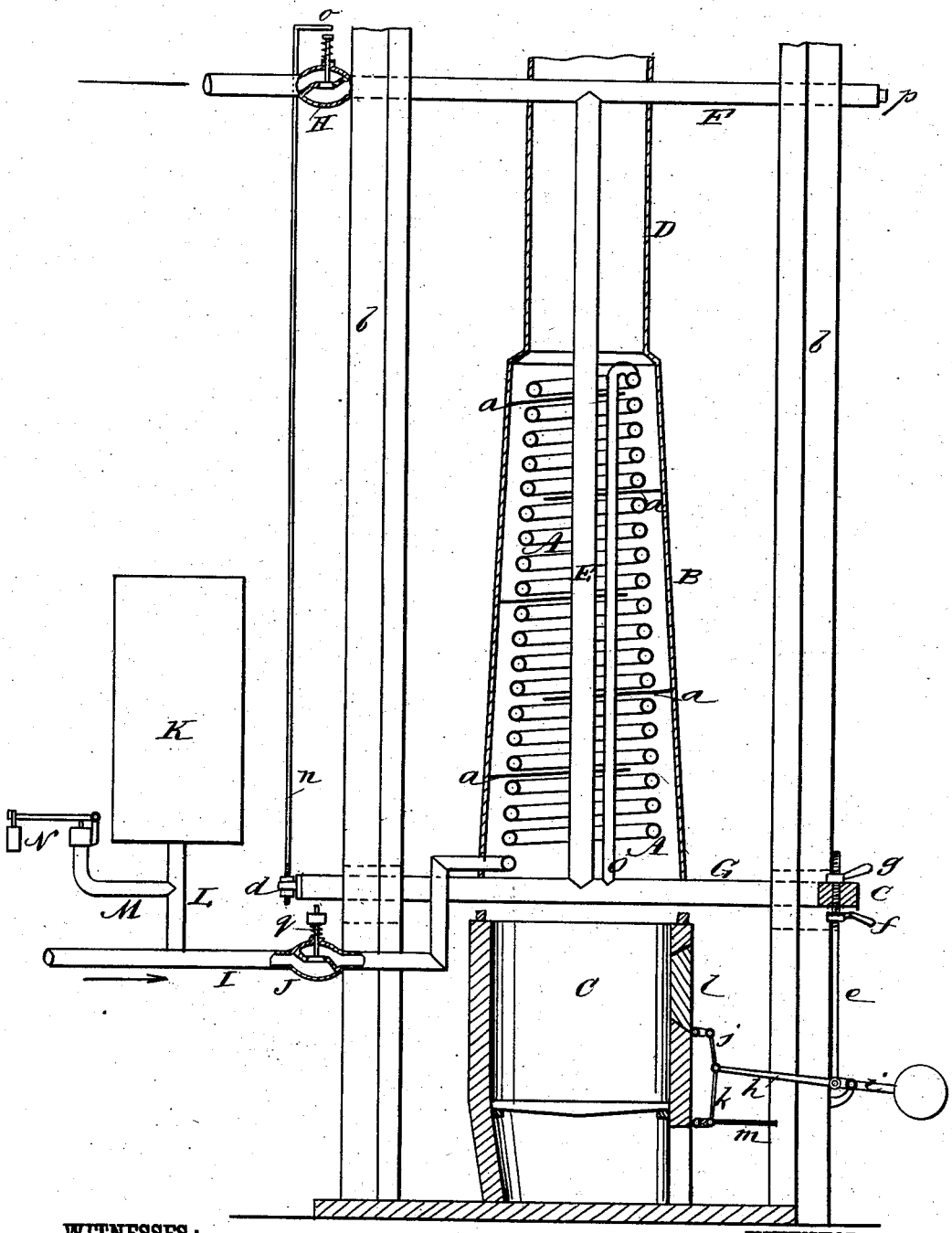
(No Model.)

H. WILLIS.

STEAM GENERATOR.

No. 264,591. Patented Sept. 19, 1882.



WITNESSES:

C. Neveux

C. Sedgwick

INVENTOR:

H. Willis

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

HARRISON WILLIS, OF BROOKLYN, NEW YORK.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 264,591, dated September 19, 1882.

Application filed July 6, 1882. (No model.)

To all whom it may concern:

Be it known that I, HARRISON WILLIS, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Steam-Generator, of which the following is a full, clear, and exact description.

My invention relates to the class of boilers known as "coil-boilers;" and it consists essentially in the combination, with a coil, of a central pipe arranged to receive the steam and superheat it, the said pipe being fixed at its upper end and free to move at its lower end when expanded or contracted by variations of temperature.

