

(No Model.)

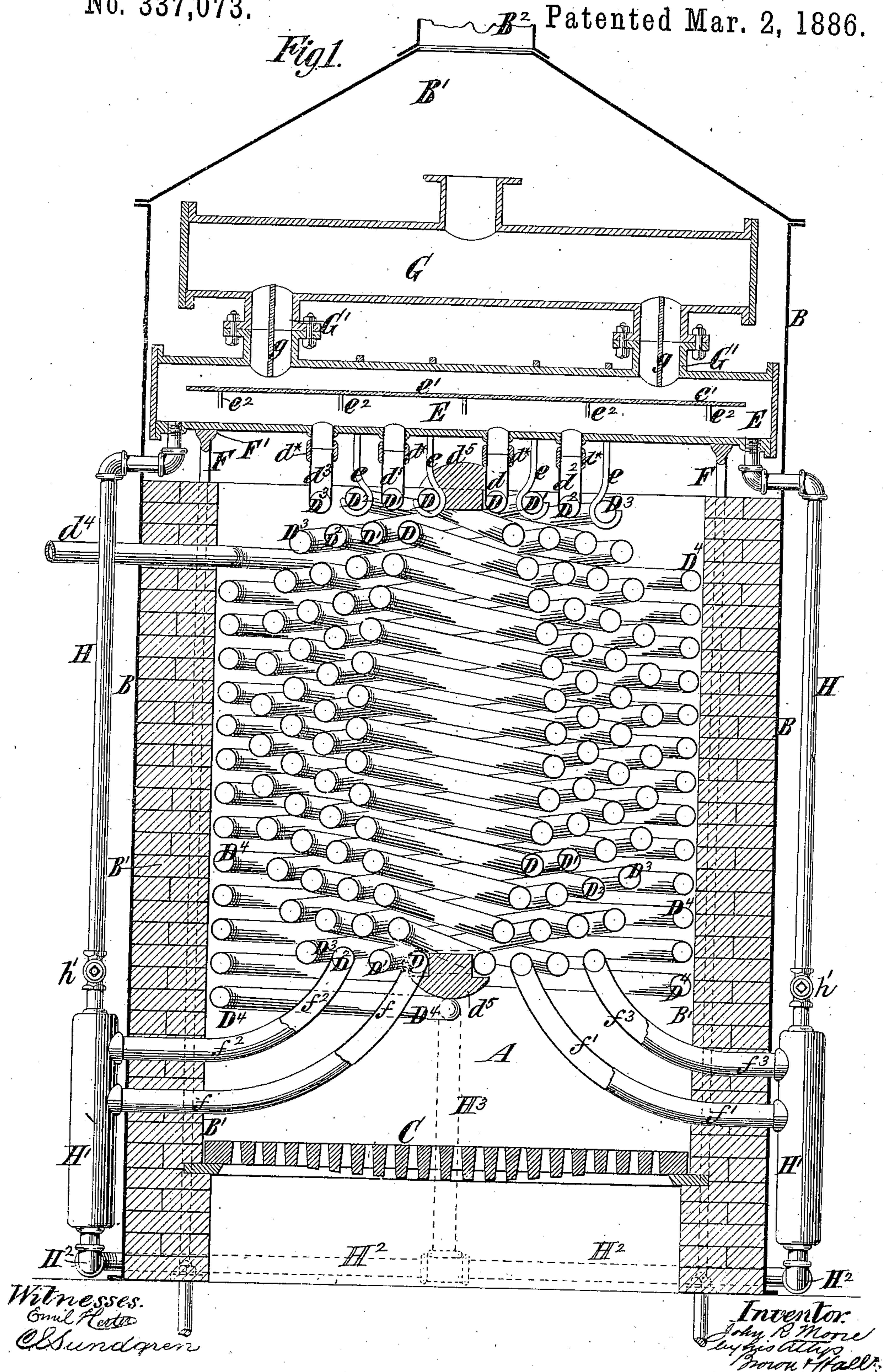
2 Sheets—Sheet 1.

J. R. MOORE.
STEAM GENERATOR.

No. 337,073.

Patented Mar. 2, 1886.

Fig 1.



