3 Sheets—Sheet 1.

J. FIRMENICH & F. P. STIKER.

SECTIONAL BOILER.

No. 169,977. Patented Nov. 16, 1875.

Fig. 1.

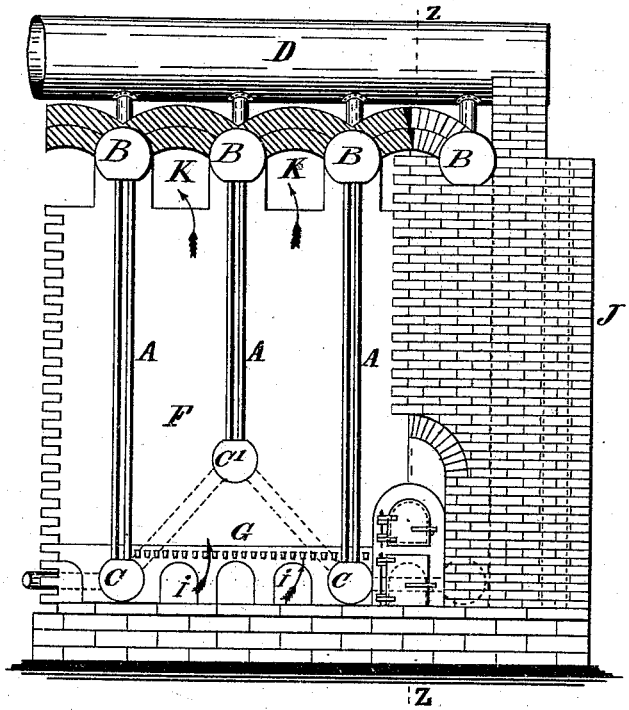
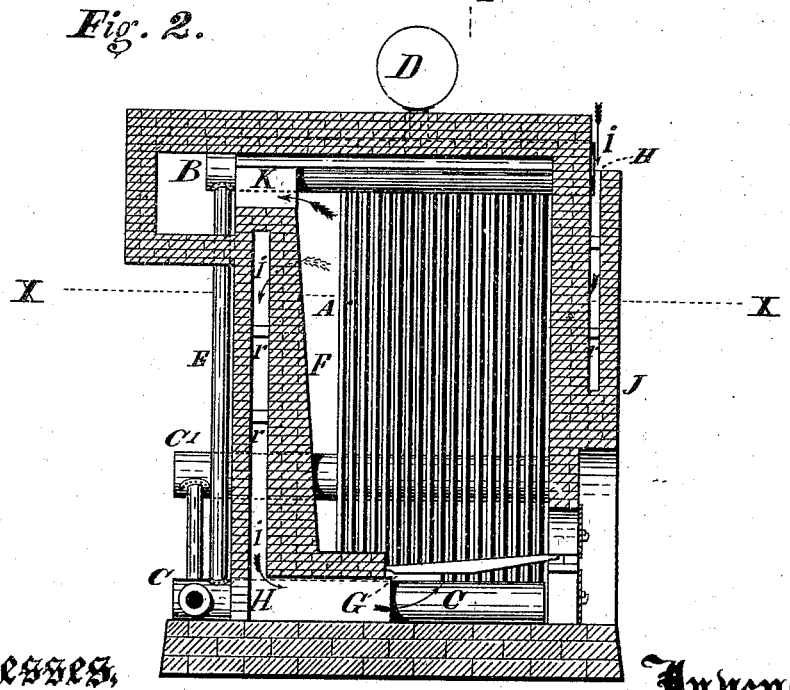


Fig. 2.



Witnesses.

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3 Sheets—Sheet 2.

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SECTIONAL BOILER.

No. 169,977. Patented Nov. 16, 1875.

Fig. 3.

