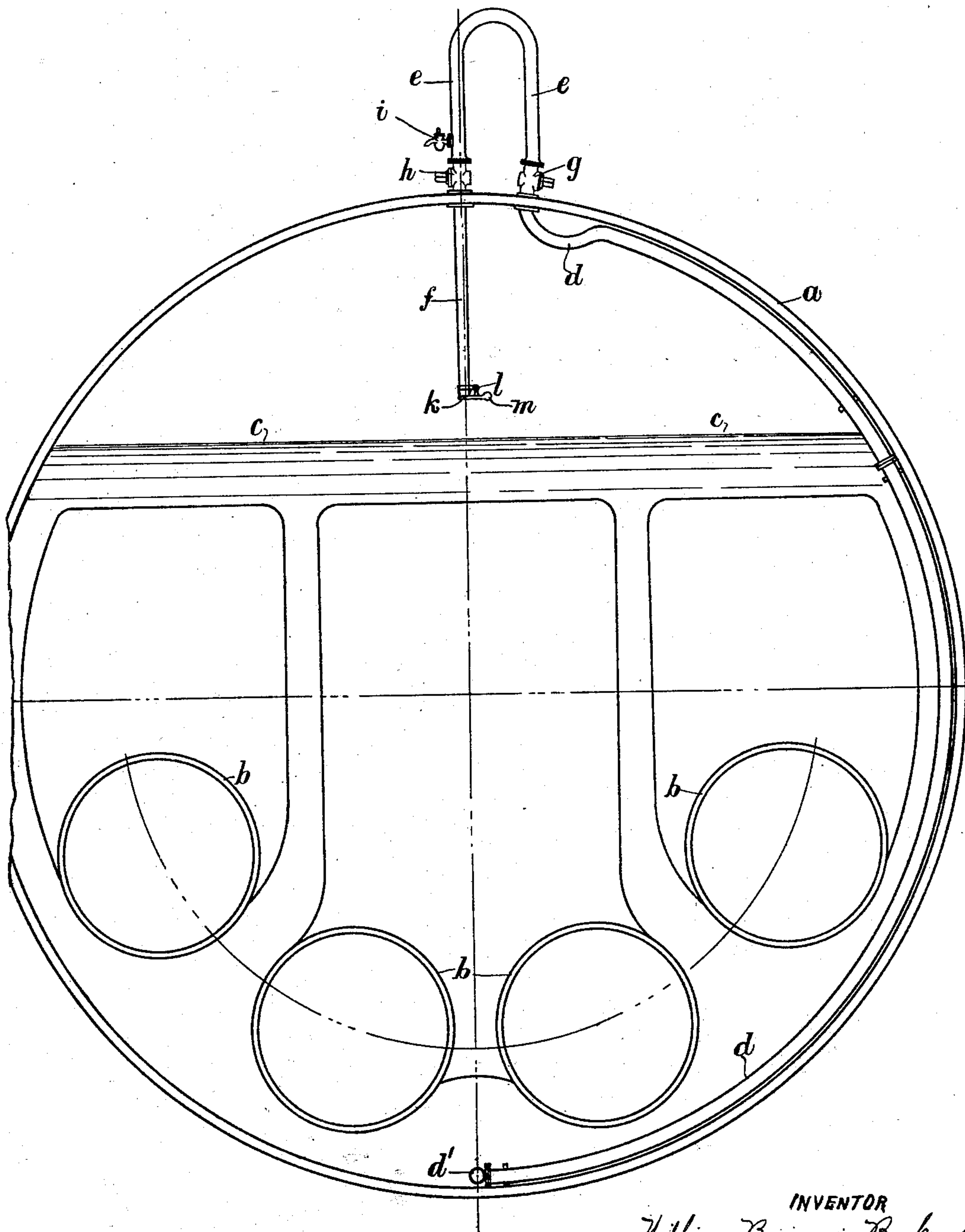


No. 676,112.

Patented June 11, 1901.

W. B. BARKER.
STEAM GENERATOR.
(Application filed Oct. 25, 1900.)

(No Model.)



WITNESSES:

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WILLIAM BENJAMIN BARKER, OF LIVERPOOL, ENGLAND.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 676,112, dated June 11, 1901.

Application filed October 25, 1900. Serial No. 34,264. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BENJAMIN BARKER, a subject of the Queen of England, and a resident of Liverpool, in the county of Lancaster, England, have invented certain new and useful Improvements in Steam-Generator Water-Circulators, of which the following is a specification.

This invention has reference to the circulation of water in steam-generators in which the water is held more or less in bulk in a cylinder and wherein a portion of such body of water exists below the level of the heating-surface of the furnace, flues, or otherwise or is difficult or slow in circulation, such as in generators of the "Scotch" or "marine" types and others in which analogous or equivalent conditions exist.

It is well known that in steam-generators of the kinds above referred to and in others more or less analogous to them the water existing or lying at the bottom below the level of the furnaces or flues thereof is or remains of a lower temperature than the temperature of evaporation, often quite cool relatively, and that this fact is very detrimental to the structure of the generator itself as well as constituting a cause tending to prevent such boilers being as highly efficient in steam generation as they otherwise would be; and the object of the present invention is chiefly to overcome these defects and difficulties.

