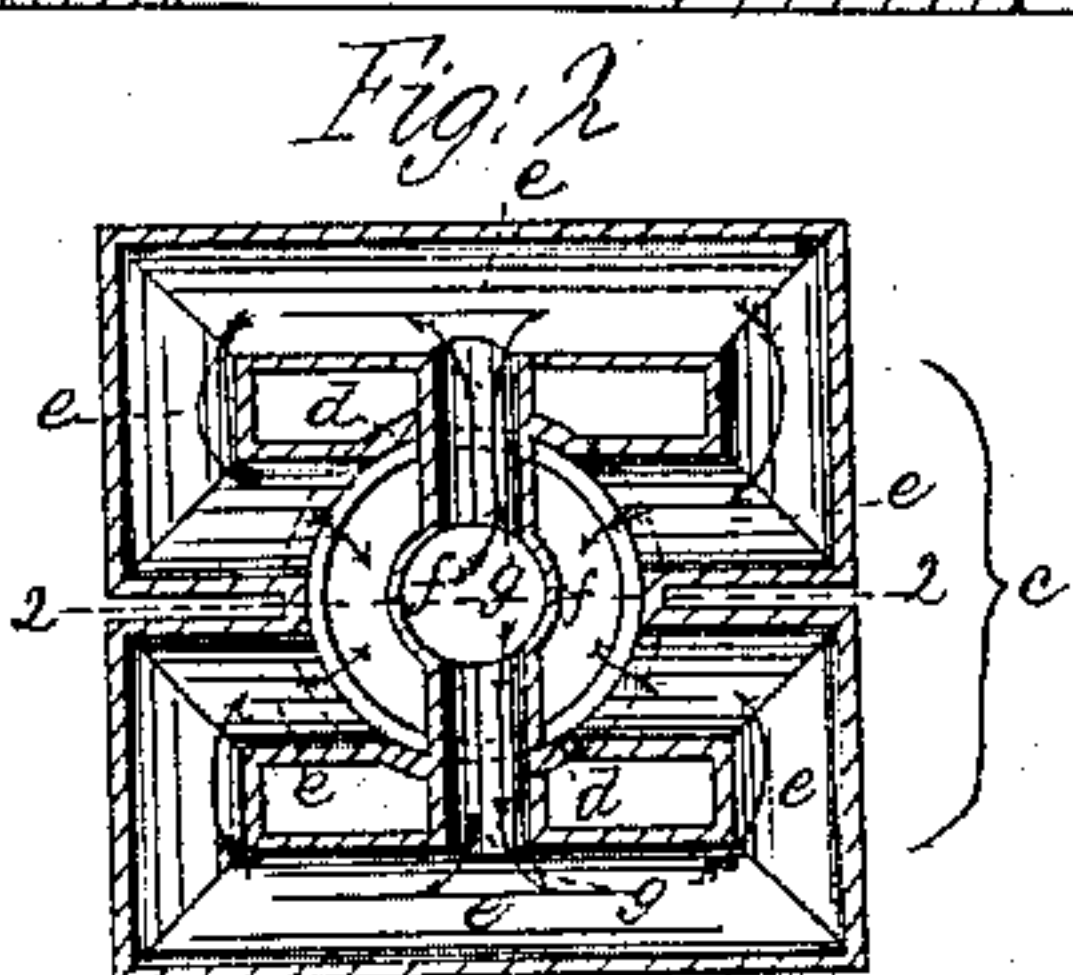
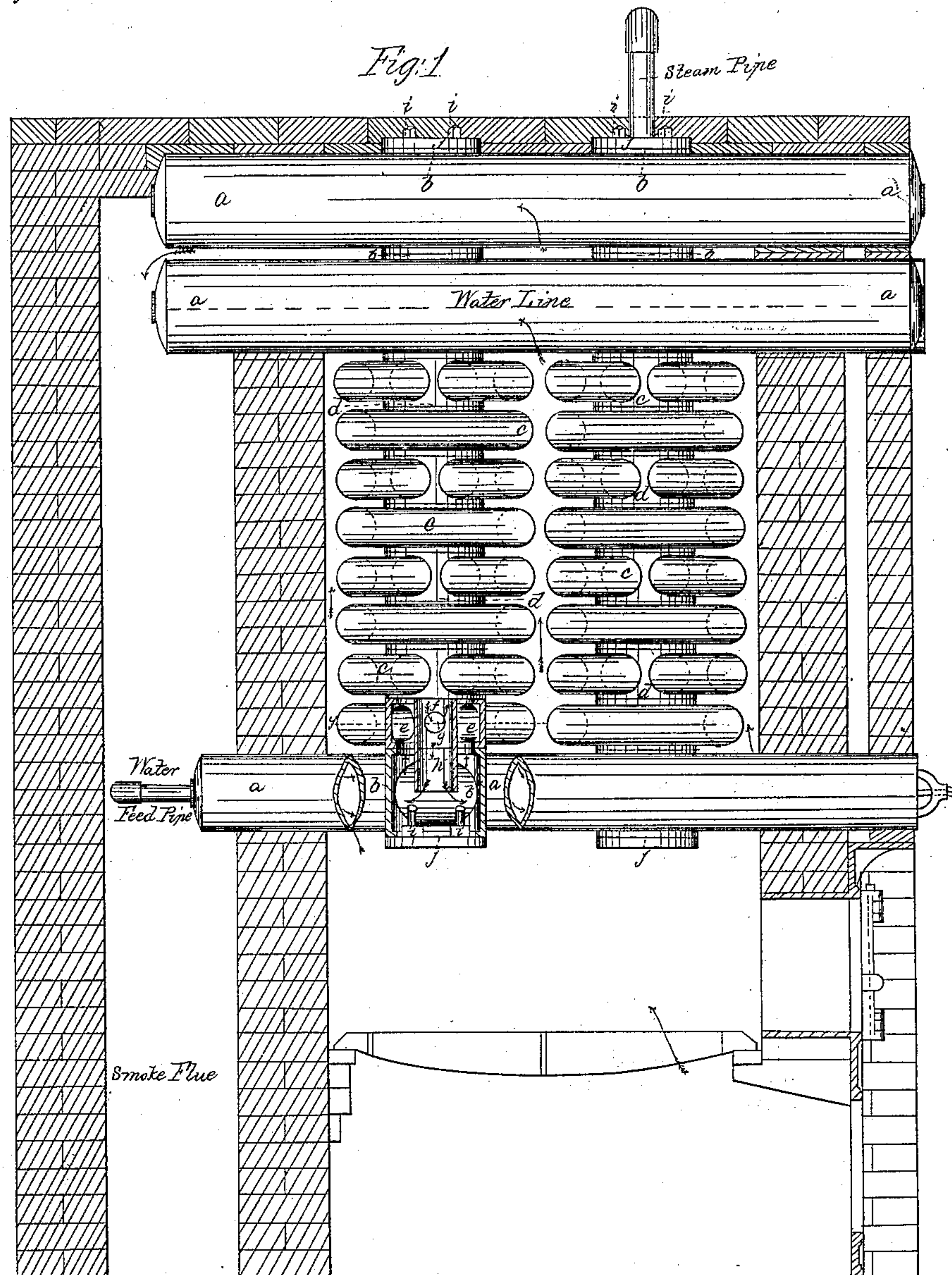


