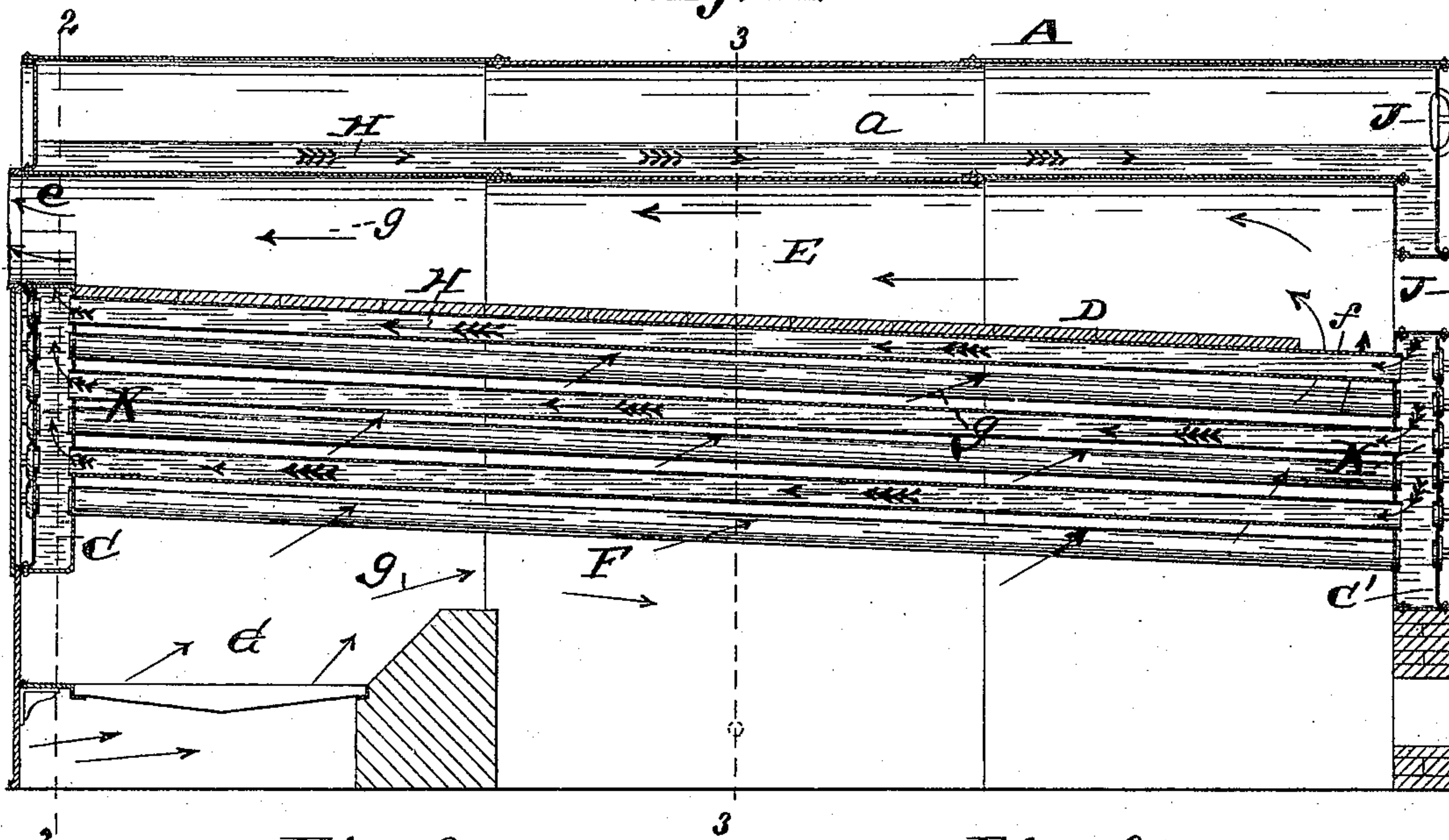


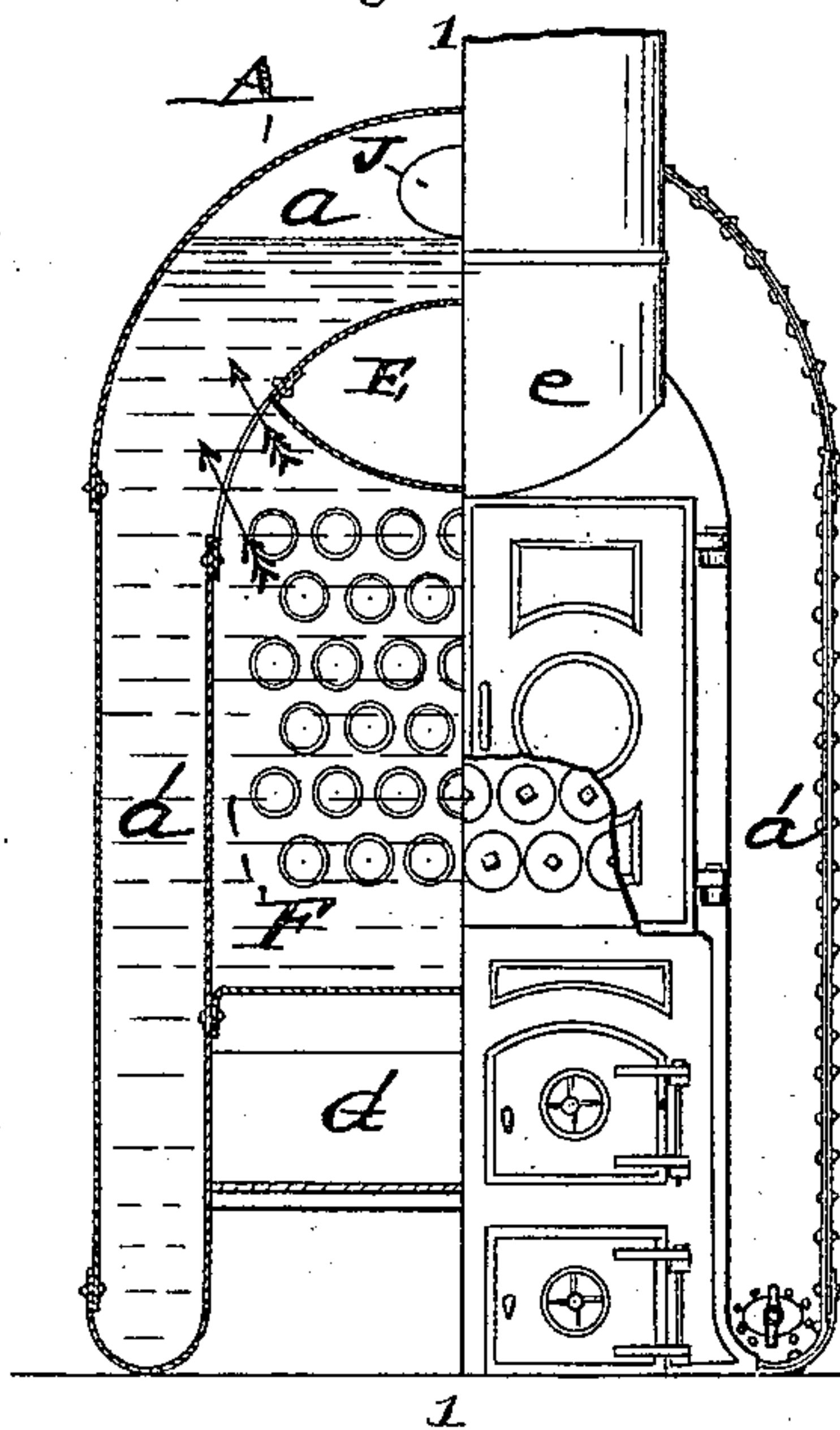
E. C. SMITH.  
STEAM BOILER.

Patented June 8, 1886.

