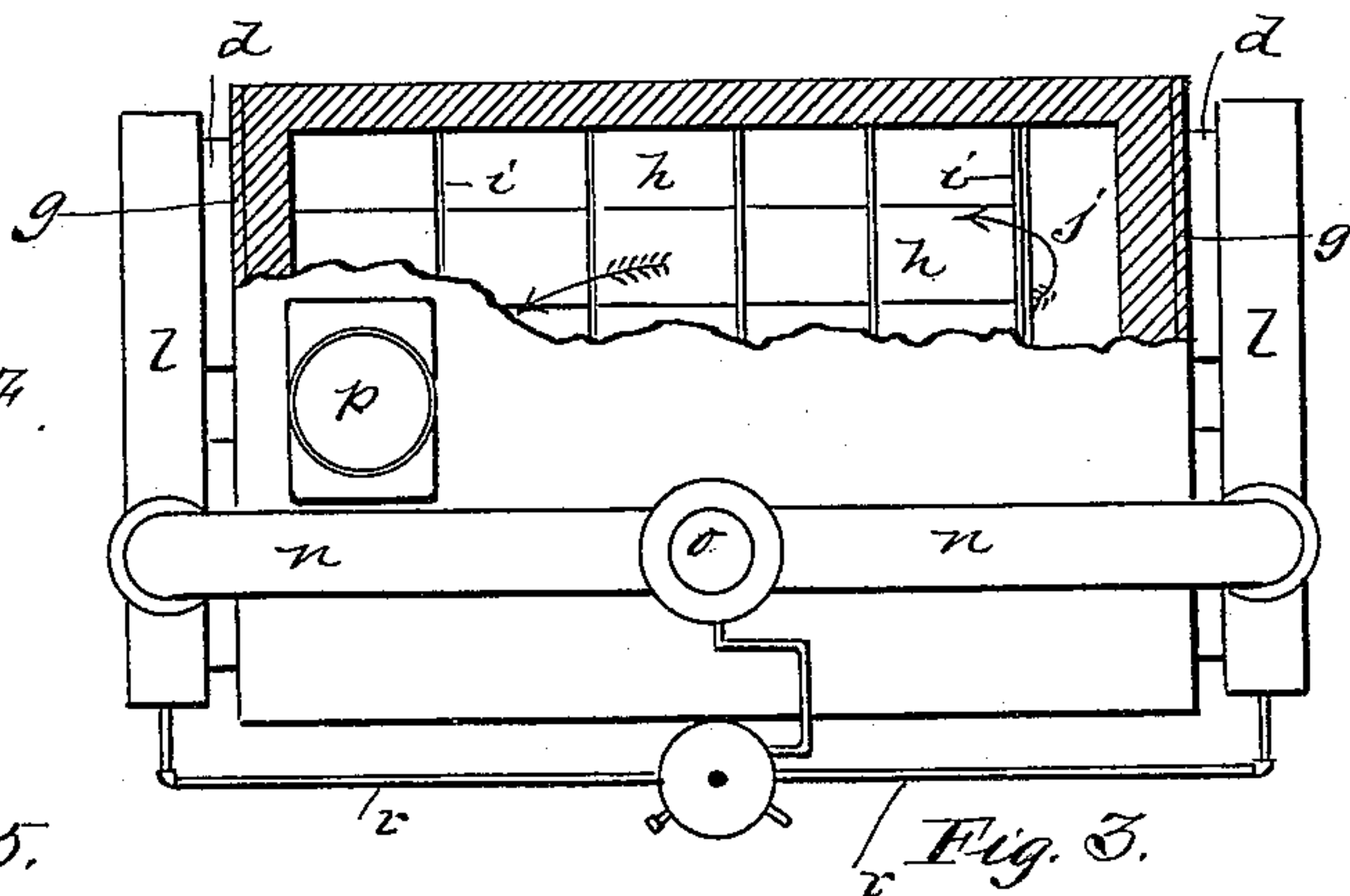
