E. B. FREEMAN.

FUEL ECONOMIZER.

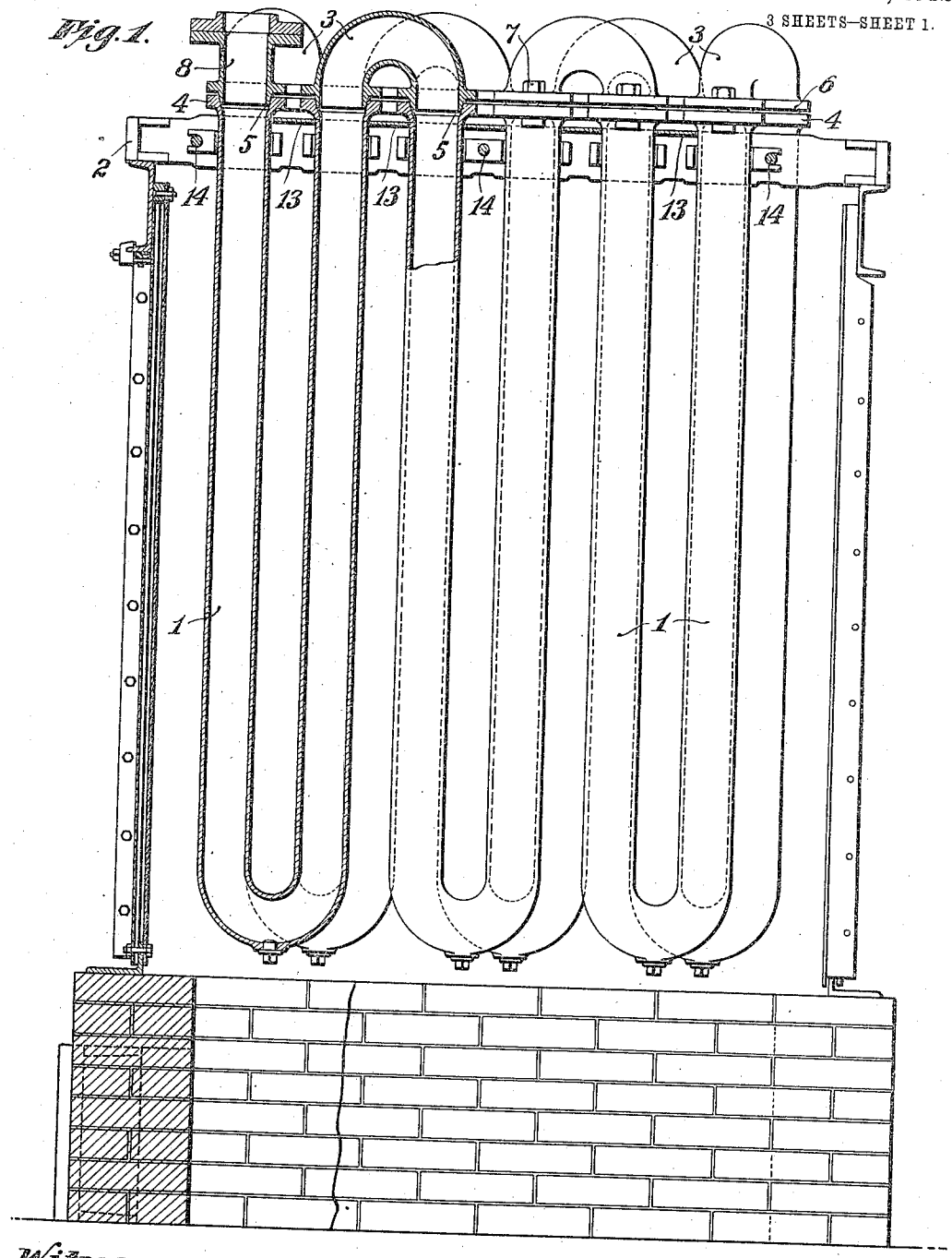
APPLICATION FILED JULY 19, 1907.

1,043,312.

