

No. 619,413.

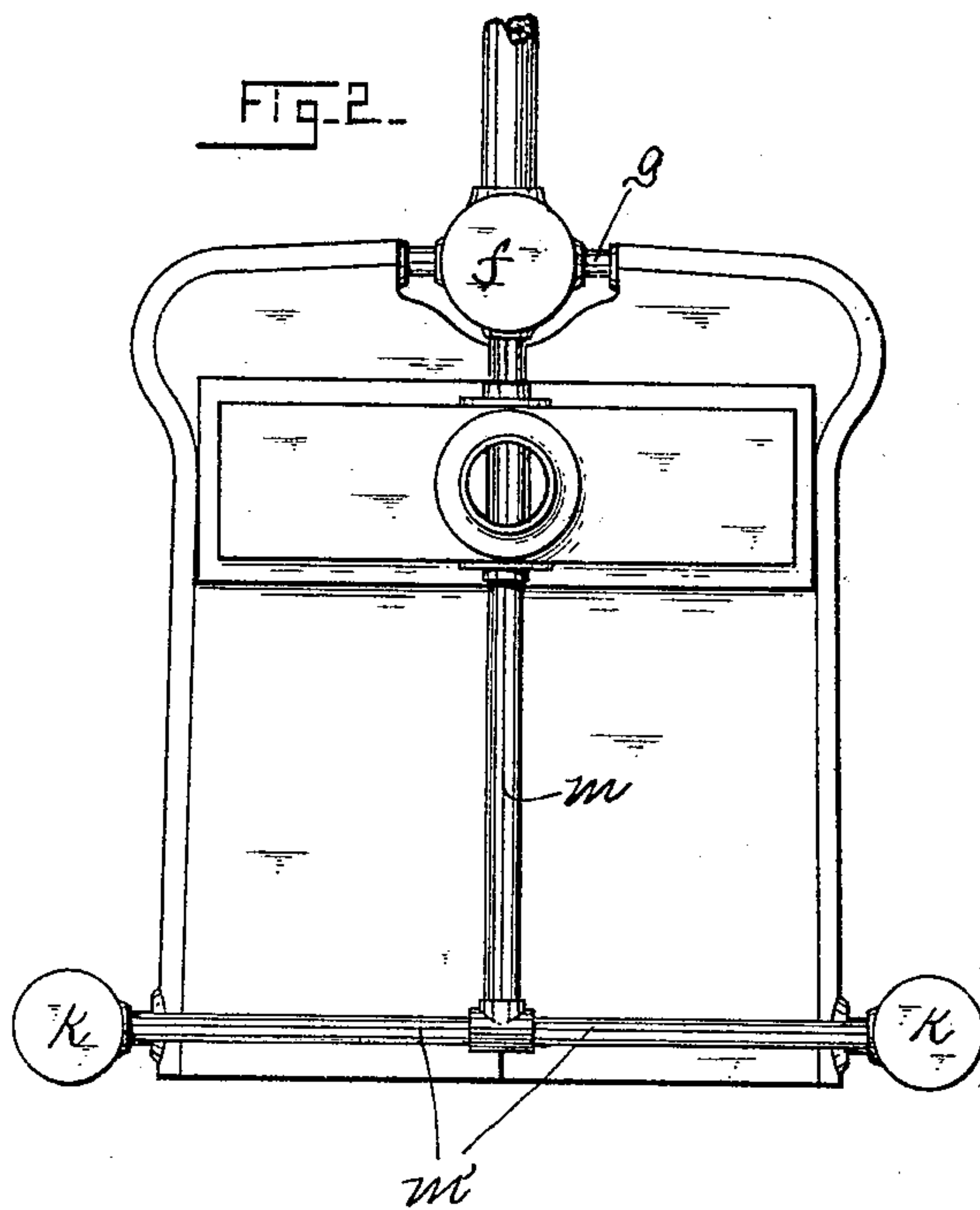
