

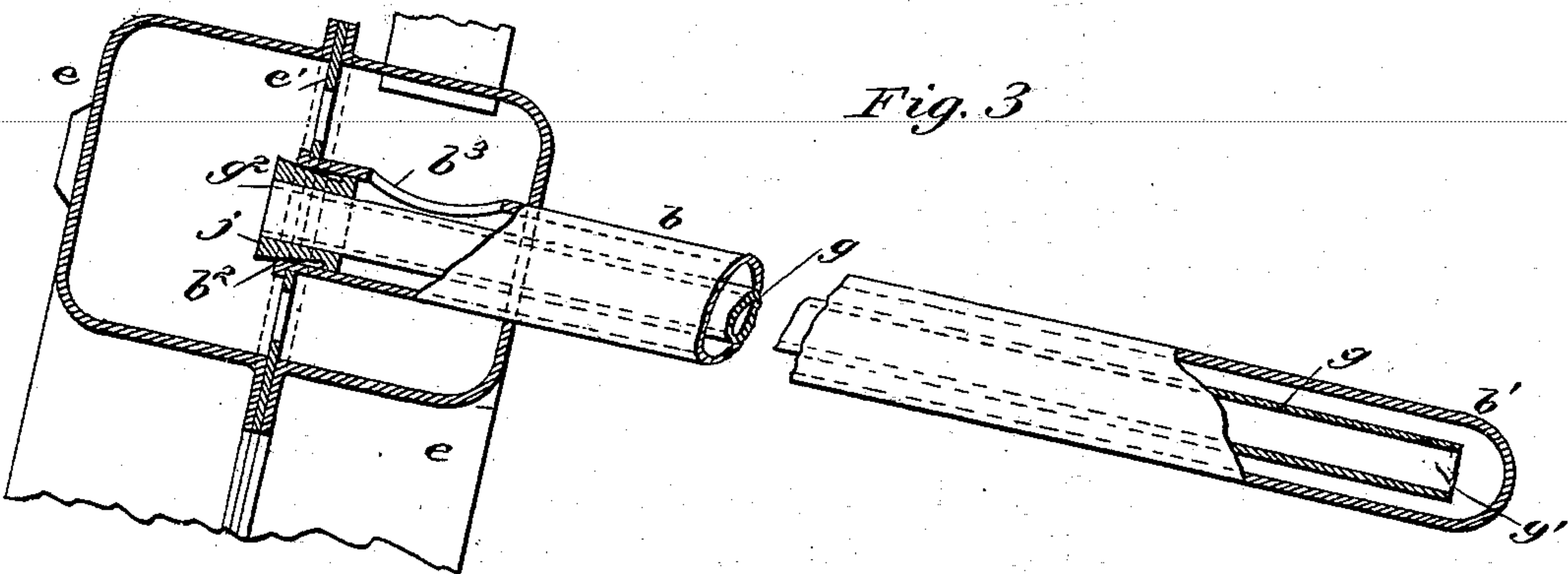
