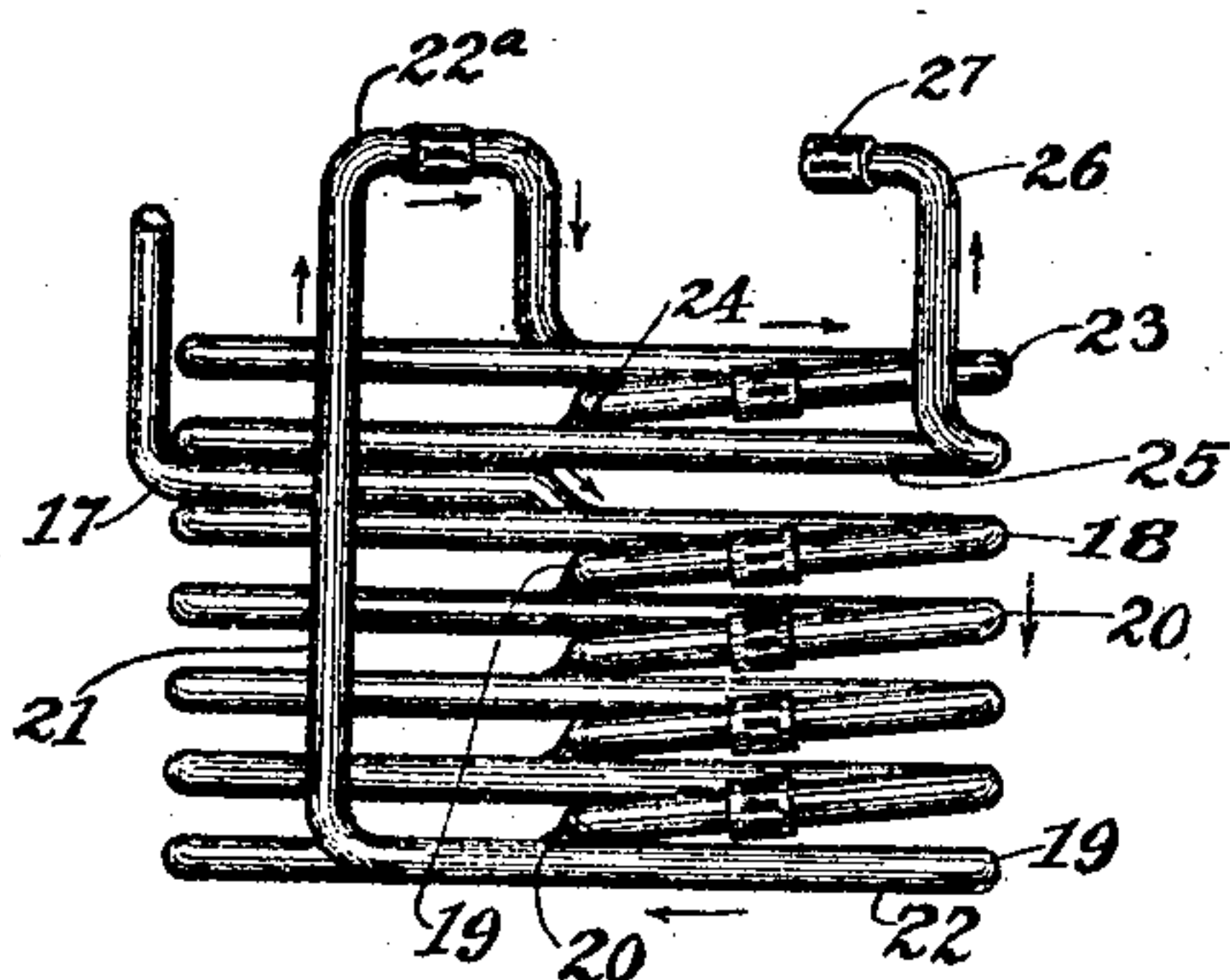
