

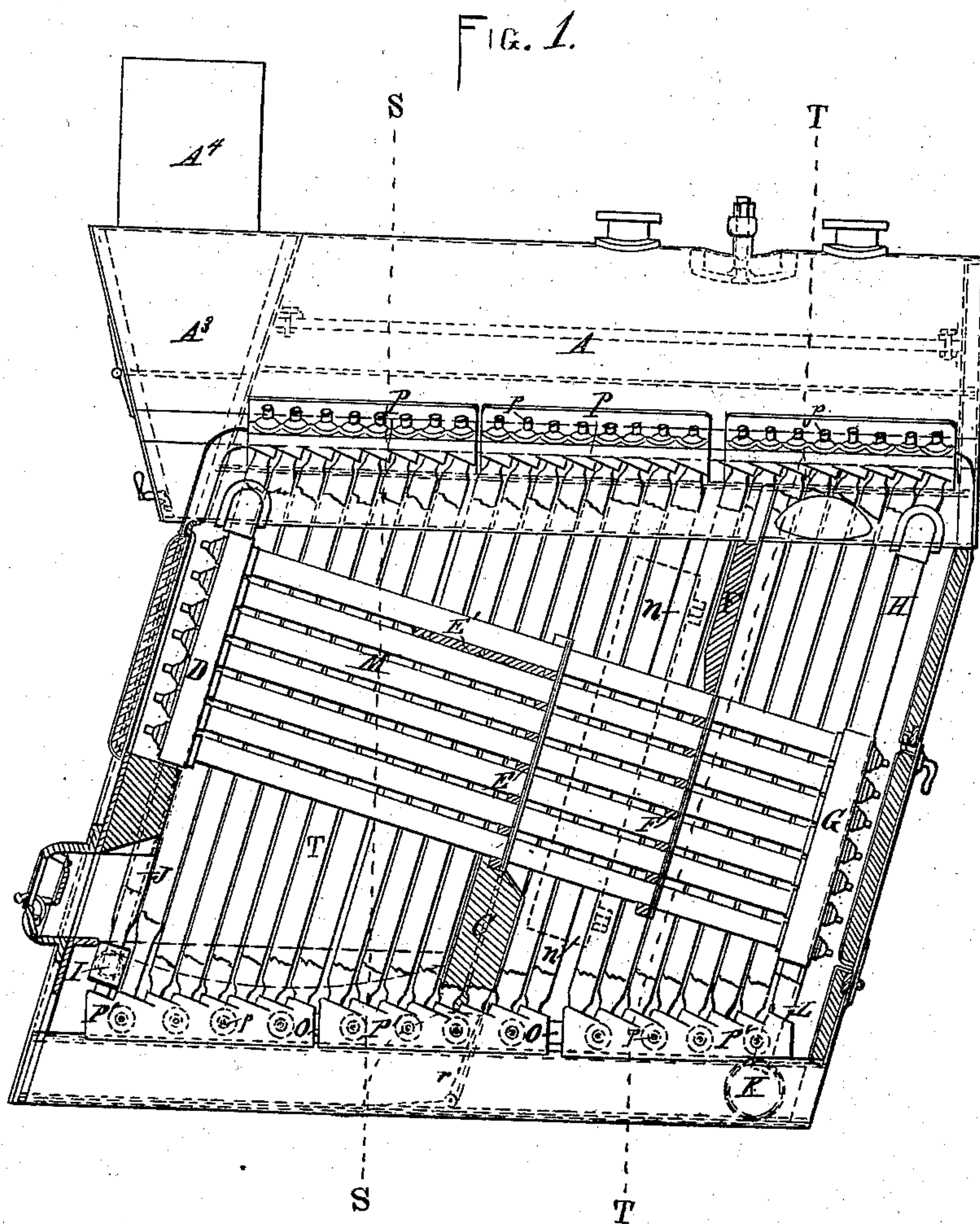
(No Model.)

