

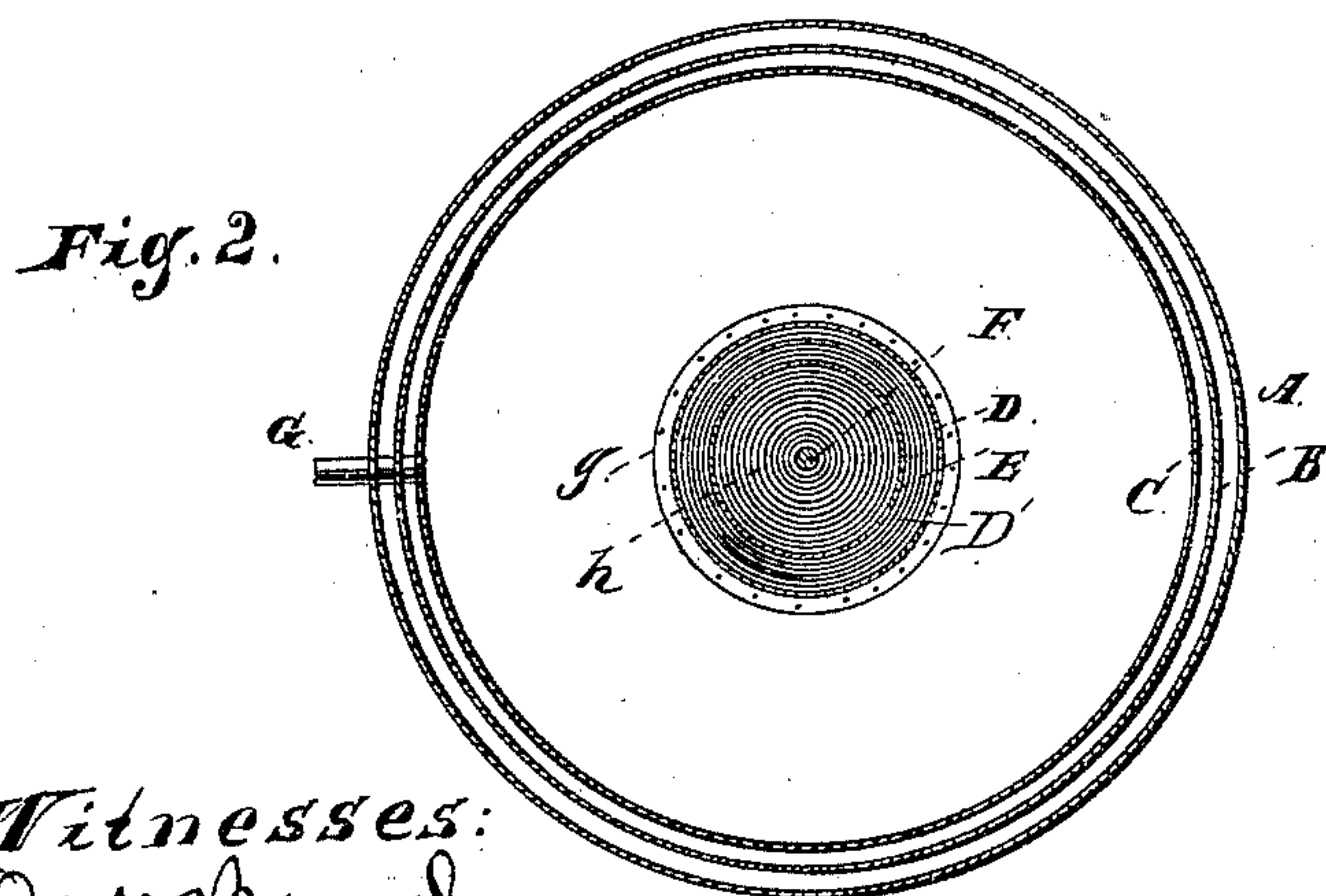
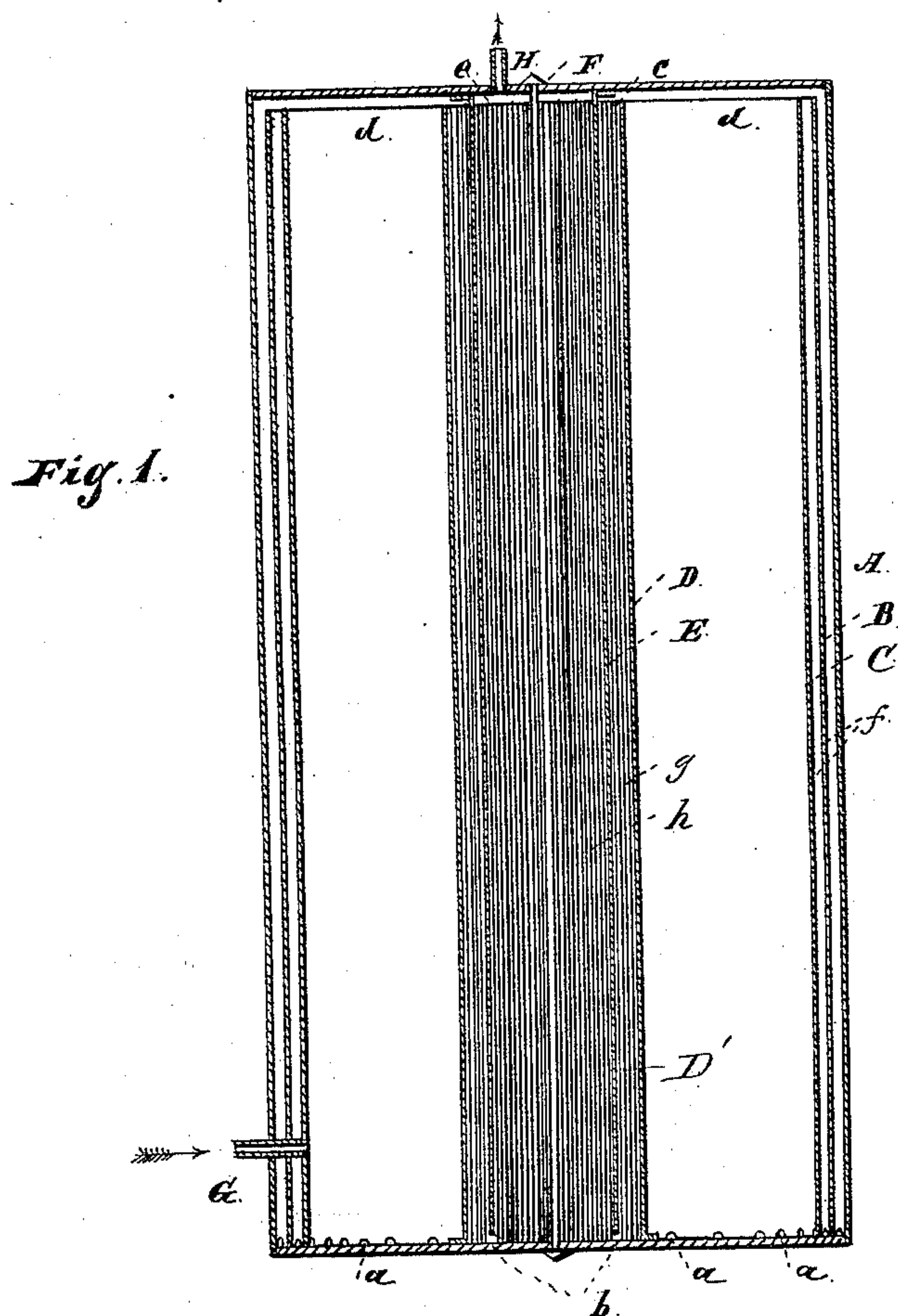
(No Model.)

