C. F. WILLIAMS.

HEATER.

APPLICATION FILED AUG. 14, 1914.

1,197,985.

Patented Sept. 12, 1916.

2 SHEETS—SHEET 1.

Fig 1

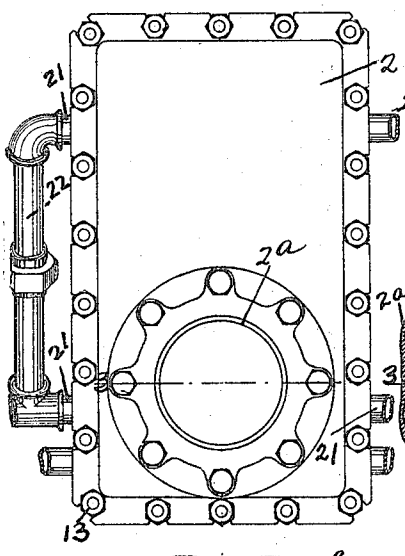
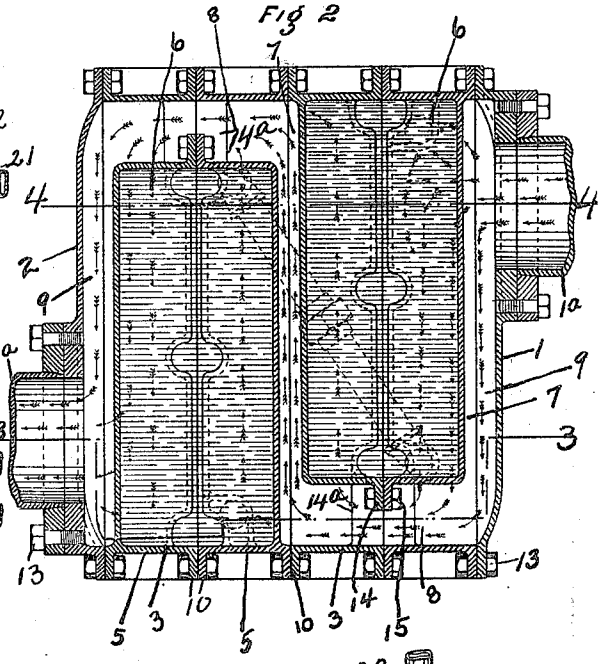