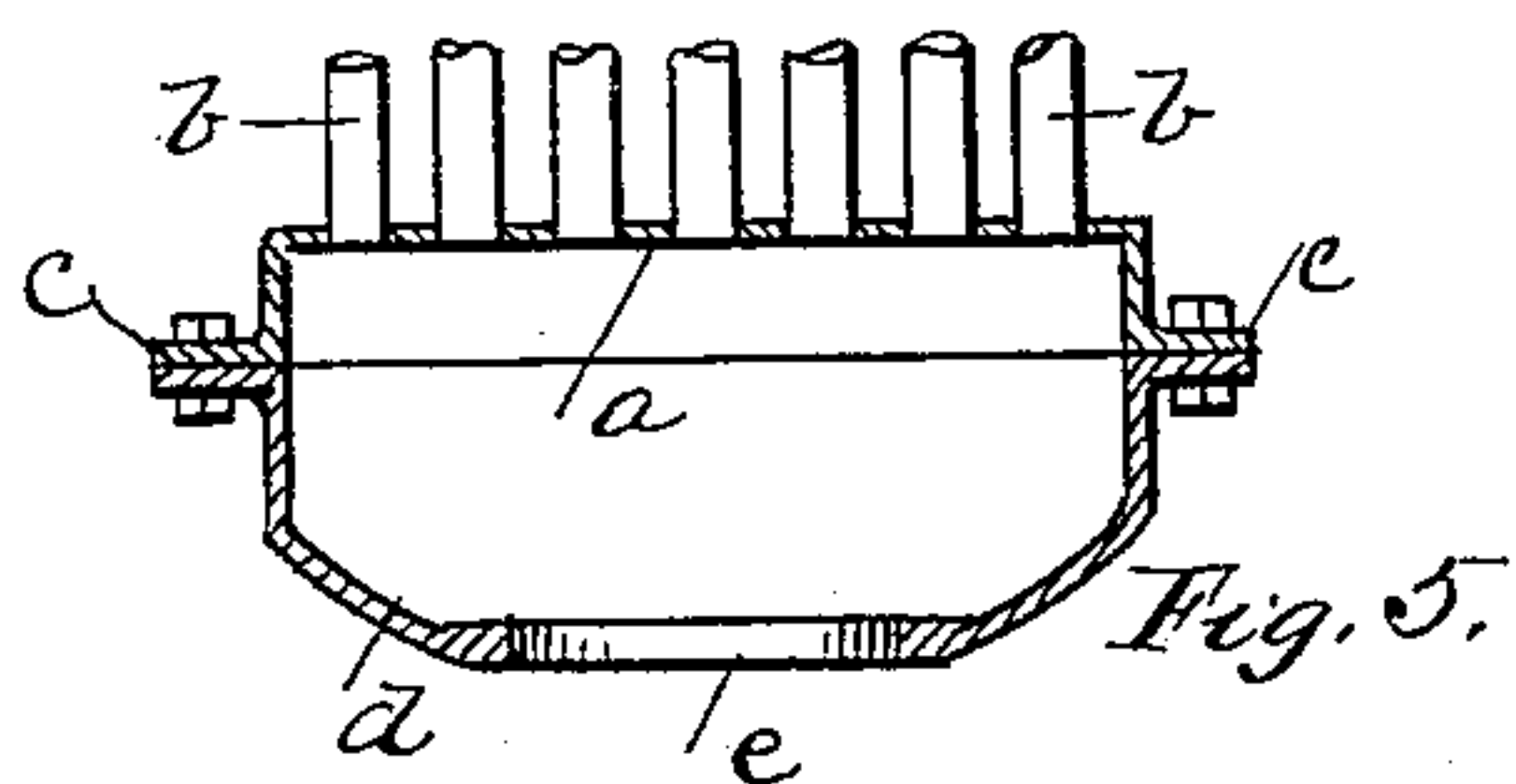