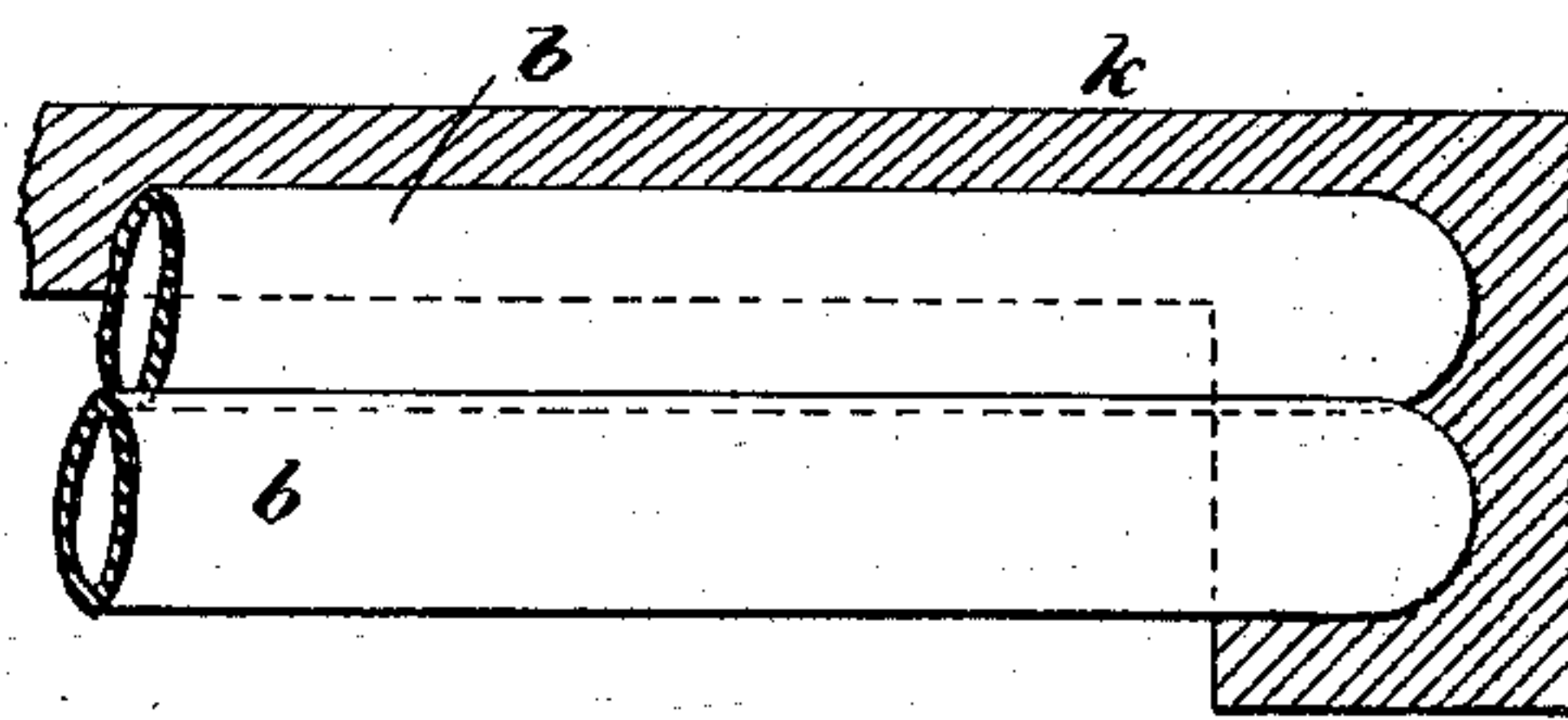
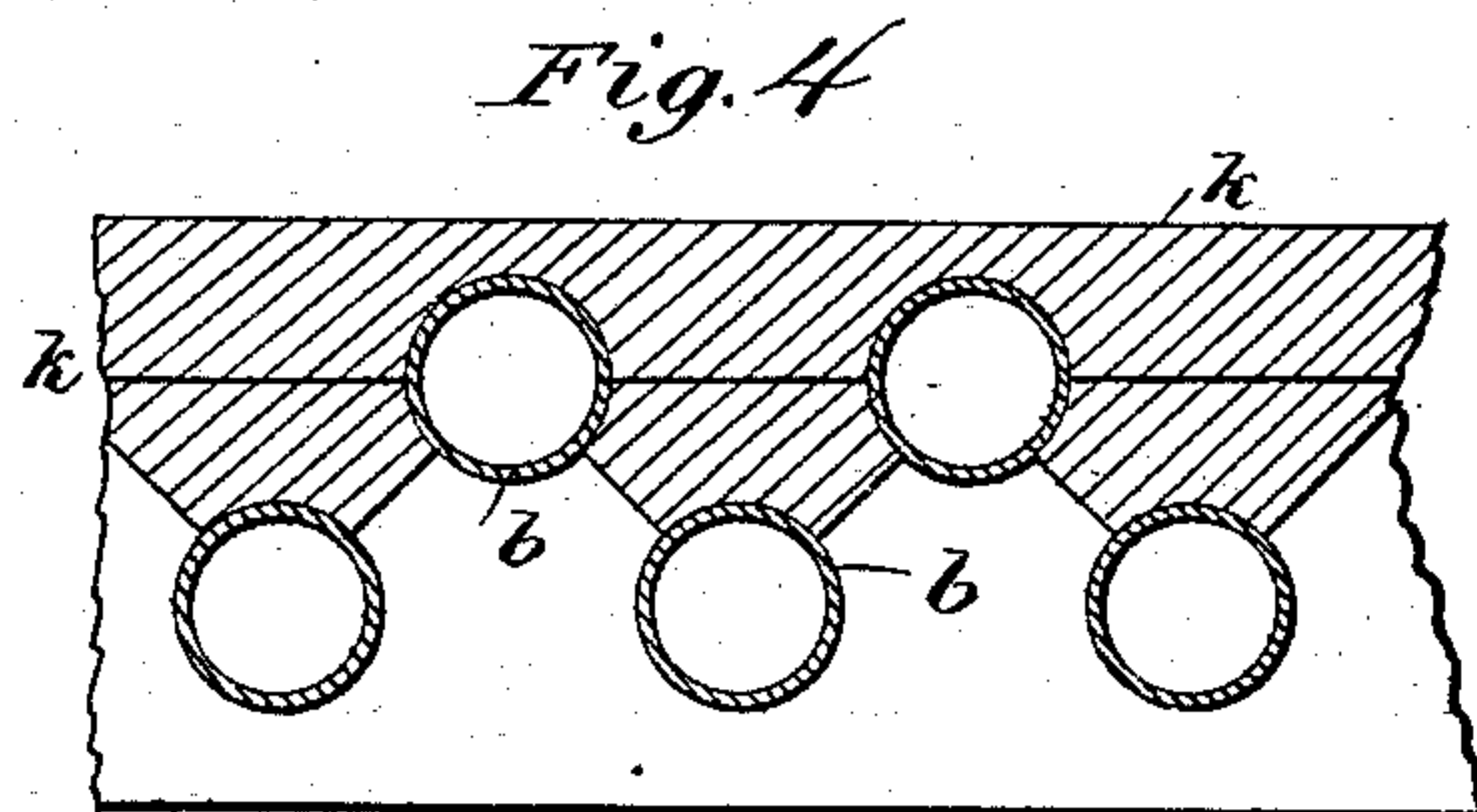