2 Sheets—Sheet 1.

G. H. BABCOCK, S. WILCOX & N. W. PRATT.
Steam Boiler.

No. 229,352.

Patented June 29, 1880.



WITNESSES=

Charles C. Stetson
W. C. Dey

INVENTOR=

G. H. Babcock
S. Wilcox
N. W. Pratt
by their attorney [Signature]

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FIG. 2.

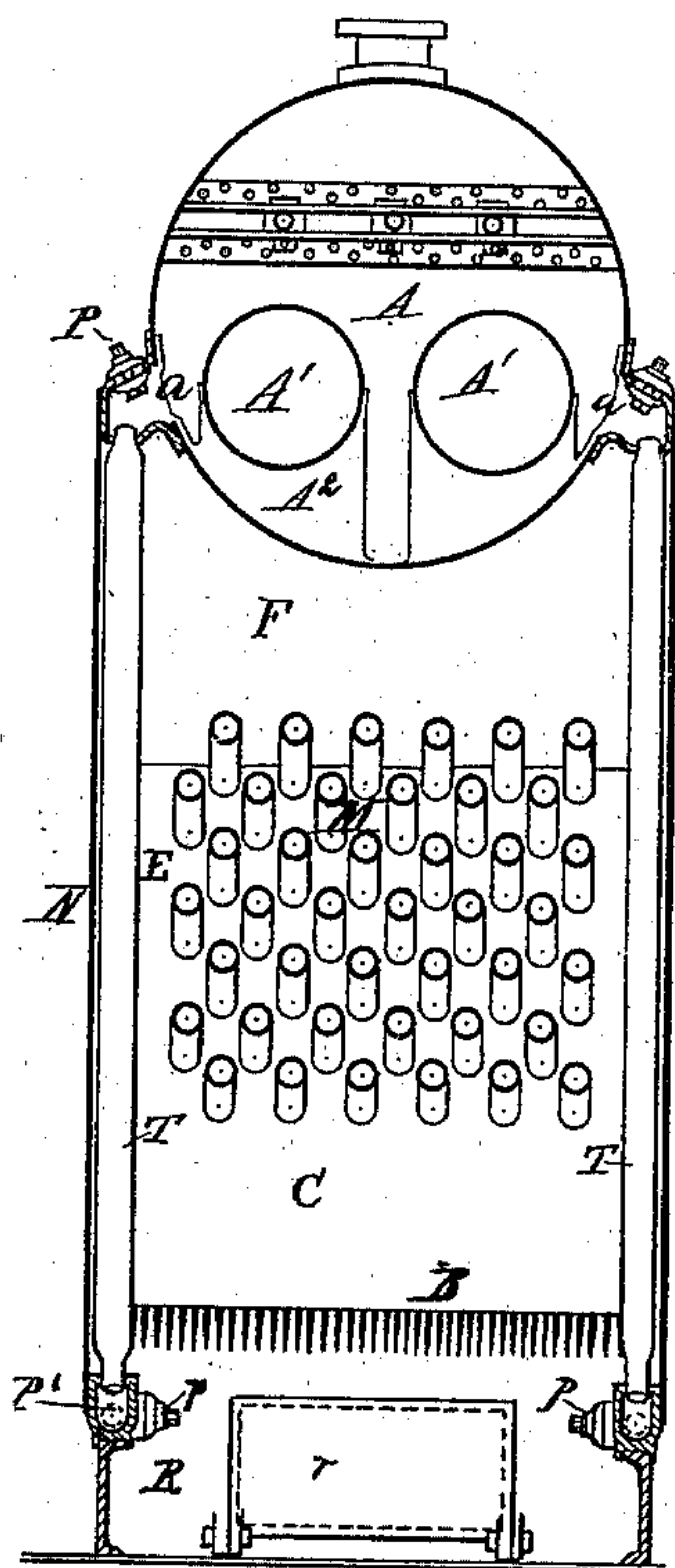
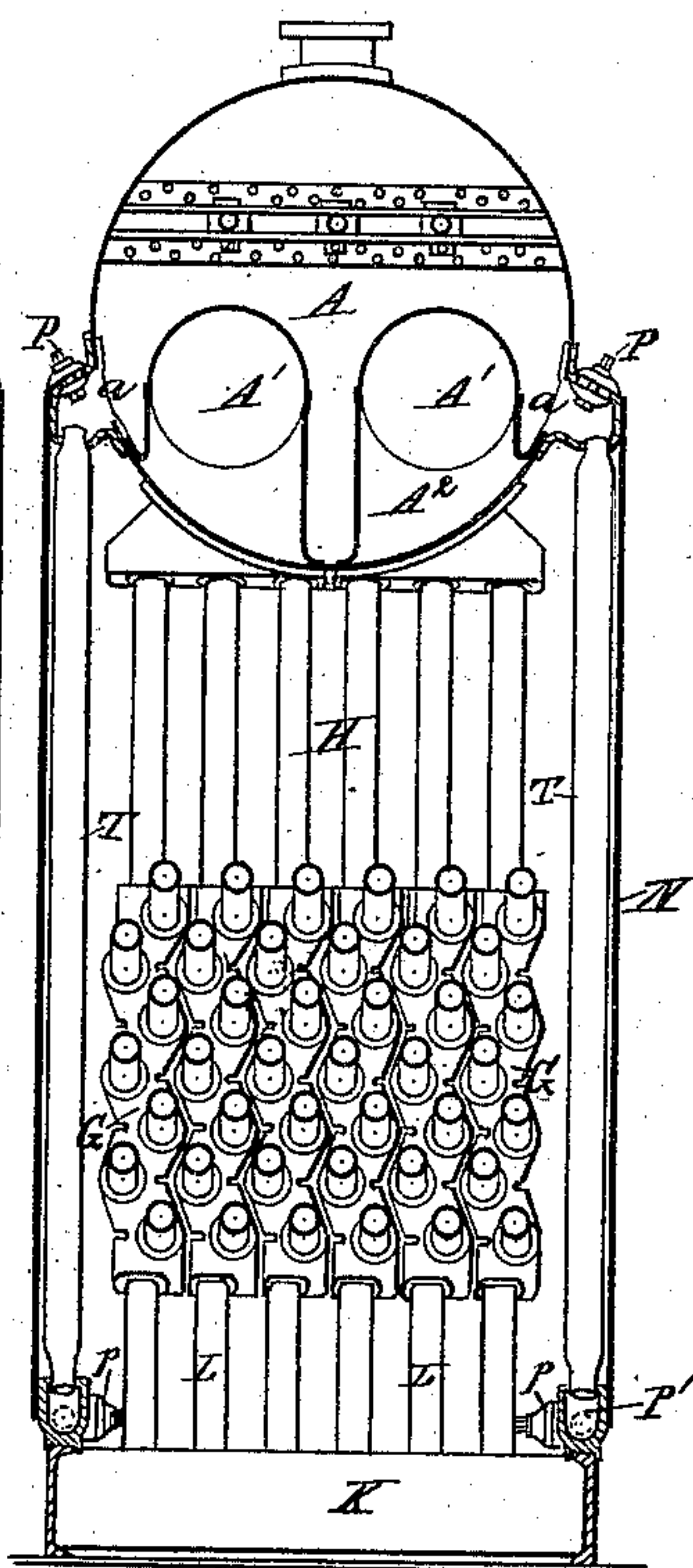


