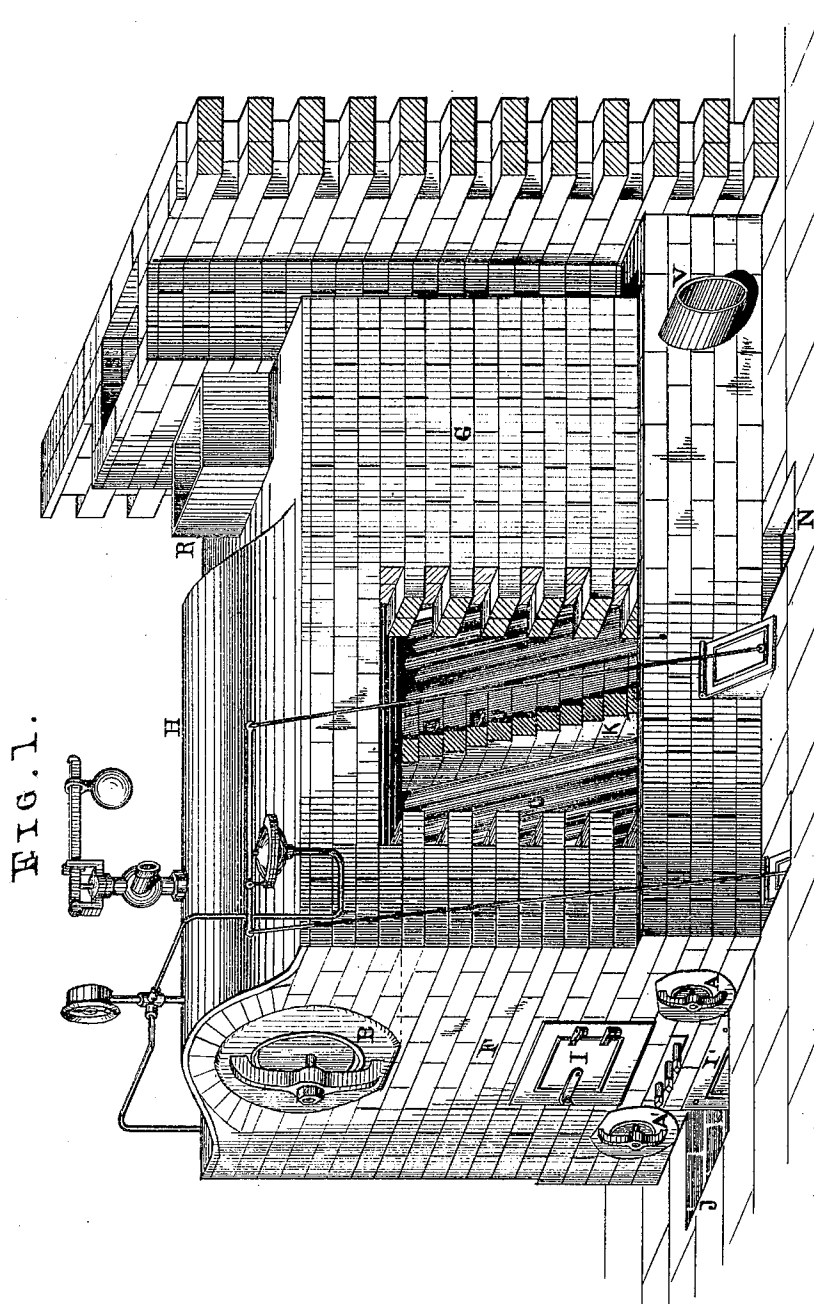


J. & G. FIRMENICH.
COMBINED SECTIONAL STEAM GENERATOR AND HOT AIR
FURNACE.

No. 178,425.

Patented June 6, 1876.



