

L. H. Colborn,  
Rotary Steam Boiler.

N<sup>o</sup> 59,361.

Patented Nov. 6, 1866.

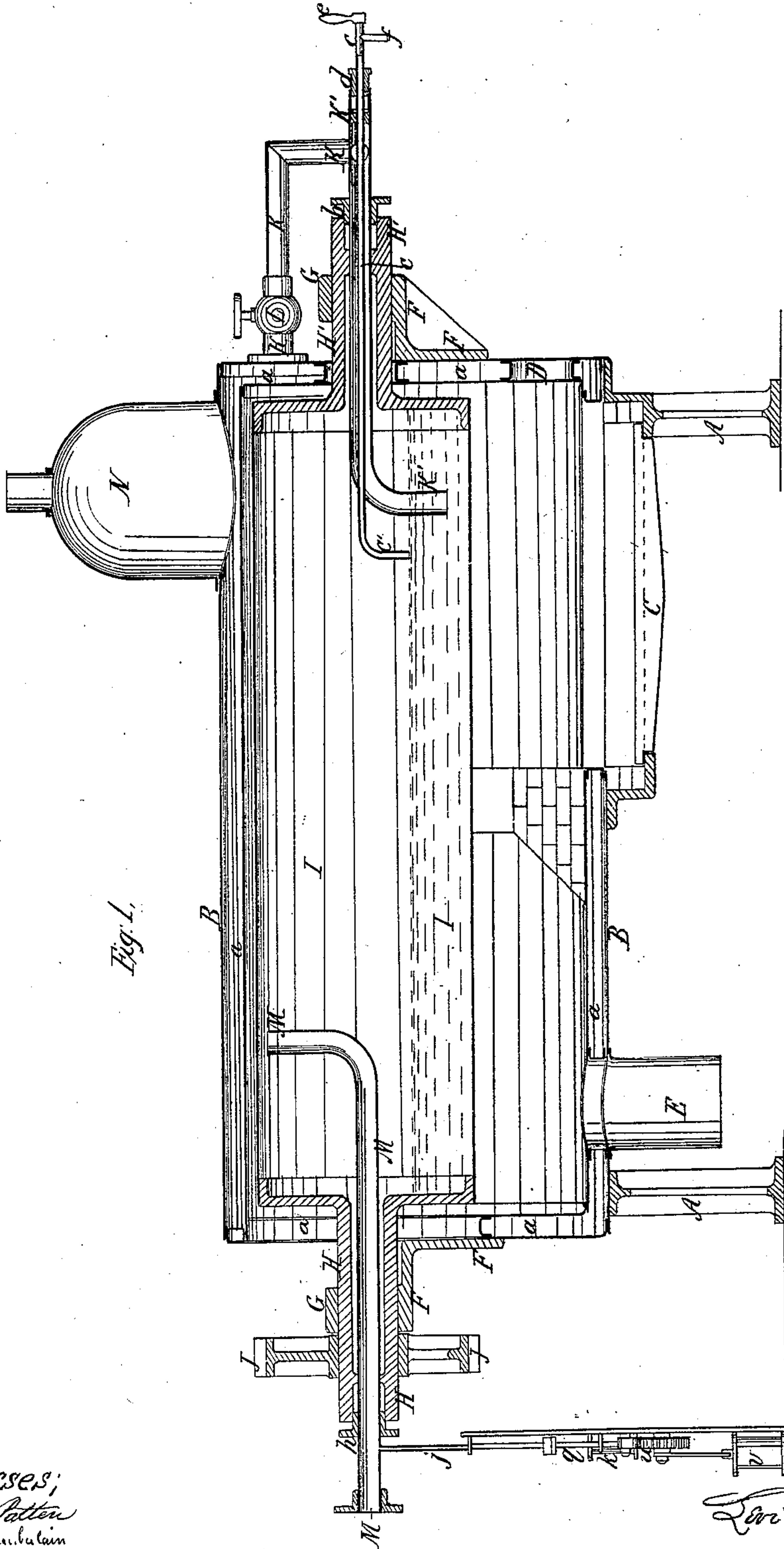


Fig. 1.