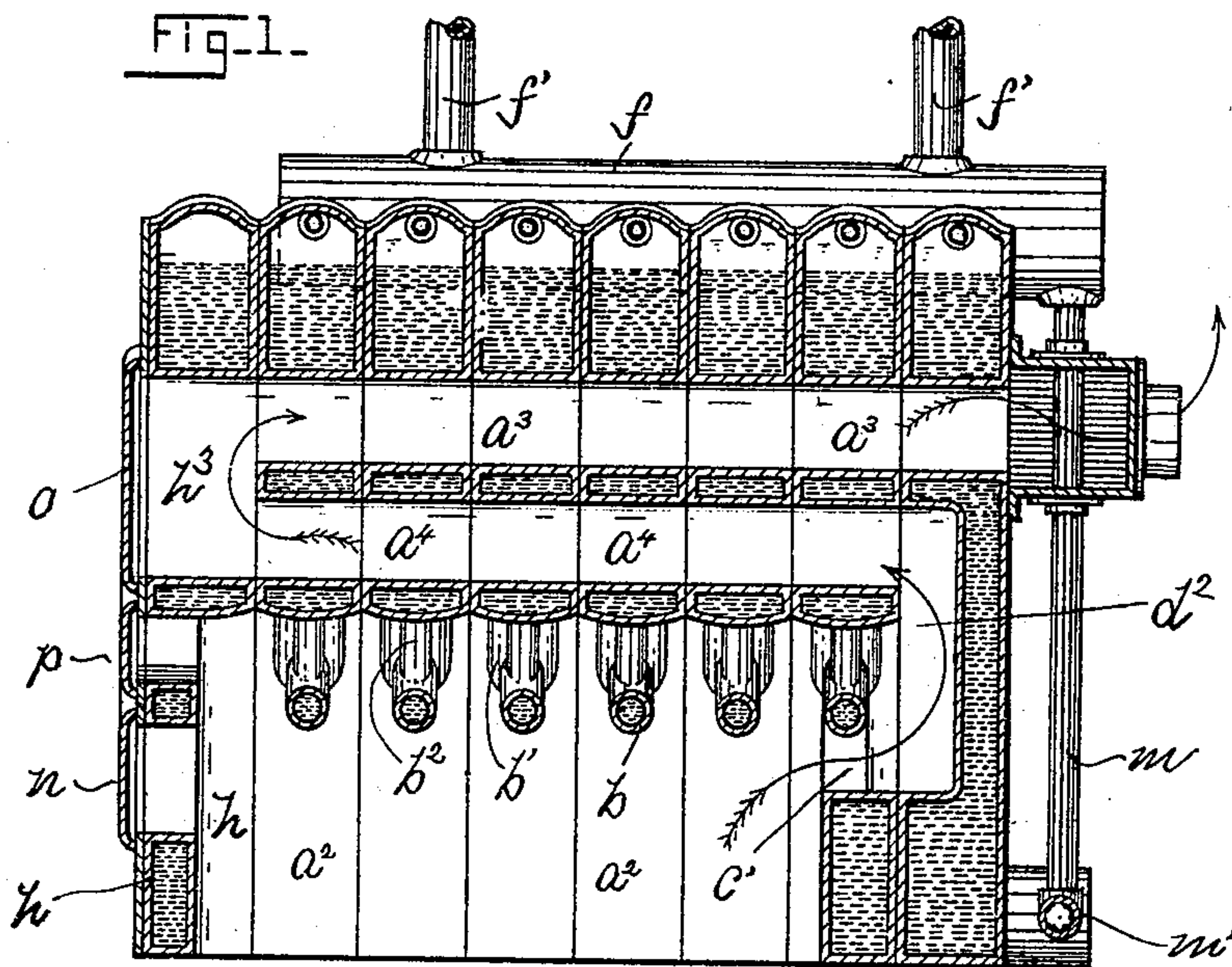
Patented Feb. 14, 1899.

