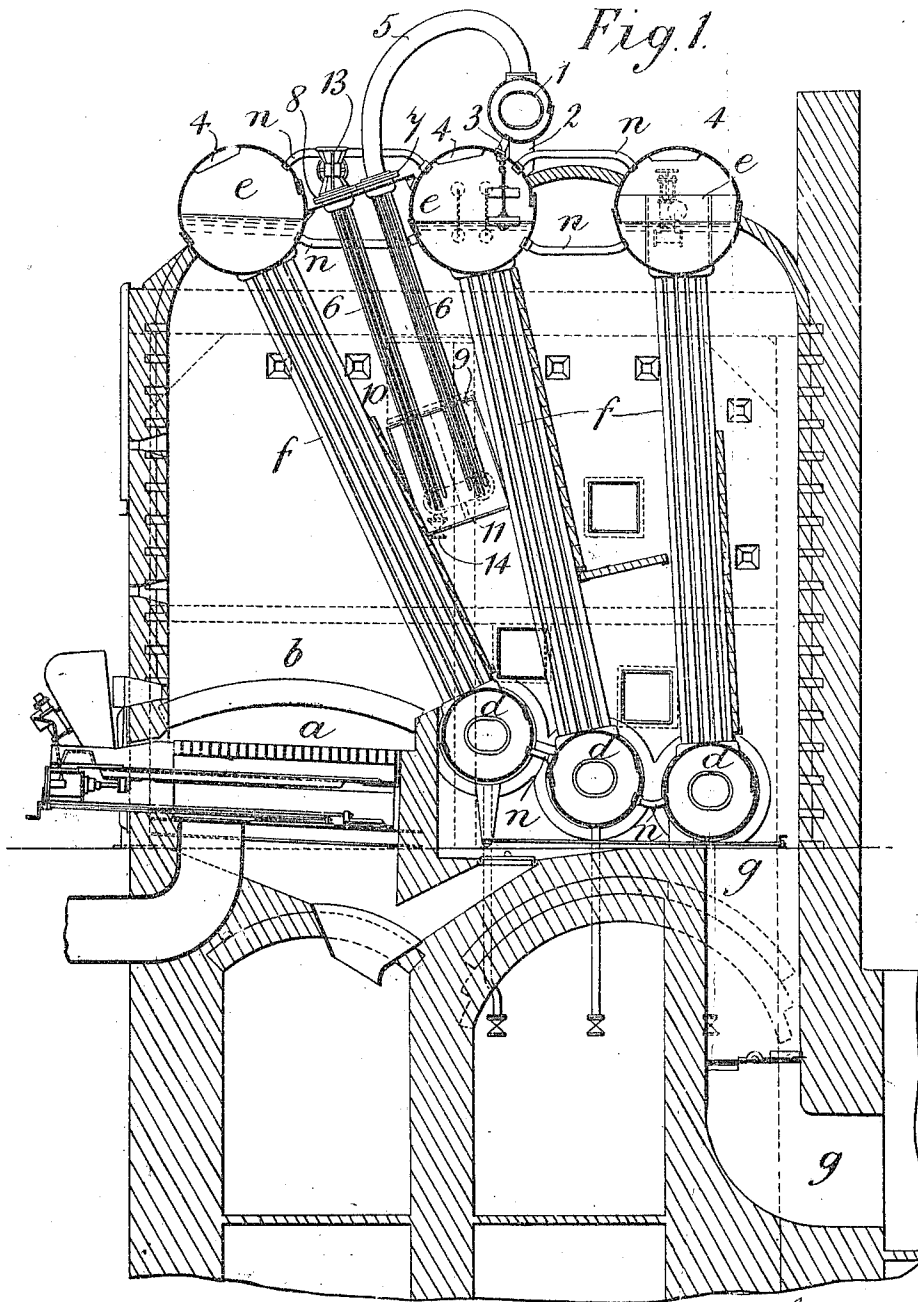


W. A. WOODSON.
STEAM BOILER.
APPLICATION FILED JULY 19, 1909.

1,030,218.

Patented June 18, 1912.