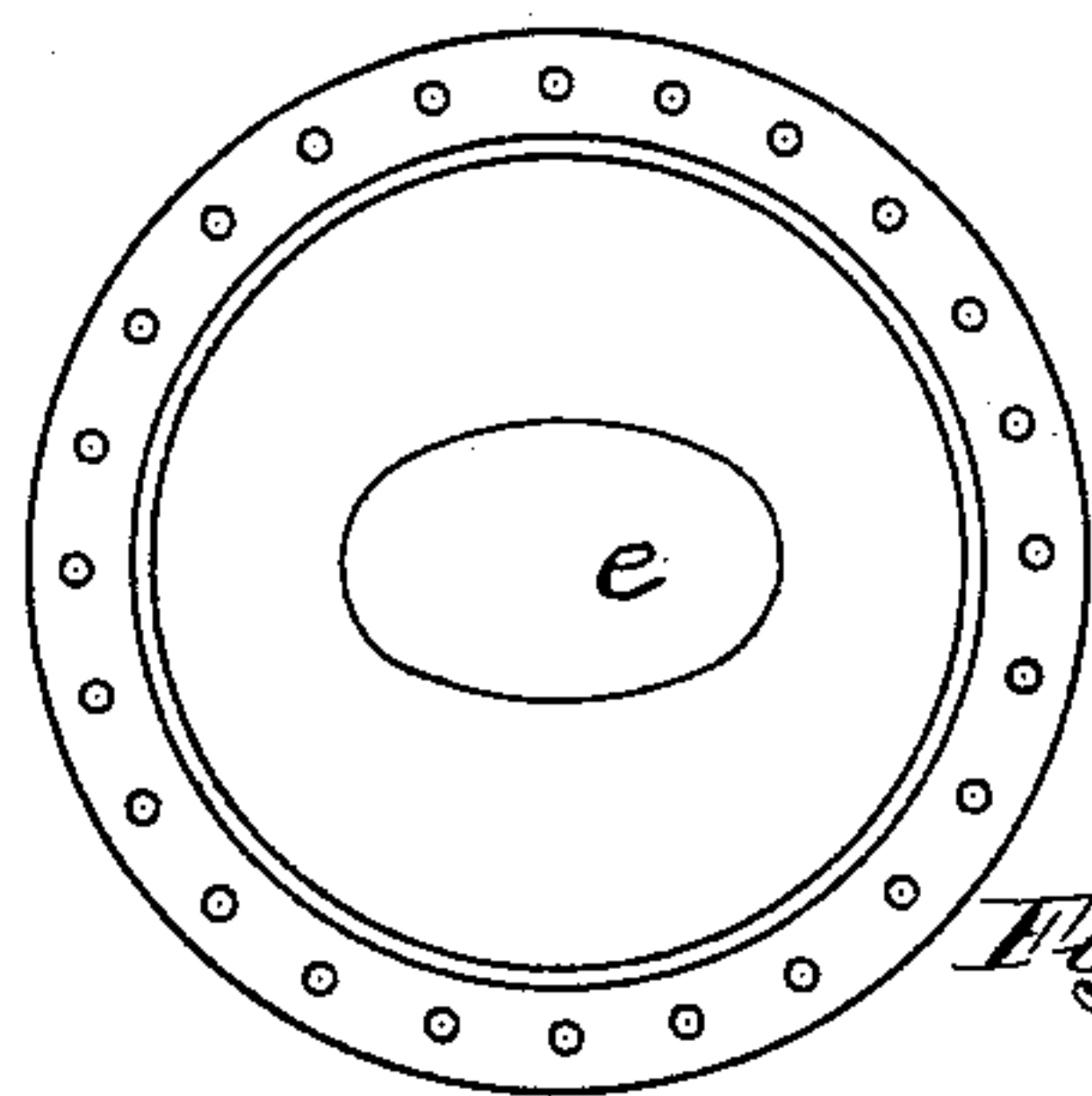