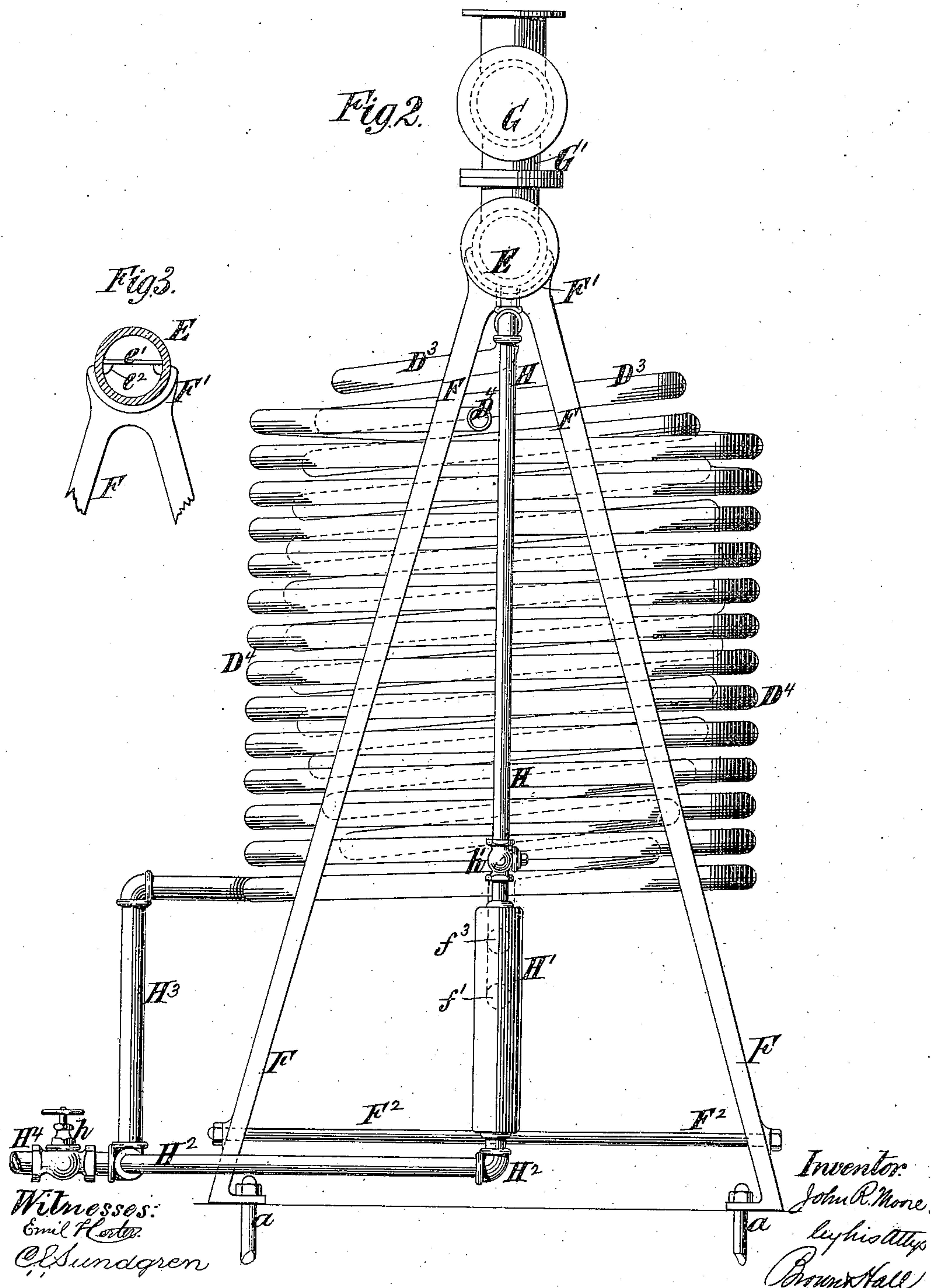
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2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

JOHN R. MOORE, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO
JOSEPH B. SEE, OF SAME PLACE.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 337,073, dated March 2, 1886.

Application filed September 17, 1885. Serial No. 177,324. (No model.)

To all whom it may concern:

Be it known that I, JOHN R. MOORE, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Steam-Generators, of which the following is a specification.

My invention relates to that class of steam-generator in which the heating surface is composed of coils arranged within a furnace.

