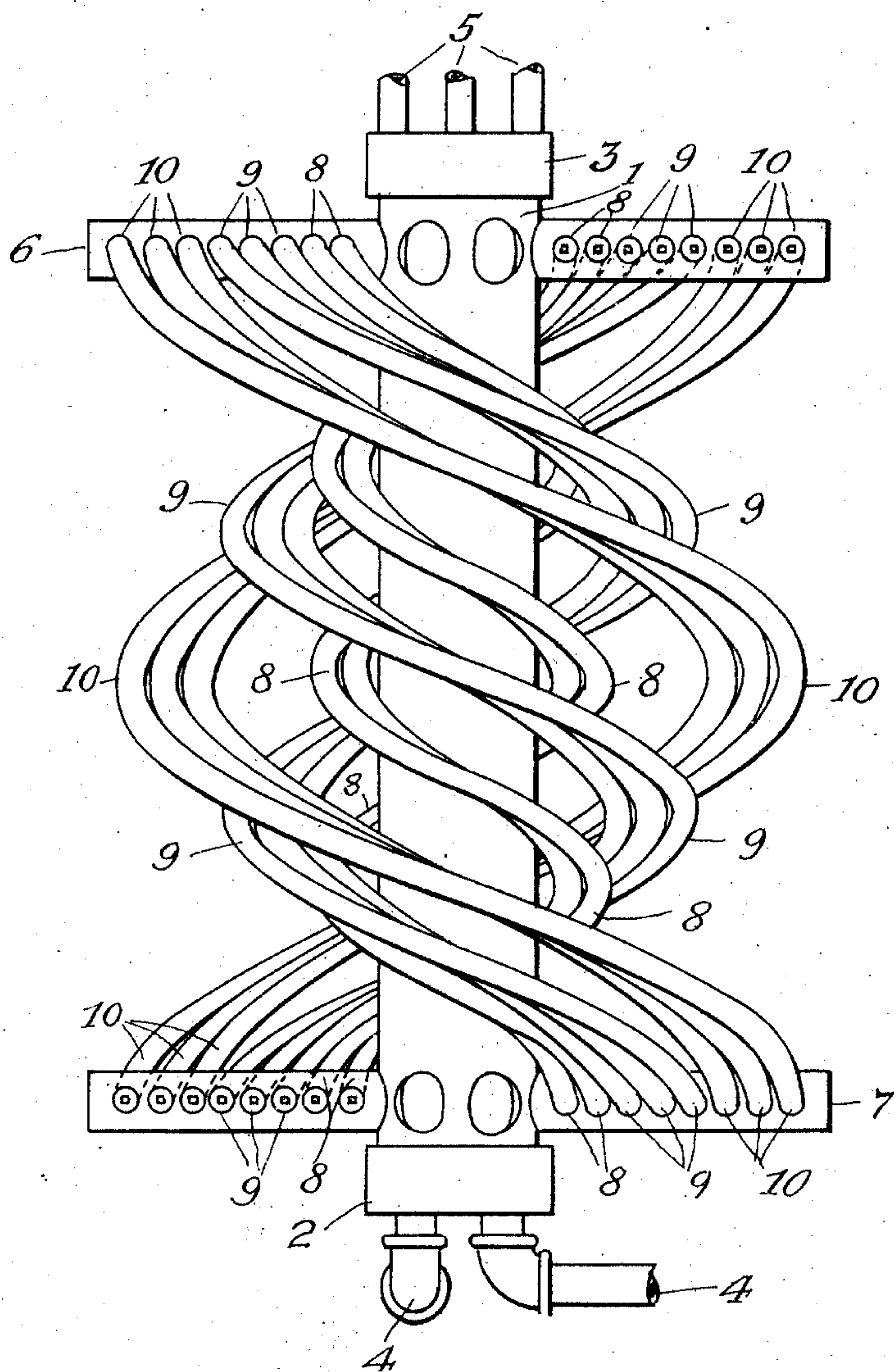


No. 883,229.

PATENTED MAR. 31, 1908.

H. E. PENNEY.
STEAM GENERATOR.
APPLICATION FILED SEPT. 28, 1907.



Witnesses:
Theo. Laggard
H. A. Bowman

Inventor:
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UNITED STATES PATENT OFFICE.

HERBERT E. PENNEY, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR TO NOTT FIRE ENGINE COMPANY, OF MINNEAPOLIS, MINNESOTA, A CORPORATION.

