

(No Model.)

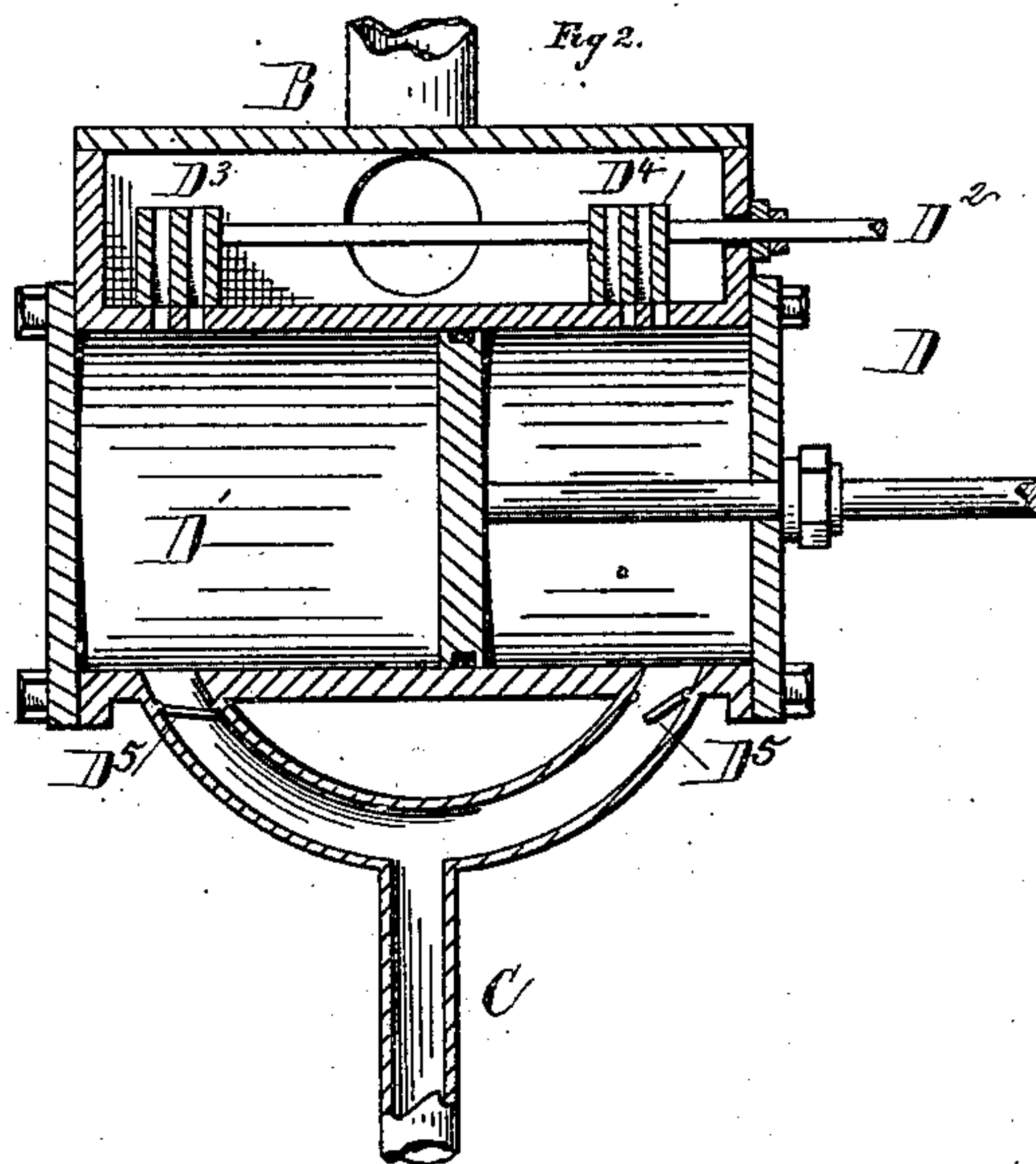
