

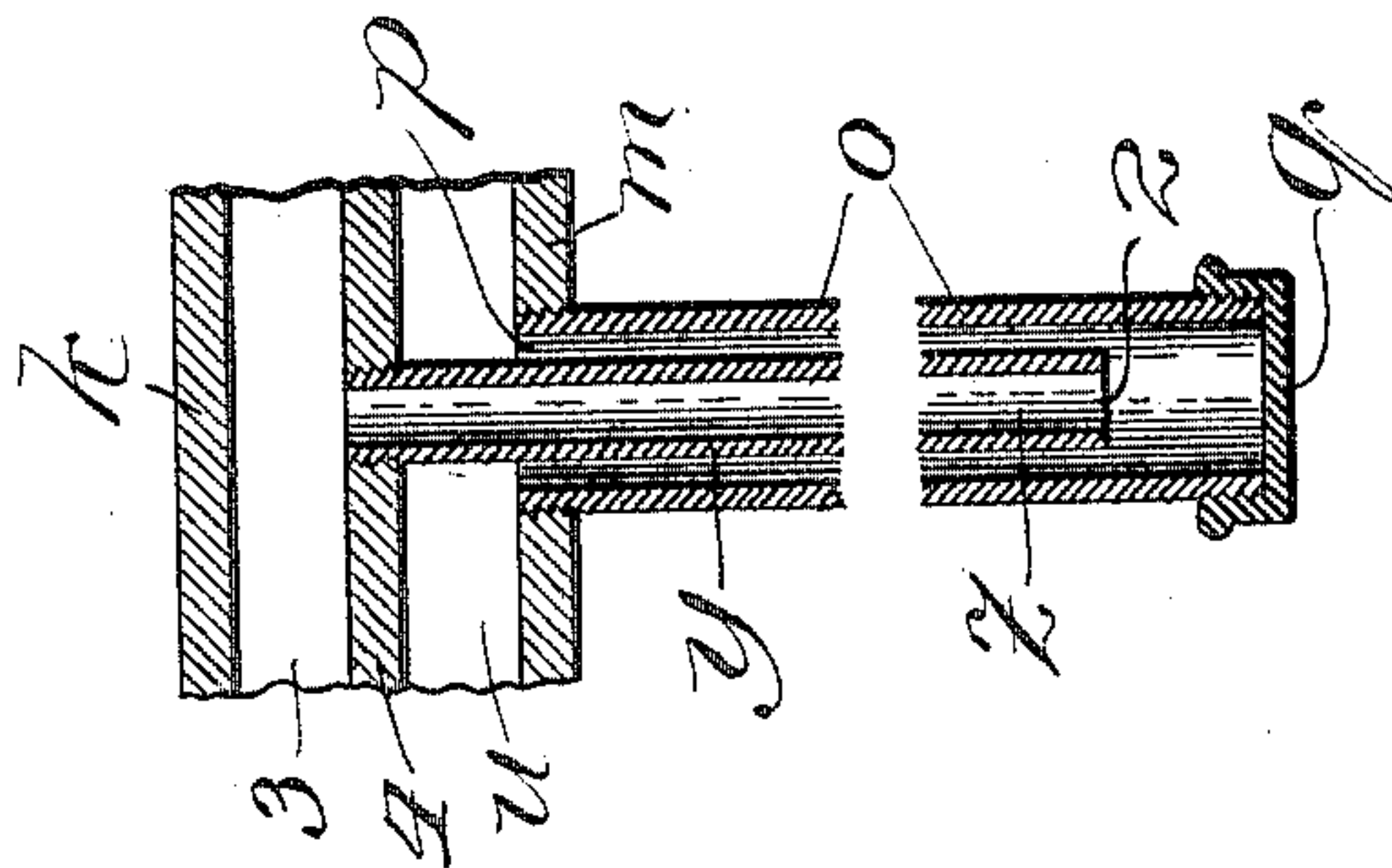