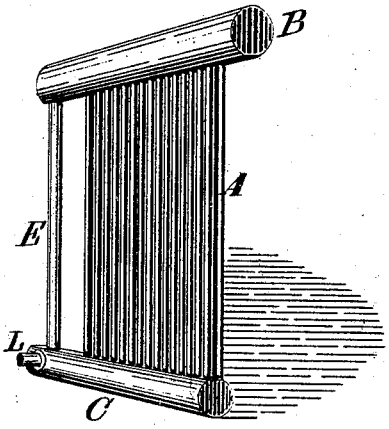
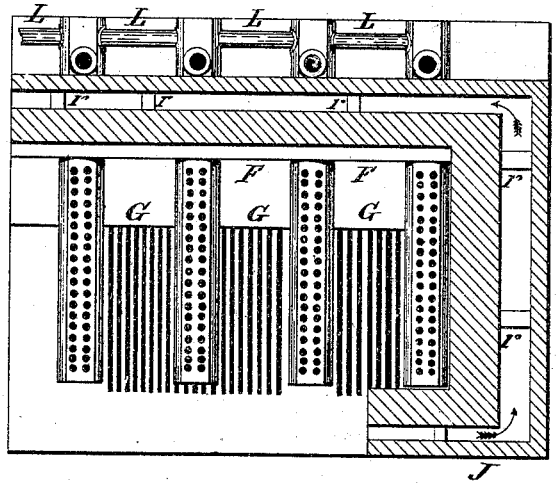


Fig. 4.



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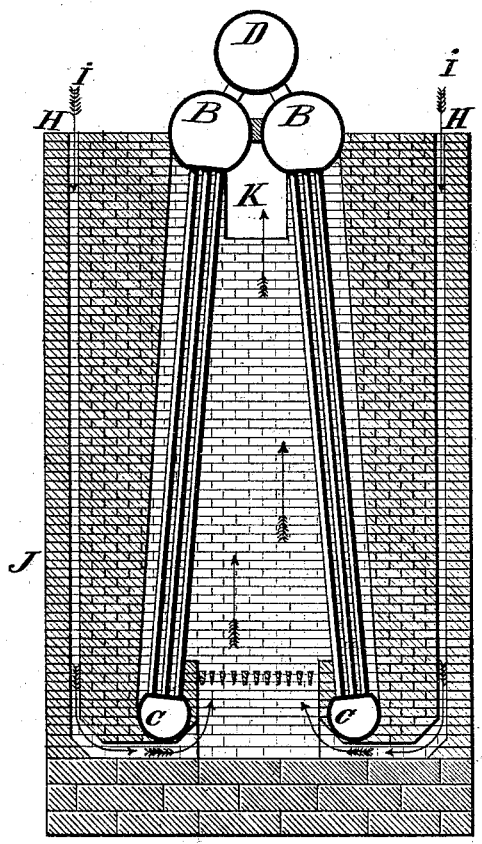
SECTIONAL BOILER.

No. 169,977. Patented Nov. 16, 1875.

Fig. 5.



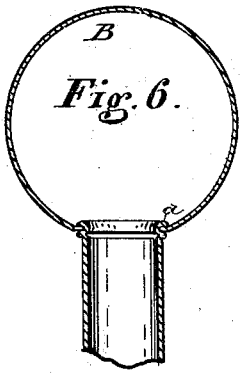


Fig. 6.

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UNITED STATES PATENT OFFICE.

JOSEPH FIRMENICH AND FLAVIUS P. STIKER, OF BUFFALO, NEW YORK, ASSIGNORS TO JOSEPH FIRMENICH, GEORGE FIRMENICH, AND FRANK FIRMENICH, OF SAME PLACE.

IMPROVEMENT IN SECTIONAL BOILERS.

Specification forming part of Letters Patent No. **169,977**, dated November 16, 1875; application filed January 8, 1875.

To all whom it may concern:

Be it known that we, JOSEPH FIRMENICH and FLAVIUS P. STIKER, of the city of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification:

In the present practice of constructing steam-boilers with the heating-surfaces in close proximity to the fuel, the gases issuing therefrom are chilled by coming in contact with the boiler plate or surface, which is preserved at a low temperature by the water on the opposite side, and being both good conductors of heat, the refrigerating action is at once rapid and powerful; consequently the temperature is reduced below the point required for inflammation, so that an incomplete combustion takes place, and the gases pass off partly unburnt, thereby causing a proportionate loss of fuel.