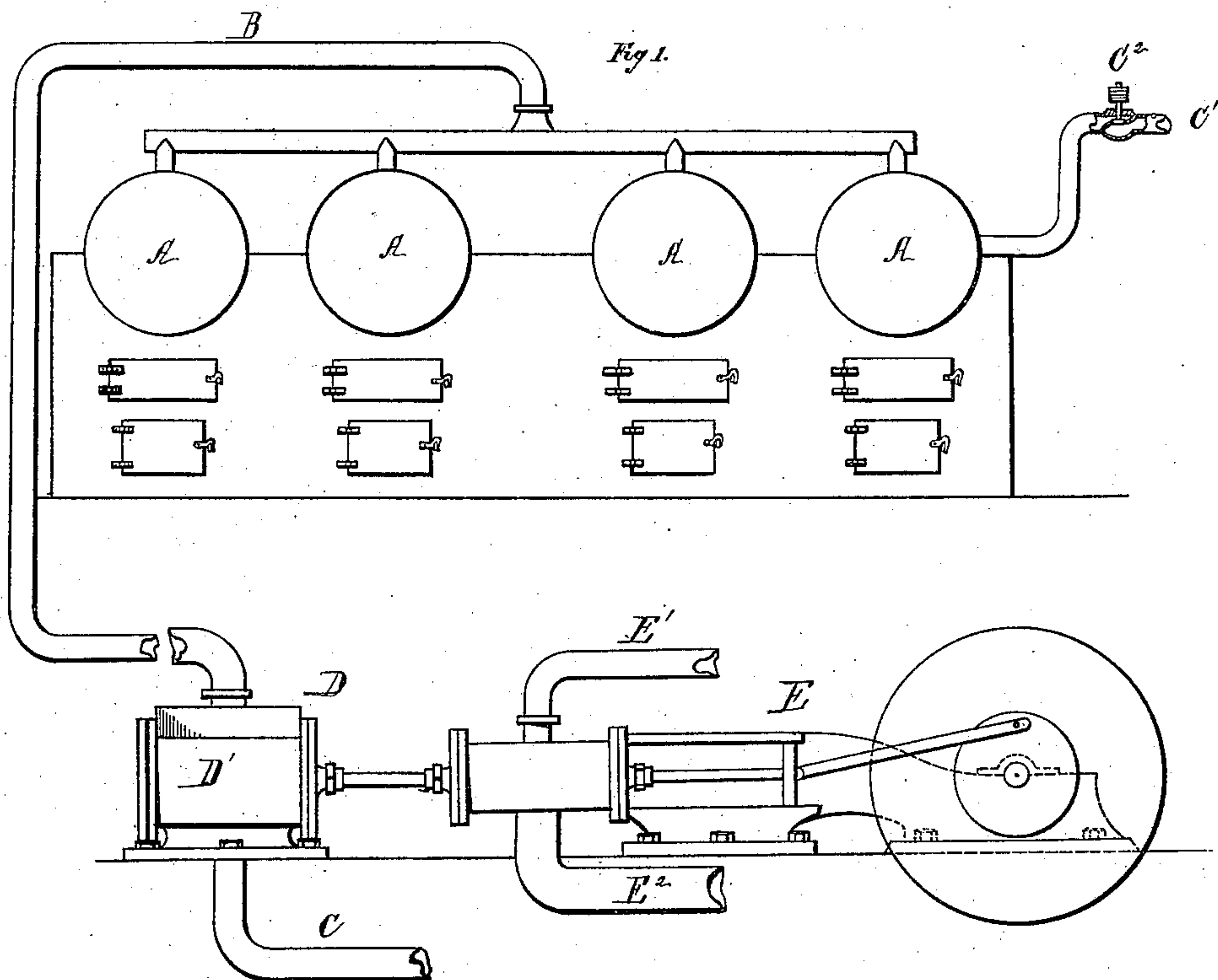
2 Sheets—Sheet 1.