According to this invention the mode by which the object and effect referred to is accomplished consists in moving the water from the bottom of the generator by a pipe or pipes within it leading from the lower part to the upper part through the water-space and steam-space, then out of the steam-generator through a pipe, preferably in the form of a loop, and then down again into the steam-generator and steam-space, into and through a pipe therein, the lower open end of which will stand preferably a few inches above the water-level.

The invention will be further described with the aid of the accompanying drawing, which illustrates a steam-generator in cross-section of the marine or Scotch type with my improvements applied to it.

Referring to the drawing, *a* is the shell of the generator, and *b* represents the furnaces.

c represents the normal water-level.

d represents the pipe within the generator-shell *a* and extending from the bottom of the water-space to a point near the top of the same space.

e is a pipe in the form of a loop on the outside of the shell *a*, one leg of which is connected with pipe *d* and the other with an internal length of pipe *f*, the lower end of which stands preferably a few inches above the water-level *c*. A cock *g* is disposed between the lower end of one leg of the loop-pipe *e* and the upper end of *d*, and another cock *h* is disposed between the lower end of the other leg of the loop-pipe *e* and the upper end of the pipe *f*, while a small test-cock *i* is mounted on the pipe *e* near the cock *h*. Then on the lower end of the pipe *f* there is a valve *k* suspended by a hinge *l*, supported from the pipe *f*, and this valve has a projecting weighted part *m*, which is of just sufficient weight to press the valve *k* toward and onto the discharge end of the pipe *f*—that is, this weight is very slightly greater than the weight of the valve itself and offers the least possible resistance to the discharge of liquid from this pipe.

On the lower end of the pipe *d* there is preferably a pipe *d'*, extending along the bottom of the boiler and perforated at its upper part. This distributes the intake of water from different points throughout the length of the bottom of the boiler.

The mode of putting the apparatus in action is by first closing the cock *h* and opening the cock *g* and also the small test-cock *i*. Then as soon as pressure is created in the generator and acts on the surface of the water *c* water is forced through the pipes *d'* and *d* into the loop *e*, from whence it discharges by the small test-cock *i*. When this takes place, the cock *h* should be opened and the cock *i* closed, whereupon the water will fall from the down-leg of the loop-pipe *e* through the cock *h* and pipe *f* into the water in the generator, opening in its flow the balanced valve *k*. This action will continue so long as there is any pressure of steam in the generator.

With regard to the motive power, in virtue of which the continuous circulation of water up through the pipe *d*, loop *e*, and the pipe

f after the closing of the test-tap *i* takes place, it is believed that this is mainly derived by the existence of the loop *e* on the outside of the generator in contact with the
 5 air, whereby the water will be cooled somewhat—that is, it will be cooler and denser in the downflow or descending leg of the loop and pipe *f* than in the rising leg, furnishing thereby just sufficient power to effect the lift
 10 and circulation required.

I have found in my practice with the invention that a very small pressure will start the apparatus, the cock *i* being opened and the cock *h* closed, and that when once started
 15 it continues automatically and without any attention until the pressure in the generator ceases to exist.

Sometimes, and more especially when all the pipes are of about the same diameter,
 20 there is a tendency for the circulation to cease temporarily or appear to do so—that is, the circulation appears to be intermittent—when no back-pressure discharge-valve *k* is employed on the discharge end of the
 25 pipe *f*; but with this valve the action is entirely regular and continuous.

The temperature of the water at the bottom of the steam-generator is I find by my invention maintained within a few degrees
 30 of the highest temperature of water in the steam-generator, whereas, as is well known, generally the temperature of water at the bottom below the lowermost furnace *b* and the temperature of the shell-plates *a* at this part
 35 are comparatively cool, and so cool as to cause stresses and strains to be set up in the plates, often producing leaky joints and rivets and causing destruction of the plates by rust, pitting, &c.

40 What is claimed in respect of the herein-described invention is—

1. A steam - generator water - circulating means, comprising a pipe extending from the interior lower part of the generator below the

lowermost furnaces upward within said generator to above the water-level, upward outside the generator-shell through the air, and then down into the interior again to a point near the water-level, where the water is discharged. 45 50

2. A steam - generator water - circulating means, comprising a pipe extending from the lower part of the generator, below the lowermost furnaces, to above the water-level, upward outside the generator-shell through the
 55 air, and then down into the interior again to a point near the water-level, where it is discharged; and a tap on the descending part of the external pipe for allowing the escape of water when starting the apparatus; substantially as set forth. 60

3. A steam - generator water - circulating means, comprising the internal pipe *d* extending between the bottom of the shell *a* at the top; an external loop-pipe *e* standing
 65 above the shell of the generator, one leg of which is connected with the pipe *d*; cocks *i* and *h* on the descending leg of said loop; and an internal pipe *f* connected with the other leg of the loop *e*; substantially as described. 70

4. A steam - generator water - circulating means comprising an internal pipe extending from the lower part of the generator to the upper part; a loop-pipe connected with same, on the outside of the generator-shell; an internal pipe connected with the descending
 75 leg of the loop, and extending down to near the water-level in the generator; and a discharge-controlling valve on the lower end of said internal descension-pipe; substantially as set forth. 80

In witness whereof I have hereunto set my hand in presence of two witnesses.

WILLIAM BENJAMIN BARKER.

Witnesses:

JNO. W. BROWN,

FRANK E. FLEETWOOD.