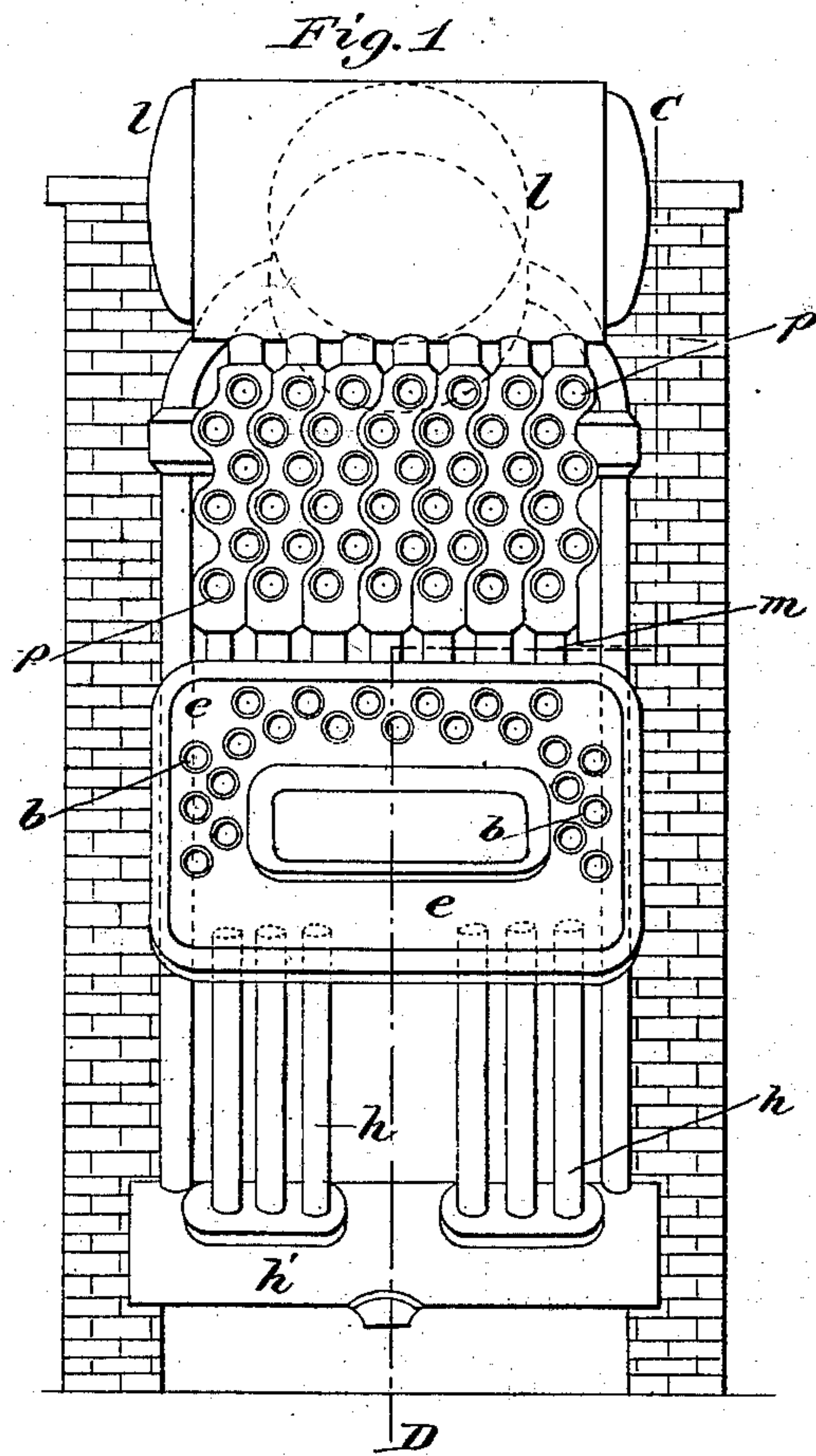
(No Model.)