It also consists in valve and damper connections controlled and operated by the expansion and contraction of the said pipe.

Referring to the drawing, which is an elevation partly in section, A is a conical coil of iron pipe, inclosed by the casing B, which rests upon the fire-chamber C. The casing B is provided with baffle-plates *a*, which extend into the coil of pipe alternately from opposite sides, leaving a zigzag course for the products of combustion on their passage from the fire-chamber C to the flue D. A vertical pipe, E, which I prefer to have larger in diameter than the pipe of which the coil-boiler is made, is placed axially in the coil A, and extends upward into the smoke-flue D, and is rigidly connected at the top with the horizontal pipe F and at the bottom with the horizontal pipe G. The upper horizontal pipe, F, is rigidly supported in posts *b*, or otherwise, as may be found most convenient, and the lower horizontal pipe, G, extends through slots in the casing B and through slots in the posts *b*, and is moved up or down as the pipe E contracts or expands. The lower horizontal pipe, G, is stopped at its ends by plugs *c d*. The plug *c* is perforated vertically to receive a threaded rod, *e*, adjustable up and down by nuts *f g*, and jointed at its lower end to a lever, *h*, fulcrumed at *i*, and connected at its free end by rods *j k*, with the fire and draft doors *l m*, respectively, so that a downward movement of the lever *h* closes the draft and opens the fire-door, and the reverse movement of the lever produces the opposite effect. The plug *d* in the pipe G is reduced in thickness and perforated vertically to receive the rod *n*, which is threaded and provided with two nuts—one on each side of the plug *d*—for convenience of adjustment. The rod *n* extends upward and is bent at a right angle at its upper end, forming an arm, *o*, which extends over the downwardly-opening valve H in the horizontal pipe F. The pipe leading from the valve H conveys steam away from the boiler for use. The end of the horizontal pipe F opposite the valve H is closed by a plug, *p*.

Water under pressure is supplied to the coil A through the pipe I, which connects with the lower end of the coil, and is provided with a valve, J, opening outward, and kept closed by external water-pressure and by a spring, *q*. An air-chamber, K, is connected with the water-supply pipe I by the pipe L, and a pipe, M, branching from the pipe L, supports an ordinary safety-valve, N.

Communication is established between the coil A and the pipes G E F by a pipe, O, connected with the upper end of the coil A and extending downward through the coil to the pipe G, to which it is connected.

A fire having been built in the fire-chamber C, and the coil being partly full of water, steam is generated in the coil and discharged through the pipe O into the horizontal pipe G, filling the pipes G E F, where it is retained and superheated until a temperature indicated by a certain expansion of the central pipe is reached. The downward movement of the pipe G, resulting from the expansion of the pipe E, carries the rod *n* downward, bringing the arm *o* into contact with the stem of the valve H, opening the valve, and allowing steam to escape for use. The object in retaining the steam is to secure the required temperature and to prevent priming. The downward motion of the pipe G, in addition to opening the valve H, opens the valve J and allows water to enter the coil through the supply-pipe. The pressure of the water-supply must exceed that of the boiler-pressure in order to insure the entrance of the feed-water. The feed-water pressure may be simply that of any city water-works, or it may be maintained by means of a pump. The air-chamber K equalizes the pressure of the feed-water in the usual well-known way, and is sufficiently large to receive a portion or all of the water of the boiler should the pressure raise

unduly, in which case the valve J would be opened outwardly by boiler-pressure and against the pressure of the feed-water. The safety-valve N limits the pressure in the feed-pipe I and air-chamber K.

My improved boiler requires no special attention, as the pressure is limited by the pressure of the feed-water. It is not liable to destructive explosion, as it is made of tubes, which withstand great pressure and would do little damage if exploded. It furnishes dry steam, and is economical in the use of fuel.

I do not limit or confine my invention to the precise form herein described, as I may in some cases secure the expansion-pipe at its lower end and allow it to expand upward. I may also use brass, copper, or other metal for the expansion-pipe.

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

1. In a steam-generator, the combination of the expansion superheating-pipe E with the water-supply valve J, as herein specified.

2. In a steam-generator, the combination of the expansion superheating-pipe E with the steam-valve H, as herein specified.

3. In a steam-generator, the combination of the expansion superheating-pipe E with the draft-regulating mechanism, as herein specified.

4. In a steam-generator, the coil-boiler A, in combination with the expansion superheating-pipe E, as herein specified.

5. In a steam-generator, the combination of an expansion superheating-pipe, E, with the smoke-flue D, as herein specified.

6. In a steam-generator, the coil A, pipes E, F, G, and O, in combination, as specified.

HARRISON WILLIS.

Witnesses:

GEO. M. HOPKINS,

C. SEDGWICK.