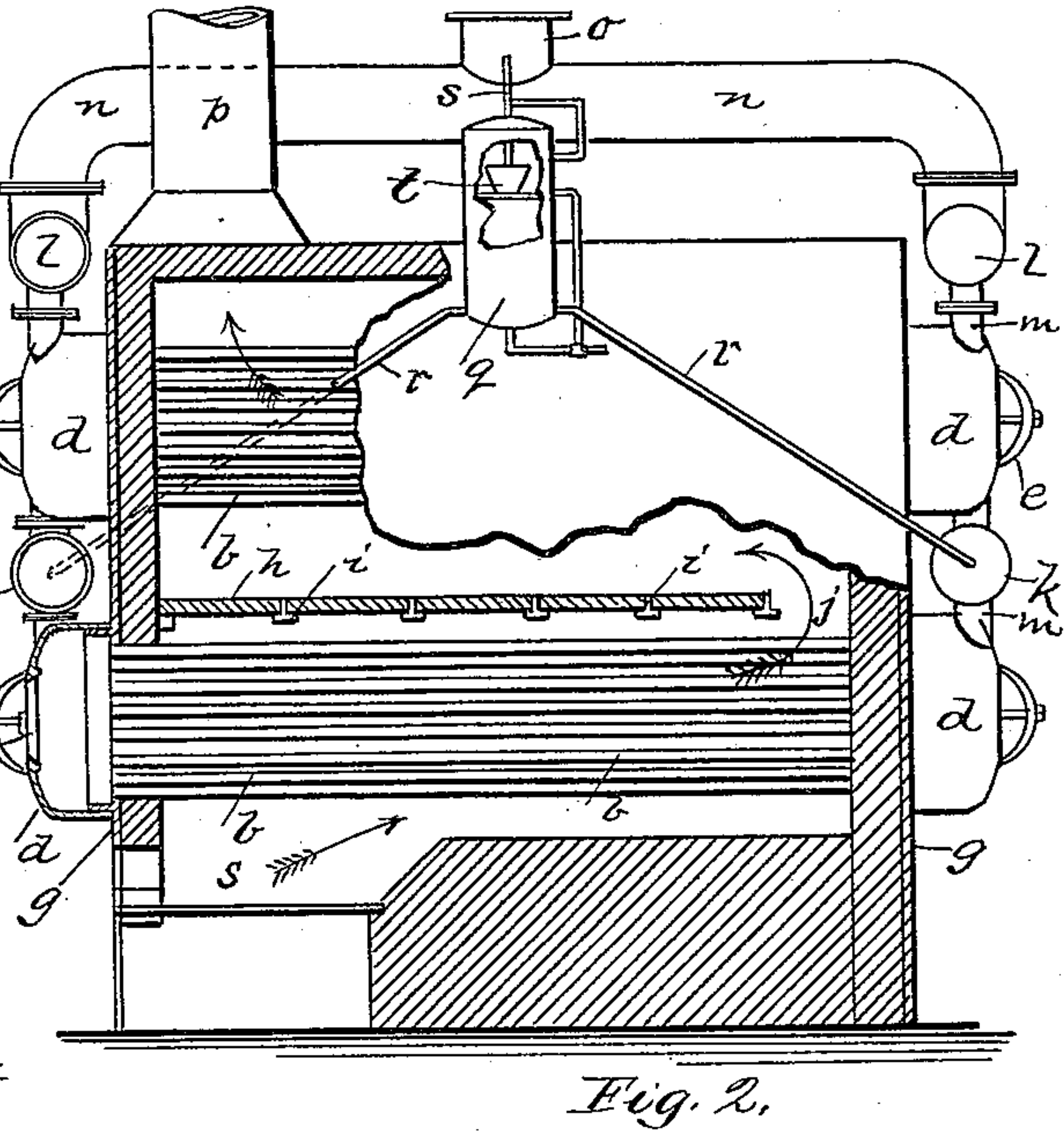