W. C. HIGGINS.
STEAM GENERATOR AND HOT WATER HEATER.

(Application filed Apr. 13, 1898.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES

George M. Luther.
May F. Ritchie.

INVENTOR

Walter C. Higgins,
BY
Frank H. Allen,
ATTORNEY.

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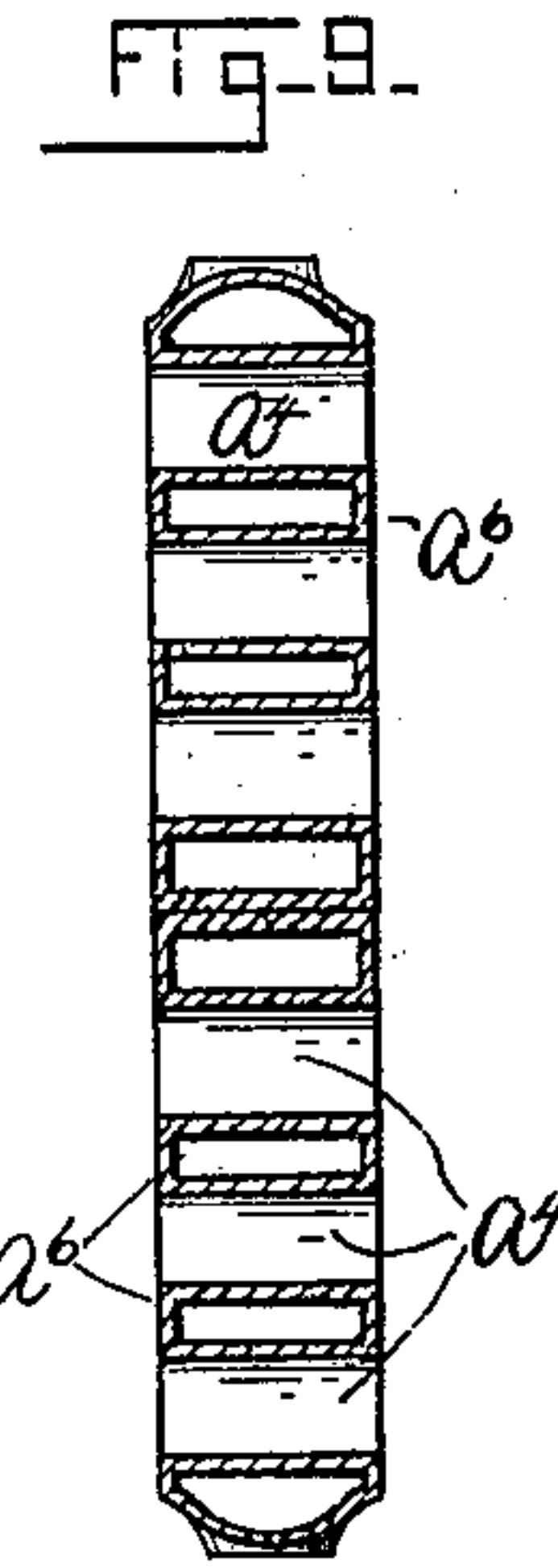
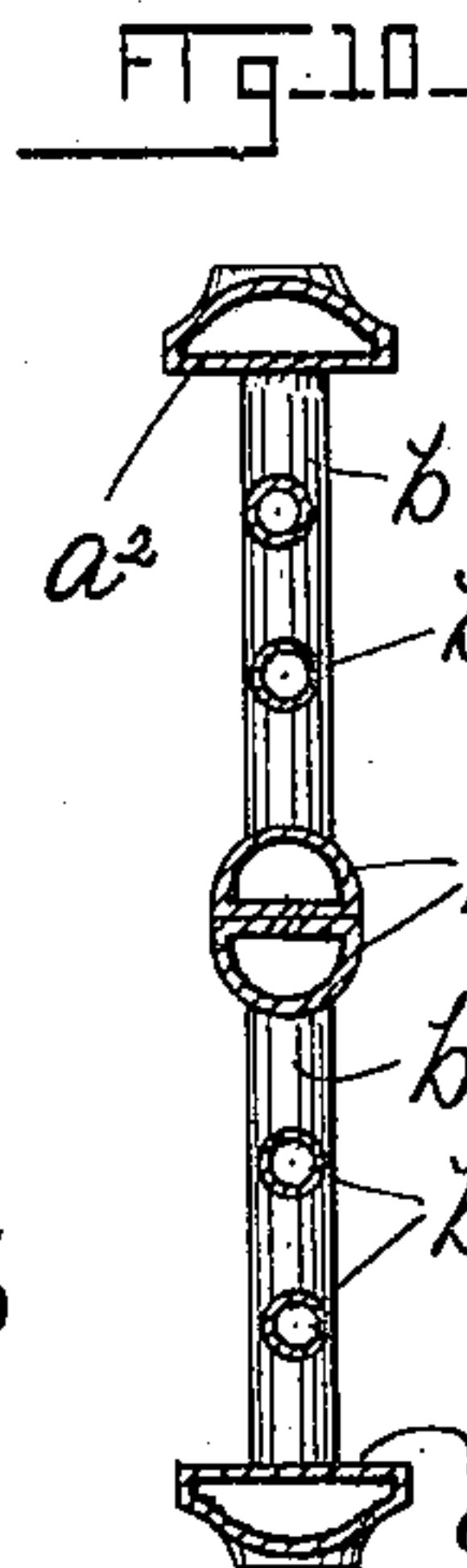
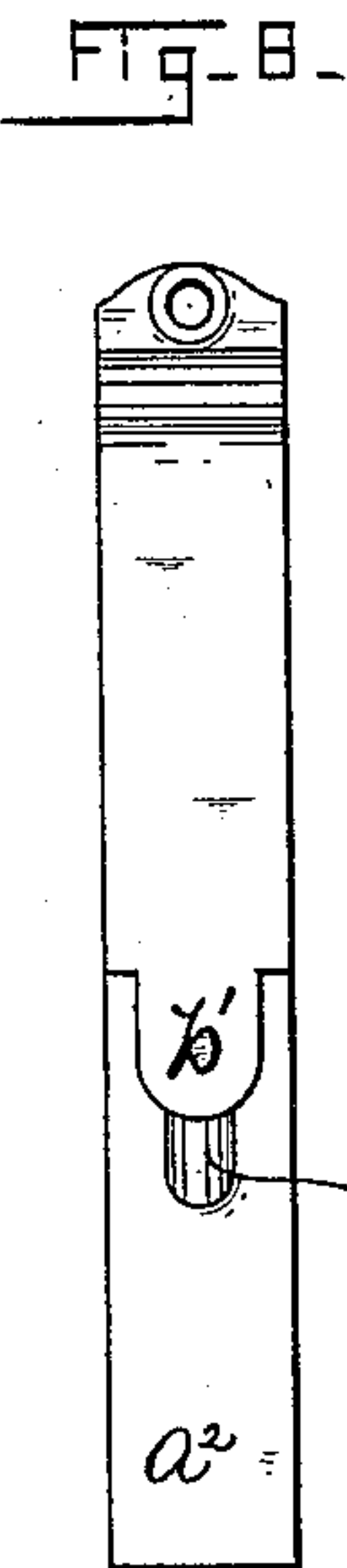