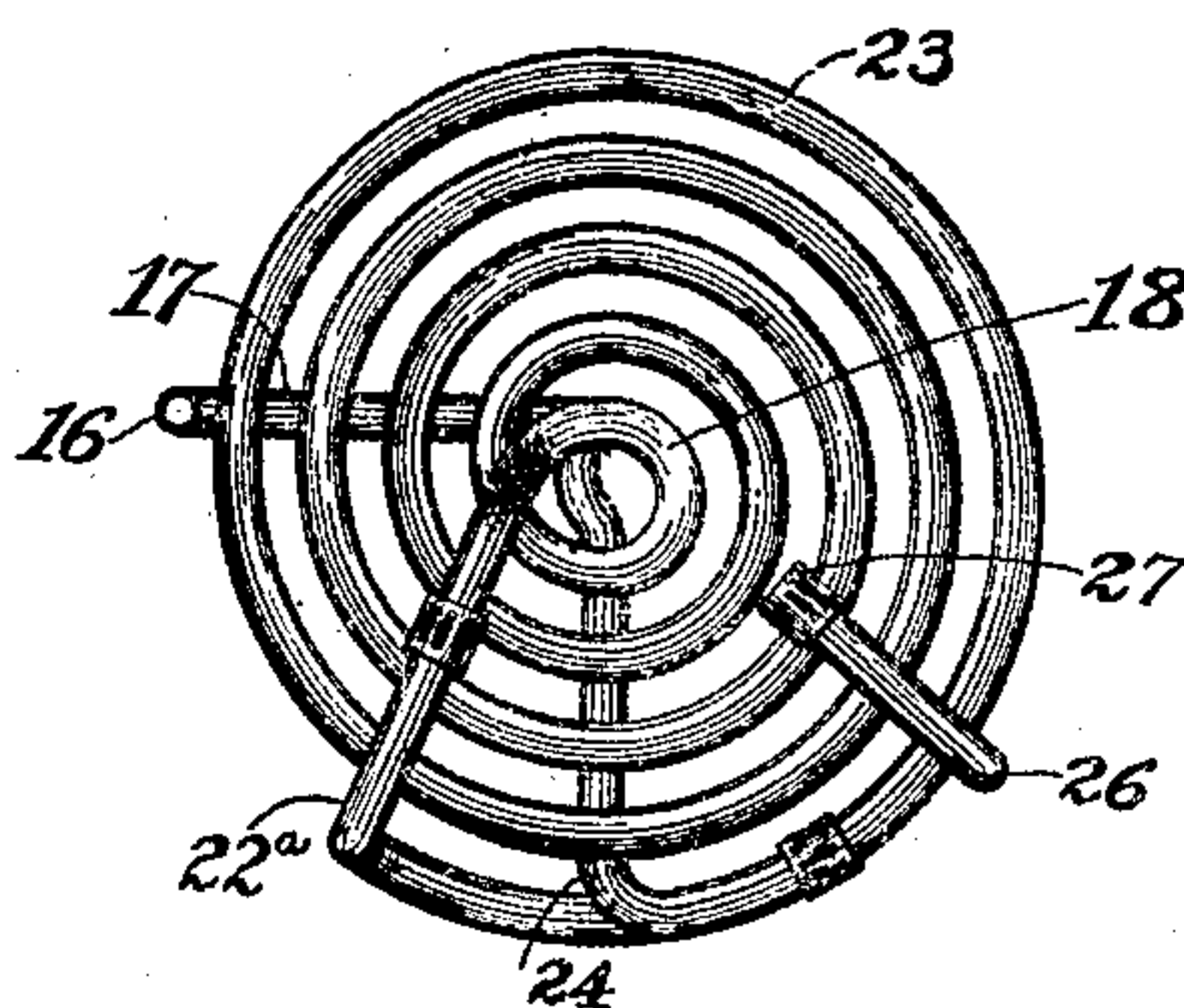