A. D WOODMAN.

Steam Generator.

No. 232,220.

Patented Sept. 14, 1880.



Witnesses:
Geo Bond.
H. F. Burns.

Inventor:

Asa D Woodman

UNITED STATES PATENT OFFICE.

ASA D. WOODMAN, OF CHICAGO, ILLINOIS.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 232,220, dated September 14, 1880.

Application filed April 20, 1880. (No model.)

To all whom it may concern:

Be it known that I, ASA D. WOODMAN, residing at Chicago, in the county of Cook and State of Illinois, and a citizen of the United States, have invented a new and useful Improvement in Stratified Boilers and Steam-Generators, of which the following is a full description, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical section, and Fig. 2 a cross-section.

The object of this invention is to construct a boiler which will produce what is known as "blue steam" in sufficient quantity for use, either as power or in the reduction of ores, without the danger of explosions; and its nature consists in constructing a generator or boiler with a stratified or laminated exterior or shell, and an interior stratified central column or division, both or either.

In the drawings, A indicates the exterior shell, and B C the interior metallic strata; D, the exterior cylinder of the central column; D', the central column or division; E, a partition therein; F, a stay-bolt; G, feed-water pipe; H, steam-pipe; *a*, notches or holes at the bottom of the strata B C; *b*, open passage at the bottom of partition, cylinder, or plate E; *c*, an open passage at the top of central column or division-cylinder, D'; *d*, an open passage at the top of the strata B C; *e*, steam-space; *f*, strata of less density than the metal in the outer cylinder or shells; *g*, metallic strata in that part of the column where the steam descends; *h*, metallic strata in that portion of the column where the steam ascends.