*Fig. 1.*



*Fig. 2.*



*Fig. 3.*

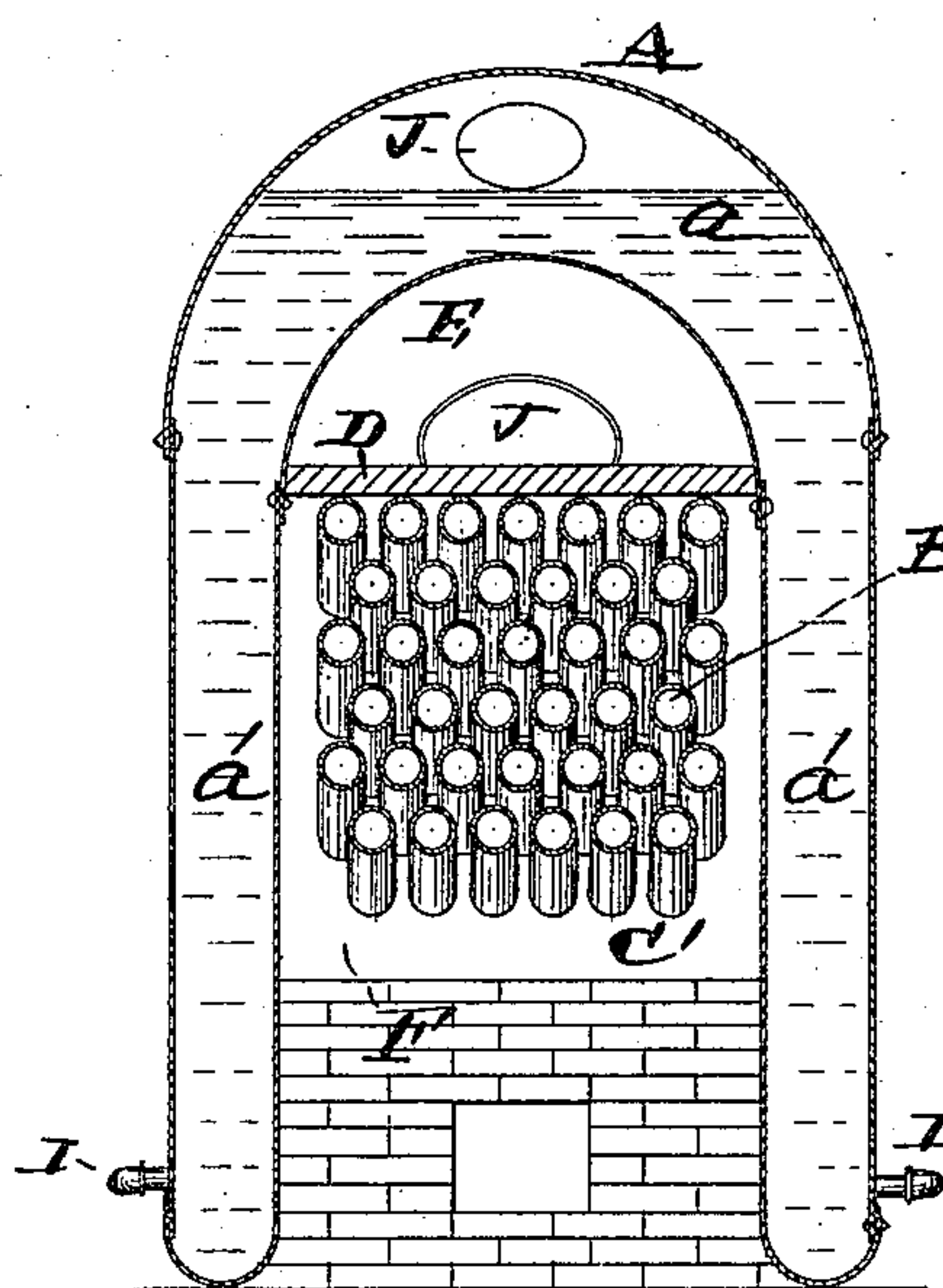