3 Sheets—Sheet 1.

J. E. GRETTY,
STEAM BOILER.

No. 503,700.

Patented Aug. 22, 1893.



Witnesses
J. F. Coleman
E. A. Finckel

Inventor
John Edward Gretty
by *W. H. Finckel*
his atty.

(No Model.)

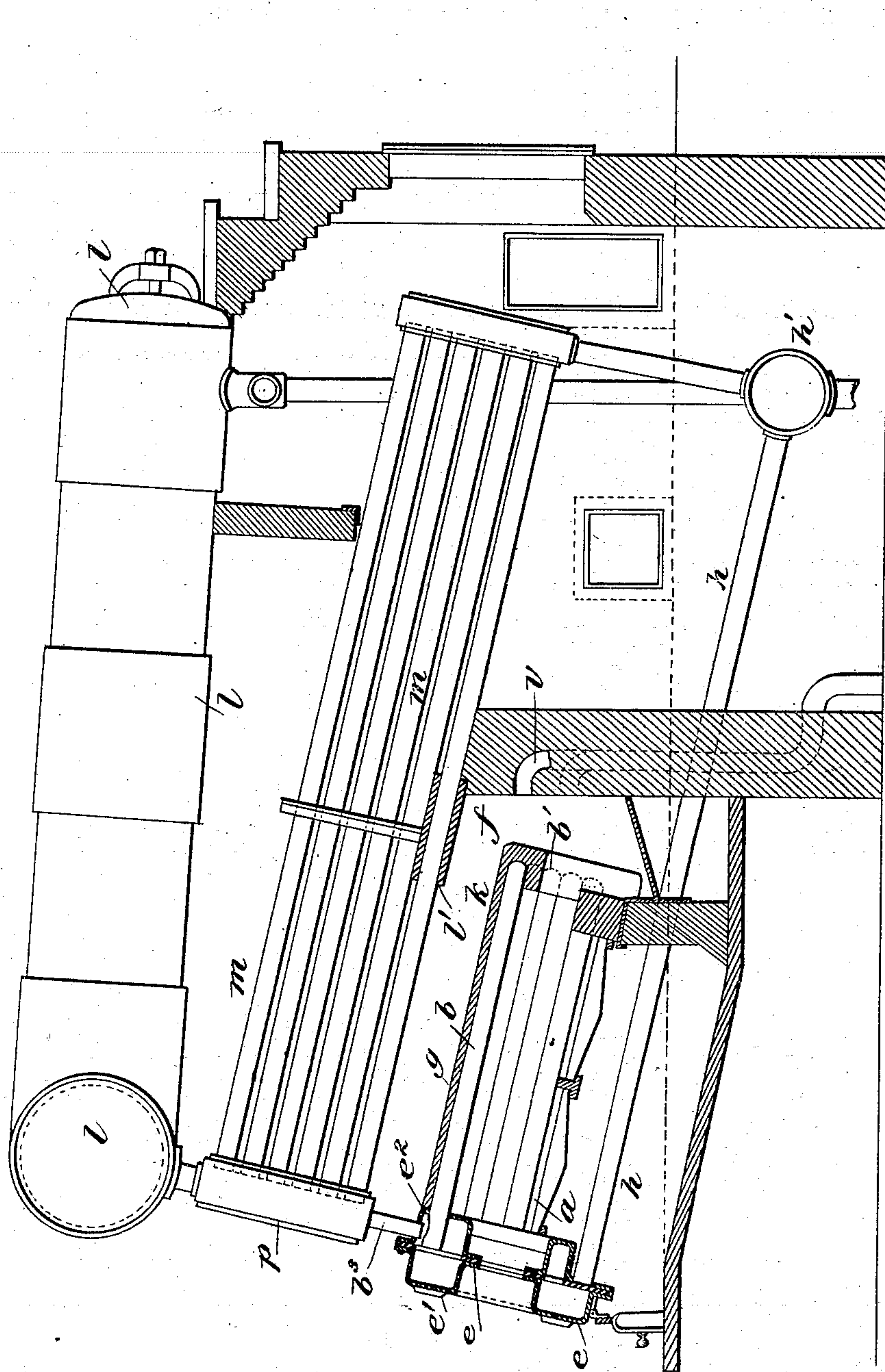
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STEAM BOILER.