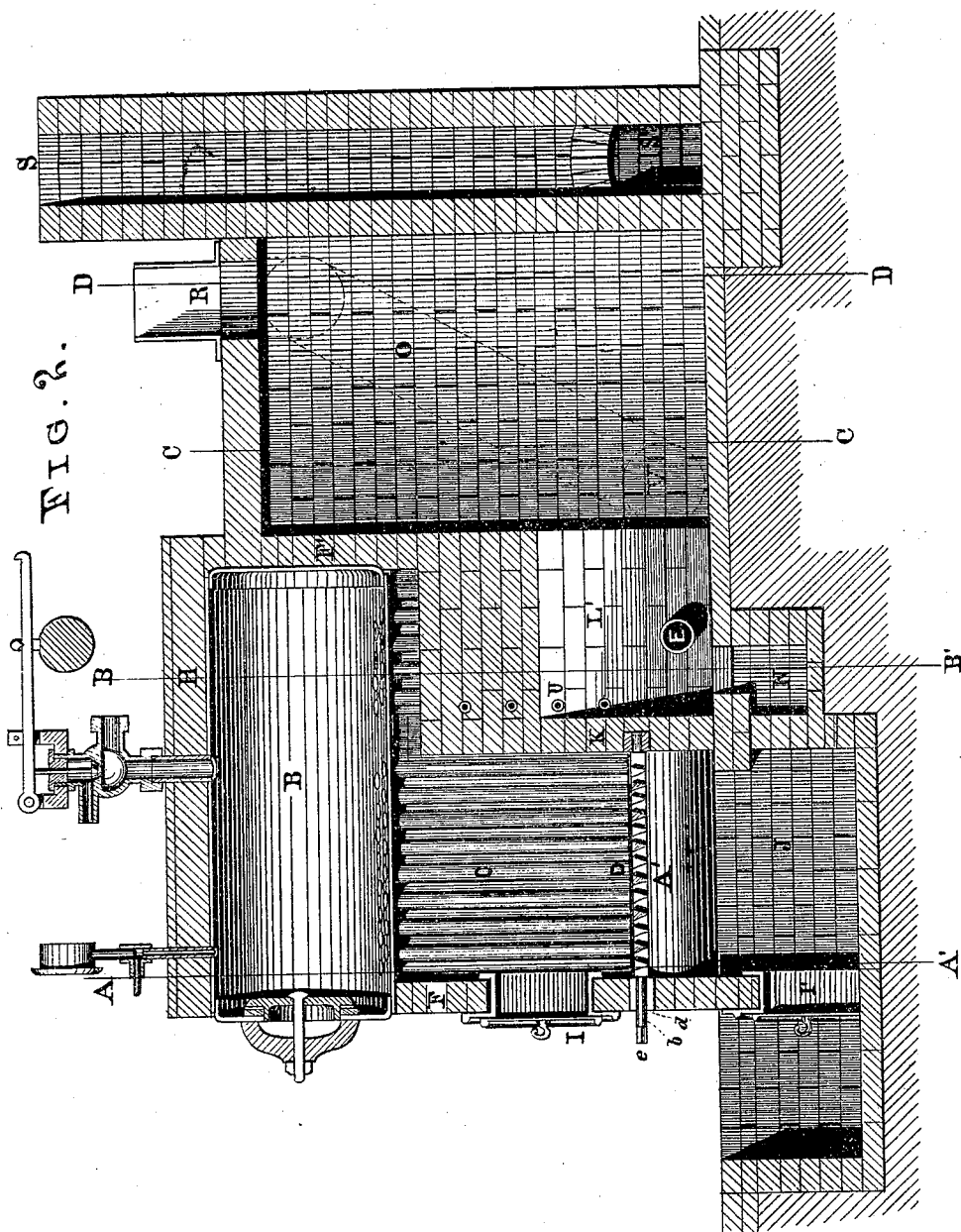
WITNESSES:
Frank Heisch
John B. Edmonde

INVENTOR:
J. & G. Firmenich
by Michael J. Stark
their atty.