10 Important objects of the invention are to provide a generator in which steam will be made very rapidly, in which the coils and connecting parts will be supported in a very stable manner and preferably independent of the furnace-structure, and to secure a thorough separation of the steam and water which pass from the coils, so that dry steam will be produced.

20 In the accompanying drawings, Figure 1 is a vertical section of a generator embodying my invention. Fig. 2 is a side view of the working parts of the generator, the casing and furnace being omitted; and Fig. 3 is a transverse section of a drum with which the upper ends of the heating-coils are connected and a portion of the frame which supports this drum.

Similar letters of reference designate corresponding parts in the several figures.

30 A designates the furnace, which, as represented, consists of a cylindric metallic shell or casing, B, and a lining, B', of fire-brick or other suitable material.

C designates the grate, which may be of any suitable construction.

35 The heating-surface of the generator is formed by a series of coils which are arranged vertically in the furnace, and of which any suitable number may be employed. I have here represented four coils, D D' D² D³, which are arranged one within another, and which are of barrel-like form, or have their convolutions gradually increasing in diameter from the middle upward and downward toward opposite ends. This gives the coils approximately the form of two cones united at their bases, the lower one being inverted. These coils are to be made of pipes or tubes. I have also represented a feed-coil, D⁴, which is of 50 cylindric form and surrounds the heating-

coils, it being arranged near the interior wall of the furnace.

E designates a drum arranged horizontally above the furnace-coils, and which may be of cast or wrought metal. As here represented, 55 this drum is supported upon upright frames F, the form of which is best shown in Figs. 2 and 3. These frames may be of wrought-iron, and consist of two diverging legs united at the upper ends to form a semicircular 60 cradle, F', wherein the drum E rests, and having their ends secured by bolts *a* to the foundation of the boiler. The two legs of the frame F may be connected at their lower ends by a bolt, F², as shown in Fig. 2, so as to prevent them from spreading. 65

The several coils D D' D² D³ are connected at their upper ends by branches *d d' d² d³* with the under side of the drum E, each branch being connected by a coupling, *d**, with a nipple fixed 70 in the drum. These branches *d d'*, &c., serve to support the coils on their one side, and the coils are additionally supported by suspenders or hangers, *e*, which are hung from the drum E, and which receive the upper convolutions of 75 each coil at a point opposite its branch *d d'*, &c. In this way the coils are suspended or depend from the drum and have their weight supported by the drum and the frames F.

Above the drum E, I have represented a 80 steam-drum, G, which is connected by branches G' with the drum E, and in these branches G' are vertical plates or partitions *g*, which have the effect of separating or dividing the water from the steam which passes 85 upward through the branches into the steam-drum G.

I have shown in the drum E a horizontally-arranged partition or baffle-plate, *e'*, which may be supported on lugs or ears *e²*, projecting 90 from the inner sides of the drum. The steam which passes upward through the branches *d d'*, &c., when the generator is in operation, impinges against the under side of the baffle-plate *e'*, and in this drum E the water is separated from the steam. 95

From opposite ends of the drum E return-pipes H lead downward, and are connected at their lower ends with manifolds H', from which branches *f f' f² f³* lead to and connect 100

with the lower ends of the several coils D D', &c. These manifolds H' are connected at their lower ends by a pipe, H², and this pipe is in turn connected by a pipe, H³, with the lower end of the feeding-coil D⁴, the pipes H² H³ being arranged outside the furnace. From the pipe H² leads a blow-off, H⁴, in which is a blow-off valve, h, and in each of the downwardly-extending return-pipes is arranged a check-valve, h', which may be of the ordinary form, and which is placed so that it opens downward or in a direction away from the drum E. These valves h' permit the passage of water downward through the pipe H and manifolds H', and prevent the passage of water upward through the pipes H.

With the upper end of the feeding-coil D⁴ is connected a feed-pipe, d⁴, which leads from the feed-pump or injector.

The generator is inclosed by a cap or top, B', secured to the outer casing, B, and from it leads the outlet-pipe B² to a smoke-stack or chimney.

The inner heating-coil, D, may have stop-pers d⁵ closing its interior at the top and bottom, so that the heated products from the furnace A will be prevented from passing directly upward through the inner coil, D, and will be compelled to circulate or travel circuitously upward between the convolutions of the several coils, and will therefore be most effective in heating them.