Fig 2



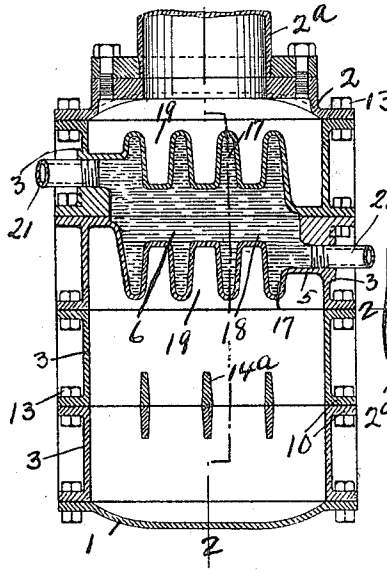


Fig 3

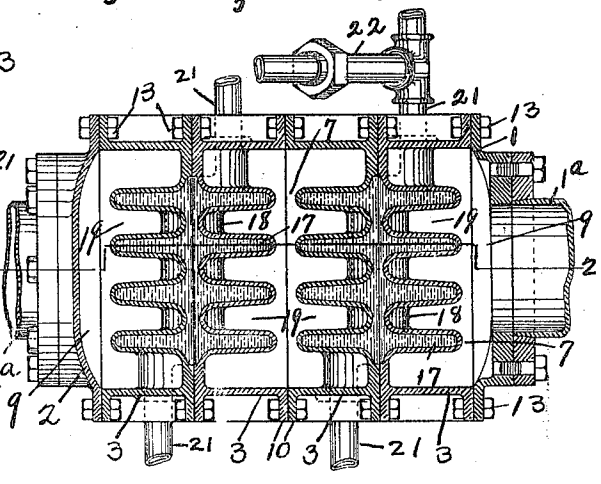


Fig 4

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2 SHEETS—SHEET 2

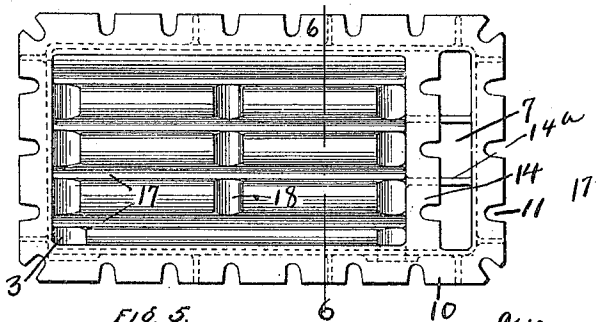


Fig. 5.

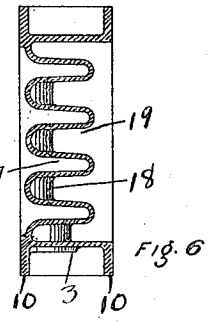


Fig. 6

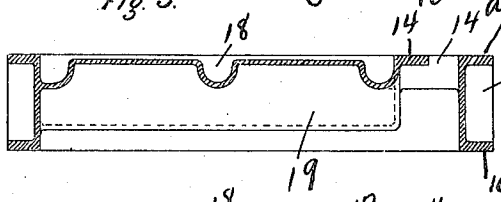


Fig. 7.

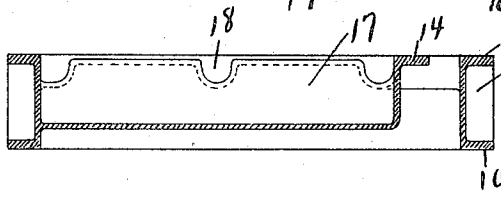


Fig. 8

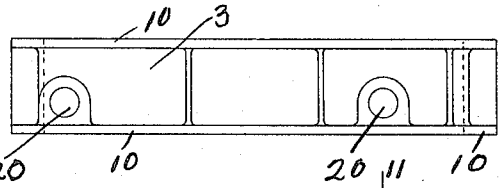


Fig 9

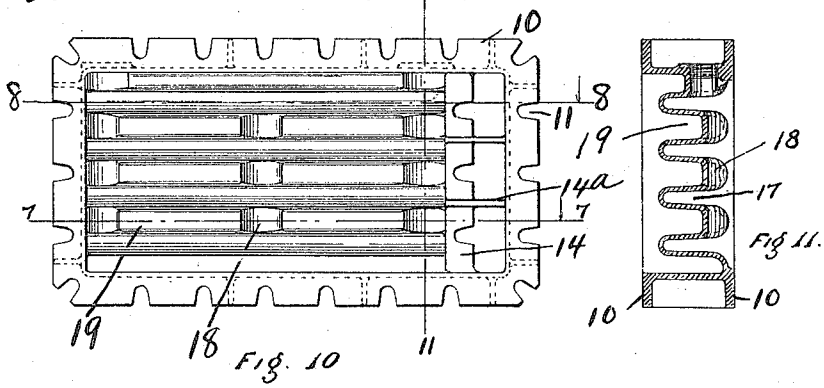


Fig. 10

Fig 11.

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UNITED STATES PATENT OFFICE.

CHARLES F. WILLIAMS, OF ERIE, PENNSYLVANIA.

HEATER.

1,197,985. Specification of Letters Patent. Patented Sept. 12, 1916.

Application filed August 14, 1914. Serial No. 856,800.

To all whom it may concern:

Be it known that I, CHARLES F. WILLIAMS, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented new and useful Improvements in Heaters, of which the following is a specification.

This invention relates to heaters and consists in certain improvements in the construction thereof as will be hereinafter fully described and pointed out in the claims.

More particularly the invention relates to that type of heaters wherein one fluid, usually water, is heated by steam or exhausted gases from internal combustion engines. It is desirable to be able to vary the capacity of heaters of this type and one of the objects of this invention is to so form a heater that it may be added to as desired. It is also desirable that the additions may be made from a stock form and that only a few forms or shapes will satisfy all demands.