*E. Reynolds,*  
*Sectional Steam Boiler.*

*No 59,780.*

*Patented Nov. 20, 1866.*



*Witnesses:*  
*Francis Smith*  
*Ab. W. Bathingham*

*Inventor*  
*Edwin Reynolds*



# United States Patent Office.

## IMPROVEMENT IN STEAM GENERATORS.

EDWIN REYNOLDS, OF BOSTON, MASSACHUSETTS.

*Letters Patent No. 59,780, dated November 20, 1866.*

### SPECIFICATION.

#### TO ALL WHOM IT MAY CONCERN:

Be it known that I, EDWIN REYNOLDS, of Boston, in the county of Suffolk, and State of Massachusetts, have invented certain new and useful Improvements in Steam Boilers, and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it:

This invention is an improved construction of sectional cast-metal boilers, embodying therein the general plan and method of obtaining and determining proper circulation of water and steam currents, shown and described in my patent No. 47,130, dated April 4th, 1865.

My present invention relates particularly to the general form of the central cast sections of this boiler, which are located in the combustion chamber above the grates, and in connection therewith to the arrangement by which spaces are secured, free from currents and the direct action of the fire, in which sediment deposits and from which it can be easily removed.

Of the drawings illustrating an embodiment of my invention—

Figure 1 denotes a side elevation of my improved boiler, showing it in a brick-work setting, with the grates, &c., forming the furnace; a portion of the boiler being broken away to exhibit beyond in vertical section on the line *z, z*, fig. 2, one of the parts or sections shown in horizontal section in said figure, said horizontal section being taken in the line *y, y*, seen in fig. 1.