STEAM-GENERATOR.

No. 883,229.

Specification of Letters Patent.

Patented March 31, 1908.

Application filed September 28, 1907. Serial No. 394,952.

To all whom it may concern:

Be it known that I, HERBERT E. PENNEY, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification.

My invention relates to steam-generators and particularly to such as employ tube-sections composed of headers and coiled tubes connecting them.

The object of the invention is improvement of the arrangement of the tubes.

In my Patent No. 751,002, dated February 2, 1904, and in several other patents issued to me, I described an arrangement of the tubes in which all of the tubes were bent in spiral courses of equal pitch. My present improvement contemplates a construction in which the pitch and depth of the spiral coils of some of the tubes is varied from that of others. In using the term "pitch" I refer to the distance between the tube coils measured on a line parallel to the axis; and in using the term "depth" I refer to the radial measurement of the coils. Such improvement is illustrated in the accompanying drawings in which

Figure 1 shows in elevation pairs of headers connected by tubes a portion of which are coiled one turn, another portion a turn and a half, and still another portion two turns.

For the purpose of illustrating the application of such improvement I have shown the adjacent ends of the headers connected to an upright central cylinder the lower end of which is arranged to admit water and the upper end to discharge steam; but do not confine myself to such application; for the lower headers may be connected to some other source of water-supply, and the upper headers arranged to discharge into a steam-space other than that provided by a central cylinder.

In the drawings 1 designates a vertical cylindrical drum, the ends of which are closed by caps 2 and 3, which are preferably screwed on. Water is admitted through the lower cap 2 by means of pipes 4, and steam discharge pipes 5 are connected to the upper cap 3.

To the upper and lower end portions of the drum are connected radially arranged headers 6 and 7, preferably six at each end and

arranged in vertical alinement. The headers have their outer ends closed; and are of somewhat oval shape in cross-section for convenience in attaching the tubes to them.

To each pair of headers that are in vertical alinement is connected adjacent to the drum a tube, or a plurality of tubes, 8 that are coiled two complete turns in their spiral courses between the headers, to which they are attached at corresponding distances from the header ends. A plurality of the succeeding tubes, designated 9, three in number, as illustrated, are coiled one and a half turns in their courses between the headers. And the remainder, three in number, as illustrated, and designated 10, of the tubes are coiled only one turn in their spiral courses between the headers.

It is desirable to use tubes of comparatively small diameter placed as close together as practicable in order that a considerable number may be employed. In the construction illustrated eight tubes are shown connected to each header, making an aggregate of forty-eight coiled tubes in the boiler. The number of tubes in a group of a given pitch may be varied from the number above indicated, as desired, without departure from the plan and operation of my improvement. Such arrangement of tube-coils serves to so fill the space within the boiler-shell with water-tubes as to obstruct all direct passageways for the hot gases and compel them to take very irregular courses in rising from the furnace to the smoke-stack, and thus serves to subject the tubes to a maximum amount of heat.

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

1. In a steam generator, a series of lower and upper headers in radial arrangement around a vertical axis, and coiled tubes connecting the lower with the upper headers, the coils being arranged in groups of varying pitch and depth and those of each group being of the same pitch but of different depths, substantially as set forth.

2. In a steam generator, a series of lower and upper headers in radial arrangement around a vertical axis, and coiled tubes connecting the lower with the upper headers, the coils being of varying pitch, those of like pitch being aggrouped and the pitch of the coils of the successive groups increasing in

length from the inner to the outer groups, substantially as set forth.

3. In a steam generator, a series of lower and upper headers in radial arrangement
5 around a vertical axis, and coiled tubes connecting the lower with the upper headers, the coils being of varying depth and aggrouped in groups of like pitch, the pitch of the coils of the successive groups increasing in length
10 from the inner to the outer groups, substantially as set forth.

4. In a steam generator, a series of lower and upper headers in radial arrangement
15 around a vertical axis, and coiled tubes connecting the lower with the upper headers, the

coils being of varying pitch and depth, those of like pitch and depth being aggrouped and the pitch and depth of the coils of the successive groups increasing in length from the inner to the outer groups, substantially as 20 set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses this 17th day of September, 1907.

HERBERT E. PENNEY.

Witnesses:

P. H. GUNCKEL,

H. A. BOWMAN.