

No. 684,386.

Patented Oct. 8, 1901.

R. M. SHAFFER.  
STEAM GENERATOR.

(Application filed Apr. 3, 1901.)

(No Model.)

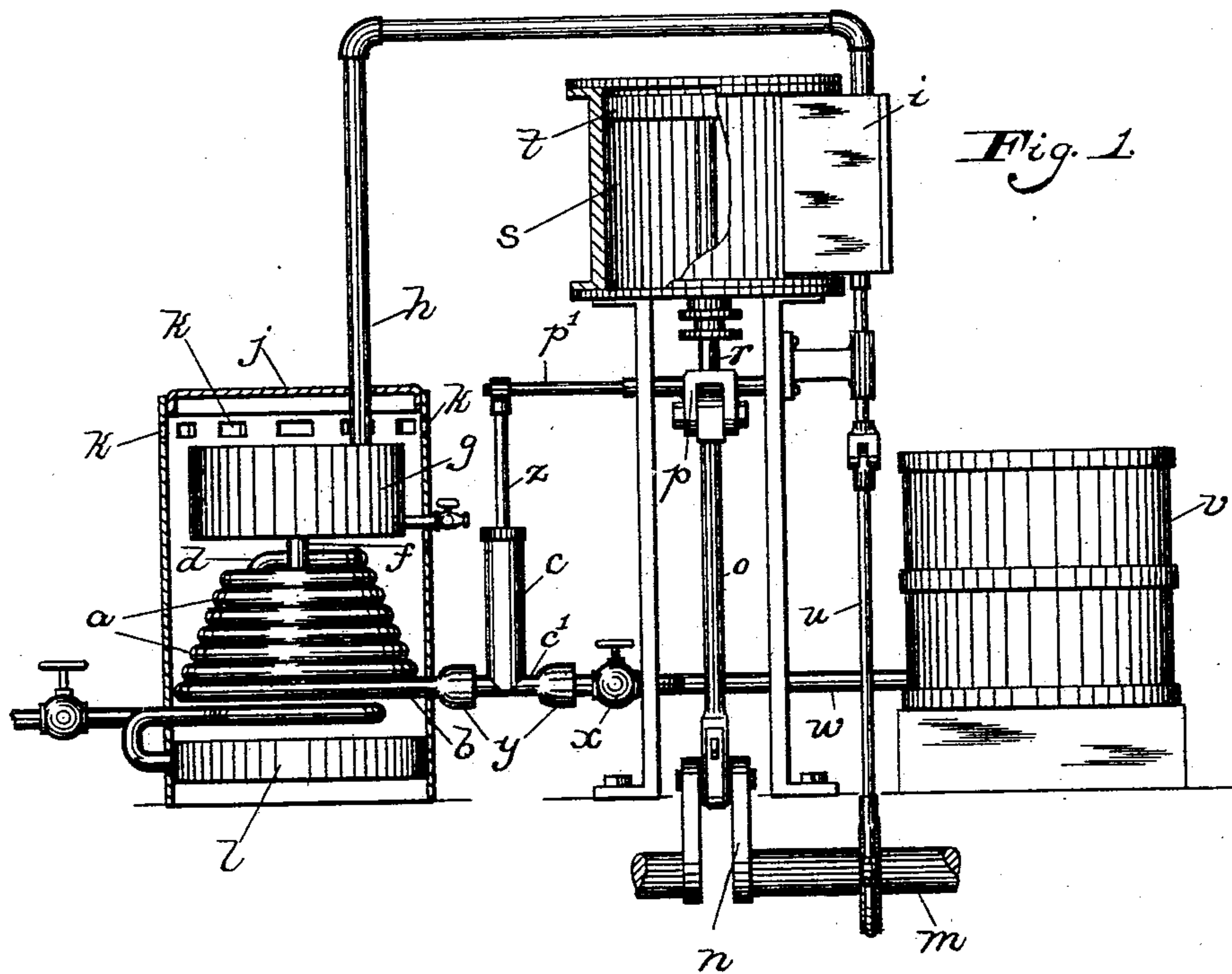


Fig. 1.