The exterior shell or cylinder, A, is made of boiler-iron in the usual manner, or it may be made of copper or other suitable metal, and it is made steam and water tight. The heads or ends may be crowned, so as to dispense with the central stay-bolt, F, but when made flat, as shown, its use will be required.

Inside of the exterior shell I place the cylinders or strata B C, which are made of thin or sheet metal—usually galvanized sheet-iron. These cylinders or strata are attached to the lower head or end by flanges and rivets, or by other suitable means, and at or near the point of attachment they are provided with openings or holes *a*, through which the water

passes into the spaces between them and to the exterior shell. A free steam-passage, *d*, is left between them and the upper end or head, so that steam may freely pass to or from the spaces. A row of holes like that at the lower end may be used, instead of an open space, when it is desired to attach these cylinders or strata to both heads.

The central column or division is made by forming two cylinders, D and E, of sheet metal of sufficient weight or strength to be firmly attached and held in position by flanges and rivets or other fastening device. The cylinder or division D is attached to the lower head, so as to leave a space, *c*, at the top, and the cylinder or division E is similarly attached to the upper head, so as to leave a space, *b*, at the bottom. The space between these two cylinders is filled with metallic strata made of thin sheet metal, which need not be galvanized, and their edges need not be fastened together. The space is filled with these sheet-metal strata *g*, so that they come in contact with each other, but without pressure one upon another, and for the best results there should not be any space between them exceeding one thirty-second of an inch.

The strata or cylinder-sheets *g* and *h* are either cut irregularly at the bottom or are provided at that point with notches, so as to give a circulation. The strata *h* are made to nearly or quite fill the space inside of the cylinder E, in the same manner that the space between E and cylinder D is filled. An open space, *e*, is left at the top for a steam-space, which, in the proportion shown, is sufficient when the generator is used for reducing ores; but when used in generating steam for power this steam space should have a greater capacity, which is made by shortening the filling sheets or strata *h*, so as to leave a space of from six to ten inches between the upper ends and the head. The spaces *f*, in use, have their lower parts filled with water and the upper with steam, which form strata less dense than the metal divisions, and these spaces should be about one-sixteenth of an inch across, and it is not essential that the metal strata B C be attached to the head, as exact regularity in the width of spaces is not necessary.

As shown, the generator is what I call a

"five-strata boiler," the parts A B C forming the metallic strata and the spaces *f* forming the strata of less density.

5 The shell can be reduced to three strata, or it can be increased to any desired number, and by inserting a division-plate, like E, it may be made to work on the principle of the central column.

10 I do not limit myself to the combination of the exterior strata with the interior, as either is of value and importance without the other, while the best results are obtained by combining them.

15 The feed-water is admitted through the tube G, which is to be provided with the usual appliances. So is also the steam-pipe H. The generator is to be also provided with a furnace at the lower end, and the brick or metal work arranged to head the sides or cylinder 20 up as far as may be desired.

25 In operation water is introduced into the main space and into the spaces *f*. The gray steam there formed passes through the space *c* and down between the metallic strata *g*, thence through the space *b* and up between the strata *h* to the steam-space *e*; and during its passage through this strata it becomes changed into blue steam, which is a quality of steam nearly, but not quite, superheated. The steam 30 is taken for use through or by the pipe H, and if it is desired, for any purpose, to take or use ordinary steam, an additional pipe may be inserted in the upper head at any point over the main space.

35 With the exception of the exterior shell or cylinder, the cylinders or metallic strata need

not be connected at their adjoining edges, or be made to withstand steam-pressure.

By this construction of the boiler I produce blue steam without danger of explosions, and 40 greatly reduce such danger, if not entirely eliminate it, so far as caused by the introduction of cold or tepid water, as it is impossible for the water to come in contact with sufficient steam and heated metal to condense the steam, 45 or form new steam with explosive power, for the water and the chill cannot pass through in time to cause an explosion. I have thoroughly tested this, and find the generator safe as against explosion from this cause. The 50 stratification also aids greatly in retaining heat and economizing the use of fuel.

The device will be found well adapted for use as a gas-generator.

What I claim as new, and desire to secure 55 by Letters Patent, is—

1. The exterior shell, A, in combination with one or more interior thin metallic cylinders or divisions having narrow water space or spaces 60 between them, substantially as and for the purpose specified.

2. In a steam-generator, the central column, D', having the division E, and the spaces within filled with thin metallic sheets, sub- 65 stantially as described.

3. The combination of the stratified outer shell, A, with the stratified interior column, D', substantially as and for the purpose set forth.

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