FIG. 3.



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UNITED STATES PATENT OFFICE.

GEORGE H. BABCOCK, OF PLAINFIELD, NEW JERSEY, AND STEPHEN WILCOX AND NATHANIEL W. PRATT, OF BROOKLYN, NEW YORK, ASSIGNORS TO SAID BABCOCK AND WILCOX.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 229,352, dated June 29, 1880.

Application filed March 12, 1880. (No model.)

To all whom it may concern:

Be it known that we, GEORGE H. BABCOCK, of Plainfield, Union county, in the State of New Jersey, STEPHEN WILCOX, of Brooklyn, Kings county, in the State of New York, and NATHANIEL W. PRATT, of Brooklyn aforesaid, have invented certain new and useful Improvements relating to Steam-Boilers, of which the following is a specification.

Our improved boiler is more especially intended for use on shipboard. We propose to term it a "marine sectional tubular boiler." The front and rear of the furnace are of tubes; so, also, are the sides of the furnace and sides of the flue-space or entire space for the gaseous products of combustion under the main barrel. These tubes extend up and down. They are connected in sections, with provisions for circulating the water actively through the whole.

The following is a description of what we consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a side elevation, partly in section. Fig. 2 is a cross-section on line S S in Fig. 1, the horizontal bridge being omitted, and Fig. 3 is a cross-section on line T T in Fig. 1.

Similar letters of reference indicate like parts in all the figures.

Some of the parts correspond to similar parts in our ordinary well-known style of steam-boiler for land purposes.

An important portion of the heating-surface is formed by a series of inclined straight tubes arranged parallel to each other and extending over the fire, being highest at the front end. These ordinary parts in our boiler are indicated by M. They are secured at the front end in sectional chambers or front connections, D, and at the rear end in corresponding sectional chambers or back connections, G, which latter connect with the rear end of the barrel A by a series of straight pipes standing slightly inclined, as indicated at H. The grate is marked B and the fire-bridge C. Two partial partitions, E F, are introduced in the ordinary manner to

compel the hot gases to move several times across the spaces between the pipes M. These principal members may be like the corresponding parts of our ordinary land-boiler, except for certain modifications in the barrel A, as follows: At each side is formed a series of holes, *a*, which are covered by caps connected to the upper ends of the sets of side tubes, and allow a strong current of steam and water to enter the barrel from these sources. P P, &c., are these caps.

T are the tubes extending up and down at the sides, and P' are chambers which connect the tubes T together at the bottom. These tubes are inclined, being farther back or toward the rear of the boiler at their upper ends. The top cap, P, and bottom chamber, P', being level, it is important that the holes for the insertion of the tubes T are correspondingly inclined.

We provide a sufficient number of the tubes T to form a tight wall, touching, or nearly touching, each other, and covering the whole of both sides of the furnace, and also of the combustion-chamber and of the liberal flue-space in rear of it, through which the hot products of combustion move. But we make these in several sections. We have shown them as three sections on each side—that is to say, the larger tubes, which extend up and down on one side of our boiler, are divided into three sets. Each set connects with a corresponding short cap at the top and short chamber at the bottom.

The caps P of the several chambers are bolted or riveted with a steam-tight joint to the exterior of the barrel A, each chamber covering and communicating with one of the orifices *a*. Each cap is open on the face toward the boiler. Being bolted with its opening against a corresponding opening, *a*, there is a free passage for the steam and accompanying water rising from the tubes T and flowing into the barrel A.

Whenever required for repairs, cleaning, or the like, one section, P T P', can be taken out and replaced without necessarily disturbing the whole.

We provide a communication between the bottom chambers, P', of the several sections. This is effected by means of short thimbles O, which are tapped or otherwise strongly fitted in the adjacent ends of two chambers, and form a liberal connection, through which the water may circulate. The three sections forming a side therefor operate as one, and the water displaced by the energetic production of steam in the pipes T at the front, immediately against the furnace, may be supplied by a descending current through the pipes T farther rearward, where the heat is less, so that the little steam there generated will offer but slight obstruction to the descent.

A chamber, I, extends across under the front of the grate. It is connected by pipes J to the bottoms of the front chambers, D. These pipes are, of course, omitted opposite to the door. The chamber I connects at each end to one of the bottom chambers, P'.

K is a mud-drum extending across under the rear. It connects by pipes L to the bottoms of the chambers G, and also at each end to the side chambers, P'. Provision is made for blowing out or taking out the sediment at short intervals by hand-holes.

