K. MEIER.

CAST IRON BLAST HEATER.

APPLICATION FILED JAN. 4, 1912.

1,047,676.

Patented Dec. 17, 1912.

2 SHEETS—SHEET 1.

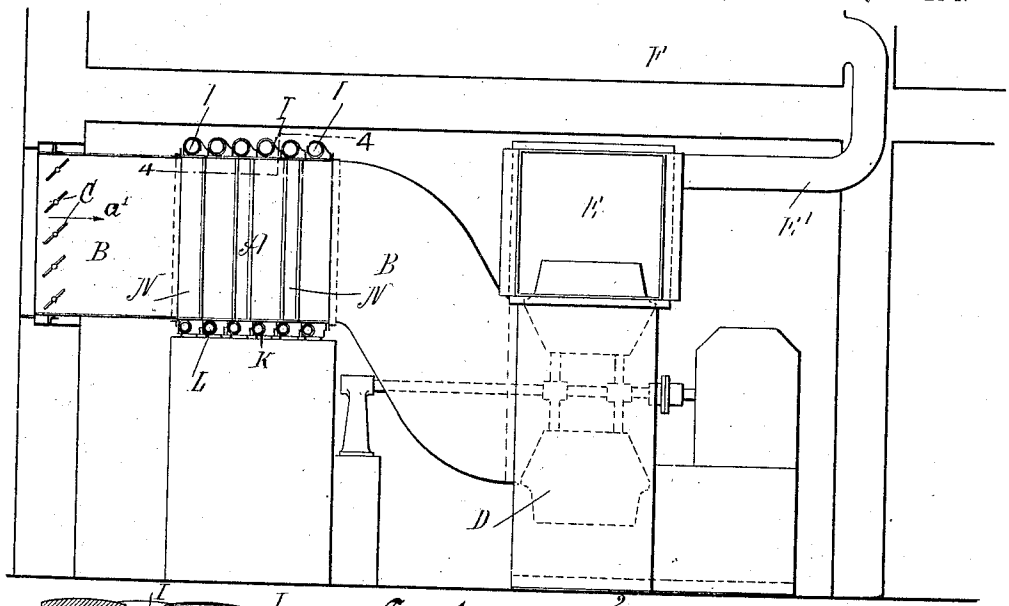

Fig. 1.

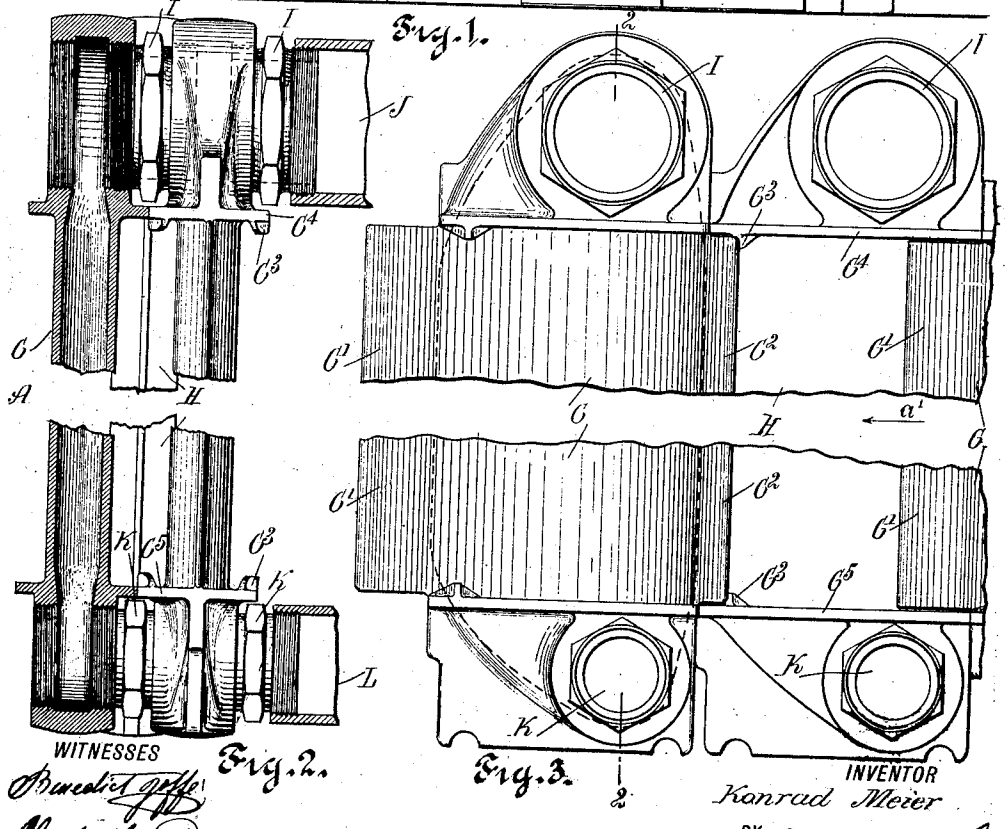

Fig. 2.

