No. 736,713.

PATENTED AUG. 18, 1903.

H. L. FULENWIDER.

STEAM BOILER.

APPLICATION FILED JUNE 13, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

FIG. 1.

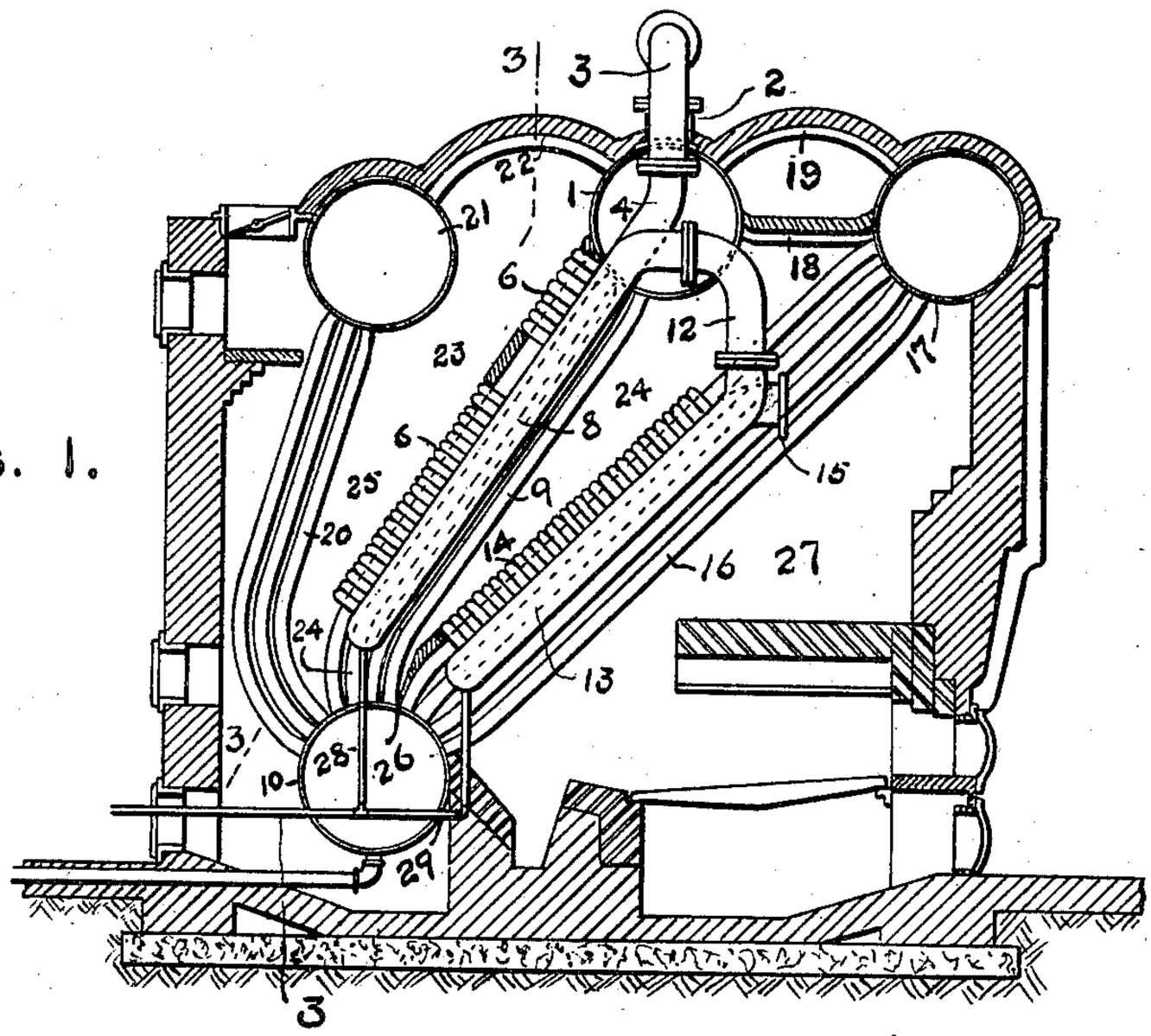
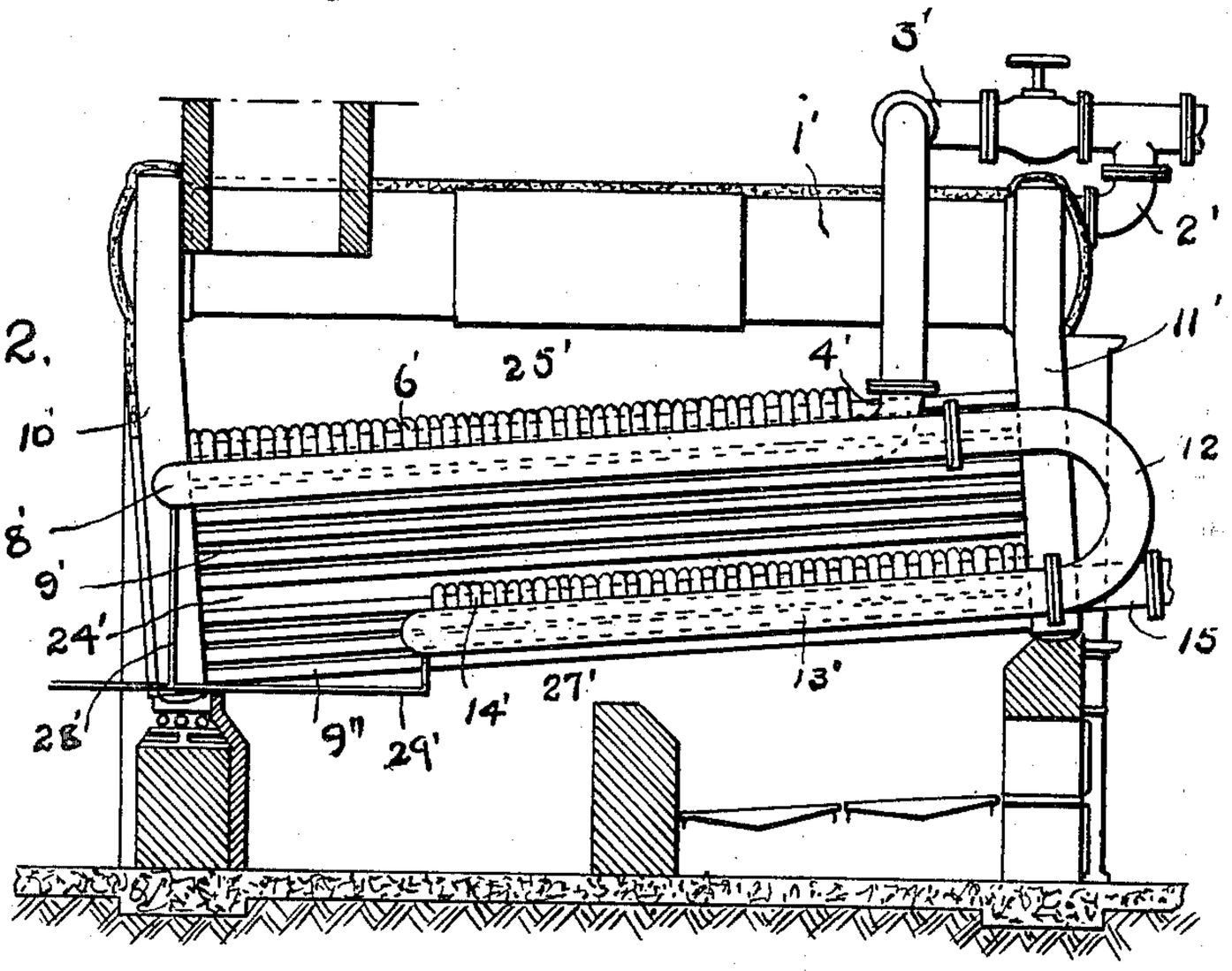


FIG. 2.