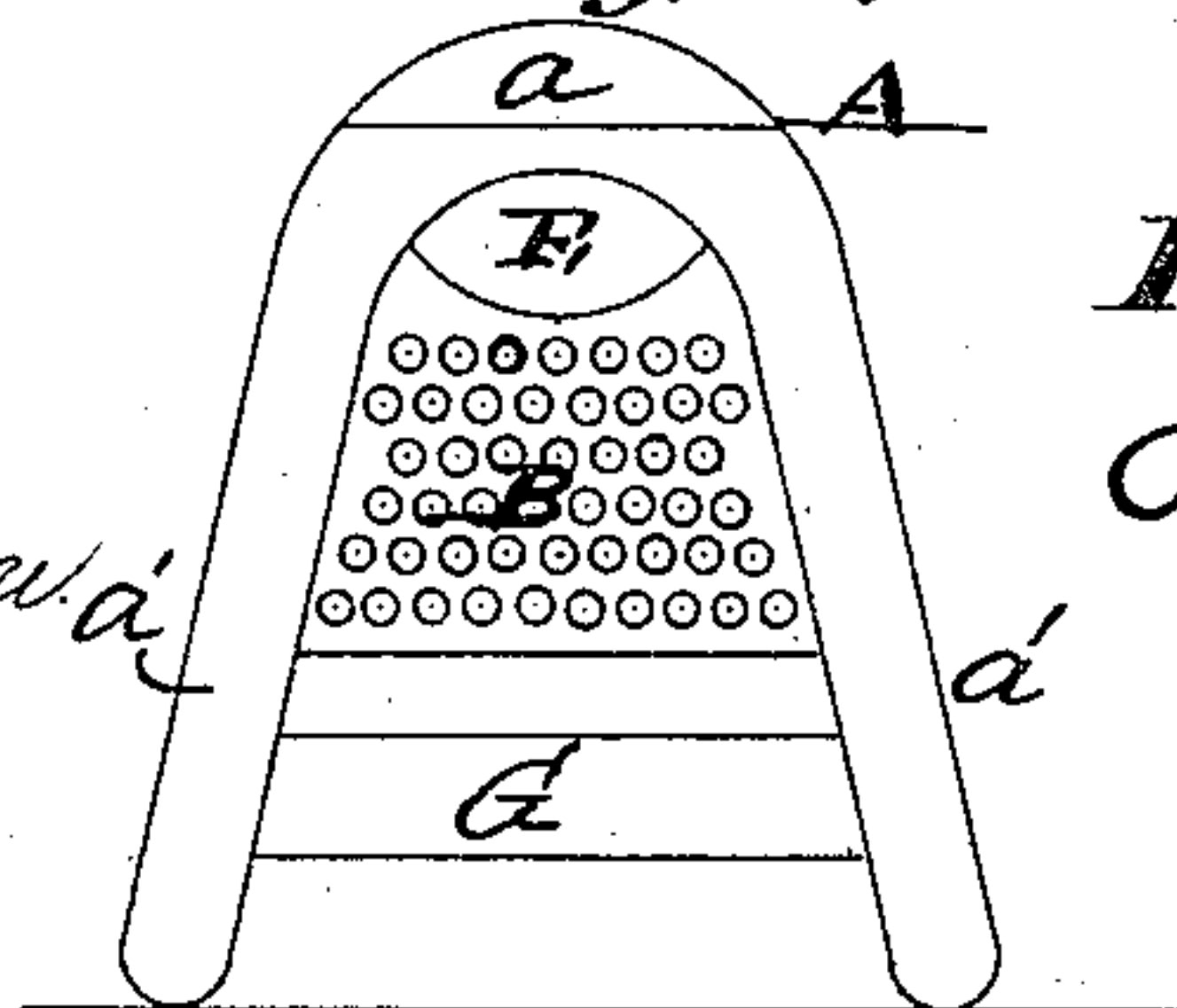


