No. 714,530. Patented Nov. 25, 1902.

P. J. SWEENEY.

WATER TUBE STEAM BOILER.

(Application filed July 11, 1902.)

(No Model.) 3 Sheets—Sheet 1.

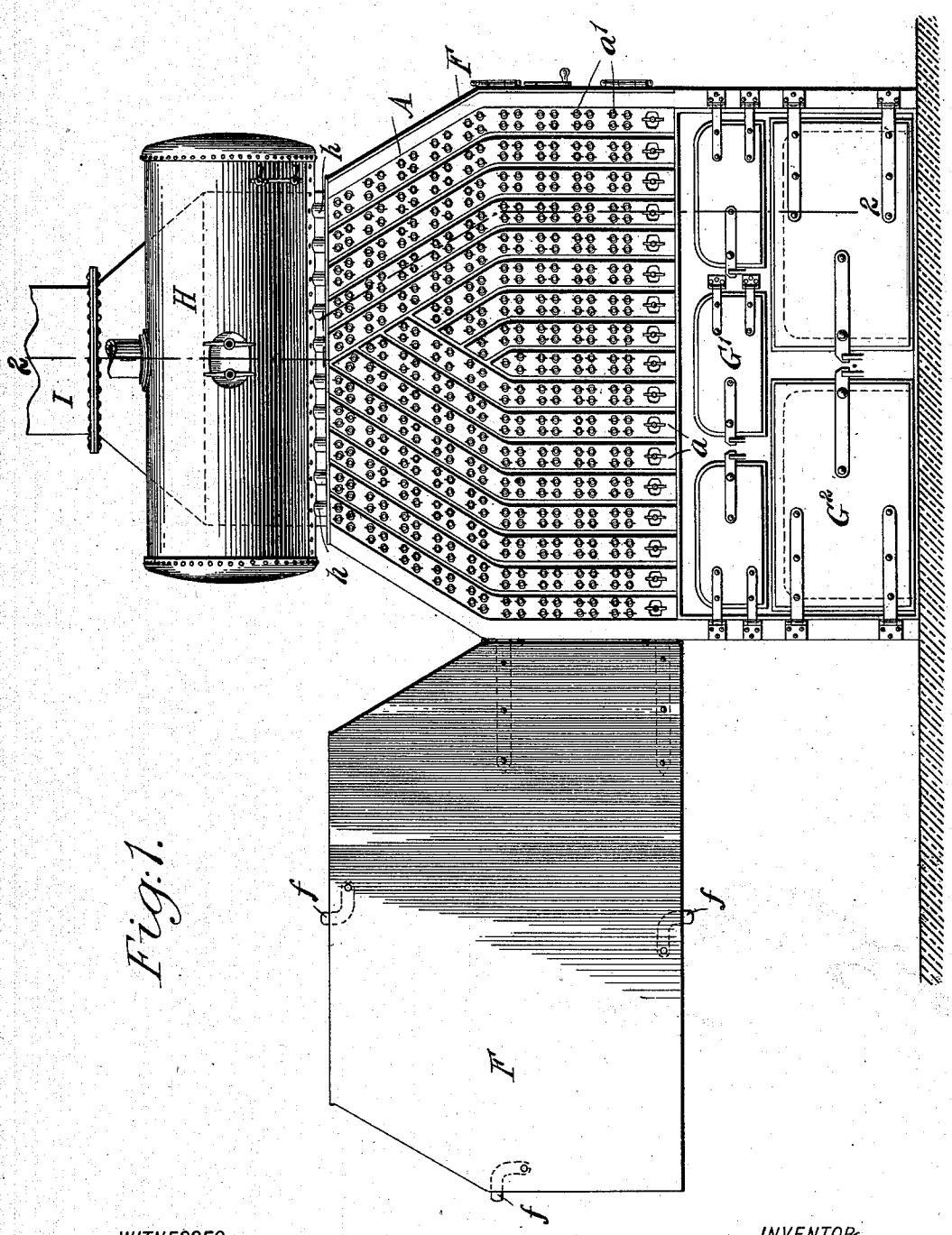

Fig. 1.

WITNESSES:

Glenn H. Niles.

B. Bradway.

INVENTOR

Patrick J. Sweeney.

BY

Goepel & Niles

ATTORNEYS.