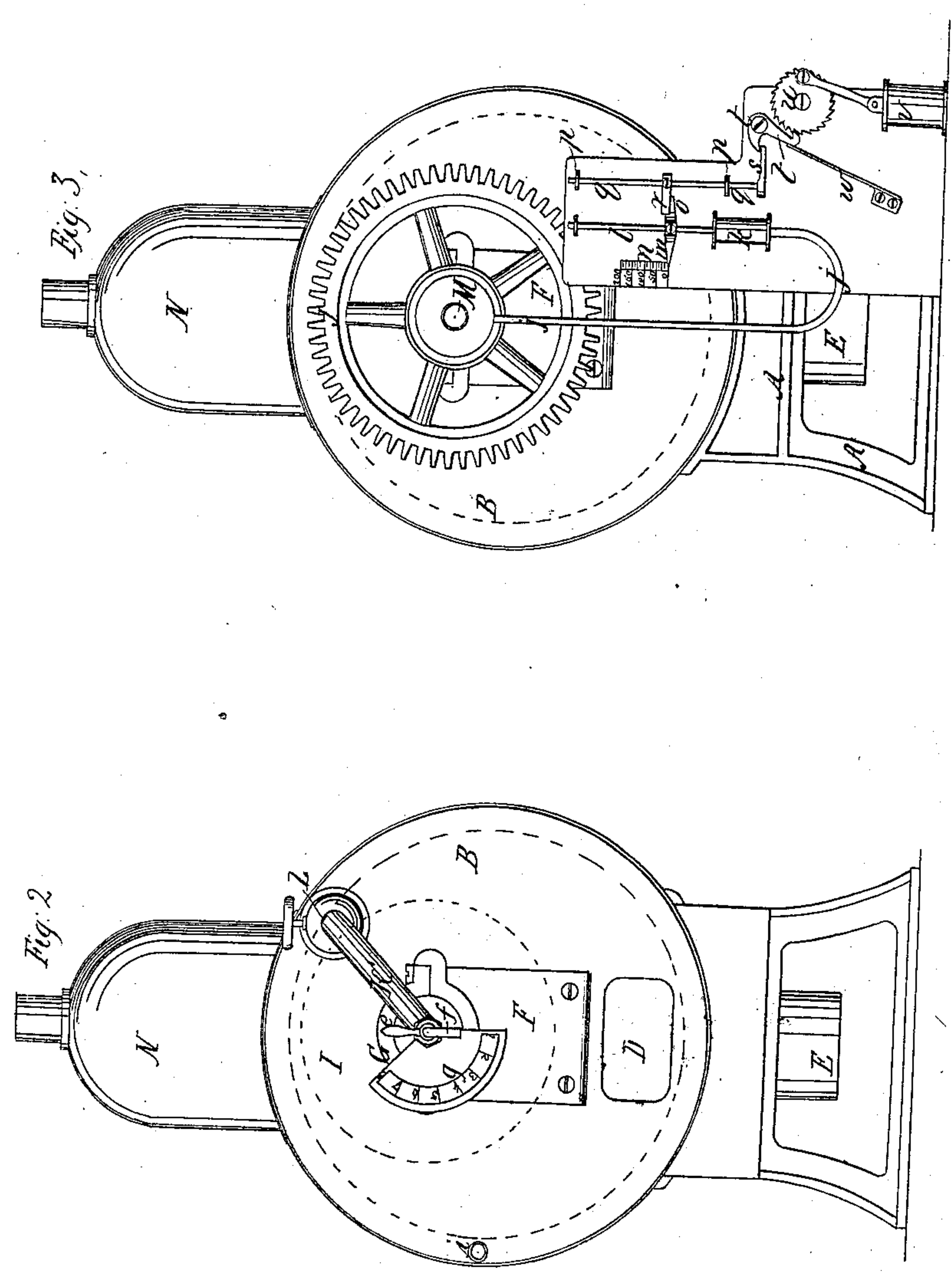
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# UNITED STATES PATENT OFFICE.

LEVI H. COLBORN, OF CHICAGO, ILLINOIS.

## IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. **59,361**, dated November 6, 1866.

*To all whom it may concern:*

Be it known that I, LEVI H. COLBORN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam Generators and Regulators; and I do hereby declare the following to be a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 represents a longitudinal vertical section through the steam-generator, and showing in red lines an edge view of the regulating mechanism. Fig. 2 represents an elevation of the front end of the generator, calling that the front where the fuel is fed in. Fig. 3 represents an elevation of the rear or opposite end of the generator, and showing a front view of the regulator.