Other objects of the invention will appear from the detail description and claims.

The invention is illustrated in the accompanying drawings as follows:—

Figure 1 is an elevation of the heater. Fig. 2 a section on the lines 2—2 in Figs. 1, 3 and 4. Fig. 3 a section on the line 3—3 in Fig. 2. Fig. 4 a section on the line 4—4 in Fig. 2. Fig. 5 an elevation of one of the sections, the face of the section being that ordinarily exposed to the water. Fig. 6 a section on the line 6—6 in Fig. 5. Fig. 7 a section on the line 7—7 in Fig. 10. Fig. 8 a section on the line 8—8 in Fig. 10. Fig. 9 a side elevation of one of the sections. Fig. 10 an elevation of a face of a section, the face being that forming the steam or gas chamber. Fig. 11 a section on the line 11—11 in Fig. 10.

The heater has the inlet plate 1 and discharge plate 2. These are provided with the ordinary connections 1^a and 2^a. The heater proper is made up of units 3, these units being alternately arranged so that the gas passing them passes in a serpentine path past the water chambers in the units. The units are identical in shape but are so connected together that the part that forms the top of one unit forms the bottom of the next one. The units are made up of the sections 5—5. These sections are identical in shape and each section forms half of a unit. These halves are bolted together forming the water chambers 6. The outer walls of the water chambers are corrugated forming vertical passages along said walls both within the chamber and without the chamber. The outer edges of the corrugations are preferably spaced from the faces of the units forming a passage 7 extending over all when the cover plates 1 and 2 are put in place, and when the units are put together forming a passage over all between the walls of the water chambers in excess of the passages formed by the corrugations. The water chambers do not extend the full length of the units and there is an end passage 8 formed around the ends of the water chambers so that these passages 8 connect the vertical passages formed by the corrugations and the space 7. As clearly shown in Fig. 2 by the arrows, the gases enter through the inlet 1^a, pass downwardly around the water chamber of the first unit, then upwardly between the water chambers of the first and second units, around the top of the water chamber of the second unit, then by the cover plate and passages 7 and the passages formed by the corrugations to the discharge 2^a. If a larger capacity is desired another unit similar to the first unit may be arranged adjacent to the second unit and this may be continued indefinitely.

The cover plates are identical in shape and are made interchangeable. The inlet and discharge should be opposite the water chamber so that the fluid must flow along the side of said chamber. The cover plates preferably have the depressions 9 so that when in place they supplement or add to the passage 7.

The sections are provided with the flanges 10 which extend around their edges on both faces. These flanges are provided with the notches 11 in which are arranged the bolts 13. In this way, the sections are bolted together forming the units 3 and the units are bolted together and the face plate bolted on forming the heater as a whole. The walls of the water chambers which are spaced from the outer wall of the heater are provided with the flanges 14 and these are bolted together by bolts 15, the passage 8 affording access to the bolts 15 for assembling the units. The sections have the depressions 17 formed in their faces and the walls of these depressions are corrugated, thus increasing the surface of the walls and in addition thereto providing for the ex-

pansion and contraction to which these devices are subjected. The corrugations on the face of the depression forming the water chamber have the lateral passages 18 through them so that in the movement of the water vertically through the chambers there is also a free lateral communication from the passage formed in one corrugation to the next. Preferably, however, the corrugations themselves do not contact when the sections are together as clearly shown in Fig. 4 so that there is throughout the length of the chamber a lateral communication. These openings 18 at the bottom also form a continuous passage across the heater which is of assistance in flushing out the chamber, scale and other matter deposited in this passage or enlargement at the bottom of the water chamber. If the units are alternately reversed, there will be a passage 18 always at the bottom of every other unit. Preferably three of these cross passages are formed. As shown there is one at each end of the chamber and one midway. The corrugations in the walls of the water chamber form passages within said chamber and also form passages 19 outside the chamber.