N is a casing, of cast or sheet iron, or partly of each, which is removable in sections of convenient size to allow access to the interior parts when required.

It is important to provide orifices for the insertion of a hose for blowing out ashes or soot which may accumulate on the pipes M. We attain this by providing sufficient spaces between the sectional chambers D G. The orifices thus provided at the front and rear allow the cleaning of the spaces between the tubes M at both ends, but there is liable to be an accumulation of such light material near the middle of the length which the strong blast from either end cannot well reach.

We provide high and narrow doors *n* in the sides of the casing N, through which a corresponding nozzle or other cleaning agency may be introduced laterally to clean the mid-length of the tubes.

We esteem it important to retain the hot products of combustion within the space under the barrel of the boiler, and not to allow them to pass rearward beyond the rear ends of the tubes M. To this end we arrange the partial partitions E F, as shown, so that there is an uptake or an ascending-flue for the gases, under the rear end of the barrel. The gases, on arrival at the bottom surface of the rear of the barrel, find a passage upward into the horizontal flues A' through short vertical flues A². The flues A' are continued out at both ends of the boiler for convenience of construction and cleaning; but the rear ends are covered by doors, which are always closed when the boiler is working. At the front end of the barrel A the gases are collected in a

smoke-chamber or breeching, A³, from whence they flow freely upward to the stack A⁴.

We provide a continuous bed, of cast or wrought metal, under the whole. This may be made to serve as a pan to contain water when desired, for additional safety against fire, or other purpose.

The partition R, between the base of the smoke-chamber and ash-pit, is formed with a door, *r*, which opens forward by turning on a horizontal axis at the bottom. When this is opened any light ashes accumulating in the back part can be readily removed through the ash-pit.

Our invention does not prevent the use of the ordinary gages and other appliances. We propose to use it with any and all of the ordinary or suitable styles of boiler attachments.

Hand-holes secured by covers *p* are liberally provided both in the top caps, P, and in the bottom chambers, P', to accommodate the expander in setting the tubes and to facilitate repairs.

Our boilers may be used singly or in sets. For a large steam-vessel we would make the parts of moderate size and obtain the required large production of steam by using a number of sets.

There is a tendency of the gaseous products of combustion to move obliquely across the furnace, and, clinging close to the top edge of the fire-bridge or partition E, to pass without sufficiently bathing the extreme front end of the boiler. We provide a horizontal extension, E', from the front of E, near its top, sustained in position by the tubes M. This, which we may term a "horizontal partition" or "horizontal bridge," compels the gases to strike the boiler at the extreme front end and to flow along over this horizontal, or nearly horizontal, bridge, producing their fullest possible effect till they drop to pass under the partition F.

We claim as our invention—

1. In a steam-boiler having a barrel, A, with connected heating-tubes M and their connections D G, the side tubes, T, and connecting-chambers P P', in combination with each other and with the connecting-thimbles O, adapted to allow the water to descend in the rearmost tubes, T, and to ascend in those against the furnace, as herein specified.

2. The horizontal flues A' and connecting-flues A², in combination with the barrel A, main heating-tubes M, connections D and G, partial partitions E F, side tubes, T, and inclosing-case N, as herein specified.

3. In combination with a boiler having a barrel, A, main heating-tubes M, and connections D G, having orifices for cleaning the exteriors of the tubes, the casing N, and side doors, *n*, adapted to facilitate the cleaning of the mid-lengths of the tubes, as herein specified.

4. In combination with the barrel A, extending from front to rear of the boiler, tubes M, front partition, E, and one or more partial partitions, F, in rear thereof, the horizontal
5 bridge E', arranged, as shown, to compel the hot gases to strike the barrel at its front end, as herein specified.

In testimony whereof we have hereunto set our hands, at New York city aforesaid, this 5th

day of March, 1880, in the presence of two to subscribing witnesses.

GEO. H. BABCOCK.
STEPHEN WILCOX.
NAT. W. PRATT.

Witnesses:

LUTHER C. WARNER,
CHARLES C. STETSON.