Fig. 3.

WITNESSES

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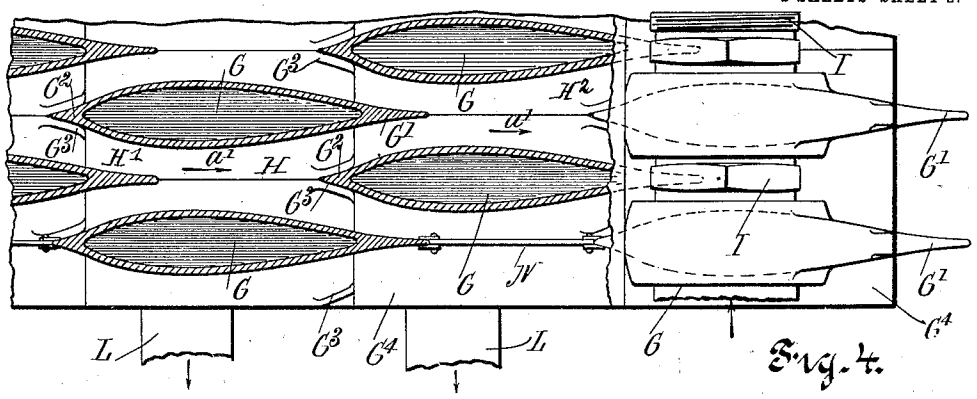

Fig. 4.

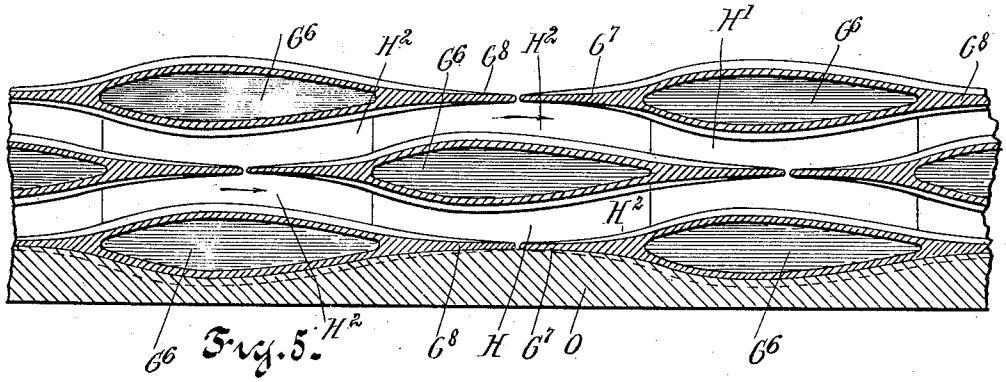

Fig. 5.

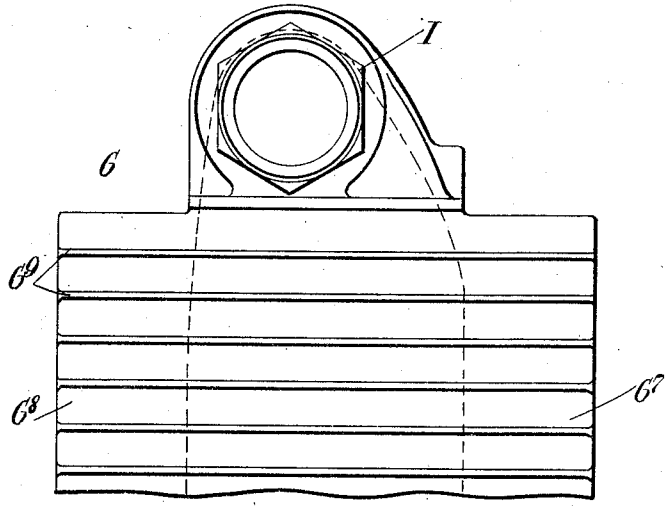

Fig. 6.

WITNESSES

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UNITED STATES PATENT OFFICE.

KONRAD MEIER, OF NEW YORK, N. Y.

CAST-IRON BLAST-HEATER.

1,047,676. Specification of Letters Patent. **Patented Dec. 17, 1912.**

Application filed January 4, 1912. Serial No. 669,314.