Similar letters of reference, where they occur in the separate figures, denote like parts of the apparatus in all the drawings.

My invention consists, first, in the arrangement of a cylindrical or spherical inner revolving generator, with an exterior encircling stationary boiler or heater, and with communicating passages between them, so that the inner boiler may be supplied with heated water from the outer boiler or heater.

And my invention further consists in using, in connection with an interior cylindrical or spherical revolving generator and an exterior encircling stationary boiler or heater, a fire-grate so located as that the burning products shall impinge both upon the inside of the outer boiler or heater and upon the outside of the inner generator.

And my invention further consists in combining with a steam generator a regulator that will preserve a uniform head of steam by setting a pump in action whenever the steam becomes excessive or rises above the regulated or defined point, and allow additional water to be forced into the generator, and thus reduce the pressure, and that will stop or throw the pump out of action whenever the pressure falls to the point at which the gage or indicator is set.

To enable others skilled in the art to make and use my invention, I will proceed to describe the same with reference to the drawings.

A represents stands or supports, on which the generator is placed. B is an outer boiler or heater, permanently supported on the stands A, and is composed of an outer and inner jacket, with water-space *a* between them. The grate-bars C are placed at one end of the boiler or heater B, and the fuel is fed in at D, and the bars are so incased at the sides as to cause the heat and flame to be within the boiler or heater, the draft being from underneath the grate-bars. E is the exit-flue, leading to the stack or chimney.

On the ends of the boiler or heater B there are secured brackets F, for supporting boxes G, in which the hollow journals H H' of an inner revolving generator, I, turn, said generator being revolved by means of the gear J on one of its journals, and driven from the engine or any other moving power. The generator I is represented as cylindrical, and located in the upper portion of the outer boiler or heater, B. It may, however, be a spherical or globular boiler, and cast in one piece, with hollow trunnions or journals, on which it may be supported and revolved.

There is connected with the water-space *a* of the external heater or boiler, B, a pipe, K, having a check-valve, L, in it, and uniting with a pipe, K', that passes through the hollow journal H' and into the inner revolving generator, I, where its end is bent downward, as shown in the section, Fig. 1. Where the pipe K' enters the hollow journal H it is suitably packed, as at *b*, to make a steam-tight joint and allow the journal to turn. The heated water from the external cylinder, B, is forced through the pipes K K' into the interior of the revolving generator I by a force-pump in any of the usual well-known ways.

Through the pipe K' passes a small pipe, *c*, with suitable packing, as at *d*; and on the outer end of this small pipe there is a handle or lever, *e*, and a blow-off pipe or cock, *f*. The inner end, *c'*, of this pipe is bent downward, and terminates in the generator at about the height at which the water is kept or should be kept therein, or a little below that point, so that whenever the water in the generator falls below the designated point, or below the end of the pipe, *c'*, steam will blow off instead of water, as would be the case if the regulated



supply of water were kept up. An indicator plate or segment, *g*, may be arranged near the sweep of the blow-off or try-cock at *f*, so that as it is turned it will show on the indicator the height of the water within the generator.

From the upper part or steam-space in the generator there is a steam-pipe, *M*, that leads out through the hollow journal *H*, whence it may be carried to the engine or place where it is to be used, said steam-pipe being packed, as at *h*.

The exterior boiler or heater, *B*, may be supplied with water through the pipe *i*, Fig. 2, by any of the usual well-known means. The inner surface of the exterior boiler or heater being in direct contact with the fire, the water in the water-space *a* will become highly heated, and indeed steam itself may be made therein of several pounds pressure, if so desired; and that the steam so made in the exterior boiler or heater may be used for heating or warming buildings, a dome, *N*, may be placed on it, into which the steam may rise, and thence carried off in pipes where it is to be so used.

The intention and object of my invention are to use but a small quantity of water in the inner generator, so that steam may be quickly made, and of very high pressure, and the generator is revolved over the fire, so that it may not burn out so readily as it would if stationary. The generator is supplied with water heated to a very high degree in the external boiler or heater, so that high steam may be always generated, and with a great degree of safety, from the continued revolving of the boiler, which prevents it from being burned out.