2 SHEETS—SHEET 1.



Witnesses
E. R. Beck
L. E. Carpenter

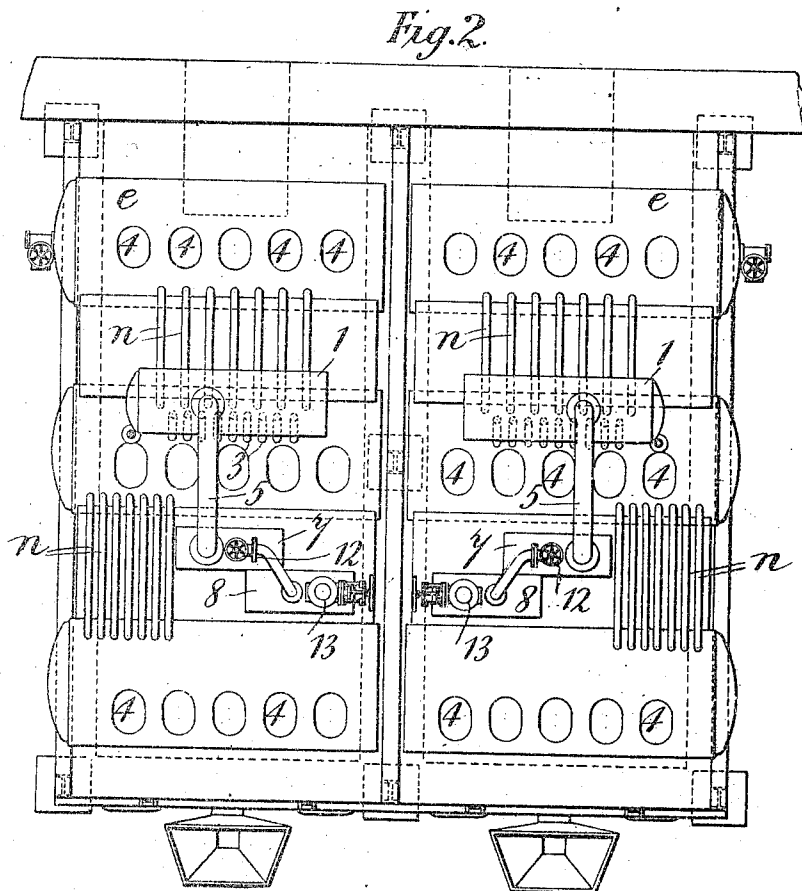
Inventor
W. A. Woodson
by A. S. Patterson
att'y.

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Witnesses
E. R. Pick
S. L. Burket

Inventor
W. A. Woodson
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UNITED STATES PATENT OFFICE.

WILLIAM ARMSTRONG WOODSON, OF GATESHEAD, ENGLAND.

STEAM-BOILER.

1,030,218.

Specification of Letters Patent.

Patented June 18, 1912.

Application filed July 19, 1909. Serial No. 508,477.

To all whom it may concern:

Be it known that I, WILLIAM ARMSTRONG WOODSON, a subject of the King of Great Britain and Ireland, residing at Gateshead-on-Tyne, in the county of Durham, England, have invented Improvements in and Relating to Steam-Boilers, of which the following is a specification.

This invention has reference to water tube steam boilers of the type described in the specification of prior British Letters Patent No. 28383 of 1903 and to steam superheaters suitable for use therewith.

Figure 1 of the accompanying drawings illustrates a battery of two boilers and superheaters embodying this invention in transverse vertical section. Fig. 2 a plan.

Each boiler in the battery under notice, as in the earlier constructions, comprises a furnace *a* arranged at the front of the boiler, a combustion chamber *b* above the furnace *a*, three lower water drums *d*, three corresponding upper steam and water drums *e*, straight water tubes *f* arranged in groups connecting said water and steam drums *e* and water drums *d*, and a rear flue *g*, the several drums *d* and the several drums *e* being connected by circulating tubes *n*.

The furnaces *a* are shown fitted with underfeed stoker apparatus, although other forms of stokers, such as chain grate or other traveling types of stokers can be fitted; and there are no arches over the fire grates.

Instead of a large common steam drum arranged at right angles to the three upper drums *e* and connected thereto by steel necks, a steam drum 1 is arranged above and slightly to one side of the middle steam and water drum *e* and extending parallel thereto. The drum 1 is carried by brackets 2 and is connected to the middle drum *e* by tubes 3 so that all bolted joints are obviated and freedom of movement is allowed to the three drums *e* for expansion and contraction. The groups of tubes *f* connecting the upper drums *e* to the lower drums *d* are not staggered but are arranged in a straight row and the manholes 4 in the drums *e* are correspondingly arranged in a straight line, one over each nest of tubes. Steam from the upper part of the steam drum 1 flows through a pipe 5 to a superheater arranged in the path of the hot gases flowing to the flue *g*, between two of the drums *e* and corresponding tubes *f*. The tubes 6 in which the superheating takes place are bent to L

shape and are attached by expanding or other suitable means to tube boxes 7, 8, 9 and 10 made of forged steel and arranged outside the combustion chamber of the boiler. The tube boxes 9 and 10 are arranged vertically side by side at one side of the boiler and are placed in free communication with each other by a connecting pipe 11.

12 is a by-pass valve connecting the tube box 7 to the tube box 8 and 13 is a main outlet valve fitted on the box 8.