To all whom it may concern:

Be it known that I, KONRAD MEIER, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Cast-Iron Blast-Heater, of which the following is a full, clear, and exact description.

The invention relates to heating apparatus for heating air by the use of steam, hot water or other heating medium, and its object is to provide a new and improved cast iron blast heater, arranged to provide a large heating capacity for the air in a comparatively small space, to permit increased velocity of the air and to minimize the resistance to the flow of air and reduce the power required for forcing or drawing the air through the heater, and to avoid dead air spaces and thereby make the heater self-cleaning.

For the purpose mentioned use is made of heating chambers or sections for the passage of the heating medium having the shape of an elongated ovoid in cross section with short pointed head and fine elongated tail; the heating chambers being spaced apart and shaped to form passages between them for the passage of the air to be heated by contact with the exterior surfaces of the said heating chambers, the said air passages being alternately contracted and expanded at a right angle to the direction of the flow of the air through the said air passages.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the cast iron blast heater installed in connection with or as a part of a heating and ventilating apparatus; Fig. 2 is an enlarged cross section of a heating chamber coupled to another heating chamber shown in elevation, the section being on the line 2—2 of Fig. 3; Fig. 3 is a side elevation of the same; Fig. 4 is a sectional plan view of the same on the line 4—4 of Fig. 1; Fig. 5 is a sectional plan view of a modified form of the cast iron blast heater; and Fig. 6 is a side elevation of part of one of the chambers shown in the modified form illustrated in Fig. 5.

The cast iron blast heater A, as shown in Fig. 1, is arranged within or forms part of a duct B provided at its inlet end with admission valves or regulating dampers C for controlling the inflow of the air to be heated, and the discharge end of the duct B connects with a fan or a blower D for producing a suction action in the duct B and the heater A and for forcing the heated air into a manifold E from which lead branch pipes E′ to the rooms F to be heated.

The cast iron blast heater A is formed of heating chambers or sections G, the interior cross section of each chamber or section being in the form of an elongated ovoid, and the exterior cross section of each chamber or section being in the form of an elongated ovoid having a short pointed head and a fine elongated tail, the heating chambers or sections being fastened together in spaced relation in transverse rows and these rows being placed adjacent one another in parallelism so that the heads of one row lie between the tails of the adjacent row and the longitudinal rows formed are staggered and the chambers or sections of alternate transverse rows are alined. The heads of the chambers or sections are directed against the stream of air, passing through the heater in the direction of the arrow *a′*. The upper ends of the chambers or sections G in a transverse row are connected with each other by nipples I, and one outermost section is connected with a pipe J connected with a boiler or other source of steam, hot water or other heating medium. The other outermost section of a row is normally closed by a plug. The lower ends of the heating chambers G in a transverse row are connected with each other by nipples K, and one outer section is connected with a pipe L for carrying off the water of condensation or returning fluid to a suitable place of discharge. The section at the other end of a transverse row is normally closed by a plug. Thus by the arrangement described steam or hot water or other suitable heating medium is passed through the heating chambers G, so as to heat the same and thus heat the air passing through the passages H by contact with the exterior surfaces of the heating chambers.

The heating chambers G are arranged in such a manner that the air passages H between the longitudinal rows of heating chambers are undulating as shown, and the heating chambers in adjacent rows are staggered, and the forward end G^2 of a heating chamber G in one row extends between opposite heating chambers of the next flanking

row in front and behind, as will be readily understood by reference to Figs. 4 and 5. By reference to these figures it will also be noticed that the air passages are alternately gradually contracted at H′ and gradually expanded at H² in the direction of the width of the air passages, that is, at a right angle to the flow of the air through the air passages. It will further be noticed that the curves on which the area for the air passages H is contracted are shorter than those on which they are expanded thereby forming easier deflection of the air current at the point where the momentum of the air is highest. It will be noticed that the sections are so arranged that a short curve on one section confronts or is opposite to a long curve on the adjacent section, and hence the passage contracts or expands due to the difference in the rate of curvature of the confronting walls of the passage.

It is expressly understood that the peculiar curvature given to the air passage as shown and described, is designed to convert the static head of the air into the dynamic head and reconvert the dynamic head into the static head and thereby minimize the repeated losses of head incidental to concentrations and enlargements of area. Owing to the particular design of the air passages the free area of the air passages can be materially reduced without appreciable reduction of the air volume and close and steady contact of the air with the exterior surfaces of the heating chambers is secured at the highest speed obtainable.