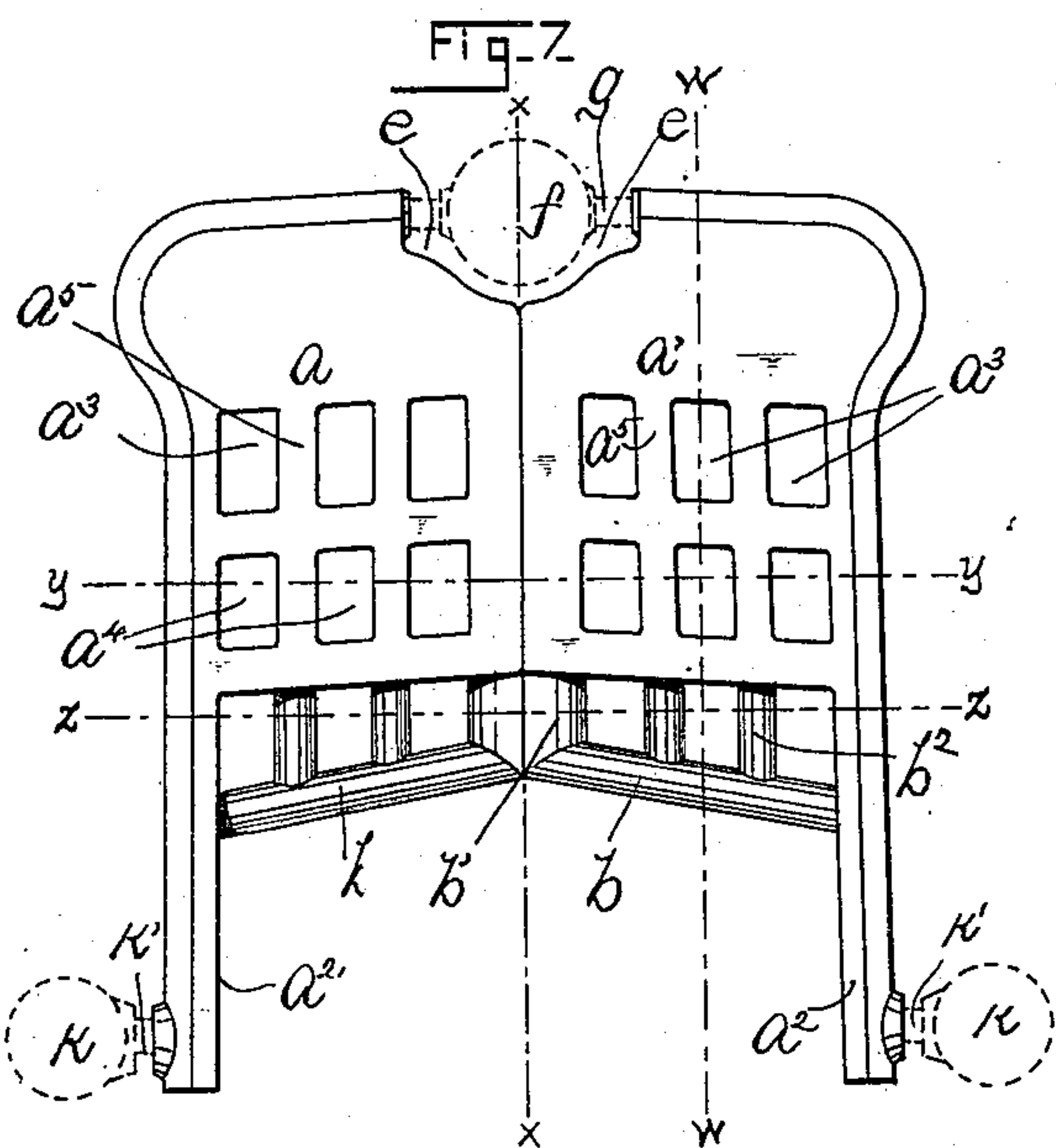
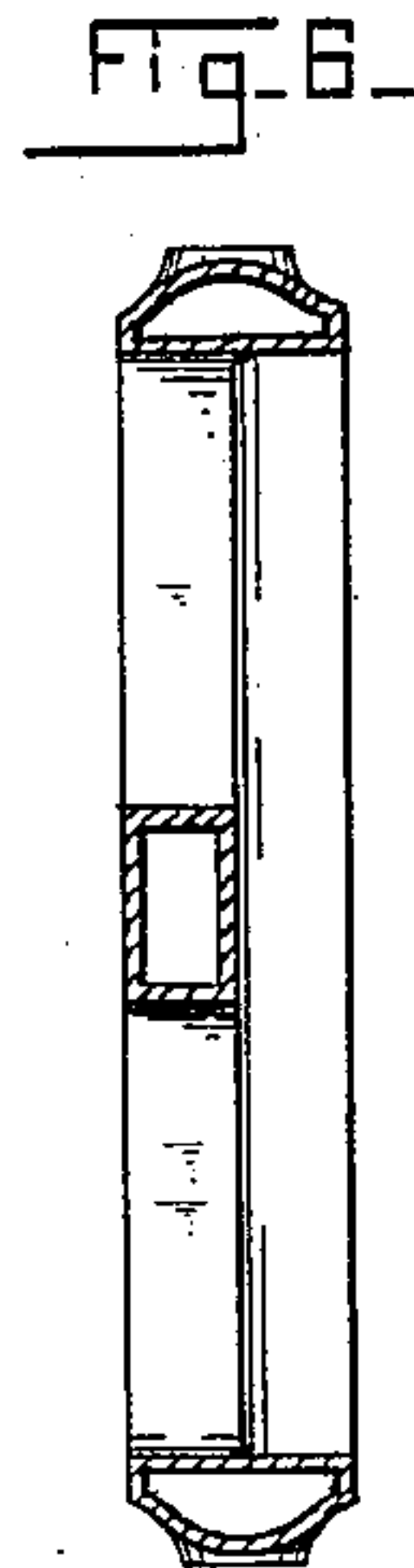
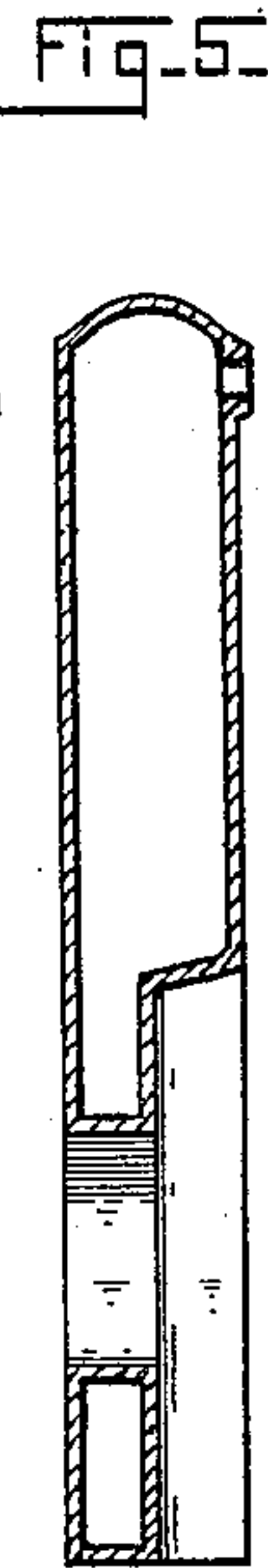
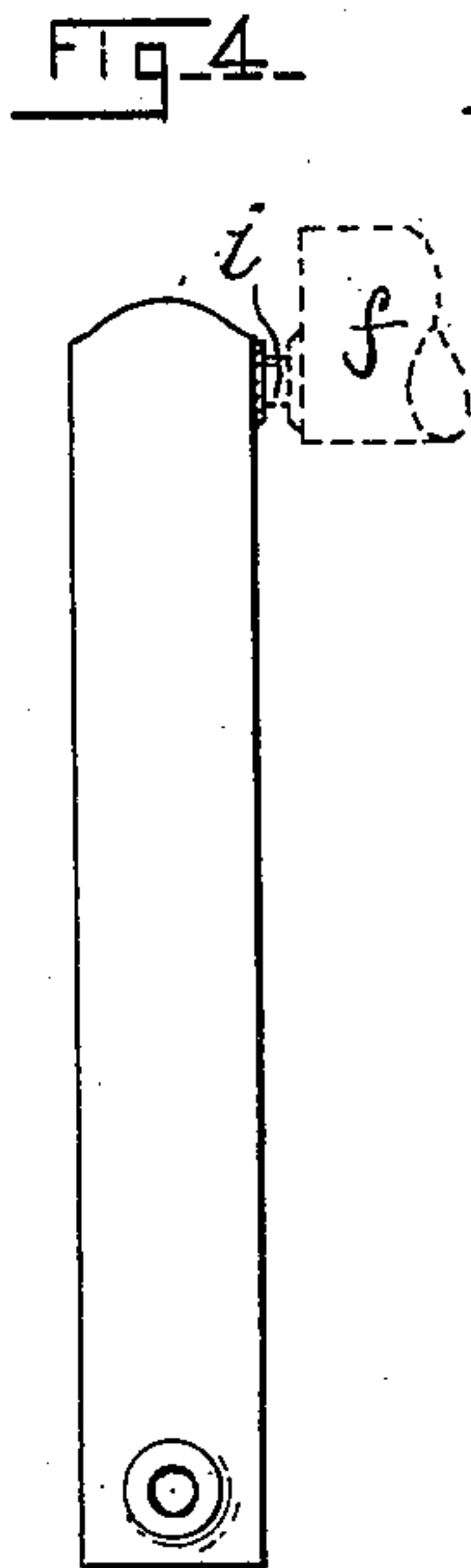