Furthermore, according to this invention in order to provide for expansion and contraction in steam boilers of the type comprising a lower water drum, an upper steam and water drum, groups or nests of straight water tubes connecting said drums and extending through the combustion chamber and baffles arranged transversely of the length of the drums and extending alternately in upward and downward directions and so arranged in relation to the boiler furnace that the gases flow between the tubes in a sinuous course lengthwise of the drums, the lower water drum is suspended by the water tubes from the upper steam and water drum and is otherwise unsupported, the upper drum being carried by the setting or casing of the boiler and in this way all injurious straining of the parts owing to expansion and contraction is avoided.

The water tubes are arranged in nests located in a straight row or staggered as heretofore proposed in boilers of other type described in the specification of prior British Letters Patent Nos. 28383 of 1903 and 23305 of 1904 and over each group of tubes a manhole is provided in the upper drum thereby enabling the tubes to be easily examined when desired.

Instead of being arranged in a brickwork setting the improved boiler can be fitted if desired with a marine type casing in which case it can be fixed in its casing and finished completely with the tubes already expanded in the drums, the whole forming a self contained structure capable of being placed in any desired position for use.

The drum 1 is carried by brackets 2 and is connected by numerous short tubes 3 distributed lengthwise thereof to the middle drum only so that all bolted joints are obviated and freedom of movement is allowed to the three drums *e* for expansion and contraction; the tubes 3 and the drum 1 are external to the boiler casing so that the movement

of the drum 1 is simply that due to the expansion of the tubes *f* and the tubes 3 are connected to the middle drum *e* at the same side of the vertical plane containing the axis of the drum as that on which the inclined tubes *f* are disposed, which arrangement tends to prevent water driven from the tubes *f* being carried through the tubes 3 into the steam drum 1.

10 : A number of boilers constructed as described can be arranged side by side to form a battery of boilers as well understood.

What I claim is:—

1. In a steam boiler, water drums arranged one behind the other, the rear water drum being at a lower level than the front water drum, steam and water drums corresponding in number to said water drums and located at the top of the boiler, a furnace grate arranged in front of the foremost of said water drums, groups of straight water tubes of equal length connecting said water drums to said steam and water drums, circulating tubes connecting the said water drums, circulating tubes connecting the said steam and water drums, a steam drum extending parallel to said steam and water drums, and tubes connecting said steam drum to one only of said steam and water drums.

2. In a steam boiler, water drums arranged one behind the other the rear water drum being at a lower level than the front water drum, steam and water drums corresponding in number to said water drums and located at the top of the boiler, a furnace grate arranged in front of the foremost of said water drums, groups of straight water tubes of equal length connecting said water drums to said steam and water drums, circulating tubes connecting the said water drums, circulating tubes connecting the said steam and water drums, a steam drum extending parallel to said steam and water drums, and tubes arranged in a row that extends from one end of the said steam drum to the other connecting said steam drum to one only of said steam and water drums.

3. In a steam boiler, water drums arranged one behind the other the rear water drum being at a lower level than the front water drum, steam and water drums corresponding in number to said water drums and located at the top of the boiler, a furnace grate arranged in front of the fore-

most of said water drums, groups of straight water tubes of equal length connecting said water drums to said steam and water drums, the connection of said groups of tubes to one of said steam and water drums being mainly at one side of the central vertical plane of said drum, circulating tubes connecting the said water drums, circulating tubes connecting the said steam and water drums, a steam drum extending parallel to said steam and water drums, and steam tubes connecting the said steam and water drum to which the groups of straight water tubes are connected at one side of the central vertical plane to said steam drum, the connection of said steam tubes to said steam and water drum being at the same side of the central vertical plane as that at which the said groups of tubes are connected.

4. In a steam boiler, water drums arranged one behind the other the rear water drum being at a lower level than the front water drum, steam and water drums corresponding in number to said water drums and located at the top of the boiler, a furnace grate arranged in front of the foremost of said water drums, inclined groups of straight water tubes of equal length connecting said water drums to said steam and water drums, the connection of said groups of tubes to one of said steam and water drums being mainly at one side of the central vertical plane of said drum, circulating tubes connecting the said water drums, circulating tubes connecting the said steam and water drums, a steam drum extending parallel to said steam and water drums, and steam tubes inclined in opposite direction to that of said groups of tubes, connecting the said steam and water drum to which the groups of straight water tubes are connected at one side of the central vertical plane to said steam drum, the connection of said steam tubes to said steam and water drum being at the same side of the central vertical plane as that at which the said groups of tubes are connected.

Signed at Newcastle-on-Tyne, England, this sixth day of July 1909.

WILLIAM ARMSTRONG WOODESON.

Witnesses:

H. NIXON,

W. D. COOKSON.