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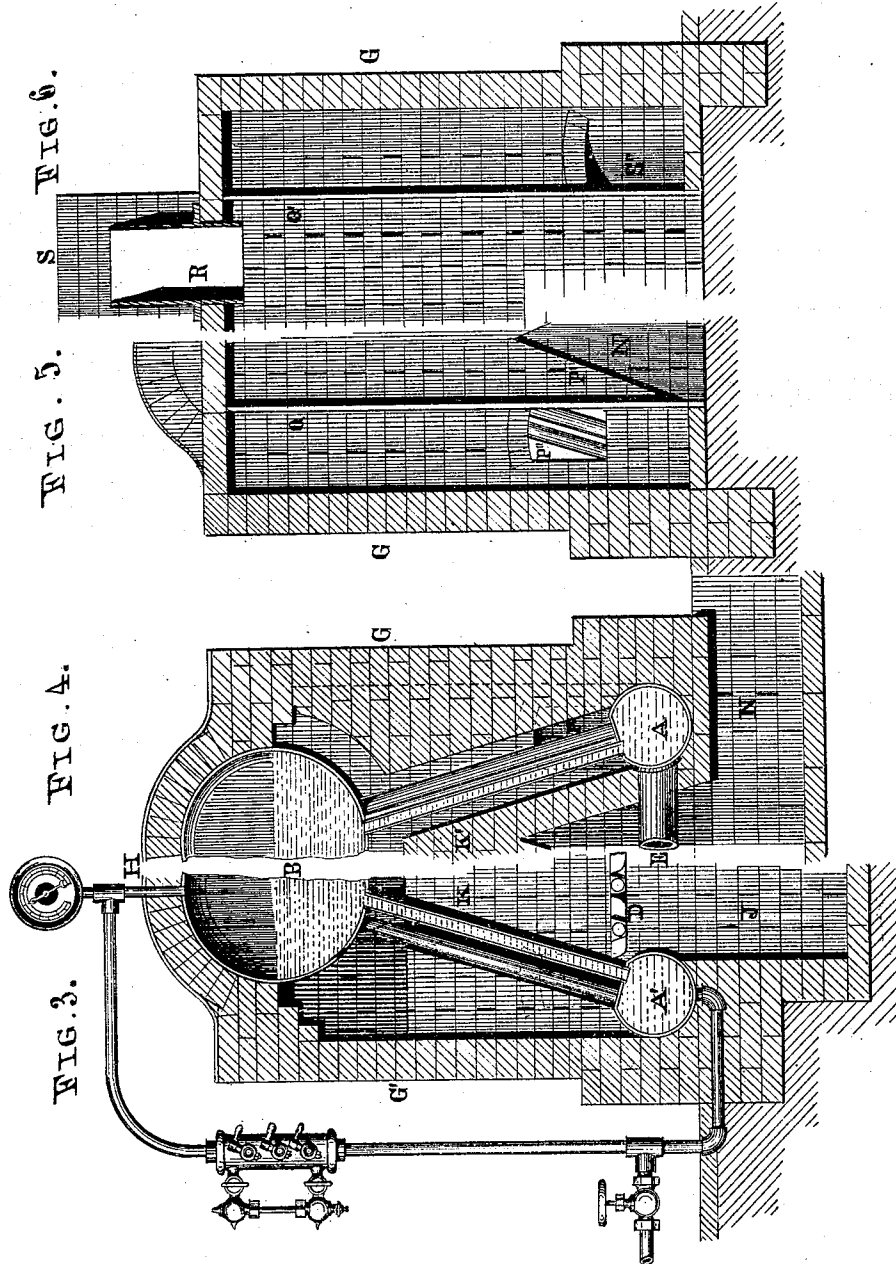
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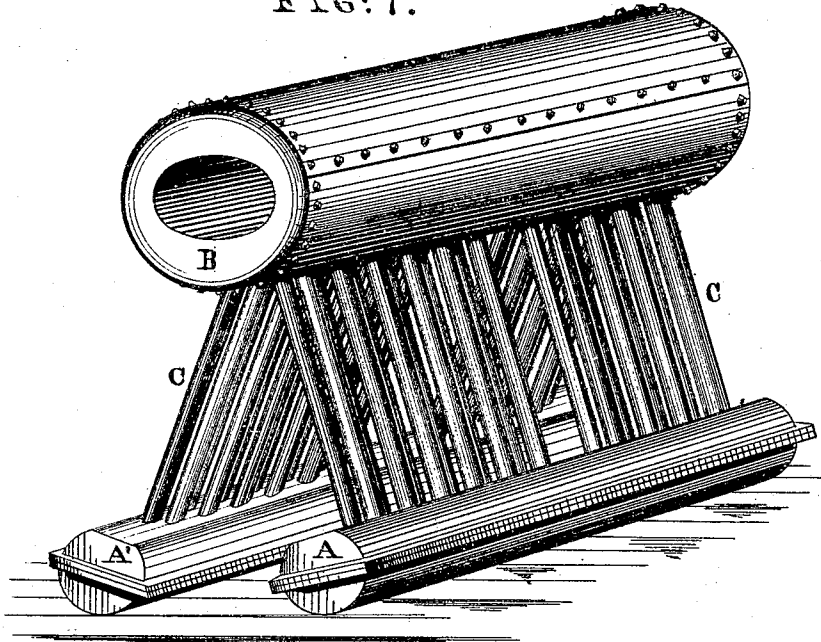
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FIG: 7.