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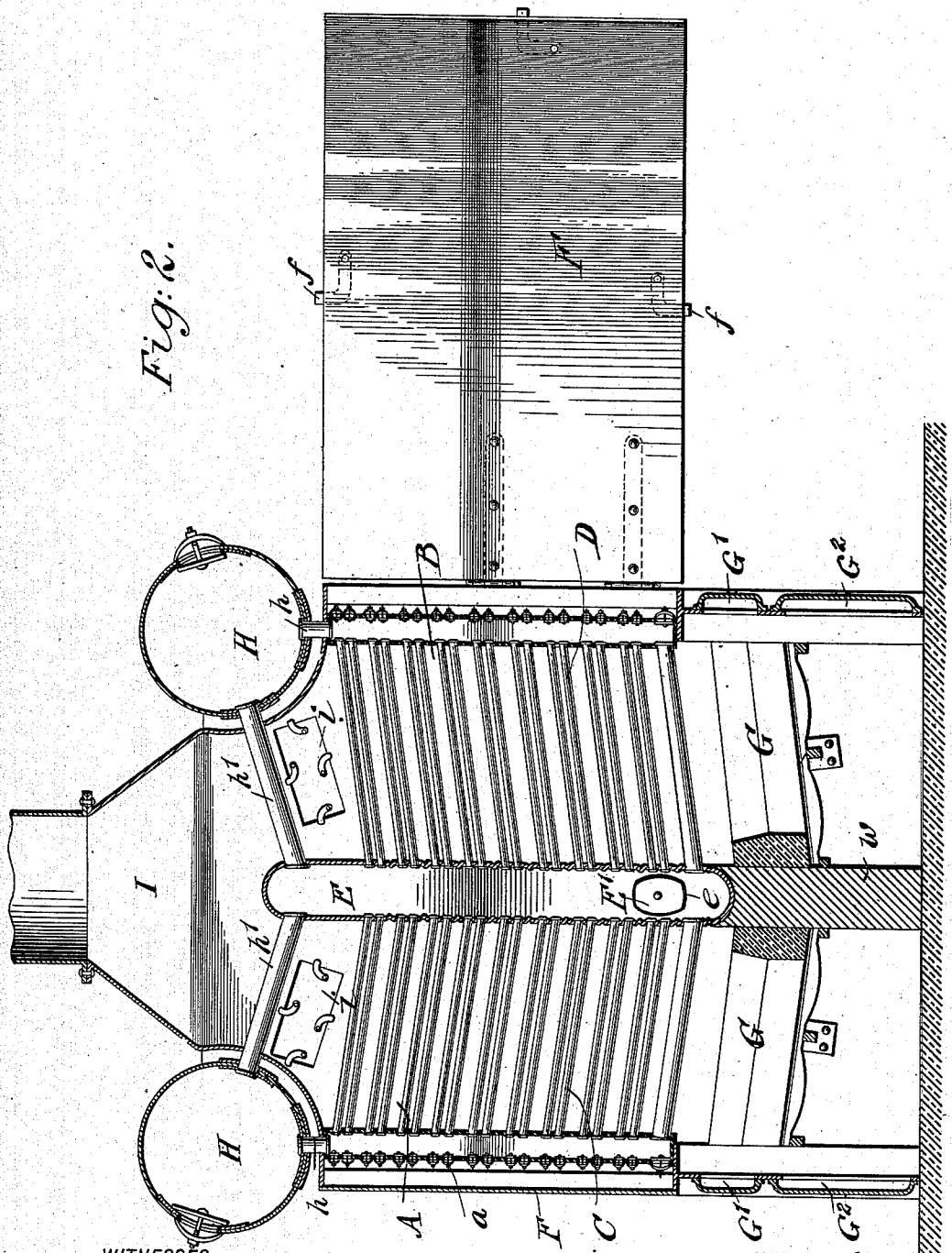
Fig. 2.



WITNESSES:

Glenn H. Niles.

S. Broadway.

INVENTOR

Patrick J. Sweeney.

BY

Glenn Niles

ATTORNEYS.

No. 714,530. Patented Nov. 25, 1902.

P. J. SWEENEY.

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Fig. 5.

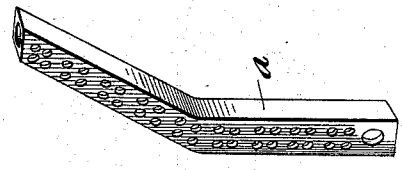


Fig. 4.