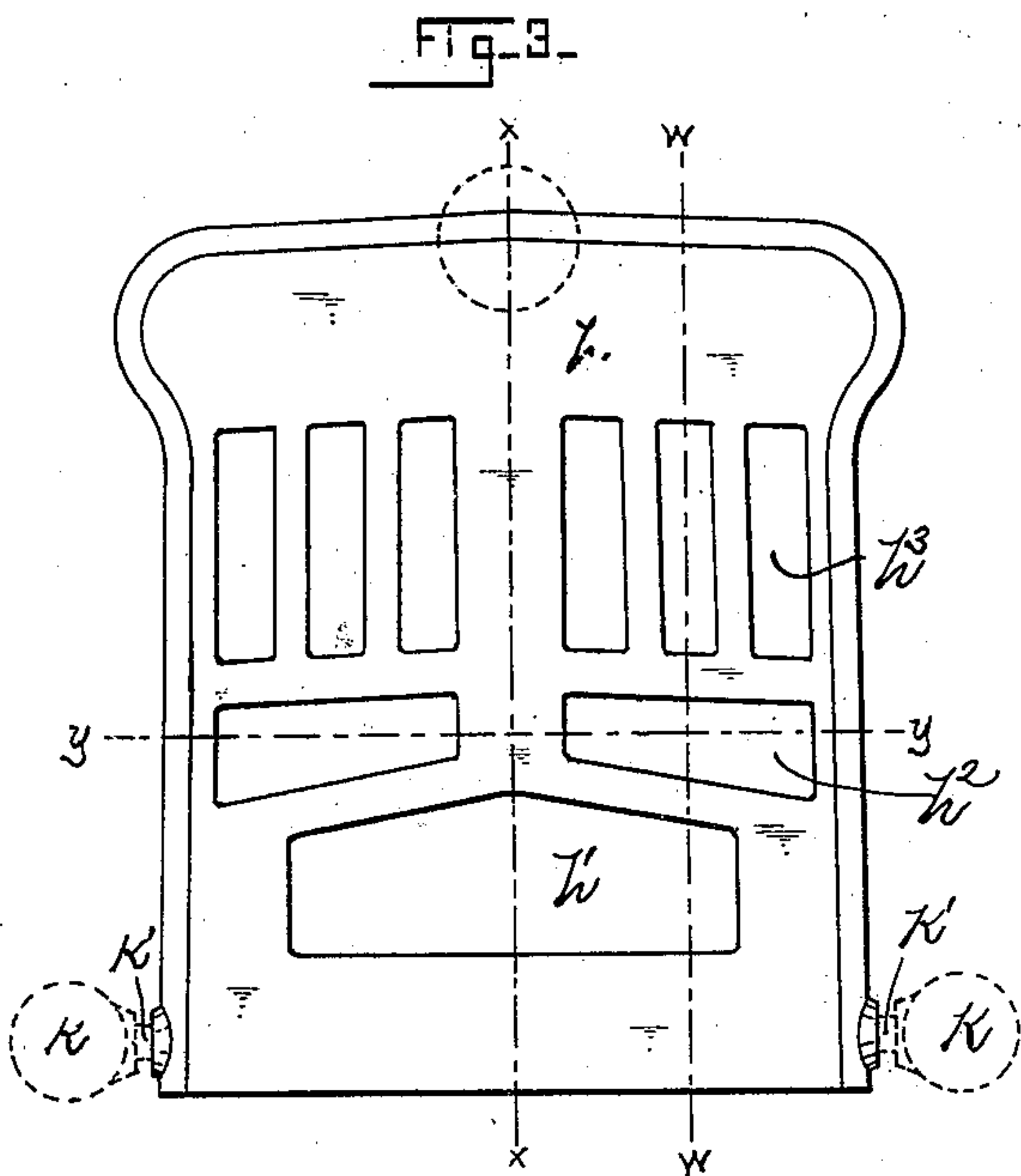
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(Application filed Apr. 13, 1898.)