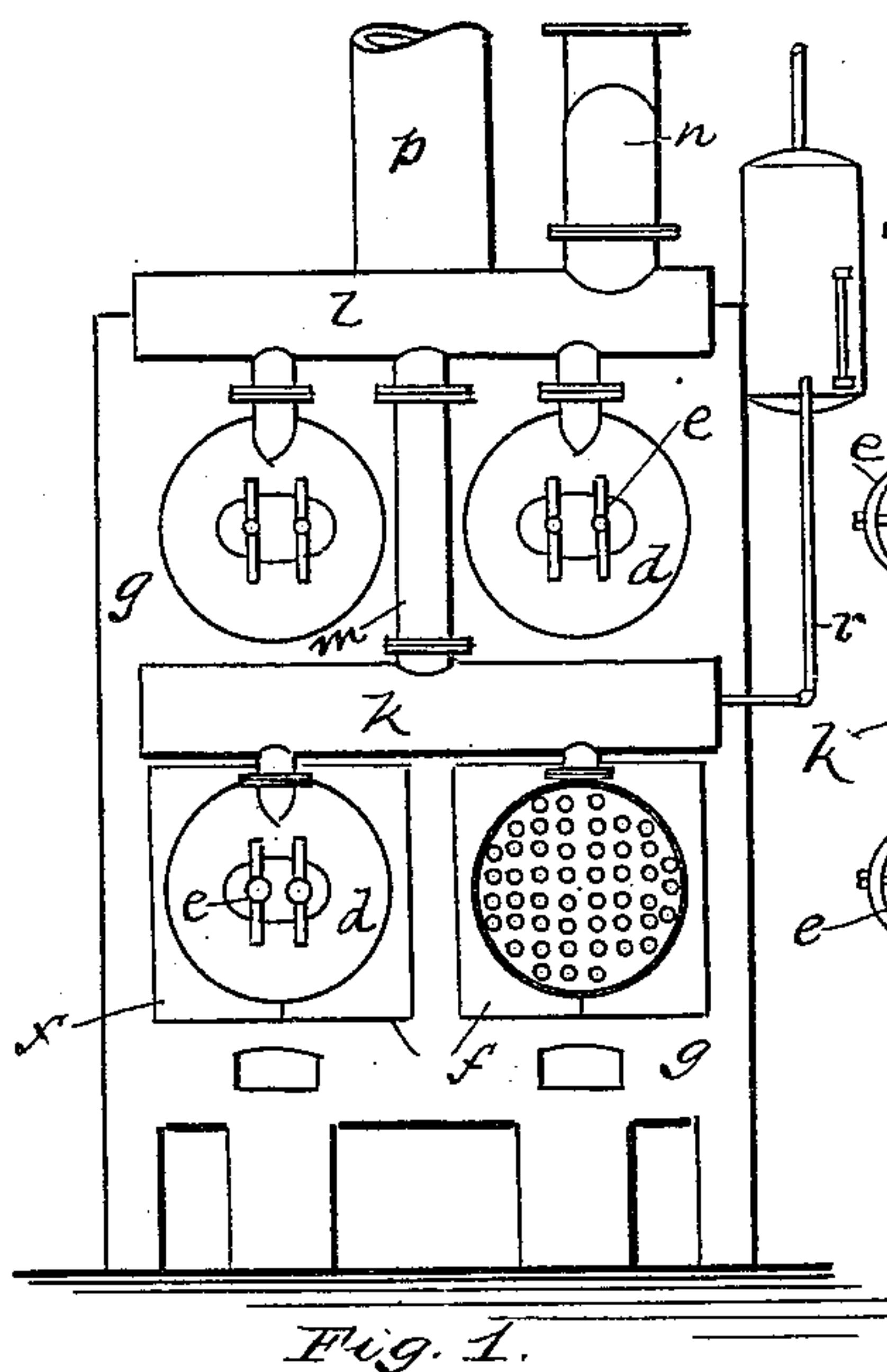