WITNESSES:

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INVENTORS:

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UNITED STATES PATENT OFFICE.

JOSEPH FIRMENICH AND GEORGE FIRMENICH, OF BUFFALO, NEW YORK,
ASSIGNORS OF ONE-THIRD THEIR RIGHT TO FRANK FIRMENICH, OF
SAME PLACE.

IMPROVEMENT IN COMBINED SECTIONAL STEAM-GENERATORS AND HOT-AIR FURNACES.

Specification forming part of Letters Patent No. 178,425, dated June 6, 1876; application filed
February 1, 1876.

To all whom it may concern :

Be it known that we, JOSEPH FIRMENICH and GEORGE FIRMENICH, of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements on Combined Sectional Steam-Generators and Hot-Air Furnaces; and we do hereby declare that the following description, taken in connection with the accompanying sheets of drawings, forms a full and exact specification.

Our present invention relates to improvements on our recently-patented steam-generator; and it consists in the arrangement, with two mud-drums, of an upper steam and water drum, the latter being connected with each of the former by a series of heating-tubes arranged obliquely, the whole being incased by a brick setting of a peculiar construction, as hereinafter set forth, in such manner that an air-chamber is provided within such setting, wherein air is heated by the radiation of the walls, whereby a part of the waste heat is made available for heating and other purposes.

In order to enable others skilled in the art to which our invention appertains to make and use the same, we shall proceed to describe its particulars, and thereby refer to the annexed sheets of drawings heretofore mentioned, in which—

Figure 1 is a perspective elevation of our steam-heater complete. Fig. 2 is a longitudinal sectional elevation. Figs. 3, 4, 5, and 6 are transverse sectional elevations in the lines A A, B B, C C, and D D, respectively—Figs. 3, 4, and 6 as seen from the front, and Fig. 5 as looking toward that direction. Fig. 7 is a perspective view of the generator proper.

Like parts are designated by corresponding letters in all the drawings.

A A' are two mud-drums, made of either wrought or cast iron, each in one piece or two longitudinal halves, properly jointed. B is a water and steam drum, situated above the mud-drums, and connected therewith by a series of heating-tubes, C, screwed, riveted, or expanded in these drums. The mud-drums are placed a sufficient distance apart to pro-

vide for a grate-surface between, and the tubes C are arranged in an oblique position to meet the steam and water drum B. D is the grate, situated between the mud-drums A A'. E is a tube connecting the mud-drums near their rear end. These parts, taken collectively, form the steam-generator proper, and that is set in masonry, consisting of the front wall F, side walls G G', middle wall F', and arched top H. The front wall F is penetrated by the drums A, A', and B, and it has also openings provided with the doors I and I'—one for the fire-box, and the other for the ash-pit. Within the space bounded by these walls, as described, is placed a transverse wall, K, serving as a fire-bridge, and longitudinal side walls K' K'', all extending to within a convenient distance of the water and steam drum B. The walls K' K'' reach from the transverse wall K to the middle wall F', and inclose an air-chamber, L', which is in communication with the exterior of the steam-generator through the duct N, as shown in Figs. 1, 2, and 4, and with the rear chamber O, through the opening P' in the middle wall F', as shown in Fig. 5. Q Q' are two partitions in the rear chamber O, dividing this space into three compartments, the middle one being a continuation of the air-chamber L', and those on both sides channels for the passage of the products of combustion. R is a conductor-pipe leading from the enlarged air-chamber L' to such place or places where heated air may be required. S is the chimney, having connection with the two side channels in the rear chamber O through the ducts S' S'', as shown in Figs. 2 and 6. The gases of combustion pass from the fire-box over the fire-bridge wall K, with the side passages between the walls G G' and K K', and through the openings P'' P''' into the side passages in the rear chamber, and thence into the chimney. In their passage they strike the tubes C, and the lower half of the steam and water drum B, and also the various walls of the masonry, and are sufficiently reduced in temperature without materially affecting the draft.