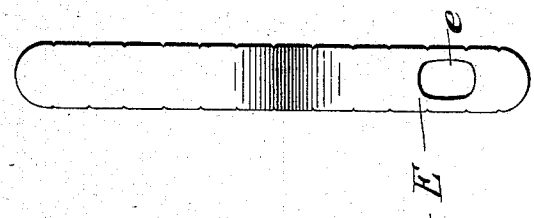
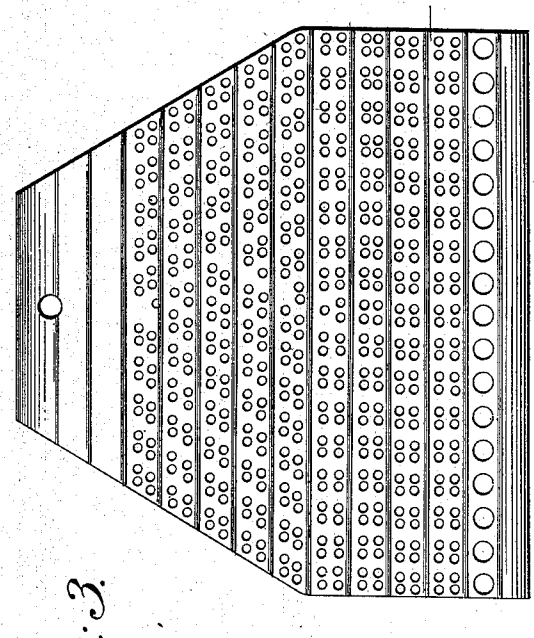


Fig. 3.



WITNESSES:

Glenn H. Niles.

D. Bradway.

INVENTOR

Patrick J. Sweeney

BY

Goepel & Niles

ATTORNEYS.

UNITED STATES PATENT OFFICE.

PATRICK J. SWEENEY, OF ELIZABETH, NEW JERSEY.

WATER-TUBE STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 714,530, dated November 25, 1902.

Application filed July 11, 1902. Serial No. 115,171. (No model.)

To all whom it may concern:

Be it known that I, PATRICK J. SWEENEY, a citizen of the United States, residing in Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Water-Tube Steam-Boilers, of which the following is a specification.

This invention relates to certain improvements in water-tube steam-boilers which are specially adapted for marine purposes in which the water-tubes and their headers are so arranged that a comparatively small space is taken up, while a comparatively large heating-surface and fire-grate area are obtained; and the invention consists of a water-tube steam-boiler which comprises front and rear headers formed of a number of individual sections, a corrugated header located intermediately between the front and rear headers, a system of inclined water-tubes connecting the front and rear headers with the intermediate header, steam-drums arranged parallel above the front and rear headers and connected with the same and with the intermediate header, and inclined grate-bars located below said water-tubes; and the invention consists, further, of certain details of construction and combinations of parts, which will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of my improved water-tube steam-boiler, showing the front door in open position. Fig. 2 is a vertical section on line 2 2, Fig. 1. Fig. 3 is an elevation of the intermediate corrugated header. Fig. 4 is a side view of the same, and Fig. 5 is a perspective view of one of the sections of the front or rear header.

Similar letters of reference indicate corresponding parts.

My improved water-tube steam-boiler is more especially intended for marine purposes, and in order to economize space is arranged in the nature of a double steam-boiler, in which a central or intermediate header is employed in conjunction with two systems of inclined water-tubes connecting opposite sides of the same with the front and rear headers. The front and rear headers are each composed of a plurality of sections or water-legs *a*, of which seventeen are shown in the drawings, said sections being grouped with short ones in the center and longer ones at each side, and they are made of angular shape, so that their upper parts converge toward each other, as shown clearly in Fig. 1. The front and rear headers A and B, respectively, are connected by two systems of inclined water-tubes C and D with the intermediate header E, the lower row of water-tubes being of larger diameter than the upper inclined water-tubes, which are preferably arranged in groups of four, as shown in the drawings. The upper portion of the boiler converges from two sides, and each of the four sides is provided with a door F, which is locked to the exterior casing of the steam-boiler by means of suitable latches *f*, the doors of the converging sides being bent at an obtuse angle, as shown at the right hand of Fig. 1. Below the systems of water-tubes C and D are arranged inclined fire-grates G, which extend from the front wall of the boiler to the intermediate header E, the rear ends of the grate-bars being supported by suitable fire-brick walls *w*, the side walls being also lined with fire-brick wall. Access is given to the inclined grates by front doors G′. Below the grates are arranged the ash-pits, to which access is given by front and rear doors G^2. Above each header is arranged a steam-drum H, which is connected by nipples *h* with the upper end of the longer sections or water-legs of the front and rear headers, said steam-drums being also connected by larger inclined tubes H′ with the upper end of the intermediate header E. The shorter water-legs at the center of the front and rear headers are not connected with the steam-drums, but they are connected with the intermediate header, so as to form an independent circulating system centrally above and in close proximity to the fire. This secondary or independent circulating system is formed by the lower portion of the intermediate header, and the shorter water-legs of the front and rear headers, and their connecting water-tubes. By means of this system the water becomes heated to a high degree in the lower water-tubes and rises in the water-legs and returns