WITNESSES:

Francis J. Ginther

Utley Crane.

INVENTOR:

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By Charles N. Butler

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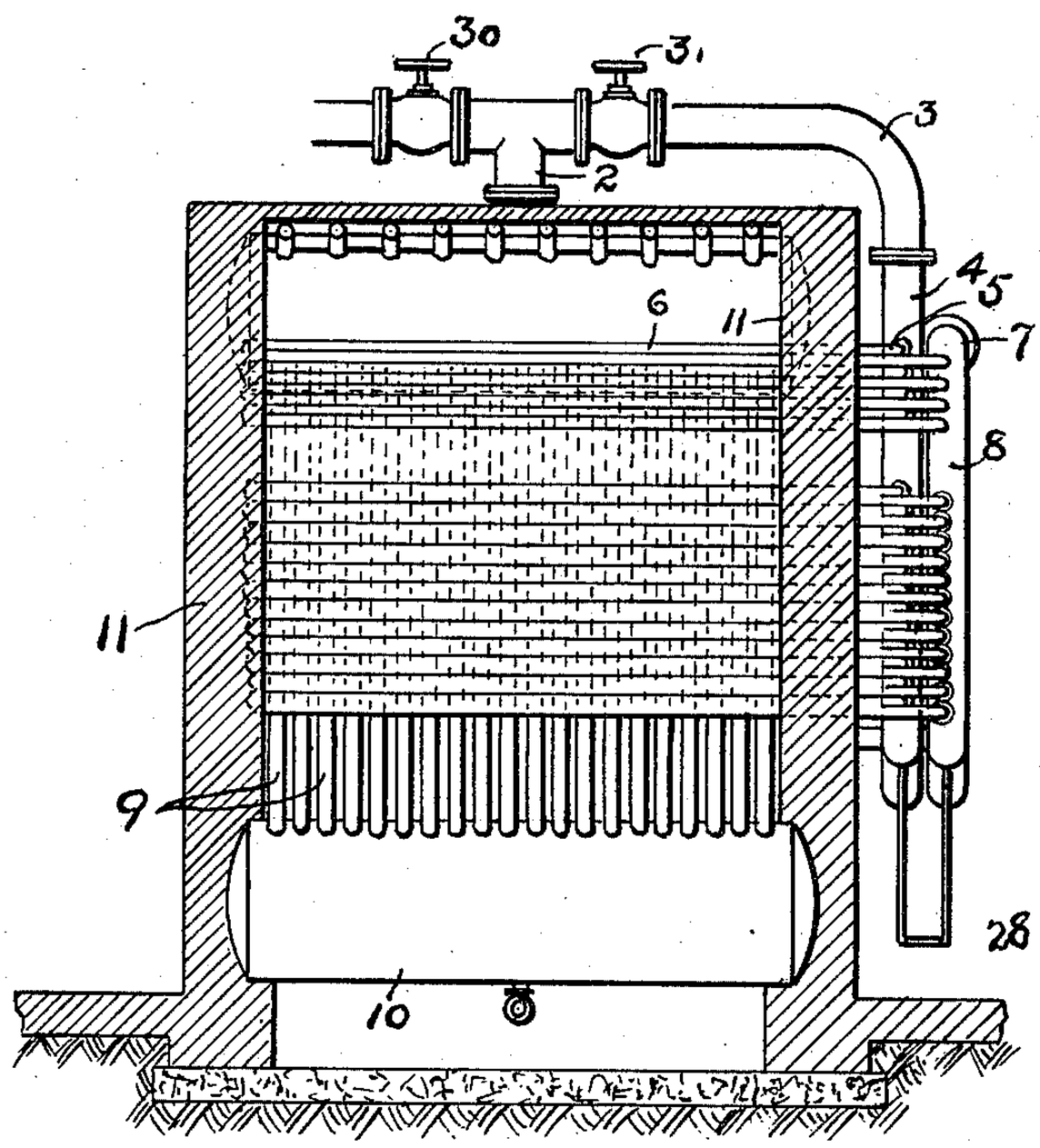
NO MODEL. 2 SHEETS—SHEET 2.