The walls K' K'' and partitions Q Q' may

be either iron or brick, the former being preferable as being the better conductor of heat, and the space between them constitutes the air-chamber L', within which cold air, coming through the duct N, is heated, and escapes through the conductor R to such place or places where heated air may be required—as, for instance, to heat a part of a series of rooms—while the steam from the boiler may be led through suitable pipes to radiators placed in the various other rooms, &c., that cannot be supplied with such hot air; or, if desired, one or more radiators may be boxed up and placed below the floor, and the hot air from the duct R led into this box, to allow the comingling of the hot air with the indirect heat from the radiator.

It will thus be seen that we avail ourselves of a considerable quantity of an otherwise waste product—the heat radiated by the walls of the generator—wherefrom a material saving of fuel will result.

Instead of arranging the hot-air chamber L' as described, conductor-pipes V, as shown in Figs. 1 and 2 in dotted lines, may be led through the rear chamber O, and the partitions Q Q' dispensed with. In this case the gases of combustion would strike these conductors V directly, and thus heat the air passing through them. These conductors may be led through the chimney S into rooms above, and provided with suitable registers, to still further utilize the heat of the furnace. This arrangement of the conductor-pipes V is applicable to almost any kind of furnace or steam-heater or stoves.

In order to give the hot air sufficient moisture we may make a proper steam-connection between the generator and the conductor R, or other known arrangements may be resorted to to obtain the desired result.

To obtain a perfect combustion in the furnace, ducts U are arranged in the walls G G', just behind the fire-bridge wall K, whereby the hot gases of combustion, passing the channels between the walls G G' and K' K'', are furnished with a fresh supply of air, and thereby cause the inflammation of any of the gases that would otherwise escape unburned.

Regulators may be placed on those ducts U to control the supply of air. These ducts may also be made to lead from the air-chamber L', whereby a supply of hot air may be brought in contact with the hot gases of combustion, which would perhaps give better results than the intermingling of cold air therewith.

The steam-generator is provided with all the usual and necessary appurtenances, such as safety and check valves, water and steam indicators, and automatic dampers to regulate the draft, &c., and it may be placed in low cellars, under sidewalks, or other outdoor rooms, on account of its compact form and the comparatively small space it occupies.

Having thus fully described our invention, we claim—

1. The combination, with a steam-generator, substantially as described, of the air-heating chamber L', having inlets and outlets, substantially as described.

2. The combination, with the chamber L', of the air-ducts U, arranged to establish a communication between the said chamber and the gas-passages behind the fire-bridge wall K, to admit heated air to supply combustion in the rear of said bridge-wall, substantially as described.

3. The combination, with the outer walls of a boiler-setting, of the fire-bridge wall K and the side walls K' K'', said walls being arranged to form passages for the gases of combustion from the furnace to the chimney, in conjunction with the outer walls of a boiler-setting, and an interior hot-air chamber, L', wherein air entering through suitably arranged ducts is heated by the radiation of said walls, substantially as described, for the purpose set forth.

4. The combination, with a boiler-setting, substantially as described, of the rear chamber O, having partitions Q Q', substantially as described, for the purpose set forth.

JOS. FIRMENICH.
GEORGE FIRMENICH.

Witnesses:

MICHAEL J. STARK,
FRANK HIRSCH.