That the steam-boiler may be self-regulating as to the amount and pressure of steam that it is making, I arrange a device that will, by the excessive pressure of the steam, put a force-pump or its equivalent in action, so as to throw an additional quantity of water into the boiler, and thus reduce its steam-making capacity, and which device, when the steam-pressure within is reduced to the adjusted or previously-regulated quantity, will throw the force-pump out of action, which is accomplished as follows: A small steam-pipe, *j*, extends from the steam-pipe *M* to a small steam-cylinder, *k*, in which there is a piston-head attached to a rod, *l*, and upon this rod there is an indicator, *m*, made adjustable at pleasure and working over a scale, *n*, said indicator having upon it a lifting-toe, *o*. Parallel with the rod *l*, and in lugs *p p*, in which it may move, there is another rod, *q*, having upon it an adjustable toe-piece, *r*, under which the toe *o* on the indicator takes. The lower end of the rod *q* has a foot-piece, *s*, at right angles to its stem, over which a pivoted hook, *t*, catches, the lower end of said hook being controlled by a spring, *w*, which throws it into connection with a ratchet-wheel, *u*, connected with a pump, *v*, and also tends to keep the upper end of the hook over the foot-piece *s*. So long as the hook holds onto the ratchet the force-pump cannot work; but

when it is drawn or thrown out from the ratchet then the pump is free to act; or the working of the foot-piece *s* may be made to operate a clutch that will, when moved by the rising of the steam, as will be hereinafter explained, put the force-pump *v* in action and throw an additional supply of water into the boiler, and when the steam-pressure is reduced by this additional supply of water then the spring *w*, or its equivalent, a weight, may return the rods to their regulated positions.

The operation is as follows: Suppose the indicator *m* to indicate at zero on the scale the desired pressure in the boiler. When the pressure exceeds the defined or desired quantity the rod *l* will be raised up by the action of the steam in the cylinder *k*. The toe-piece *o* will lift up the rod *q* by means of its toe *r*, with which that (*o*) is in contact. The lifting of the rod *q* causes, through its foot-piece *s*, the hook *t* to move and its lower end to leave the ratchet *u* and release the pump *v*, which may immediately go into action. The hook *t*, in moving away from the ratchet, acts against and compresses a spring, *w*, which spring, as soon as the steam falls to the designated point, will again throw the hook or dog into the ratchet, and again hold it and the pump from acting; or, as before stated, this rising of the steam may throw in a clutch that will set the pump at work, while the recoil or reaction of a spring may again throw it out when the pressure has subsided. The indicator and toe-pieces may be set at any point on the scale and at the exact pressure at which it is desired to work the boiler. Whenever the pressure exceeds that at which the indicator is set on the scale it will rise, and, as above stated, set the pump in action, and whenever, by reducing the pressure to the desired point, the indicator falls, the spring will again act and check the pump, so that the pressure of the steam generated is regulated by itself by setting a pump in action when too high and stopping it when at the desired point, the quantity of water thrown into the boiler or the want of it thus working the regulator.

The fire and heated products of combustion, it will be perceived, are in immediate and direct contact with both the outer and inner boiler, so that there is little or no heat lost by conduction from outside walls, and but from the different areas of surface and the different quantities of water in the outer and inner boilers the temperature would be uniform in both. As arranged, however, saturated steam may be generated in the outer boiler, and dry or superheated steam in the inner boiler, and the inner boiler receives its supply of highly-heated water, as before stated, from the outer boiler.

Having thus fully described the nature, object, and purpose of my invention, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The arrangement of a cylindrical or spherical inner revolving steam-generator with an encircling exterior stationary boiler or heater, and with communicating pipes or passages be-



tween them, so that the inner generator may be supplied with heated water from the outer boiler or heater, substantially as and for the purpose described.

2. The arrangement of an interior revolving steam-generator and an encircling exterior stationary boiler or heater, and the former supplied with water from the latter, a fire-grate so located and incased as that the burning products thereon shall impinge directly upon the inside of the outer boiler or heater and upon the outside of the inner steam-generator, substantially as and for the purpose described.

3. Combining with the steam-generator a regulator that will preserve a uniform head of steam by setting a pump in motion whenever the steam becomes excessive or rises above a defined point or pressure, and throw out the action of the supply-pump whenever the pressure falls to the defined point, substantially in the manner set forth.

LEVI H. COLBORN.

Witnesses:

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