FIG. 3



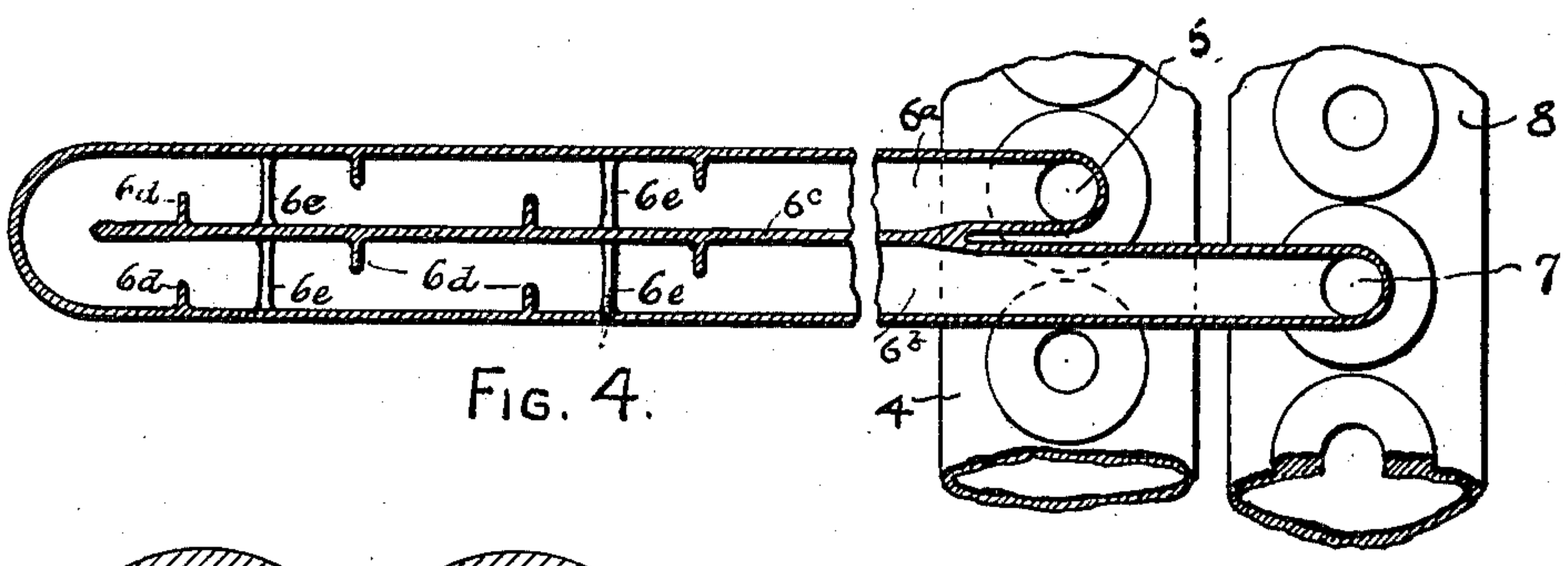


FIG. 4.