No. 503,700.

Patented Aug. 22, 1893.

Fig. 2



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(No Model.)

3 Sheets—Sheet 3.

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Fig. 6

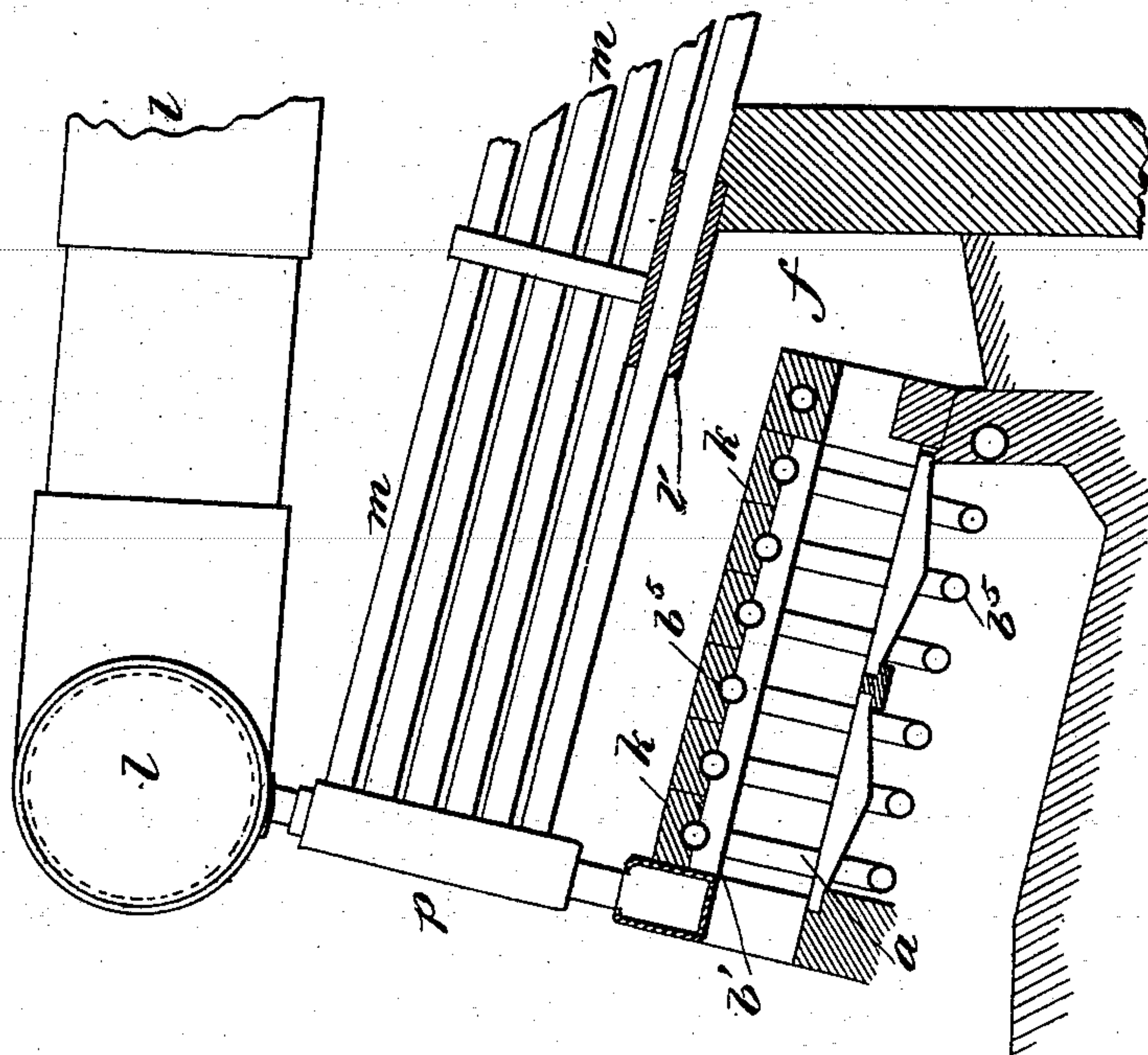
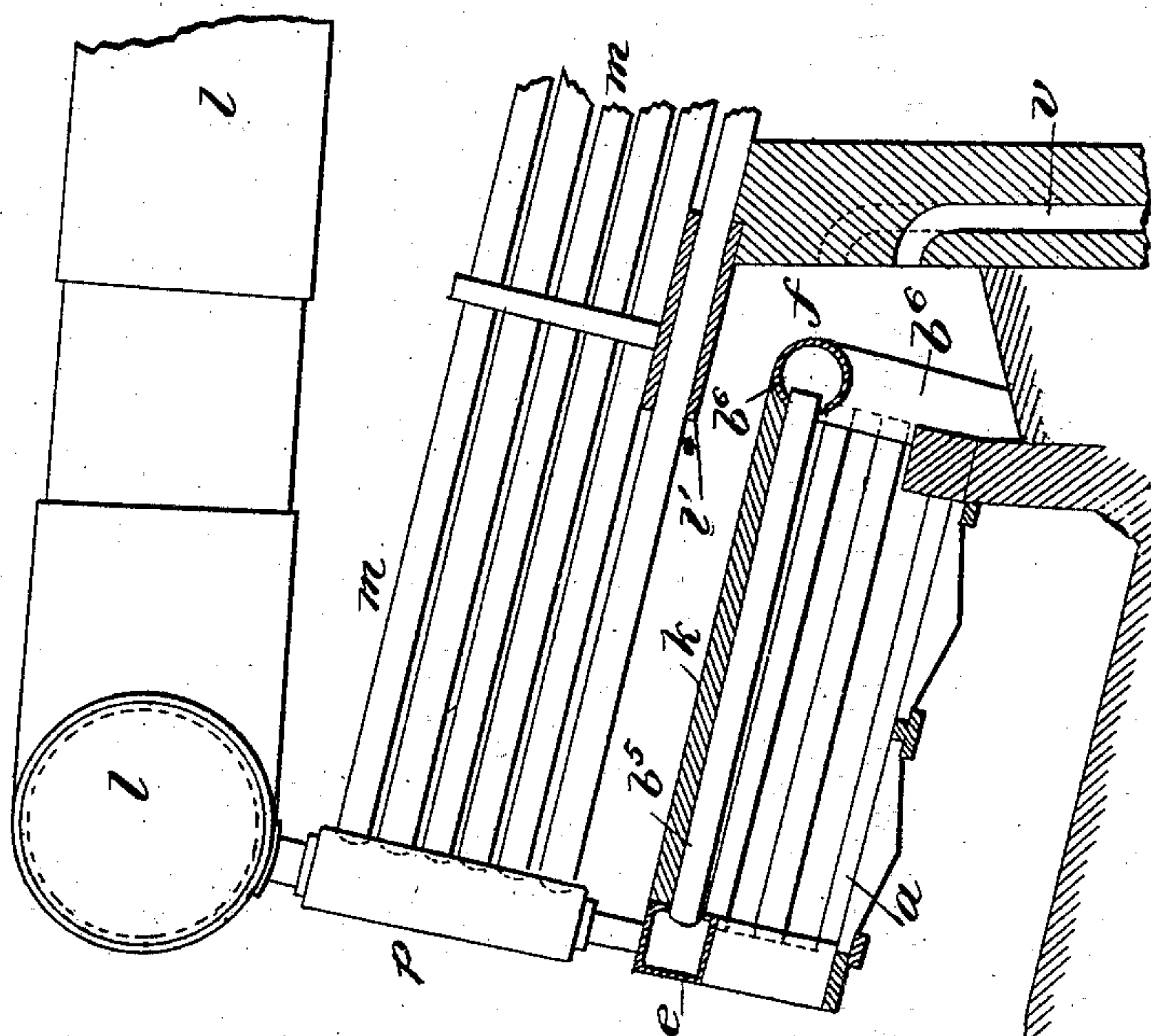


Fig. 5



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his atty.