M. S. FOOTE.

METHOD OF AND APPARATUS FOR STEAM HEATING.

No. 294,982.

Patented Mar. 11, 1884.



WITNESSES

Samuel C. Thomas.

N. S. Wright.

INVENTOR

Mark S. Foote
By W. C. Leggett
Attorney

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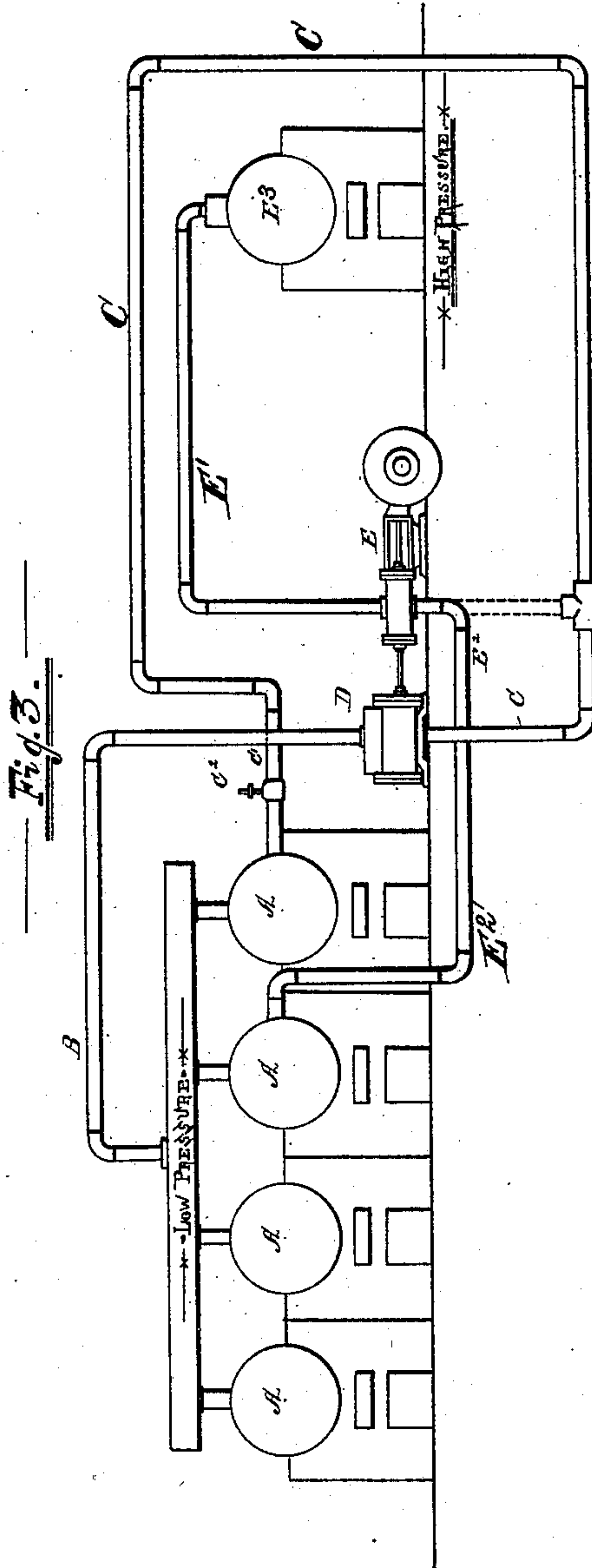
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UNITED STATES PATENT OFFICE.

MARK S. FOOTE, OF BURLINGTON, IOWA.

METHOD OF AND APPARATUS FOR STEAM-HEATING.

SPECIFICATION forming part of Letters Patent No. 294,982, dated March 11, 1884.

Application filed June 30, 1883. (No model.)

To all whom it may concern:

Be it known that I, MARK S. FOOTE, of Burlington, county of Des Moines, State of Iowa, have invented a new and useful Improvement in
5 Method of and Apparatus for Steam-Heating; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it
10 pertains to make and use it, reference being had to the accompanying drawings, which form a part of this specification.

My invention consists in the combination of devices and appliances hereinafter specified, and more particularly pointed out in the claims.

15 In the drawings, Figure 1 is a diagram illustrating my invention. Fig. 2 is a separate view of a pump-cylinder designed for illustrating the principle of my invention. Fig. 3
20 is a side elevation of the complete plant.

Heretofore in steam-supply systems it has been customary to raise steam in one or more
25 boilers or generators, bringing it to a considerable pressure, and in that condition passing it off through the mains and service-pipes, for the purpose of yielding heat or steam for power
30 in various parts of the surrounding district, and in some heating apparatus engines have been used for impelling the heated fluid. In those devices, however, a great consumption
35 of fuel is necessitated, and powerful generators, in order to generate and manage the steam under high pressure sufficient to cause
40 it to circulate throughout the system.

It is the object of my invention to generate
35 steam in boilers at a low pressure of a few pounds, and yet to feed that steam into and cause it to circulate through the mains and
40 service-pipes at a high pressure.

To accomplish this object, A represents a
40 series of boilers. B represents a steam-pipe leading therefrom to the mains C. D is an intermediate pump. E is a steam-engine or other suitable motive power for driving the
45 said pump. The engine E is supplied with steam through pipe E' from a high-pressure generator, E'. It will be understood, however,
50 that instead of the engine E, any other power of like capacity may be employed for operating the pump D—as, for instance, a water-wheel or other device—it only being necessary
55 that the power at E for driving the pump shall be greater than the pressure of steam in the