Fig. 8



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UNITED STATES PATENT OFFICE.

CARL L. THUDICHUM, OF ROLAND PARK, MARYLAND.

STEAM-GENERATOR.

No. 914,618.

Specification of Letters Patent.

Patented March 9, 1909.

Application filed October 24, 1907. Serial No. 398,939.

To all whom it may concern:

Be it known that I, CARL L. THUDICHUM, a citizen of the United States, residing at Roland Park, in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification.

This invention relates to boilers for generating steam for the propulsion of automobiles or other steam-propelled vehicles.

The object of the invention is the provision of an improved generator of the class ordinarily known as "flash boilers" which improvement I designate as a "semi-flash" generator, and one of the principal features of which is a permanent reservoir surrounding the boiler proper which serves as a surrounding water wall, as a feed-water heater and as a continuously available reserve supply of heated water for the boiler.

With this object in view my invention consists in an improved steam generator comprising three principal parts to wit: Two external series of coils which form the water wall or the feed-water heater, an inclosed structure of coiled pipes which I denominate the boiler proper, and a series of coiled pipes below the outer series of coils, which I designate the super-heater.

In order that persons skilled in the art to which my invention appertains may be enabled to make and use the same, I will now proceed to describe the construction and operation thereof, in connection with the accompanying drawings in which—

Figure 1 is a view showing the boiler proper and superheater in side elevation and the feed-water heater in section. Fig. 2 is a top plan view of the complete structure. Fig. 3, is a view in side elevation partly in section of the outer coil of the feed-water heater, detached. Fig. 4 is a top plan view thereof. Fig. 5, is a view in side elevation of the inner coil of the feed-water heater, detached. Fig. 6, is a top plan view thereof. Fig. 7, is a view in side elevation of the inner coiled pipe structure or boiler proper. Fig. 8, is a top plan view thereof.

Referring specifically to the drawings, 10 indicates the outer coil and 11 the inner coil of the feed-water heater shown detached in Figs. 3 to 6, the latter being located within the former as clearly shown in Fig. 1, provi-

sion being made to connect these two series 55 of coils at the bottom, their connecting ends being indicated at 12 and 13 in Figs. 3 and 5.

The water for feeding the boiler is entered at the top of the series of coils 10 at the point 14 and takes its course downwardly through 60 this series of coils, passing out thereof at 12 and into the series of coils 11 at 13 (12 and 13 being connected together) from whence it takes its course upwardly through the series of coils 11 to the point 15, this point 15 being 65 connected to a pipe 16 which forms the inlet of the boiler proper.

The boiler proper is illustrated detached in Figs. 7 and 8 and comprised of a series of convolute coils of any suitable number, the 70 water from the inner coil 11 of the feed-water heater entering the coil 18 of the boiler proper through pipe 17, said pipe extending to the middle of the convolute coil 18 as shown best in Figs. 7 and 8 whence the fluid 75 takes its course through said coil outwardly until the outer turn is reached, a pipe 19 from said outer coil passing in a radial direction into the center of the next coil 20, taking same course therethrough and through all of 80 the coils of this section until at the point 210 of Fig. 7, the last radial pipe from an outer turn to an inner turn passes to the center of the bottom coil 22 and from thence the fluid passes upwardly through a vertical pipe or 85 riser 21 which at 22 takes a radial direction to the center of a convolute coil 23 through which it passes to the outer turn thereof and again inward at 24 to the center of another convolute coil 25, the last two coils forming 90 a second section of the boiler proper. From the outer turn of this coil 25, a pipe or riser 26 leads upwardly and is bent radially at 27 from whence it leads downwardly at 28 to the point 29, which is the entrance to the 95 larger convolute coils 30, 31 and 32 which form the superheater, the fluid passing from the point 29 outwardly through the coil 30, to its outer turn, thence from the point 33 radially inward to the center of coil 31, 100 thence outwardly through the said coil to the point 34 whence it passes radially into the center of coil 32 and thence to the outer turn of said coil 32, from which it passes through pipes 35 to the engine. It will 105 readily be understood that these structures are necessarily inclosed in a suitable casing and inasmuch as the construction of the

casing forms no part of the present invention it is not necessary to describe or illustrate it herein.

The water entering and passing through the series of coils 10 and 11 is thoroughly heated before being delivered as before described into the boiler proper, said coils therefore serving as a feed-water heater. Besides this the water contained in the feed-water heater forms a permanent reserve supply, surrounding the boiler proper with a water wall, the escaping gases of combustion being not only thus utilized to heat the feed-water but such utilization also serving to reduce the temperature of said escaping gases to the lowest practical point and thus protect the casing from the heat of the fire. This reservoir of reserve water is always full and at its delivery point is always at a boiling temperature. This boiling water, as soon as it passes into the highly heated pipes to the boiler proper, will immediately flash into steam and as it is more highly heated in passing through each coil of the boiler proper, it will become thoroughly superheated steam of extremely high pressure and temperature after passing through the superheater coils. The upper coils of the second section of the boiler proper above the coil 18 act as a steam drum or compression chamber and hold the water back in the coils of the boiler allowing nothing but steam to escape from the outlet. The boiler and superheater are made of the same diameter as the burner by which they are superheated and the superheater comes into immediate contact with the flame thereof, said flame next contacting with the coils of the boiler proper, thus insuring the heating of the superheater and boiler to the very highest degree so that the steam will be thoroughly superheated and raised to the highest temperature.