Fig. 4.



*J. W. Hoke.*

N. B. Anderson. a.

Eugene C. Smith  
By C. Burdick  
atty



# UNITED STATES PATENT OFFICE.

EUGENE C. SMITH, OF ST. LOUIS, MISSOURI.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 343,258, dated June 8, 1886.

Application filed March 8, 1886. Serial No. 194,473. (No model.)

*To all whom it may concern:*

Be it known that I, EUGENE C. SMITH, of St. Louis, Missouri, have made a new and useful Improvement in Steam-Boilers, of which the following is a full, clear, and exact description.

The water-space of this improved boiler is composed, mainly, of a shell of a saddle or inverted-U shape, and a system of tubes which extends longitudinally within the space inclosed by the shell, and at its ends connected with a water-space, which in turn connects with the main water-space, of the boiler, and contained within the shell. The legs which form the lower portion of the main water-space extend downward below the level of the tube system, and also below the level of the fire-place, which is thus inclosed within the shell, and whose heat-currents flow upward and rearward around and along the tubes, to the rear end of the system of tubes, thence upward into a flue which is formed above the tube system by means of a partition which extends above the tube system, but sufficiently below the arch of the shell to form the flue. The heat-currents flow forward through the flue, and emerge therefrom into the stack.

The annexed drawings, making part of this specification, illustrate the improved boiler.

Figure 1 is a vertical longitudinal section on the line 1 1 of Fig. 2. Fig. 2 is a view half in front end elevation and half in vertical cross-section on the line 2 2 of Fig. 1. Fig. 3 is a vertical cross-section on the line 3 3 of Fig. 1, and Fig. 4 is a diagram illustrating a modification in the shape of the sides or legs of the boiler.

The same letters of reference denote the same parts.

A represents what is termed the "shell." It extends throughout the length of the boiler, and it may be considered as having three parts, the arched top *a* and the legs *a' a'*.

The tubes are shown at B. They preferably incline slightly upward toward the front of the boiler, and at both ends the tubes connect with the water spaces or compartments C C', which are adapted to occupy, respectively, at the forward and the rear ends of the boiler the space beneath the top *a* of the shell A. There is communication between the compart-

ments C C' and the water-space contained within the shell A, but it is restricted to an opening or openings, such as at *c*, Fig. 2, at the upper end of the compartments.

D represents the partition which forms the bottom of the flue E, as well as the top of the flue-space F, in which the tubes B are contained. The heat-currents from the fire-place G, as indicated by the unfeathered arrows *g*, Fig. 1, flow upward and backward through the flue-space F, and around the tubes, and at the rear end of the flue-space at *f* pass into the rear end of the flue E, through which they pass to the exit *e* at the forward end of the boiler. The water-circulation is indicated by the feathered arrows H. The hottest water is in the upper part of the boiler, and the least heated water is in the legs *a' a'*. The cooler water in the legs, therefore, by reason of the water-passages to and from the compartments C C', being confined to the upper part thereof, does not unite actively with the water-circulation from the forward end of the tubes and the compartment C into the top of the shell, and thence into the compartment C' and the rear end of the tubes, and through the tubes to the compartment C, and so on, round and round, but remains more quietly in the legs, becoming heated therein by reason of the legs forming inclosing-walls for the fire-place and flue-space F, and therefore receiving heat from them, and contributing to the efficiency of the boiler. The heat from the fire-place and flue-space is thus applied advantageously to the heating of the water, as no heat can radiate from the fire-place and flue-space without encountering a water-space and yielding heat thereto. The lower portion of the legs also serves as a settling-chamber, wherein the sediment from the water can be precipitated and at a level below the influence of the fire. The water is supplied to the boiler preferably at the lower end of the legs, as at I, and at both sides of the boiler. As the water rises in the legs, it becomes gradually heated, and before reaching the top *a* its temperature has risen to that degree (290° Fahrenheit, about) at which the scale-forming element separates from the water and drops to the bottom of the legs. There are suitable man-holes, such as at J, and hand-holes K, for

reaching the various parts of the boiler. Fig. 4 illustrates how the boiler-shell can be widened, and thereby a wider grate obtained.

I claim—

- 5 1. The combination, in a steam-boiler, of the saddle-shaped shell having the top and legs, as described, the tubes, and the water-compartments at the ends of the tubes, said compartments having communication with the top only of the shell, substantially as described.
2. The combination of the shell A, having the top *a* and legs *a' a'*, the tubes B, the com-

partments C C', the flue E, the fire-place G, and the flue-space F, said compartments having communication with the top only of the shell, 15 and the compartments and top being connected as described, substantially as set forth.

Witness my hand this 3d day of March, 1886.

EUGENE C. SMITH.

Witnesses:

C. D. MOODY,  
J. W. HOKE.