No. 609,929. Patented Aug. 30, 1898.

J. DICKSON.

FEED WATER HEATER FOR STEAM BOILERS.

(Application filed Feb. 26, 1897.)

(No Model.)

Fig. 2.

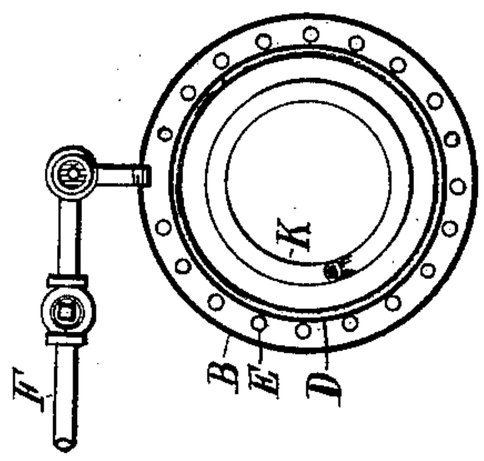

Fig. 1.

WITNESSES:

C. L. Belcher

Wm. H. Capel.

INVENTOR

John Dickson,

BY J. R. Edson

ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN DICKSON, OF NEW YORK, N. Y.

FEED-WATER HEATER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 609,929, dated August 30, 1898.

Application filed February 26, 1897. Serial No. 625,187. (No model.)

To all whom it may concern:

Be it known that I, JOHN DICKSON, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented a certain new and useful Feed-Water Heater for Steam-Boilers, of which the following is a specification.

This invention relates to feed-water heaters, and particularly to that class of such heaters as utilize the products of combustion, and is intended as an improvement upon the heater forming the subject of an application filed by me on April 16, 1895, Serial No. 587,826.

The object of the invention is to produce an effective feed-water heater wherein the expansion and contraction of parts will be compensated for without injury or detriment to any other parts and wherein the greatest advantage possible will be taken of the heat from the products of combustion, which is generally allowed to go to waste.

In most of the feed-water heaters now in use the exhaust-steam is made to heat the water on the way to the boiler. Obviously the feed-water cannot by this means be heated up to 212°, while in this device the feed-water may be heated quite up to the steam-generating point, so that on being introduced into the boiler it will be almost immediately converted into steam.

The invention then consists in the construction, combination, and arrangement of parts hereinafter fully described, and set forth in the claims.

In the accompanying drawings, which form a part of this specification, Figure 1 represents so much of a boiler and its smoke-stack as is necessary for the illustration of this invention. Fig. 2 represents a horizontal sectional view of the smoke-stack, taken just above the feed-water inlet.

A indicates the main portion of the boiler, which may be of any desired construction.

B indicates the smoke-stack, and C C′ dampers located therein.

Within the smoke-stack, as near to the boiler as possible, is located the feed-water heater. This by preference is made in a form to constitute a section of the smoke-stack, so that heaters of this sort may be made distinct articles of manufacture and readily inserted in the smoke-stack of any boiler now in use or to be manufactured. It may, however, be built within the smoke-stack regardless of the removability thereof.

In the preferred construction, as illustrated, an annular chamber is formed for the feed-water by riveting or otherwise securing at its ends to the wall of the smoke-stack a shell, as D, which by preference is corrugated substantially as shown. All the products of combustion pass through the space formed by this chamber. To provide an additional heating-surface within this chamber, flues, as E, may be expanded into the upper and lower ends of the shell D or, as may be said, in the heads of the annular chamber. Through these a portion of the products of combustion will pass.

The feed-water may be admitted to the heating-chamber in any suitable way and at one or more points about it. There is shown, however, one entrance for the feed-water, which is, by means of the pipe F, provided with suitable valves and cocks, as indicated in Fig. 2. The outlet from this chamber may be had through one or more pipes taking from its upper end. There is shown, however, but one of these pipes, as G, which connects with the distributing-pipe H, which in the form of boiler here illustrated distributes the water in fine streams just above the boiler-flues I.

A feed-water heater thus constructed is efficient to a very satisfactory degree. Its efficiency, however, is greatly increased by combining therewith a circulating-coil, as illustrated at K. This coil is preferably cylindrical and rests upon suitable supports L, attached to the wall of the stack, its upper end being steadied by means of suitable eye-rods M, also attached to the wall of the stack, substantially as illustrated. This coil is made, by preference, from a continuous length of pipe and has its ends projected through the wall of the stack. It therefore has no joints exposed to the heat within the stack. This coil has connected to its lower end a pipe or tube N, preferably of copper, which communicates with the lower end of the feed-water chamber. The upper end of the coil K is

connected by a section of tube or pipe O, also preferably of copper, with the upper end of the feed-water chamber and preferably at the side opposite to that from which the coil takes the water from said chamber.

