



A.D. 1886, 23rd JUNE. N° 8322.

COMPLETE SPECIFICATION.

An Improved Coil Steam Generator.

We, OTTO LILIENTHAL, of Berlin, in the Empire of Germany, and WILLIAM BASHALL, of 21 Holland Villas Road, Kensington, in the County of Middlesex, Engineers, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Our invention relates to the construction of coil steam generators, and consists in replacing the ordinary boiler, with its capacious water and steam spaces, by a double coil of pipes wound and jacketed in a particular way, in which steam can be generated as soon as water enters the coil, thereby facilitating its rapid and steady production.

The coils are enclosed within three metal jackets, between the outer pair of which the air supply is led downwards to the burning fuel, being warmed in its passage by contact with the middle jacket between which and the inner jacket the hot gases from the fuel pass on their way to the smoke stack.

In order that our invention and the manner in which the same is to be carried into practical effect may be thoroughly understood, we will proceed to describe the same in detail, referring in so doing to the accompanying drawings which are to be taken as part of this specification and read therewith, and in which like parts are marked throughout the figures in which they occur with the same reference letter.

Fig. 1 is a sectional elevation.

Fig. 2 is a plan taken on the line Y—Z, on Fig. 1.

Fig. 3 is a sectional elevation of an alternative method of arranging and supporting the two coil-stacks.

A is the inner stack and B the outer one, together constituting the double coil, the two joining each other at their top. The feed water enters the inner coil stack by the pipe D¹ which is attached to the inner stack at a point below the level of the bottom grate C, and the steam passes away from the bottom of the outer coil-stack at D.

The fuel is fed into the fire-box, that is, the space comprised within the inner coil, down the shoot D², conveniently fitted with a funnel top and hinged cover. The shoot is continued downwards past a few coils.



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The foundation E of the boiler encloses the ash-pit, and the shell of this part continued upwards becomes the outer jacket F of the three before mentioned. G is the central and H the inner one.

The central jacket is carried by a pair of angle rings g, g^1 .

The central and inner jackets are gathered in at the top towards a ring h which surrounds the shoot D^1 , the junction between shoot and ring being conveniently made by means of angle and plain rings as shewn. The outer jacket stops short of the ring h , thereby forming an annular space at which the air can enter.

J is an annular plate which acts as a guard to prevent fuel falling into the space between the central and outer jackets. K is the smoke stack starting from the gathering of the central jacket and passing out through the outer one. It is fitted with a damper k .

L is an iron cone carried by the angle ring g^1 , and serves as a basis upon which to build up the internal parts of the generator.

M M are brackets rivetted to the cone and upon which a ring N armed with vertical projections m can be rotated for the purpose of bringing the ashes and dust which are deposited by the combustion gases on to the ring opposite the double ash door O through which they fall out. The frame of this ash door is carried through the two jackets F and G.

The bottom grate C is hinged at c to the ring L and kept up in the horizontal position by a balance ball P, crank p , and link p^1 , the crank working in bearings upon the shell of the foundation E.

The raising of the ball P will swing the grate C down and drop the ashes and clinkers into the ash pit.

Q, Q are stays embraced by an angle ring q to which they are rivetted, and standing in the channel made by the junction of the brackets M with the ring L.

These stays are gathered in a little at the top and their width produces an annular space between the two coil-stacks down which the combustion gases pass on their way to the chimney.

The inner stack consists of two closely wound cylinders joined by a conical part in which the pipes are open-wound for the purpose of producing spaces at which the combustion gases can pass out. The top of this stack is of a smaller diameter, the fuel shoot fitting into it.

The course of the air supply to the burning fuel and of the gases thence to the smoke stack is indicated by the arrows.

The air supply enters under the ring J and flows down the annular space between the two jackets F and G, turns under the latter and through the grate and enters the fuel. The currents of heated combustion gases pass out through the open-wound part of the inner stack; a part then passing down between the coils and thence upwards into the space between the jackets H and G, while the major portion of the gases passes between the top of the two stacks and down outside the outer stack B into the space between the jackets H and G, from which the currents flow towards the smoke stack.

According to the alternative arrangement of the two coil-stacks illustrated in Fig. 3, the coils of the inner stack A^1 are not gathered in at the top, neither are any of the coils separated from each other. The shoot D^1 terminates in a thickened extension d to enable it to resist the action of the fire. The shoot is continued just below the top of the inner stack A^1 .

The stays Q^1, Q^1 are hung upon the top coil of the inner stack by hooks q^1, q^1 and are turned up into hooks q^2, q^2 at the bottom in which the outer coil-stack B^1 rests.

The hot gases from the bed of burning fuel pass some downwards between the stacks but the major part upwards between the shoot and the outer stack, and downwards outside the latter.

It is obvious that we are not restricted by our invention to constructing our improved generator vertical as illustrated. We may when convenient or desirable, as would be the case when the space to which the generator is restricted is

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irregular or not suitable for receiving a vertical generator, construct it at an angle with the horizontal which would have the effect of making the front lower coils discharge, in part, the duty of bottom grate, the position of the air supply, ash doors, and cleaning ring being modified accordingly.

5 Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

1. In a coil steam generator, the combination of fuel shoot with two coil-stacks, the coils of the inner stack being laid close together excepting where the stack is
10 gathered in towards the end of the shoot where the coils are set apart producing openings between them through which the products of combustion can pass upwards and downwards to heat the outer stack, substantially as described with reference to the accompanying drawings.

2. In a coil steam generator, the combination of three jackets producing with
15 the outer coil-stack three annular spaces down the outer one of which the air supply is taken and warmed by the gases escaping by the other two, in combination with an ash-removing ring consisting of a ring revolvable upon suitable supports and carrying vertical webs, substantially as and for the purposes described with reference to the accompanying drawings.

20 Dated this 23rd day of June 1886.

PHILLIPS & LEIGH,
Agents for the Applicants.

LONDON: Printed by EYRE AND SPOTTISWOODS,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.

1886.

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