in the upper water-tubes of this system and mixes with the water of the main circulating system, passing from the intermediate header through the water-tubes to the longer water-legs, thence to the drums, and back to the intermediate header again. Thus the secondary circulating system is independent of the main circulating system in respect to its not being connected directly with the steam-drums; but the water of the two systems mix in the intermediate header, and as the water of the secondary system has a short and quick circulation it soon effects the heating of the larger volume of water of main circulating system. The intermediate header E is formed of corrugated boiler-iron, as shown in Fig. 3, and is tapering, as are the front and rear headers, at its upper end. The inner ends of the water-tubes C and D are swaged to the front and rear walls of the intermediate header, the grouping of the holes corresponding to the grouping of the holes in the front and rear headers. The intermediate header is provided at its lower part, at opposite ends, with manholes *e* for the purpose of permitting the removal of sediment and for giving access to the intermediate header for expanding the inner ends of the water-tubes, said manholes being closed by suitable covers. Any of the water-tubes can be removed and replaced in connection with the intermediate header without disturbing the others in the case of repairing the boiler. The sections or water-legs *a* of the front and rear headers are closed by the usual caps *a'*, as shown in Fig. 1, so that on removing the same access is given to the systems of inclined water-tubes for cleaning the same.

The horizontal corrugations of the intermediate header impart the required strength to the same without requiring stay-bolts for strengthening the header. The water circulates from the front header through the water-tubes to the intermediate header and through the circulating-tubes and nipples of the front and rear headers into the steam-drums. The steam-drums are provided with the usual manholes, water-gages, and nozzles for connecting the same with the pipes conducting the live steam from the steam-drum to the place of use. The products of combustion are conducted through the systems of water-tubes in upward direction to the smoke-flue I, the side walls of the top casing being provided with doors *i* for giving access to the upper rows of water and circulating tubes and the upper end of the intermediate header, so as to permit the cleaning of the same from soot and ashes.

My improved water-tube steam-boiler is provided with a very large number of water-tubes in a small and compact space, so that a comparatively large heating-surface in proportion to the fire-grate area is obtained. All the parts can be readily cleaned, so that the boiler is specially adapted for marine purposes, and, further, my improved steam-boiler has the upper rows of tubes in the converging portion of the boiler located in line with the channels formed by the vertical arrangement of the lower tube in rows, so that the gases of combustion after passing between the bottom tubes will then strike the upper tubes and are then compelled to pass along the same to the smoke-flue, so that the hot products of combustion are utilized in a higher degree. This arrangement of the upper rows of water-tubes in the path of the products of combustion is obtained by the converging shape of the front, rear, and intermediate headers.

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

1. In a water-tube steam-boiler, the combination, with a rectangular casing having two opposite sides converging at the top and provided with doors to form the sides, of front and rear headers, an intermediate header having its interior and exterior surfaces corrugated, inclined water-tubes connecting said headers, said headers converging at their upper portions in conformity with said casing, fire-chambers below said water-tubes, said water-tubes being in regular vertical arrangement at the lower portions of said headers to form channels for the products of combustion and being in irregular vertical arrangement relatively to said channels at the upper converging portions of said headers, substantially as set forth.

2. In a water-tube steam-boiler, the combination, of front and rear headers, an intermediate header, said headers converging longitudinally at their upper portions, said front and rear headers being composed of angular water-legs symmetrically disposed to form the converging portions and grouped with shorter water-legs at the center and longer water-legs at the sides, water-tubes connecting said water-legs and intermediate header, and steam-drums connected with the longer angular water-legs and with the intermediate header, substantially as set forth.

3. In a water-tube steam-boiler, the combination, of front and rear headers, an intermediate header, said front and rear headers being composed of angular water-legs symmetrically disposed to form converging upper portions and being grouped with shorter water-legs in the center and longer water-legs at the sides, water-tubes arranged each side of said intermediate header and connecting the same with said front and rear headers, steam-drums supported above and parallel with said front and rear headers, nipples connecting said drums with the longer water-legs, circulating-tubes connecting said drums with said intermediate header, substantially as set forth.

4. In a water-tube steam-boiler, an intermediate header provided with horizontal corrugations and rows of holes between said corrugations for receiving the front and rear systems of water-tubes, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

PATRICK J. SWEENEY.

Witnesses:
PAUL GOEPEL,
C. BRADWAY.