The overlapping of the heating chambers or sections reduces the repeated drop of speed between the several rows which causes most of the pressure loss; in other words, the high speed of air is kept up more continually, keeping up the heating efficiency while reducing space, and at the same time keeping down the resistance to the flow of air. It is further understood that by alternately gradually increasing and expanding the air passages the velocity of the air is gradually increased or decreased thereby minimizing the resistance and reducing the power necessary to force the air through the passages at the same time permitting the increased velocity of air and producing high efficiency of the heating surface. By constructing the air heating chambers in the manner described sharp angles and dead air spaces are avoided and the formation of air eddies is prevented, at the same time the air is thoroughly split up during its travel through the air passages so as to insure proper contact of the air with the external surface of the heating chambers.

In order to hold the heating chambers G of a row in proper alinement with each other, the front ends G² of the said chambers fit at their upper and lower ends between lugs G³ arranged on the top and bottom flanges G⁴ and G⁵ of the next following heating chambers, as will be readily understood by reference to Figs. 3 and 4. The alternate outermost heating chambers G connect with each other by plates N, as plainly shown in Fig. 4, so that it is not necessary to provide an extra shell for the heating apparatus.

In the modified form shown in Figs. 5 and 6 the heating chambers G⁶ have their front and rear ends G⁷ and G⁸ extended in such a manner that the front end G⁷ of one heating chamber in a row is in close proximity to the rear end G⁸ of the next following heating chamber, but the passages H formed between adjacent rows are alternately gradually contracted and gradually expanded in the same manner as above described in reference to the heating chambers G shown in Fig. 4. The heating chambers G⁶ are provided on their exterior surfaces with longitudinally-extending spaced ribs G⁹ to increase the heating surface of the said heating chambers. By the arrangement described the plates N above mentioned and shown in Fig. 4 are not necessary, and the outermost rows of heating chambers can be covered with a suitable covering material O, as plainly indicated in Fig. 5.

It will be noticed that the heating chambers are provided integrally with top and bottom flanges or plates G⁴, G⁵, fitting one against the other to form a smooth top and bottom for the air passages H and at the same time the nipples or joints I and K are located above and below the said top and bottom plates, that is, outside of the air passages, and hence the joints do not form obstructions in the air passages and the heating chambers are easily joined together outside of the air passages.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A cast iron blast heater, comprising radiating elements each having an exterior cross section in the shape of a longitudinal section of an ovoid provided with a pointed head having short curves and an elongated tail having long curves, the radiating elements being arranged in transverse rows, and the said radiating elements in each transverse row being spaced apart, and the radiating elements of alternate transverse rows being alined in a longitudinal direction to form longitudinal air passages, the radiating elements in successive longitudinal rows being staggered and the said heads of the radiating elements in one transverse row extending between the said tails of the radiating elements of an adjacent row so that confronting walls of the air passages have different rates of curvature and the areas of the air passages vary accordingly.

2. A cast iron blast heater, comprising radiating elements having a cross section in the shape of the longitudinal section of an ovoid provided with a short pointed head having short curves, and a fine elongated tail having long curves, the radiating elements being arranged in spaced relation in transverse rows, the rows being spaced adjacent one another, the radiating elements of alternate transverse rows being alined in parallelism, and the heads of the radiating elements in one transverse row extending between the tails of the radiating elements of an adjacent row so that the confronting walls of the air passages formed have different rates of curvature and the passages contract and expand.

3. A cast iron blast heater, comprising radiating elements each having an exterior cross section in the shape of the longitudinal section of an ovoid provided with a short pointed head having short curves, and a fine elongated tail having long curves, the radiating elements being arranged in spaced relation in transverse rows and longitudinal rows to form longitudinal air passages, and the said radiating elements of alternate transverse rows being alined and the longitudinal rows being staggered, the heads of the radiating elements in one transverse row extending between the tails of the radiating elements of an adjacent transverse row so that the confronting walls of the air passages have different rates of curvature and each air passage alternately contracts and expands, the contraction taking place within a shorter distance than the expansion.

4. A cast iron blast heater, comprising radiating elements each having an exterior cross section in the shape of the longitudinal section of an ovoid provided with a short pointed head having short curves, and a fine elongated tail having long curves, the radiating elements being arranged in spaced relation in transverse rows and longitudinal rows to form longitudinal air passages, and the said radiating elements of alternate transverse rows being alined and the longitudinal rows being staggered, the heads of the radiating elements in one transverse row extending between the tails of the radiating elements of an adjacent transverse row so that the confronting walls of the air passages have different rates of curvature and each air passage alternately contracts and expands in the direction of the length of the air passage, and means connecting the outermost radiating elements with each other.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

KONRAD MEIER.

Witnesses:
FRANK T. CHAPMAN,
THEO. G. HOSTER.