(No Model.)

B. FORD.
BOILER FOR GENERATING STEAM.

No. 449,735.

Patented Apr. 7, 1891.



Witnesses:
M. E. Harrison,
J. A. Herrow.

Inventor,
Benjamin Ford,
C. D. Lewis
Att'y.

UNITED STATES PATENT OFFICE.

BENJAMIN FORD, OF GREEN TREE, PENNSYLVANIA.

BOILER FOR GENERATING STEAM.

SPECIFICATION forming part of Letters Patent No. 449,735, dated April 7, 1891.

Application filed February 15, 1890. Serial No. 340,596. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN FORD, a citizen of the United States, residing at Green Tree, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Boilers for Generating Steam; 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 pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to an improvement in boilers for generating steam; and it consists in the peculiar construction and combination of parts, as will be fully described hereinafter.

In the accompanying drawings, Figure 1 is a front elevation of my improved boiler arrangement, in which one of the caps or water-heads is removed, showing the tubes. Fig. 2 is a sectional elevation of the same. Fig. 3 is a plan view, a part of which is in section. Fig. 4 is a face view of one of the caps or water-heads. Fig. 5 is a sectional plan view of the same.

To put my invention into practice I construct two flue-sheets *a* of suitable size and attach thereto a series of tubes *b* in a manner well known to the art. These flue-sheets *a* are each provided with outwardly-extending flanges *c* for the purpose of attaching thereto suitable water-heads *d*, which consist in a circular flanged cup-shaped piece adapted to be fitted to the heads or flue-sheets *a* of the boiler. Each of these water-heads *d* is provided with a man-hole and covering *e*, through which the flues *b* may be cleaned. Two of these tubular boilers are constructed and arranged in the setting in a manner that either one or the other may be removed and replaced by means of sectional pieces *f* set into the fire-front *g*. These boilers *b* I prefer to arrange in sets of four, two above and two below, and arrange between each pair a partition *h*, constructed of tiles arranged and supported on cross-bars *i*, and an opening *j* for the products of combustion, located at the rear in a manner that the flame, after being brought in contact with the lower pair of boilers, will pass through the openings *j* toward the front

of the boilers *b*, where any of the unconsumed gases will be again ignited, as the fire is directly beneath the draft-stack *p* and only separated by thin tile *h*, which are constantly kept at a high temperature. These several boilers are connected at their front and rear water-heads *d* by suitable horizontal and vertically-arranged pipes *k* *l*, each section of which is provided with flanges, through which bolts pass, thus affording a means for removing or detaching the several sections. Connected to the top pipe *l* at the rear and front of the boilers is a large pipe *n*, which is provided with an upwardly-projecting branch *o*, which is connected or in communication with a large steam-drum of ordinary construction.

Near the top of this boiler-setting I arrange a combined heater and filtering apparatus *q*, which I connect by two branch feed-water pipes *r*, the one leading to the rear bottom cross-pipe *k* and the other to the corresponding section *k* at the front of the boilers.

The water-supply pipe enters the top of the filter *q* and terminates in a fixed perforated vessel *t*, which is supported within the shell of the filter, containing a suitable filtering material, or otherwise constructed to retain the sediment in the water-supply; but this filter may be of any preferred construction.

In operation the products of combustion from the fire-place *s*, circulating about the tubes of the two lower boilers *b*, heat the water therein and passing through the opening *j* are brought in contact with the tubes of the upper boilers *b* and thence into the draft-stack *p*. The cold water entering the combined heater and filter *q* is brought to a high temperature before entering the lower boilers, and the steam generated from the said boilers conducted into a steam-drum attached to the branch *o*.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sectional boiler, the combination of the upper and lower sets of boilers, each having the flue-sheet *a*, a series of tubes, and the removable heads *d*, which inclose said tubes and are secured to the flanges *c* on the flue-sheets, the horizontal transverse pipes *k* *l*, connected, respectively, to the heads of the

lower and upper sets of boilers, the vertical pipes *m*, connected to the horizontal pipes *k l*, a longitudinal horizontal pipe *n*, connecting the upper transverse pipes *ll* at the front and rear of the boiler, and the sectional tile partition between the upper and lower sets of boilers, whereby upper and lower chambers are provided and the combustion of the upper chamber is promoted by heat from the lower chamber transmitted through the partition or tile, substantially as described.

2. A boiler-setting consisting of the fireplace *s*, the tubular boilers *b b*, arranged in sets or pairs, the one set above the other, and separated by a partition-wall *h*, the opening *j*, the connecting-pipes *k l n*, and the combined heater and filter *q*, substantially as described.

3. In a steam-boiler, the combination, with a boiler-setting, a combustion-chamber, and a horizontal tile partition arranged a suitable

distance above said chamber and forming a continuous passage for the products of combustion, of the water-heads fixed in the front and rear walls of the boiler-setting above and below the tile partition, the nests or series of horizontal water-tubes which communicate with the water-heads, two or more of said nests of tubes being respectively arranged above and below said tile partition, and the water-circulation pipes outside of the boiler-setting, which connect the water-heads in series, substantially as herein shown and described.

In testimony that I claim the foregoing I hereunto affix my signature this 23d day of January, A. D. 1890.

BENJAMIN FORD. [L. S.]

In presence of—

C. C. LEE,

M. E. HARRISON.