generators A. The pump D is designed to pump steam from the generators A, taking it at a low pressure, compressing it in the cylinder D', and passing it off into the main C at a
55 higher pressure than that of the generator A, and in this way the steam is caused to circulate through the mains and service-pipes C, instead of creating such circulation by high
60 pressure of steam in the generators A. In Fig. 2 is shown the principle of such a pump-cylinder, D² being a suitable valve-rod for operating the valves D³ and D⁴, which are suitable pump-valves, and C the mains and service-pipes, and D⁵ valves therein. The steam
65 circulating through the mains and service-pipes may eventually escape in the form of steam or condensed water through a suitable drip. I prefer, however, to return the same
70 to the boiler either by a pump or directly, as shown at the right in Fig. 1 at C'. So, also, in order to enable the pump D to create a pressure within the service-pipes and mains,
75 I may employ a suitable valve, C², graduated by weights, levers, or springs to remain closed until the pressure in the service-pipes shall exceed the amount of pressure graduated by
80 this valve, at which period the valve will open and permit the steam or condensed water at this point to be discharged back into the generators A. So, also, if the steam-engine E is
85 employed for driving the pump, the exhaust from this engine may also be utilized by permitting its exhaust-pipe E² to discharge back into the generators A, the exhaust-pipes being
90 connected thereto in any ordinary way known to machinists—as, for instance, by extending the pipe E², as shown in Fig. 3; or, if desired, it may discharge into the main C, being connected thereto in any well-known
95 way—as, for instance, by a pipe shown by dotted lines in Fig. 3—providing the back-pressure from the main is not too great for economical work.

I would have it understood that my invention contemplates, broadly, the employment
100 of a pump or other suitable means whereby steam may be taken from generators at a low pressure and forced forward through the mains, thus deriving circulation by the pump or other forcing mechanism and not by the pressure of the steam in the generator. It also contemplates, broadly, the forcing of the steam from

generators at a low pressure into the mains at a higher pressure, in the latter case securing a circulation not only by the forcing action of the pump, but by the increased pressure within the mains.

My invention also contemplates a process for steam-supply systems embodying a pump or forcing means for artificially creating a circulation beyond that produced by the pressure within the generator.

I do not limit myself to any particular kind of pump or means for operating the pump, and instead of the pump a power-fan or any other mechanism for forcing the steam forward may be employed, the drawings being designed simply to illustrate the principle of my invention. The effect of compressing the steam in the cylinder of the pump is to increase its heat, and there is therefore a double benefit attained: first, of securing a high pressure and circulation in the main without a corresponding pressure in the generator, and, secondly, an increase in the heat as the steam is forced into the mains.

I am aware of the patents granted to H. Picq, December 29, 1874, No. 158,305; to W. W. Williams, April 4, 1882, No. 256,089; E. F. Osborne, October 10, 1882, No. 265,697, and F. Tudor, August 21, 1883, No. 283,537; and to Bliss, July 3, 1877, No. 192,559, and lay no claim to anything therein shown and described. My invention differs therefrom in the particulars specified in the following claims.

What I claim is—

1. The process of supplying steam in a steam-supply system, consisting of, first, generating steam at a low pressure in suitable steam-generators, and then pumping or otherwise forcing said steam by an exterior power into and forward through the mains and service-pipes, thereby creating an artificial circulation, substantially as described.

2. The method of supplying steam in a steam-supply system, consisting, first, of generating steam at a low pressure in steam-generators, and then passing the same through a pump operated by steam or other exterior power,

thereby pumping the steam forward through the mains and service-pipes, and thus creating an artificial circulation, substantially as described.

3. The method herein described for supplying steam in a steam-supply system, consisting of, first, generating the steam at a low pressure in suitable generators, and then by a suitable pump or equivalent mechanism forcing the steam forward at a higher pressure into the service-pipes and mains, substantially as described.

4. In a steam-supply system, generators for generating steam at a low pressure, a pump or other mechanism adapted to receive and force the steam forward under increased pressure into the mains, and a graduated valve or its equivalent for confining the steam within the main until it shall have reached a previously-determined degree, substantially as described.

5. In a steam-supply system, generators for generating steam at a low pressure, a pump or equivalent for receiving said steam and forcing it forward under increased pressure into the mains, said main eventually discharging again into the generators, and a graduated valve or equivalent for regulating the pressure within the main, and adapted to open by excessive pressure and permit the steam or condensed water to discharge back into the generators, substantially as described.

6. In a steam-supply system, generators for generating steam at a low pressure, a pump for receiving and forcing said steam forward at an increased pressure, a steam-engine for actuating the pump, said steam-engine being fed from a steam-generator at a high pressure, and a conduit leading its exhaust-steam into the generators A or mains C of the steam-supply, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

MARK S. FOOTE.

Witnesses:

N. S. WRIGHT,
WILLIAM F. FORD.