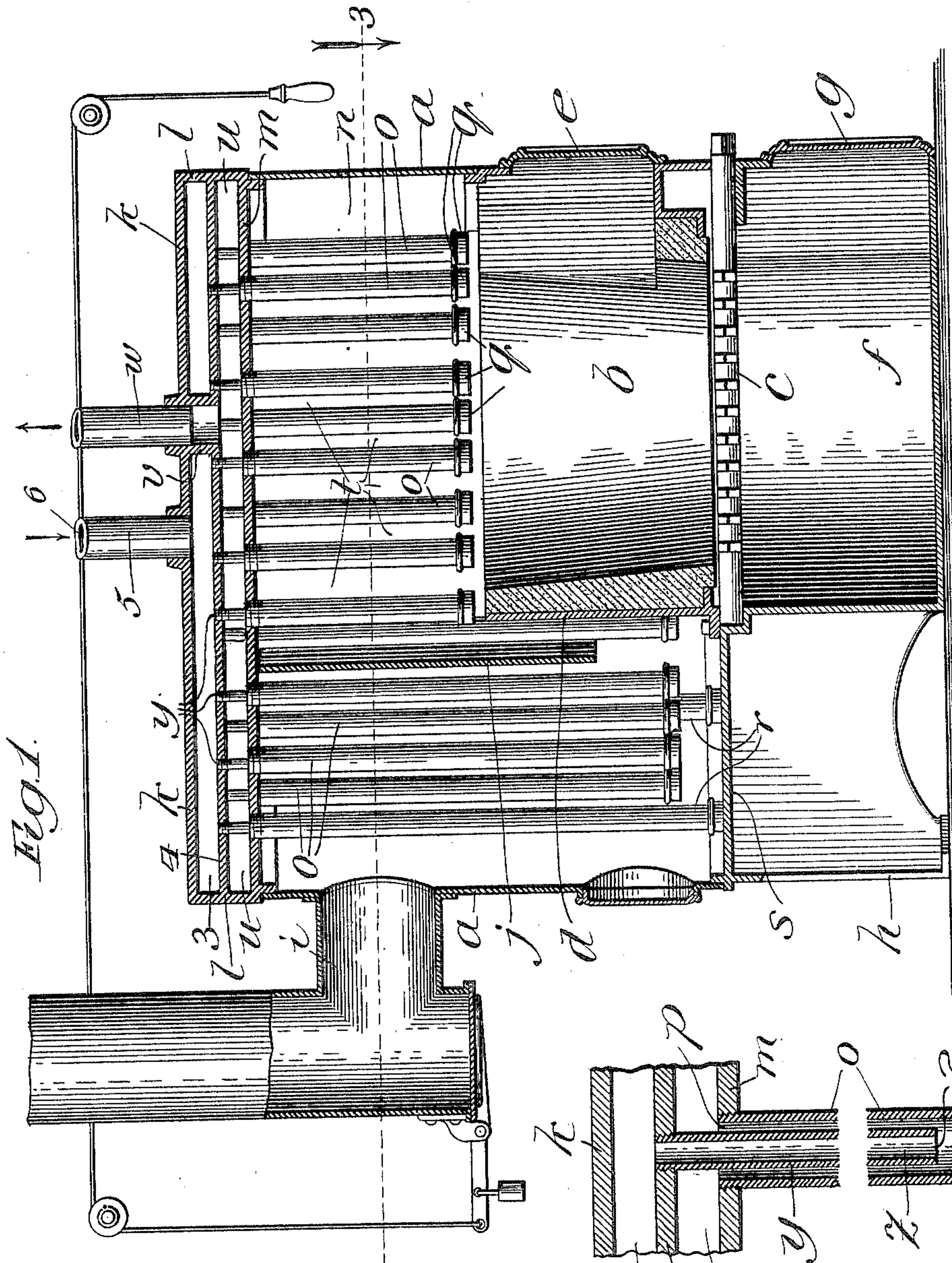
No. 817,525.