The usual custom of admitting cold air directly to the fuel is also a serious objection, as it absorbs a certain amount of heat at the cost of a proportionate amount of fuel, which might be otherwise saved, and the insufficient air-space within the boiler-furnace, provided by the present methods of construction, does not afford the necessary room for the proper intermingling and detention of the gases, so that an imperfect combustion results from this cause, and a consequent loss of fuel.

Our invention relates to that class of sectional steam-boilers in which the heating-tubes are arranged in an upright, either a vertical, or approximately a vertical, position.

Our improvements, made with a view of increasing the production of steam with a given amount of fuel, of effecting a rapid circulation, and the deposition of sediment at points below the grates, and of making a reliable joint between the heating-tubes and the drums above and below, consists, first, in constructing such a boiler of several rows of heating-tubes, connected above to a corresponding number of steam and water drums, and below to a like number of mud-drums, the grates being placed between the rows of heating-tubes and above the mud-drums; second, in combining with a steam-boiler, constructed in the main as above set forth, circulating-tubes, connecting the steam and water drums and the mud-drums outside of the combustion-chamber of the furnace.

In the accompanying drawings, Figure 1 represents a front elevation, showing part of the wall broken away, so as to expose the boiler-sections, &c. Fig. 2 is a side elevation in section through line Z Z in Fig. 1. Fig. 3 shows a perspective view of one of the sections without the steam-drum. Fig. 4 is a horizontal section through line X X, Fig. 2. Fig. 5 is a vertical longitudinal section representing a modification of our said invention. Fig. 6 represents an enlarged section through a steam or mud drum, showing the flattened side and the method of riveting the tubes thereto.

A in said drawings represents the vertical water-tubes; B, the upper water-drum; C, the lower or mud drum; D, the steam-drum. E is a vertical water-tube, of which there may be one or more arranged at the back end of each section and behind the bridge-wall, so as to allow a free circulation of the water, a downward current being caused within said tubes, in consequence of being arranged outside of the bridge-wall, and entirely out of the furnace. This part of the boiler is made of the usual material — boiler-plate. The steam-drums are flattened on one side for greater convenience in fitting the tubes to them, which are riveted, as shown in the section, Fig. 6.

A bead, *a*, is formed by a suitable expanding-tool, near each end of the heating or circulating tubes, which are made of ductile metal, as usual, which beads will abut against the exterior surfaces of the drums united by the tubes. The extreme ends of the latter are expanded in the ordinary manner against the interior side of the drums, drawing the exterior beads up into intimate contact therewith, as clearly shown.

In Figs. 1 and 2, at C^1, we have shown one of the mud-drums arranged above the grate. This is done only when we are cramped for room for grate-surface. F represents the interior of the furnace; G, the grate-bars; H, the flues or air-spaces for the admission of air to the

fuel, in the direction shown by the arrows I. J is the brick-work surrounding the boiler, in which the air-passages H are arranged.

It will be readily seen that considerable heat would pass through the brick-work and be lost were it not for this arrangement. The cold air, being admitted at the top, as shown, absorbs the heat on its way down, and carries it back again to the fuel.

K represents the outlet from the furnace into the smoke-stack or chimney. Outside of this a damper is arranged, so as to regulate exactly the amount of draft required to make the combustion as perfect as possible. L represents the tubes for connecting the sections together, as shown in Fig. 4. The passages in the brick wall are strengthened by binders, as shown by the letters *r*.

We do not confine ourselves to the arrangement of the tubes A, vertically, as they may be inclined at an angle all one way, or they may be arranged as shown in Fig. 5, in which two sections are arranged at an angle, bringing the tops nearer than the bottom.

We claim—

1. In a sectional steam-boiler, a series of steam and water drums, a corresponding series of mud-drums, and rows of upright tubes connecting them, in combination with grate or fuel surfaces, arranged between the tubes above the mud-drums, substantially as specified.

2. In a sectional steam-boiler, such as hereinbefore described, where the mud-drums are below the fire-line, circulating-tubes connecting the steam and water drums with the mud-drums outside of the combustion-chamber, substantially as specified.

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