Patented Nov. 5, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

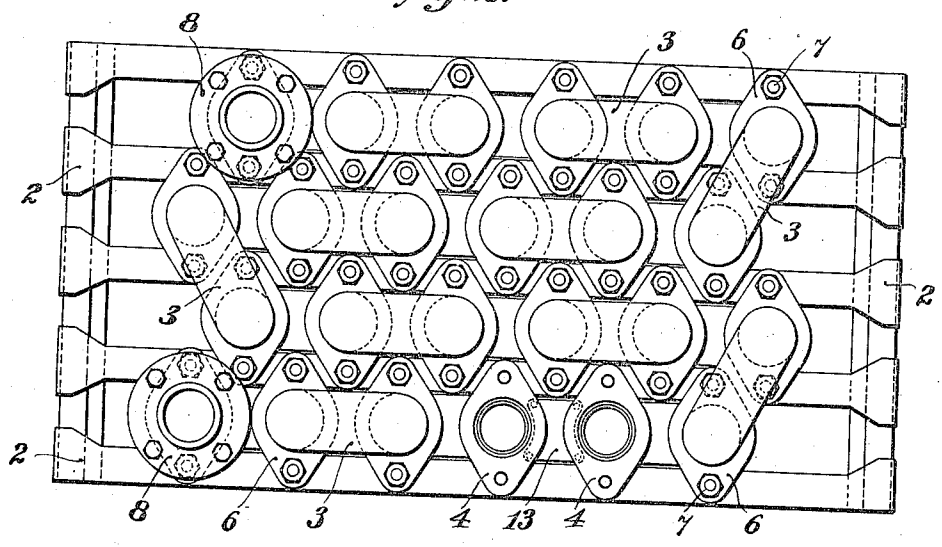
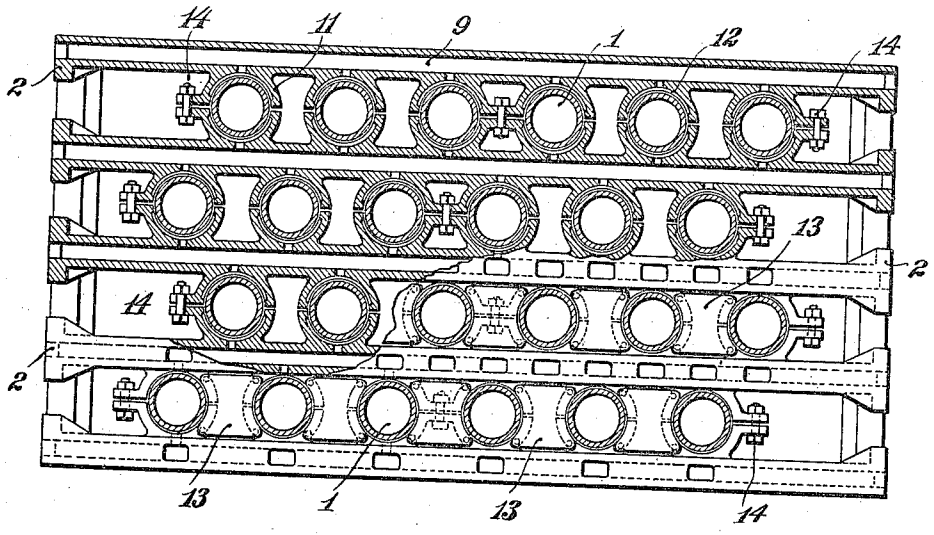