PATENTED APR. 10, 1906.

D. SHAFFER.  
WATER HEATER.

APPLICATION FILED JULY 16, 1904.

2 SHEETS—SHEET 1.



Witnesses:  
C. C. Chayford,  
Harry F. Strott,

Fig. 2.

Inventor:  
Daniel Shaffer,  
By Thomas F. Sheridan,  
Att'y.

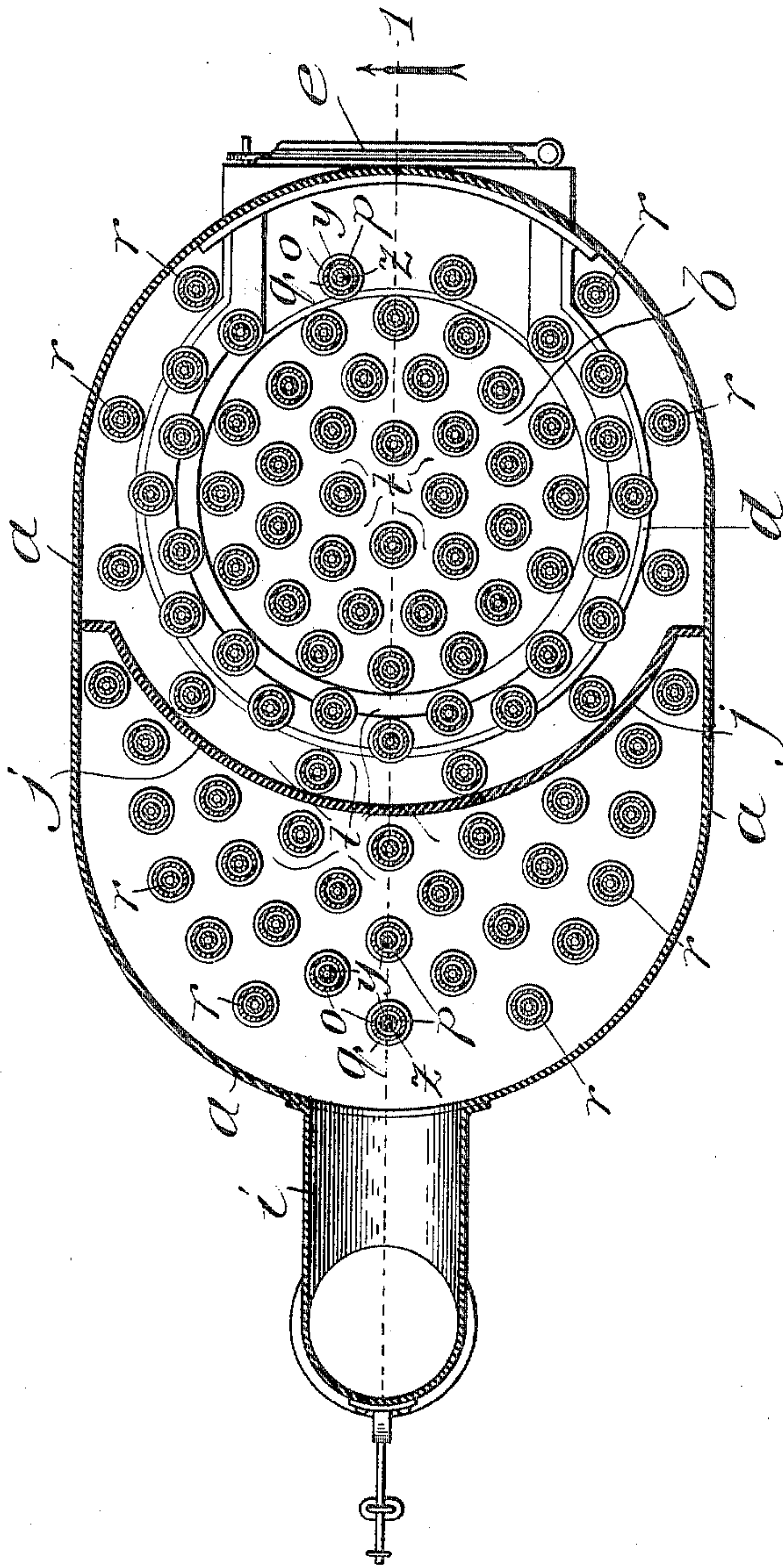
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2 SHEETS—SHEET 2.

Fig. 3.



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# UNITED STATES PATENT OFFICE.

DANIEL SHAFFER, OF AURORA, ILLINOIS.