UNITED STATES PATENT OFFICE.

JOHN EDWARD GRETTY, OF MANCHESTER, ENGLAND.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 503,700, dated August 22, 1893.

Application filed March 21, 1892. Serial No. 425,866. (No model.)

To all whom it may concern:

Be it known that I, JOHN EDWARD GRETTY, a subject of the Queen of Great Britain, residing at Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in or Relating to Steam-Boilers, of which the following is a full, clear, and exact description.

My invention relates principally to water tube steam boilers, but is also applicable to other forms of steam boilers, and consists in the employment either of single tubes arranged so that the flame from furnace passing from the under side round the rear ends of tubes, is conducted along the upper or opposite side of said tubes, or of a series of double tubes, arranged so as to encircle the furnace in any position most suitable to the form of boiler to which my invention may be applied, said double tubes being constructed by forming an outer tube which is closed at one end and open at the other, and inserting therein an inner tube of smaller diameter, that is open at both ends, and with a space between said inner and outer tubes, for purposes hereinafter described.

The objects of this invention are to secure better combustion of the fuel, to prevent the production of smoke, to secure an efficient use of the radiated heat from the fuel while in combustion for the production of steam, instead of being wasted through brick walled furnaces, and to secure economy in the use of fuel. I attain these objects by the means hereinafter described and as illustrated in the accompanying sheets of drawings.

In the several views shown therein similar letters refer to similar parts.

Figure 1 represents an end view and Fig. 2 a longitudinal section on line CD of a boiler constructed according to this invention and as is hereinafter described. Fig. 3 is a sectional elevation, partly mutilated, and on a larger scale, of the double tube and steam and water box. Fig. 4 shows in cross section and longitudinal section, the combination of the tubes and fire bricks. Fig. 5 shows my invention as practiced with a series of longitudinal single tubes, and Fig. 6 shows it as embodying a series of transversely placed single tubes.

In Figs. 1 and 2 I have shown my invention applied to a boiler of the ordinary water tube

type, a series of the aforesaid double tubes *b* being placed above and on either side of the furnace *a* in a longitudinal direction. This series of double tubes is shown bottle shaped, or tubes in which one of the ends *b'* is closed, and the other end *b²* is open; the open ends *b²* of said tubes are attached to, and terminate in a steam and water box *e*, the closed rear ends *b'* extending into the combustion chamber *f*. I attach the tubes *b* to the steam and water box *e* by carrying the open ends *b²* through steam and water box and attaching said open ends to the plate *e'* thereby obtaining additional security and support, but in order that the circulation may not be altered or affected thereby and may continue the same as if said open ends of tubes *b* were attached to the back plate *e²* of the steam and water box *e*, I form apertures *b³* in those portions of the tubes that are within the box *e*. Within each of said bottle shaped tubes *b* I place a tube *g* as shown in Fig. 3, which represents the tube *b* and part of the water box *e* drawn to an enlarged scale. The tube *g* is of a smaller diameter than the internal diameter of the tube *b* so as to form a space between the outside of the tube *g* and the inside of the tube *b*: said tube *g* extends at its rear end *g'* to within a short distance of each of the closed ends *b'* of the aforesaid bottle shaped tubes *b*; the front ends *g²* are passed through the steam and water box *e* and extending beyond the apertures *b³* of the bottle shaped tubes, terminate in and are connected to the water box or slab *e*, by means of the neck *j* which is taper shape and inserted and pressed into the end of the tube *b* that is attached to the plate *e'* of water box as herein before described.

I construct the steam and water box *e* either of the shape shown on drawings, or circular, semicircular, or other preferred form.