What I claim as new is:

1. A steam generator comprising, in combination, a feed water heater comprising a spiral coil of pipe with an inlet at the lower end and an outlet at the upper end thereof, a boiler proper located within the feed water heater and comprising a plurality of convolute coils and radial connections between the outer coil of each convolute and the inner coil of the next convolute below it, the inlet being in the inner coil of the upper convolute, and a vertical and horizontal pipe leading from the outlet of the feed water heater to the inlet of the boiler proper.

2. A steam generator including, in combination, a boiler proper comprising a section which comprises a plurality of convolute coils of pipe one above the other, with radial pipes directly connecting the outside of each coil with the center of the adjacent lower coil, a feed water heater comprising outer spiral coils surrounding the boiler proper, a vertical horizontal connecting pipe leading

from the top of the feed water heater to a coil near the top of the boiler, and a suitable outlet pipe leading from the bottom coil of the boiler to above the top coil thereof.

3. A steam generator comprising, in combination, a boiler proper which includes two superposed sections, each section comprising a plurality of convolute coils, a water inlet pipe leading from above the upper section to the inner coil of the uppermost convolute of the lower section, a connecting pipe leading from the outermost coil of lowest convolute of the lower section to the innermost coil of the upper convolute of the upper section, and an outlet pipe leading from the outer coil of the lowest convolute of the upper section to a point above said upper section.

4. A steam generator comprising in combination, a boiler including a series of convolute coils arranged one above the other with connections from the outside of each coil to the center of the next adjacent lower coil directly, and a water-wall forming a feed-water heater surrounding the boiler proper, comprising an outer spiral coil with an inlet for water at its upper end, a second spiral coil inside the first and connected thereto at the bottom, and a connection vertical and horizontal from the top of said second coil to the center of the upper convolute coil of the boiler proper.

5. A steam generator comprising, in combination, a section which includes a plurality of convolute coils arranged one above the other with connections from the outside of each coil to the center of the next adjacent lower coil, an inlet for water to the center of the upper coil and an outlet from the outside of the bottom coil, a second section comprising a plurality of similar coils superposed above each other and above the first section, a pipe connecting the outlet of the first section with the center of the upper coil of the second section, and an outlet pipe leading from the outside of the lower coil of the second section upwardly to a point above the upper coil thereof.

6. A steam generator comprising in combination a feed-water heater which includes a spiral coil with inlet for water, an outlet for the same at the top, a boiler proper comprising a plurality of superposed convolute coils within the feed-water heater, connections from the outlet of the feed-water heater to the boiler proper, a superheater comprising a series of superposed convolute coils below the boiler proper and the feed-water heater, connections between the top of the boiler proper and the center of the top coil of the superheater, and connections between the outside of each coil of the superheater, and the center of the next adjacent lower coil.

7. A steam generator comprising, in combination, spiral coil with an inlet for water at the top thereof, a second spiral coil inside

the first and connected at its bottom with
the bottom thereof, a section within the sec-
ond coil comprising a superposed series of
convolute coils, radial pipes connecting the
5 center of each coil with the outside of the
next adjacent lower coil, a pipe leading from
the upper end of the second spiral coil to the
upper coil of the inner section, a second inner
section comprising a series of convolute coils
10 superposed above the first section and con-
nected from the center to the outside of adja-
cent coils, a connection between the lower coil
of the first inner section and the upper coil of

the second inner section, a superheater com-
prising a series of superposed convolute coils 15
below the feed-water heater and inner sec-
tions, an outlet for steam from the lower coil
of the superheater, and a connection between
the lower coil of the second inner section and
the upper coil of the superheater. 20

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

CARL L. THUDICHUM.

Witnesses:

M. H. PLUNKETT,

ELIZABETH A. PARKER.