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

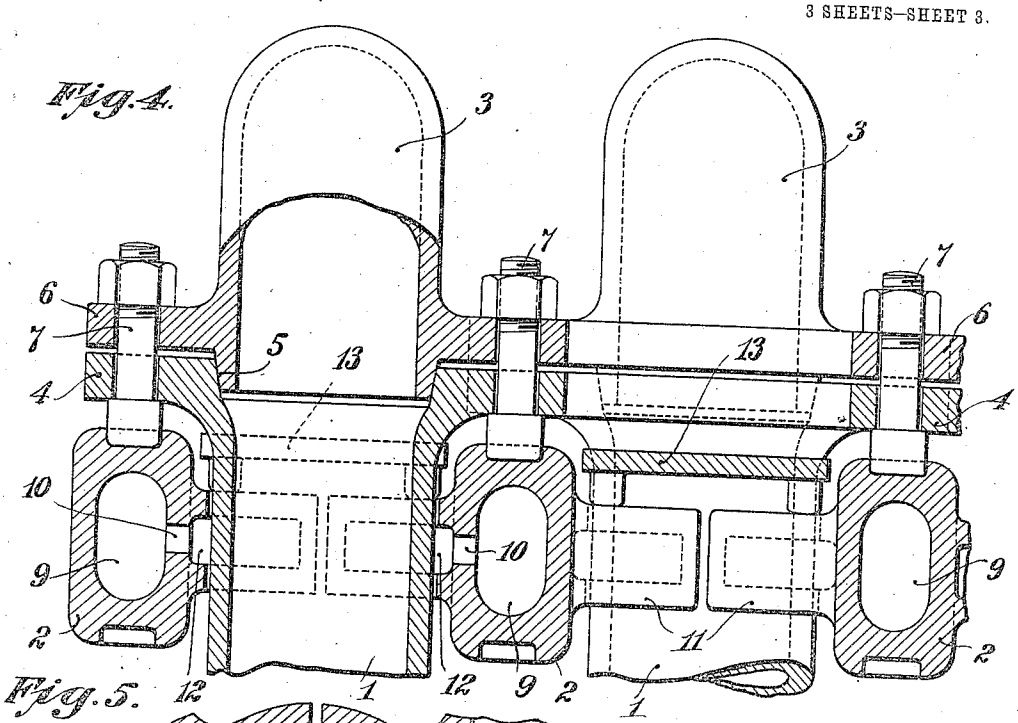
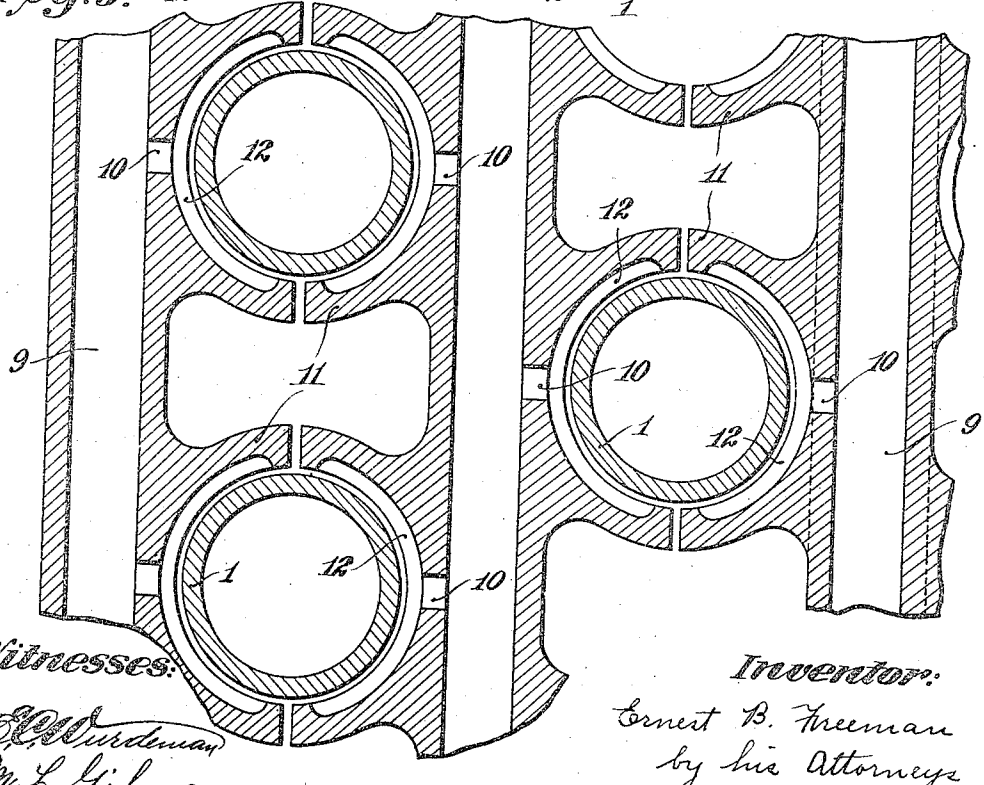


Fig. 5.