As before stated, the arrangement of the check-valves h' precludes an upward circulation through the pipes H, and when the generator is in operation the circulation takes place upward through all the heating-coils, and thence to the drum E, which constitutes a separator to divide the water from the steam, and the steam passes upward into the steam-drum G; while the water returns downward through the pipes H and manifolds H', and is supplied by the branches f f', &c., to the lower ends of the several heating-coils.

The pipe H², which connects the manifolds H' at their lower end, tends to equalize the circulation through each of the return-pipes H and manifolds and through the coils which are supplied through the branches from the manifolds.

From the above description it will be seen that in this improved generator the heating-surface is very effective. The working parts are supported independent of the casing or furnace, and are therefore not liable to be strained by unequal expansion, and effective provision is afforded for separation of the water from the steam, in order to produce dry steam and for maintaining the circulation through the heating-coils constantly in one direction.

It will be seen that by means of the pipes H² H³ and the branches f f' f² f³ the return-pipes H and the lower ends of the feeding and heating coils are all connected together.

By making the lower portions of the heating-coils of inverted conical form the several

convolutions of each coil are brought out of line vertically and are more exposed to the heat of the fire than would be the case if the coils were cylindric from end to end, even though such cylindric coils were terminated at the lower ends at different levels.

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

1. The combination, with a furnace and heating-coils arranged vertically thereon, of a horizontally-arranged drum, with which the upper ends of the coils are connected and from which the coils depend, whereby the drum is made to support the weight of the coils, upright frames independent of the brick setting of the generator supporting the drum, and return-pipes for conducting water from the drum to the lower ends of the coils, substantially as herein described.

2. The combination, with the upright frames F, the drum E, supported by them, and the coils D D', &c., having their upper ends connected by branches d d', &c., of the drum, and suspenders e, hung from the drum for supporting the coils opposite said branches, substantially as herein described.

3. The combination, with a furnace and a horizontally-arranged drum above the same, of coils arranged within the furnace and having their upper ends connected with the drum so that the coils depend therefrom, the lower portions of the coils having an inverted conical form, and return-pipes for conducting water from the drum to the lower ends of the coils, substantially as herein described.

4. The combination, with the drum E, of the coils D D', &c., having their convolutions decreasing in diameter toward each end and having their upper ends connected with the drum so that the coils depend therefrom, and return-pipes for conducting water from the drum to the lower ends of the coils, substantially as herein described.

5. The combination, with a furnace and vertically-arranged heating-coils, of a horizontally-arranged drum, with which the upper ends of the coils are connected and which constitutes a separator for the steam and water, and a steam-drum connected with the separator and receiving steam therefrom, substantially as herein described.

6. The combination, with a furnace and vertically-arranged heating-coils therein, of the separator-drum E, with which the upper ends of the coils are connected and which contains the baffle-plate e', and a steam-drum connected with the separator-drum and receiving steam from it, substantially as herein described.

7. The combination, with a furnace and vertically-arranged heating-coils therein, of the separator-drum E, with its baffle-plate, and with which the upper ends of the coils are connected, the steam-drum G and branches G', having vertical partitions g, for dividing steam and water and connecting the two drums, substantially as herein described.

8. The combination, with a furnace and ver-

5 tically arranged heating-coils therein, of a drum with which the heating-coils are connected at their upper ends, and return-pipes connecting the drum with the lower ends of the coils and containing downwardly-opening check-valves, whereby circulation can only take place upward through the coils and drum and downward through the return-pipes, substantially as herein described.

10 9. The combination, with a furnace and vertically arranged heating-coils therein, of a drum with which the upper ends of the coils are connected, return-pipes extending downward from the drum and terminating in manifolds, with which the lower ends of the coils are connected, an equalizing pipe connecting the manifolds together, a feed-pipe for sup-

plying water to the manifolds, and a blow-off pipe connected with the manifolds, substantially as herein described.

20 10. The combination, with a furnace and vertically arranged heating-coils therein, of a drum with which the upper ends of the coils are connected, a feeding-coil arranged within the furnace outside the heating-coils, return- 25 pipes leading downward from the drum, and pipes connecting the return-pipes and the lower end of the feeding-coil with the lower ends of the heating-coils, substantially as herein described.

JOHN R. MOORE.

Witnesses:

HENRY McBRIDE,
FREDK. HAYNES.