## WATER-HEATER.

No. 817,525.

Specification of Letters Patent.

Patented April 10, 1906.

Application filed July 15, 1904. Serial No. 216,704.

*To all whom it may concern:*

Be it known that I, DANIEL SHAFFER, a citizen of the United States, residing at Aurora, in the county of Kane and State of Illinois, am the inventor of certain new and useful Improvements in Water-Heaters, of which the following is a specification.

My invention relates to that class of water-heaters having hollow studs or heating-pipes arranged with suitable spaces therebetween for admitting the heated air or gases for heating the water and provided with feed-pipes extending into such water-heating pipes.

It relates particularly to the means for providing the necessary area of heating-surface in the form of studs or heating-pipes closed at their lower ends and having spaces therebetween for admitting heated air or gases for heating the water and to the means for feeding the water to be heated into such heating-pipes or hollow studs in such a manner as to produce the desired circulation of the water and permit its expansion, due to the rising temperature, without injury to the device.

The principal object of the invention is to provide a simple, economical, and efficient water-heater.

A further object of the invention is to provide a water-heater having upright heating-pipes or hollow studs closed at their lower ends, with suitable means for feeding water into such pipes or hollow studs, whereby the desired area of heating-surface is afforded, and whereby the water is fed into such pipes or hollow studs in such a manner as to permit or cause the desired circulation of the water through the pipes and permit its expansion without injury to the device.

A further object of the invention is to provide simple and efficient means whereby the water may be fed into the upright heating-pipes or studs and discharged into the lower portion thereof without mingling with the water discharged from the heating-pipes.

A further object of the invention is to provide a water-heater having a hot-water chamber provided with depending heating-pipes or hollow studs communicating therewith and closed at their lower ends and having a receiving-chamber separated from such hot-water chamber with means for feeding water from such receiving-chamber into the lower portion of such heating-pipes in such a manner as to produce the necessary circulation of the water in contact with a large area of heat-

ing-surface, whereby the expansion of the water is permitted without injury to the device and great economy of fuel is afforded.

Other and further objects of the invention will appear from an examination of the drawings and the following description and claims.

The invention consists in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of a water-heater constructed in accordance with my improvements; Fig. 2, a detail view showing the arrangement of the heating-pipes or studs and the feed-pipes extending into the same from the receiving-chamber; which is shown separated from the hot-water chamber; and Fig. 3, a sectional plan view taken on line 3 of Fig. 1.

In constructing a water-heater in accordance with my improvements I provide a furnace formed of upright side and end walls *a*, a suitable fire-box *b*, having a grate *c*, a back wall or bridge *d*, a door *e* for receiving the fuel, an ash-pan *f*, arranged under such fire-box, having a door *g*, suitable legs or supports *h*, a flue *i*, and a baffle or inner partition wall *j*, for diverting the heated gases or air downward after leaving the fire-box, all of which may be of any ordinary and well-known type. Over this furnace I mount a boiler having an upper metallic wall *k*, outer upright walls *l*, and a lower wall *m*, all preferably integral. These boiler-walls are adapted to cover the space inclosed within the outer upright walls of the furnace and engage such furnace-walls so as to form, in connection with the furnace-walls, a heating-chamber *n* and a receiving-chamber 3.

A multiplicity of depending hollow studs in the form of metallic heating-pipes *o* are connected at suitable intervals to the lower wall *m* of the boiler and form the main heating-surface thereof. They are connected to the wall or body portion of the boiler by threading the upper ends of the pipes and screwing them into suitable threaded perforations in such lower boiler-wall. The upper end of each of the heating-pipes is open, so as to form an outlet *p*, and the lower ends of such pipes are all closed either by means of a cap *q*, screwed thereon, or in any ordinary and well-known manner. A plurality of these depending pipes are made of sufficient length to extend downward, as at *r*, to a subbottom of the furnace-frame or to any suitable sup-