Each unit has a pipe connection 21 leading to the passage 18 through openings 20 at the top and bottom. The pipes 21 of successive units are connected through a pipe 22, the pipe 22 connecting with the top connection of one unit and extending to the bottom connection 21 of the next unit, and preferably running from the top of a unit nearer the outlet to the bottom of a unit nearer the inlet, the water being delivered to the unit farthest from the inlet and discharged from the unit nearest the inlet so as to get the benefit of reverse currents.

As clearly shown in Fig. 2, the operation of the device is as follows:—The gas or steam enters the pipe 1^a, passes by way of the passages 7 and 9 to the bottom of the first unit, then by the cross passage 8 to the upright passages 7 and the passages 19 formed by the corrugations, then over the water chamber of the second unit, and thence to the discharge 2^a. The heater gives a very large surface and at the same time gives quite a capacity for gas or steam so that a large volume of it may be retained in the heater for some time so that a large proportion of the heat may be taken from it.

What I claim as new is:—

1. In a heater, the combination of a unit formed of sections with depressions formed in adjacent faces, the walls of the depressions being of less length than the sections forming an opening or passage in one end of the unit when assembled and the depressions forming when assembled a fluid chamber or passage within the depressions and passages for fluid outside of said walls and around the end of the chamber formed by the depressions; and a cover plate for the unit.

2. In a heater, the combination of a unit formed of sections with depressions formed in adjacent faces, the walls of the depressions being corrugated and of less length than the sections, forming an opening in one end of the completed unit, the sections forming when assembled a chamber or passage within the depressions for fluid and a passage along the walls of said chamber and around the end of said chamber; and a cover plate for the unit.

3. In a heater, the combination of a series of units, each formed of sections with depressions formed in adjacent faces, the walls of the depressions being of less length than the sections and forming an opening in one end, the sections forming when assembled a chamber within the depressions and a passage along the outer walls of the chamber and around the end of the chamber, the assembled sections forming units of the heater, and the adjacent units thus formed being arranged with the end passages around the chambers at opposite ends of the heater thereby forming a serpentine path around and between the chambers; and a cover plate for the end sections.

4. In a heater, the combination of a series of units, each formed of sections with depressions formed in adjacent faces, the walls of the depressions being corrugated and of less length than the sections and forming an opening in one end, the sections forming when assembled a chamber within the depressions and a passage along the outer walls of the chamber and around the end of the chamber, the assembled sections forming units of the heater, and the adjacent units thus formed being arranged with the end passages around the chambers at opposite ends of the heater forming a serpentine path around and between the chambers; and a cover plate for the end sections.

5. A heater section formed with a depression in one face, the walls of the depression being of less length than the section and faced across the section forming an opening between one end of the depression and the end of the section and flanges surrounding the edges of the depression and face of the section.

6. A heater section formed with a depression in one face, the walls of the depression being corrugated and of less length than the section and faced across the section forming an opening between one end of the depression and the end of the section and flanges surrounding the edges of the depression and face of the section.

7. In a heater, the combination of a unit having two sections with depressions in adjacent faces forming when assembled a

chamber, the reverse sides of said sections having the walls of the depressions spaced from the faces of the sections and from one end of the sections, thereby forming passages along said walls and around one end of the chamber formed by the assembled sections; and a cover plate on the unit formed by the sections.

8. In a heater, the combination of a unit having two sections with depressions in adjacent faces forming when assembled a chamber, the walls of said depressions being corrugated, the reverse sides of said sections having the walls of the depressions spaced from the faces of the sections and from one end of the sections, thereby forming passages along said walls and around one end of the chamber formed by the assembled sections; and a cover plate on the unit formed by the sections.

9. In a heater, the combination of a unit formed of sections with depressions formed in the adjacent faces, the walls of said depressions being surrounded with a flange which forms a joint surrounding the depressions and forming an inclosed passage within said depressions with the sections in place, said sections having outer walls joining the flanges at the sides of the depressions, said outer walls being the walls of passages outside the passage formed by the depressions and said walls being disconnected from the end flanges of the depressions.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES F. WILLIAMS.

Witnesses:
H. C. LORD,
C. SCHURZ.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."