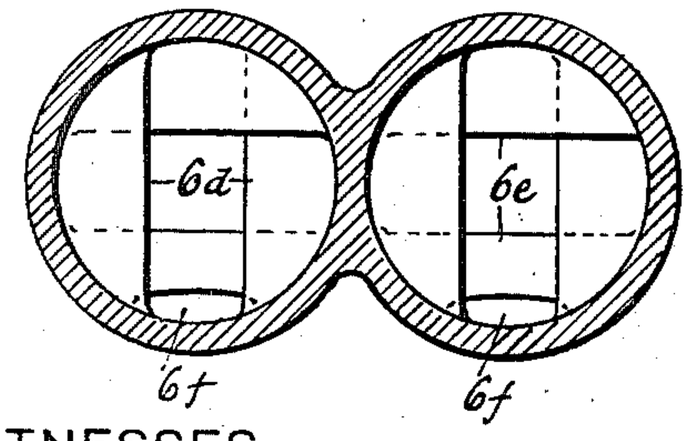


FIG. 5.

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No. 736,713. Patented August 18, 1903.

UNITED STATES PATENT OFFICE.

HENRY L. FULENWIDER, OF WILMINGTON, DELAWARE.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 736,713, dated August 18, 1903.

Application filed June 13, 1902. Serial No. 111,510. (No model.)

To all whom it may concern:

Be it known that I, HENRY L. FULENWIDER, a resident of Wilmington, in the county of Newcastle and State of Delaware, have invented certain Improvements in Steam-Boilers, of which the following is a specification.

This invention is more particularly an improved steam-boiler in which a system of tubes is employed for the combined function of superheating the steam and baffling the furnace-gases.

The nature and characteristic features of the improvements will more fully appear by reference to the following description, taken in connection with the accompanying drawings, of which—

Figure 1 is a sectional elevation of a familiar type of tubular boiler having my improvements applied thereto. Fig. 2 is a sectional elevation of a second type of tubular boiler having my improvements applied thereto. Fig. 3 is a sectional elevation taken on the line 3 3 of Fig. 1 with the tubes 20 omitted. Fig. 4 is a longitudinal sectional view in illustration of a preferred form of superheater-tube construction, and Fig. 5 is a transverse sectional view of the tubes shown in Fig. 4.

As shown in Figs. 1 and 3 of the drawings, the steam-collecting drum 1 has its steam take-off 2 connected with the steam-pipe 3, leading to the manifold 4, with which the inlets 5 of the steam-circulating tubes 6 are connected, the outlets 7 of these tubes being connected with the manifold 8. The steam-circulating tubes 6 extend transversely across the bank of water-circulating tubes 9, connecting the water-drum 10 with the drum 1, the tubes 6 being supported, preferably, by the furnace-walls 11. The manifold 8 is joined by the connection 12 with a manifold 13, to which the inlets of the steam-circulating tubes 14 are joined, the outlets of the tubes 14 being joined to the manifold 15, which leads to the steam-main. In like manner to the tubes 6 the tubes 14, preferably resting on the furnace-walls, extend transversely across the bank of tubes 16, which connect the drum 10 with the steam and water drum 17, the latter being connected with the drum 1 in a usual manner, as by the tubes 18 and 19.

The drum 10 has the farther bank of water-circulating tubes 20 connected therewith and extending to a steam and water drum 21, connected by the tubes 22 with the drum 1.

The steam-circulating tubes 6, either alone or in conjunction with sections of tiling 23, form a baffle above the bank of tubes 9 for the pass 24, which has an outlet to the pass 25, and thence to the stack between this baffle and the drum 10, and in like manner the steam-circulating tubes 14, either alone or in conjunction with sections of tiling 26, form a baffle above the bank of tubes 16 for the pass 27, which has an outlet to the pass 24 between this baffle and the drum 17. Any water that collects in the superheating system is drawn off by the pipes 28 and 29, leading from the bottoms of the manifolds, the superheater-tubes being inclined to drain the water of condensation into the manifolds.

It will now be seen that the steam collected in the drum 1 from the water-circulating system is passed when the steam-main valve 30 is closed and the superheater-valve 31 is open through a steam-circulating system of which the tubes, as 6 and 14, have the combined functions of superheating the steam and baffling the products of combustion, by which economy of construction and high efficiency in operation are obtained.