The connection of the pipes N and O with the boiler may be made in any suitable manner, either by a screw-joint, as illustrated in connection with the section O, or by a flange or collar connection, as represented on the pipe N. So, also, the unions between the sections N and O and the ends of the coil proper may be made in any suitable way, as by the flange-unions illustrated or by ground-joints, as well known in the art.

The aperture through the wall B for the upper end of the coil K is preferably made oblong vertically to allow for expansion and contraction in said coil, and similar provision may be made for the lower end of the coil.

The sections N and O may be made of copper in order that the expansion and contraction thereof may be commensurate with that of the coil K, the said coil being made of any suitable material, but preferably of iron.

As will be seen from the construction just set forth, the feed-water, entering by pipe F, will circulate a part through the annular chamber and about the flues E, and the remainder will flow from said chamber into the coil K and be returned thereto at its top, whence both portions of the water will be led off by the pipe G to the boiler.

Because of the intense heat of the smoke-stack coming directly in contact with the shell D said shell will of necessity expand to a greater extent than the wall of the stack forming the exterior of the water-chamber. Therefore said shell is corrugated to allow for this expansion.

The products of combustion in passing through the stack circulate in and about the turns of the coil K, through the flues E, and along the corrugated shell D, and in that manner transfer their heat very readily to the feed-water, so readily that the feed-water may be so regulated in its flow through the heater as to enter the boiler at very nearly the steam-generating point.

It is obvious that this form of heater may be used for various purposes and in connection with any style of boiler. It may itself be used as a boiler, if desired, since it has sufficient heating-surface to very readily serve that purpose.

Many changes in the form, construction, and kinds of material used may be made aside from those above suggested without departing from the spirit of the invention.

Various adjuncts common to boilers, such as test-cocks, check-valves, &c., may be added, and a safety device, such as an ordinary pop-valve, is preferably provided, as indicated, for instance, at P, so that should the valve Q be left closed longer than it should be after starting steam generated in the heater may have vent through the valve P. The coil K may also not only be of different shape from that represented, but it may be otherwise connected to the annular chamber, as by inserting its ends through the corrugated shell D, though in the form illustrated compensation for expansion and contraction is much more easily made. This coil may be used in a Scotch boiler or other boilers having a large flue, or it may be placed under the tubes in a horizontal tubular boiler at the rear of the bridge-wall.

While the heater described is adapted for general use and with all kinds of boilers, it is especially adapted for marine boilers, since its location economizes space in the vessel and will also allow a diminution in the size of the boiler.

What I claim as my invention is—

1. The combination with a stack-wall, of an annular feed-water chamber on the interior thereof, a coil located in the space surrounded by said chamber to be exposed to the products of combustion and having both ends projected through the walls of said stack, and sections of readily-expansible pipe connected to the extended ends of the coil and communicating with the interior of the annular chamber at substantially opposite ends thereof, substantially as described, for the purposes set forth.

2. The combination with a section of a boiler-stack, of the inner corrugated shell coupled at its ends to said boiler-stack and forming therewith an annular chamber, a primary heating-coil situated in the space inclosed by said corrugated shell and having its respective ends attached to the upper and lower parts of said stack or shell to communicate with said chamber and provide a continuous back-and-forth circulation of water to and from the coil and chamber, flues extending through said annular chamber and opening at their ends through the inner shell, and an off-bearing boiler-feed pipe independent of the circulating-coil and communication with said annular chamber, substantially as described.

3. A feed-water heater located in the stack of a boiler and consisting of an annular chamber formed by the stack and an inner wall or shell, a series of flues extending through the chamber and opening through the heads of said chamber, an interior heating-coil coextensive with the annular chamber within the space inclosed by the inner wall or shell and having its ends extended through the stack-wall, and sections of readily-expansible pipe coupled to the respective ends of said coil and with the stack-wall to communicate with the annular chamber at opposite ends thereof, substantially as described, for the purposes set forth.

4. The combination with an annular chamber located in the stack of a boiler and having an inner wall or shell, of a heating-coil situated within said inner shell and having its ends projected through the stack-wall, sections of readily-expansible pipe connected to

the ends of said coil and to the stack-wall to communicate with the chamber at opposite ends thereof, supports fixed within the stack to sustain the coil and stays connected to the stack and to the upper part of the coil, substantially as described, for the purposes set forth.

Signed at New York, in the county of New York and State of New York, this 19th day of February, A. D. 1897.

JOHN DICKSON.

Witnesses:
WM. H. CAPEL,
DELBERT H. DECKER.