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UNITED STATES PATENT OFFICE.

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FUEL-ECONOMIZER.

1,043,312. Specification of Letters Patent. Patented Nov. 5, 1912.

Application filed July 19, 1907. Serial No. 384,502.

To all whom it may concern:

Be it known that I, ERNEST B. FREEMAN, a citizen of the United States, residing at Dedham, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Fuel-Economizers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In fuel economizers as heretofore constructed the vertical circulation tubes or pipes are connected at one or both ends by means of hollow headers, each vertical tube being connected to the headers by water tight joints. This construction is not only expensive but necessitates the complete assembling of the parts of each section of the economizer in the factory and the shipment of the set-up sections to the place where the economizer is to be installed. In installing the economizer the heavy sections must be handled which adds considerably to the difficulty and expense of installation.

To avoid the necessity of assembling the sections of the economizer at the factory and the trouble and expense incident to shipping and handling the set-up sections, and also to provide an economizer of simple construction which can be manufactured and installed more cheaply and easily than economizers which have heretofore been devised, a feature of the present invention contemplates a construction in which the circulation tubes are supported by headers or tube supporters without being jointed thereto and in which the tubes are connected by coupling pipes. By constructing the economizer in this manner the parts can be made more easily and cheaply than has heretofore been possible and they can be shipped to the places of installation and there readily assembled. This feature of the present invention broadly considered contemplates any suitable form of circulation tubes, tube supporters, and coupling pipes. In the preferred form of the invention, however, the circulation tubes consist of —U— shaped pipes arranged vertically and supported at their upper ends by horizontally arranged tube supporters. The circulation tubes are preferably arranged in rows crosswise of the economizer, as is usual in this class of devices, and the tubes in each row are preferably connected by the coupling pipes in series so that the tubes and coupling pipes form a continuous passage for the water from one end of a row of tubes to the other. Also preferably the rows of tubes of the economizer are connected in series so that a continuous passage for the water is formed from one end of the economizer to the other.

In addition to the features of invention above referred to, the present invention consists in certain devices and arrangements of parts hereinafter described and claimed, the advantages of which will be obvious to those skilled in the art from the following description.

The several features of the present invention will be clearly understood from an inspection of the accompanying drawings in which—

Figure 1 is a view in end elevation partly in section of a fuel economizer embodying the same in its preferred form. Fig. 2 is a plan view, with one of the coupling pipes removed, of the circulation tubes, tube supporters and coupling pipes of the economizer. Fig. 3 is a sectional plan view of the parts illustrated in Fig. 2, a portion of said view being on a plane passing through the center of the tube supporters and the remainder of the view being on a plane passing just above the tube supporters. Fig. 4 is a detail vertical sectional view taken on a plane passing through three of the tube supporters and through one of the vertical circulating tubes and Fig. 5 is a detail sectional plan view of the parts illustrated in Fig. 4 taken on a plane passing through the center of the tube supporters.

The economizer illustrated in the drawings is provided with vertical circulation tubes 1, with horizontal tube supporters 2, and with coupling pipes 3 connecting the vertical tubes so that the tubes and coupling pipes form a continuous passageway for the

water. As illustrated the vertical circulation tubes consist of —U— shaped cast iron pipes provided with flanges 4 at their upper ends which extend over the tube supporters as best illustrated in Figs. 2 and 4. At its upper end each vertical tube is provided with a bevel joint seat as indicated at 5 in Fig. 4 and the coupling pipes 3 are provided at their ends with corresponding bevel joint seats to engage the joint seats of the vertical tubes. A metal to metal joint is thus formed which does not require any packing. The coupling pipes are preferably of cast iron and are —U— shaped as illustrated. At their ends they are provided with flanges 6 and these flanges as well as the flanges at the upper ends of the vertical tubes are perforated to receive clamping bolts 7 by means of which the coupling pipes and vertical tubes are firmly secured together.