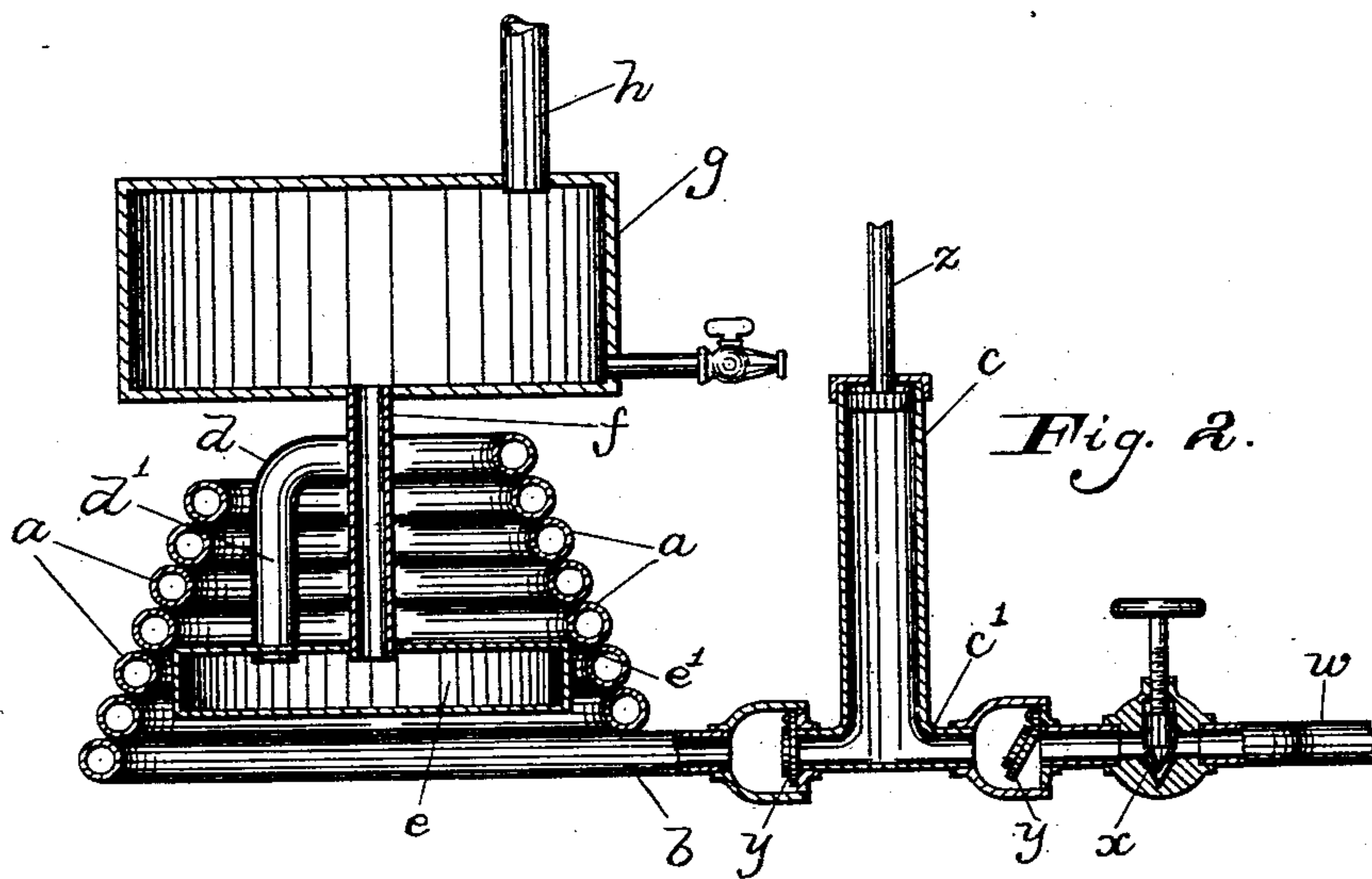


Fig. 2.

Witnesses.  
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# UNITED STATES PATENT OFFICE.

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## STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 684,386, dated October 8, 1901.

Application filed April 3, 1901. Serial No. 54,127. (No model.)

*To all whom it may concern:*

Be it known that I, RICHARD M. SHAFFER, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification.

This invention is an improvement in steam-generators of that class in which water is injected in small quantities into the generator and converted or "flashed" into steam; and one of its objects is to provide an improved device of this character in which the rapidity of the injections of water is automatically governed by some movable part of the engine or motor driven by the generated steam, whereby the amount of steam generated will be increased or diminished, according as it is required; and a further object of the invention is to provide a construction of generator of this character which will quickly and effectively convert the said small quantities of water into dry live steam and which will superheat the steam before it passes to the engine steam-chest.

The invention consists in certain constructions, arrangements, and combinations of the parts hereinafter fully described and claimed, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of a water-supply tank, working parts of an engine, and my improved steam-generator operatively connected therewith, the cylindrical hood of the latter being shown in section. Fig. 2 is an enlarged vertical sectional view of the steam-generating coil and its superheating and steam-supply drum, and also a similar view of a portion of the water-supply pipe and injector-pump.