I close the spaces between the outer row of tubes *b* surrounding furnace by means of suitably shaped fire bricks *k* as shown in Fig. 4 in order to confine and direct the hot gases along said tubes on the inner or furnace side, into the combustion chamber *f*, where they pass around the closed ends of the aforesaid tubes *b*, from whence they are deflected and directed by the fire bridge *l'* over the sides of the tubes farthest from the furnace, and

passing in an upward or forward direction circulate through the inclined water tubes forming boiler.

I place beneath the ordinary fire bars of furnace in a longitudinal direction as shown in Fig. 2, a convenient number of tubes *h*, the front ends of which I connect to the aforesaid water box or slab *e* and the rear ends of said tubes to a mud drum *h'* placed at rear end of boiler.

I connect the upper part of steam and water box *e* to a steam and water drum *l* placed above the series or nest of inclined tubes *m* which form the boiler, by the use either of vertical tubes or by a slab, or by headers *p* as shown on drawings to which the front ends of aforesaid inclined tubes *m* forming boiler are attached or connected. By these means, the circulation is carried from the rear end of boiler along the tubes *h* connecting the mud drum *h'* with the bottom part of water box or slab *e*, entering therefrom into the tubes *g* that are placed within the bottle shaped tubes *b*, extending over and on each side of furnace, passing from thence into the closed or rear ends *b'* of the tubes *b* and returning along the space that is formed between the inner and outer tubes, into the steam and water box *e* at front of boiler and from thence either through the aforesaid vertical tubes, or slabs, or through the headers *p*, into the upper steam and water drum *l*.

If in addition to the hereinbefore described double tubes *b* extending over and around furnace, a row of like tubes are used under the furnace so as to entirely incase the furnace, I place the tubes *h* connecting mud drum with the front water box *e* either on each side of furnace or in other convenient position.

Fig. 5. represents a series of single tubes *b⁵* placed in a longitudinal position over and on each side of furnace *a*, and may also be placed underneath said furnace if desired, terminating in a header *b⁶*, the spaces between the outer sides of said tubes being closed by suitably shaped fire bricks in the manner hereinbefore described.

Fig. 6. represents a series of single tubes *b⁵* placed transversely around furnace with their ends connected to a header *b⁷*, placed over center of furnace, the spaces on outer sides of said tubes being filled in with fire bricks *z* as hereinbefore described. The central header and the end tubes of the series nearest the combustion chamber *f* are also incased with fire brick.

To assist secondary combustion I may form openings *v*, see Fig. 2, in the fire bricks forming combustion chamber or the fire bridge, through which hot air may be passed to mix

with the gases and the flame from the furnace.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In water tube or other forms of steam boilers, a series of double tubes composed of an outer tube closed at one end and open at the other and a smaller inner tube open at both ends, placed in a longitudinal direction over or surrounding the furnace, with their front ends connected to a water box, slab or header, and their rear ends extending into a combustion chamber formed between the ends of tubes and fire brick wall, the spaces between the outer sides of said tubes being filled in with suitably shaped fire bricks all combined and arranged substantially as set forth in order that the flames from the furnace may be caused to pass along the under or inner side, round the rear ends of said tubes and return along the opposite sides thereof in the manner and for the purpose substantially as herein before described.

2. In a water tube or other form of steam boiler, a series of tubes placed in a longitudinal direction over or surrounding the furnace that is to say, above and on each side thereof with their front ends connected to a water box, slab or header, and their rear ends extending into a combustion chamber, and connected to a header of any convenient shape, the spaces between the outer sides of said tubes being filled in with suitably shaped fire bricks all combined and arranged substantially as set forth, in order that the flames from the furnace may be caused to pass along the under or inner side round the rear ends of said tubes, and return along the opposite sides thereof for the purpose and in the manner substantially as herein before described.

3. In a water-tube or other form of steam boiler, the combination with the combustion chamber, of tubes arranged above and on each side of such chamber and extending into the same and terminating in a header, fire-brick inserted in and filling the spaces between the outer sides of said tubes, and a fire-bridge arranged at the rear of and above the combustion chamber and beneath the boiler, all arranged substantially as described, so that the flames from the furnace shall pass along the under side and around the rear portion of said tubes and along the opposite side thereof, in the manner and for the purpose set forth.

In testimony whereof I have hereunto set my hand this 7th day of March, A. D. 1892.

JOHN EDWARD GRETTY.

Witnesses:

LEONARD H. DEAN,
THOMAS PRESCOTT.