The manner in which the vertical tubes are connected by the coupling pipes so as to form a continuous passage for the water from one end of the economizer to the other will be readily apparent from an inspection of Fig. 2 in which it will be seen that the tubes of each row are connected in series and that the rows are also connected in series. The water enters and leaves the economizer through couplings 8 connected to the end tube in the first and last rows as indicated in Fig. 2. These couplings consist of short vertical pipes provided with joint seats and flanges similar to those on the coupling pipes 3.

To permit an air blast to be applied to the vertical circulation tubes so as to clean the soot therefrom, each tube supporter 2 is provided with an air passage 9, extending its entire length, and with air outlets 10, opening toward the outer sides of the tubes, as best illustrated in Fig. 4. To cause the air issuing from the outlets 10 to pass downwardly along the vertical tubes the tube supporters are provided with laterally extending brackets 11 which surround the tubes as illustrated in Figs. 3 and 5, and the tubes are held centrally in the openings formed by these brackets by the lower ends of the bolts 7 which are received in recesses cast in the upper surfaces of the tube supporters. To permit the air to pass completely around the circulation tubes the brackets 11 are provided with grooves 12 extending from the outlets 10 nearly to the ends of the brackets. It will be understood that the top of the economizer is covered with cement as usual in this class of devices so that the air issuing from the outlets 10 into the grooves 12 is compelled to pass downwardly along the tubes through the openings between the tubes and the brackets 11.

It will be noted that spaces are left at the upper portion of the economizer between the brackets 11. To close these spaces cover plates 13 are provided which are held in place by projections from the underside of the plates as indicated in Figs. 3 and 4. The spaces between the tube supporters at the ends of the rows of tubes may be covered in any suitable manner.

As indicated in Fig. 3, the vertical circulating tubes pass down between the tube supporters. In order to hold the tube supporters in position they are secured to one another by bolts 14 passing through perforated lugs formed on certain of the brackets 11. In the form of economizer illustrated, the vertical tubes of one row come opposite the spaces between the vertical tubes of the next row so that the gases passing through the economizers are compelled to follow a sinuous path, this arrangement of the tubes producing what is known in the art as a staggered tube economizer.

The air passages of the tube supporters 2 are connected in any suitable manner to means for producing a blast of air. The way in which these connections can be arranged will be obvious to those skilled in the art and it has therefore been considered unnecessary to illustrate them in the drawings.

The nature and scope of the present invention having been indicated and the preferred form of the invention having been specifically described, what is claimed is:—

1. A fuel economizer having, in combination, circulation tubes consisting of a plurality of series of —U— shaped pipes, a plurality of tube supporters supporting said series of pipes and coupling pipes connecting the —U— shaped pipes.

2. A fuel economizer having, in combination, a plurality of series of vertical circulation tubes, a plurality of tube supporters supporting the series of tubes and coupling pipes connecting the tubes.

3. A fuel economizer having, in combination, a plurality of series of vertical circulation tubes, a plurality of tube supporters supporting the tubes, flanges at the upper ends of the tubes extending over the tube supporters and coupling pipes connecting the tubes.

4. A fuel economizer having, in combination, circulation tubes consisting of a plurality of series of —U— shaped pipes provided with bevel joint seats at their ends, a plurality of tube supporters supporting the tubes, and coupling pipes for the tubes provided at their ends with bevel joint seats to engage the joint seats of the tubes.

5. A fuel economizer, having, in combination, circulation tubes consisting of a plurality of series of U-shaped pipes, a plurality of separate tube supporters extending between and supporting said pipes, and coupling pipes connecting the U-shaped pipes.

6. A fuel economizer, having, in combina-

tion, a plurality of series of vertical circulation tubes, a plurality of separate tube supporters extending between and supporting the tubes, flanges at the upper ends of the tubes extending over the tube supporters, and coupling pipes connecting the tubes.

In testimony whereof I affix my signature, in presence of two witnesses.

ERNEST B. FREEMAN.

Witnesses:

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C. E. SNOW.