The general construction of the boiler shown in the drawings is as follows: Large horizontal pipes, *a, a*, located side by side, united by vertical pipes, *b, b*, cast between and with the pipes *a, a*, and opening into said pipes, are employed to make the upper and lower parts of the boiler. For the lower part of the boiler I prefer to make use of but one such casting, but for the upper part more than one such casting may be used. Two such castings are shown in the drawing as forming the upper part of the boiler, in the lower one of which it is intended to establish the water line or level at or about its centre, leaving the space above in this casting, and the entire space in the upper casting, for a steam chamber. The ends of the vertical pipes, *b, b*, are faced off to make joint surfaces, and at either or both ends of the horizontal pipes hand or man holes should be provided, though these are essential only in the section making the lower part of the boiler, where they afford means for cleaning out solid deposit.

The central cast sections are as a whole designated by the letter *c*, and are of peculiar general form; as will be described, they forming nearly the whole of the steam generating surface of my boiler. Each of these sections, *c*, are made up of a vertical pipe, *d*, the ends of which correspond in diameter with the vertical pipes, *b*, and like said pipes, *b*, have their ends faced off to joint surfaces square to their axes. With this pipe, *d*, two pipes, *e, e*, are joined in such a manner that both ends of each pipe, *e*, shall open into pipe *d*, the outline of pipes *e, e*, being curved or angular, as may be preferred, for convenience of casting, all parts of this section being made in one casting. In the centre pipe, *d*, is cast a smaller pipe, *f*, the ends of which are faced off flush with the ends of pipe *d*, the pipe *f* being sustained in pipe *d* by two horizontal pipes, *g, g*, the bores of which pass through pipe *d*, and communicate with pipes *e, e*, between the ends thereof, which debouch into pipe *d*, said bores or passages being smaller in diameter than are the bores or passages in pipes *e*. In each of the vertical pipes, *b*, of the lower part of the boiler, and extending from the tops thereof to about the centres of the diameters of the lower pipes, *a*, is a pipe, *h*, of diameter corresponding to the diameter of pipe *f*. The pipes, *a*, and the sections, *c*, are held together by long screw bolts, *i*, which also act to confine covering plates, *j*, to the open ends of pipes, *d*, as shown in the drawing.

It is intended that the walls of the combustion chamber shall approach nearly to the series of the sections, *c*, and the ends of pipes, *a*, which project beyond shall be set in the brick work, thus supporting the boiler and being protected from the direct heat of the fire.

The construction having been described, I will now explain the operation of the boiler, which we will suppose filled to the water level. The heat of the fire acting directly on the pipes, *e*, and on the exterior of pipes, *d*, causes steam to be generated, which, with hot water accompanying, tends to rise upward in the annular space between pipes *b*, and *h*, and *f*, while the space in pipes *h* and *f*, being remote from the fire, remains comparatively cool, and the water therein takes a downward direction to supply the place of that which rises as it is heated, and thus circulation is established in the boiler and is maintained therein so long as heat is applied thereto.

The direction of the water currents is shown by the black arrows on the drawings. The current establishes itself passing downward through *f*, through *g*, through *e*, into and upward through *d*, till, having parted with its steam and some of its caloric, it finds its way to the top of pipes *f*, and flows downward therein as described.

The current sets in each section, *c*, as described, because of the difference in the diameter of the pipes *g* and *e*. The latter being the largest, the steam can rise higher therein than it can in pipe *g*, the axes of both *g* and *e* being located in the same plane. The same result might be accomplished without difference in the diameters of the pipes, provided they were otherwise so arranged that the tops of pipes *e* should be higher than the tops of pipes *g*. The circulation thus established is rapid and prevents deposit of sediment within section *c*. But the ends of the lower set of pipes, *a*, have little circulation within them and are not exposed to direct heat. There the deposit is made, and can remain without injury to the boiler, it being removed from time to time through the hand holes provided, so as to prevent too great an accumulation of sediment.

Any number of these boilers may be connected in range, by extending the brick-work setting and coupling the steam and water spaces of the adjacent boilers by suitable piping.

I claim the sections, *c*, when constructed and arranged so as to operate substantially as described.

Also, in connection therewith, I claim the arrangement of the sediment chambers in the ends of the lower pipes, *a*.

EDWIN REYNOLDS.

Witnesses:

FRANCIS GOULD,

M. W. FROTHINGHAM.