port, so that they form a support for the principal portion of the weight of the entire boiler structure, with its pipes or tubes. While only two of these supporting-tubes or pipes are shown in Fig. 1, it will be readily understood that a sufficient number are provided at suitable intervals and in suitable positions to support substantially the entire weight of the boiler. Tubes at the front portion of the boiler, for instance, may be elongated for this purpose. The tubes immediately over the fire-box are of course made sufficiently short to provide the desired space for the fire-box, and those back of the fire-box are of sufficient length to utilize all of the available space of the portion of the heating-chamber back of the fire-box. These heating-pipes *o* are so arranged as to provide suitable spaces *t* therebetween for admitting the heated gases or air from the furnace, a very large heating-surface being thus afforded. The upper ends of these heating-pipes, which form the outlets thereof, communicate with a hot-water chamber *u*, having an outlet formed by walls *v*, and a pipe *w*, such pipe being adapted to be connected with any tank, radiator, or other device in connection with which the heated water is intended to be used. A multiplicity of feed-pipes *y* are provided, preferably one for each of the heating-pipes or depending hollow studs *o*. These feed-pipes are open at both ends and form a passage *z*, which communicates, through the receiving-chamber and main inlet-pipe herein-after described, with a suitable source of water-supply. The lower end of each feed pipe or passage has an outlet 2 inside of the lower portion of the heating-pipe, so that the water is fed into the heating-pipes near their lower ends, so that it is free to pass upward on the outside of the feed-pipes and inside the heating-pipes without mingling with the feed-water, and the feed-water is kept entirely separate until fed to the lower ends of the heating pipes. For the sake of the manifest advantages and convenience which result from such a construction the upper ends of these feed-pipes open into a receiving-chamber 3, which is formed above the hot-water chamber between the upper wall *k* of the boiler and a preferably horizontal partition-wall 4, in which the upper ends of such feed-pipes are mounted. The pipes are threaded and inserted into similarly-threaded perforations in such partition-wall for receiving them, so that they all communicate with the receiving-chamber. The main feed-pipe 5 forms the inlet for the receiving-chamber, and its passage 6 connects the passages *z* in the feed-pipes with any suitable source of water-supply to which the main feed-pipe may be connected in any ordinary and well-known manner.

In operation the water to be heated is admitted through the main feed-pipe 6 to the

receiving-chamber 3 and is separated from the hot-water chamber by means of the partition-wall 4, as already described. It passes from such receiving-chamber downward through the passages *z* in the feed-pipes into the lower portion of the heating-pipes *o*, where it first comes in contact with the heating-surface of such pipes. The heated gases or air from the furnace surrounds the heating-pipes, raising the temperature of the water contained therein to the boiling-point, or in excess of that, if desired. The heated water passes upward into the hot-water chamber, from which it may be drawn as desired and in which it is prevented from mingling with the feed-water, as already suggested.

The water-receiving chamber and the hot-water chamber being separated, the difference in temperature between the water passing through the feed-pipes and that passing out of the heating-pipes produces a constant circulation. The water may be heated above the temperature at which steam is produced without injury to the device.

I claim—

1. In an apparatus of the class described, the combination of metallic walls forming a receiving-chamber and a heating-chamber, a fire-box, a series of pipes arranged over such fire-box having closed lower ends and open upper ends communicating with the heating-chamber, a series of relatively long pipes having closed lower ends extending below the level of the lower ends of the pipes over the fire-box and forming supports for the receiving and heating chambers, and feed-pipes open at both ends and having their upper ends connected with the receiving-chamber and their lower ends extending into the closed pipes, respectively.

2. In an apparatus of the class described, the combination of metallic walls forming a receiving-chamber and a heating-chamber, a fire-box, a series of pipes arranged over such fire-box having closed lower ends and open upper ends communicating with the heating-chamber, a series of relatively long pipes having closed lower ends extending below the level of the lower ends of the pipes over the fire-box and forming supports for the receiving and heating chambers, feed-pipes open at both ends and having their upper ends connected with the receiving-chamber and their lower ends extending into the closed pipes, respectively, and a baffle arranged back of the fire-box and extending below the level of the lower ends of the pipes which are over the fire-box for diverting the heated gases from the fire-box downward to the lower portions of the relatively long pipes.

DANIEL SHAFFER.

Witnesses:

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CHARLES MURPHY.