It will be understood that this superheater system may be applied to other usual types of boilers, as that shown in Fig. 2, in which the steam-collecting drum 1′ has its steam take-off 2′ connected with the steam-pipe 3′, leading to the manifold 4′, with which the inlets of the steam-circulating tubes 6′ are connected, the outlets of these tubes being connected to the manifolds 8′. The tubes 6′ extend transversely across the furnace-chamber above the bank of tubes 9′, connecting the headers 10′ and 11′ for the drum 1′. The manifold 8′ has a connection 12′ with a manifold 13′, with which the inlets of the steam-circulating tubes 14′ are connected, the outlets of these tubes being connected with the manifold 15′, leading to the steam-main, the tubes extending transversely across the furnace-chamber above the bank of tubes 9″, connecting the headers 10′ and 11′. These superheater-tubes 6′ and 14′ form baffles dividing the furnace-chamber into the communicating passes 24′, 25′, and 27′. The water

of condensation is drawn off from the steam-circulating system by the pipes 28′ and 29′.

As shown in Figs. 4 and 5, the superheating-tubes may be cast in pairs, having the inlet-bore 6^a separated from the communicating outlet-bore 6^b by the wall 6^c and provided with the interior baffles 6^d and 6^e for breaking up the currents of steam and effecting a more thorough superheating thereof. A channel 6^f, unobstructed by the baffles 6^d and 6^e, is provided at the bottom of the tubes' bores for draining off the water of condensation.

Having described my invention, I claim—

1. In a steam-boiler, a water-circulating system comprising one or more banks of tubes, in combination with a steam-circulating system comprising one or more baffles of tubes, and one or more passes formed by said baffle or baffles of tubes and containing said bank or banks of tubes, substantially as specified.

2. In a steam-boiler, a water-circulating system comprising a bank of tubes, a steam-collecting drum connected therewith, a steam-superheating system comprising a baffle of tubes connected with said drum, and a pass or passes formed by said baffle of tubes and containing said bank of tubes, substantially as specified.

3. In a steam-boiler, a steam-collecting drum and a steam-superheating system connected therewith comprising a pair of manifolds and tubes connected therewith extending across the furnace-chamber of said boiler, substantially as specified.

4. In a steam-boiler, a furnace-chamber, water-circulating tubes in said chamber, a steam-collecting drum connected with said tubes, and steam-circulating tubes comprised in a baffle for said furnace-chamber, substantially as specified.

5. In a steam-boiler, a water-circulating system comprising a bank of tubes, and a steam-collecting drum connected therewith, in combination with a steam-circulating system comprising a manifold connected with said steam-collecting drum, a series of tubes having their inlets connected with said manifold and extending transversely across said water-circulating tubes, and a second manifold with which the outlets of said steam-circulating tubes are connected, substantially as specified.

6. In a steam-boiler, a water-circulating system comprising one or more banks of tubes and a steam-collecting drum connected therewith, in combination with a steam-superheating system, comprising one or more steam-conductors, connected with said drum, steam-circulating tubes having their inlets connected with said steam conductor or conductors and extending transversely to said water-circulating tubes, and one or more steam-conductors to which the outlets of said steam-circulating tubes are connected, substantially as specified.

7. In a steam-boiler, a pair of conduits, in combination with a series of water-circulating tubes, and a series of steam-superheating tubes having their inlets connected with one of said conduits and their outlets connected with the other of said conduits, said superheating-tubes being arranged in the form of a baffle and having internal baffles adapted for breaking up currents in fluids flowing therethrough, substantially as specified.

In witness whereof I have hereunto set my hand, in the presence of the subscribing witnesses, this 10th day of June, A. D. 1902.

HENRY L. FULENWIDER.

Witnesses:

FRANCIS S. GINTHER,

UTLEY CRANE.