My improved steam-generator is provided with a generating-coil *a*, formed of suitable tubing or length of pipe closely coiled into conical form. The lower end *b* of said pipe extends outwardly in a horizontal direction from said coil and is connected to one leg of a water-injecting pump *c*, hereinafter described, and the other (upper) end, *d*, of said pipe, as shown in Fig. 2, extends downwardly, as at *d'*, within the coil and opens at its lower end into the top of a lower super-

heating-drum *e*, which is located within the coil, just above the bottom thereof, and is of a diameter slightly less than the adjacent convolution of the coil, so as to leave an annular space *e'* between it and the coil, around which the heat-currents may ascend. To the top of said lower superheating-drum is secured one end of a short vertically-extending open pipe *f*, and to the other upper end of said pipe is secured an upper superheating and steam-supply drum *g*, whose bottom is located a short distance above the uppermost convolution of the coil and is of a larger diameter than the same, so that it will spread the heat-currents ascending within the coil. The pipe *f* establishes communication between the lower and upper drums. To the top of the upper drum *g* is secured a steam-feed pipe *h*, which leads the steam to the steam-chest *i* of the engine, as shown in Fig. 1.

A cylindrical hood *j* envelops the upper steam-drum *g* and steam-generating coil *a*, and of course the drum *e* within it, and is provided at its top with openings *k*, which form a draft and allow the escape of the products of combustion, and within said hood and below the coil *a* is located a burner *l* for generating and burning the vapor of hydrocarbon oils or gas. It is obvious that any form of burner may be used.

The engine, of which parts are shown in the accompanying drawings and to which my steam-generator is applied, is of ordinary construction and is merely selected for the purpose of illustrating the invention. It is provided with a driving-shaft *m*, having a crank *n*, to which one end of a pitman *o* is connected. The other end of said pitman is connected to a cross-head *p*, secured to the piston-rod *r*, which works through the head of a steam-cylinder *s* and is attached to the piston *t*. The letter *i* designates the steam-chest, in which is an ordinary slide-valve actuated in the ordinary manner by means of the eccentric-rod *u*, connected to the driving-shaft *m*.

The letter *v* designates a water-supply tank, to which is secured an outlet-pipe *w*, provided with a needle-valve *x*, and the injector-pump *c* has one leg *c'* attached to said pipe and its other leg attached to the lower outwardly-



projecting end of the coil *a*. Check-valves *y* are mounted in said pump-legs, and the piston-stem *z* of said pump is connected to a projecting arm *p'* on the engine cross-head *p*.

5 In practical operation the vapor-burner *l* is lighted, and the needle-valve *x* is adjusted according to the quantity of water it is desired to inject into the generator at each stroke of the pump. When the driving-shaft *m* is  
10 turned, the reciprocating cross-head *p* will operate the pump-piston, whose upstroke will draw a small quantity of water into the pump-barrel and whose downstroke will inject said quantity of water into the lower end of the  
15 coil *a*, and it is obvious that the speed of the engine will automatically govern the rapidity with which the pump injects the successive quantities of water into the coil. Just as soon as a small quantity of water is injected into  
20 the generating-coil *a* the heat will "flash" it into steam, which steam will circulate upwardly through the coil, becoming dryer at every convolution, and will thence flow downwardly into the lower superheating-drum *e*,  
25 just over the burner, and will also flow from said lower drum to the upper superheating and steam-supply drum *g*, from whence it will be fed to the steam-chest *i*.

30 It is to be noted that the heat-currents from the burner *l* will ascend the inside of the coil *a* and heat every portion of the latter and will spread around the two drums *e* and *g*, thereby insuring that the steam fed to the engine is perfectly dry and "live."

35 As the amount of water injected and steam generated is automatically governed by the engine, no water-glass is required.

40 Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A steam-generator, having in combination a pipe formed into a conical coil with its smaller end uppermost and the upper end of the pipe extending downwardly within the  
45 coil; a superheating-drum secured to said pipe end and located within the coil and spaced from the latter; a second superheating and

steam-supply drum in communication with the said first-named drum and located directly above the smaller end of the coil and of a diameter greater than said coil end; and a hood  
50 enveloping said coil and steam-supply drum and spaced from the sides of the latter, whereby the ascending heat-currents will be concentrated at the small upper end of the coil  
55 and will then spread out over the bottom and around the sides of the said steam-supply drum.

2. The combination of a steam-generator provided with a conical generating-coil of  
60 pipe whose upper end extends downwardly within the coil; a superheating-drum within the base or larger end of said coil and connected with the said downwardly-extending pipe end; a second superheating-drum above  
65 the said coil and connected with the first-named drum; a pump provided with two oppositely-extending legs each provided with a check-valve and one of which legs is connected to the pipe at the base or larger end  
70 of the coil; and a water-supply tank provided with a water-pipe connected to the other leg of said pump, as set forth.

3. The combination of a steam-generator provided with a conical coil of pipe whose  
75 upper end extends downwardly within the coil; a superheating-drum within the base or larger end of the coil and connected to said downwardly-extending pipe end; a second superheating-drum above the coil and in com-  
80 munication with said lower or first-named drum; a water-pump connected to the pipe at the base or larger end of the coil; and an engine whose reciprocating cross-head is provided with a projecting arm connected to the  
85 pump-piston, and whose steam-chest has a pipe connection with the superheating-drum above the coil, as set forth.

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

RICHARD M. SHAFFER.

Witnesses:

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