(No Model.)

3 Sheets—Sheet 2.



WITNESSES

Abigail M. Luther.
May F. Ritchie.

INVENTOR

Walter C. Higgins,
BY
Frank H. Allen,
ATTORNEY.

No. 619,413.

Patented Feb. 14, 1899.

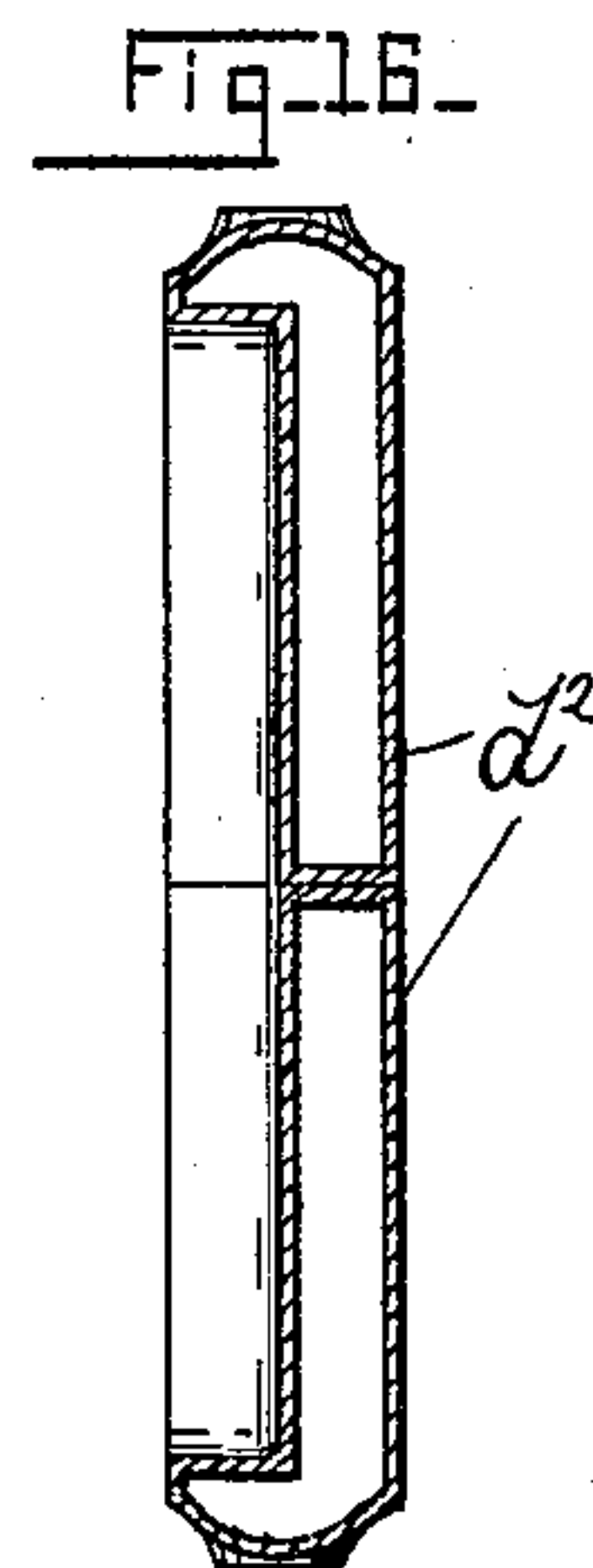
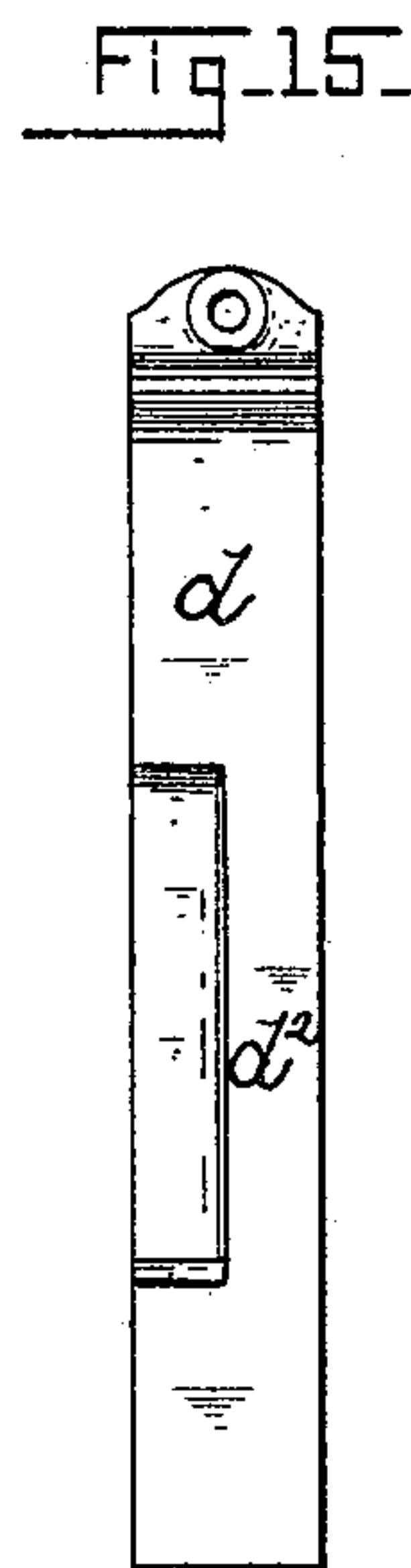
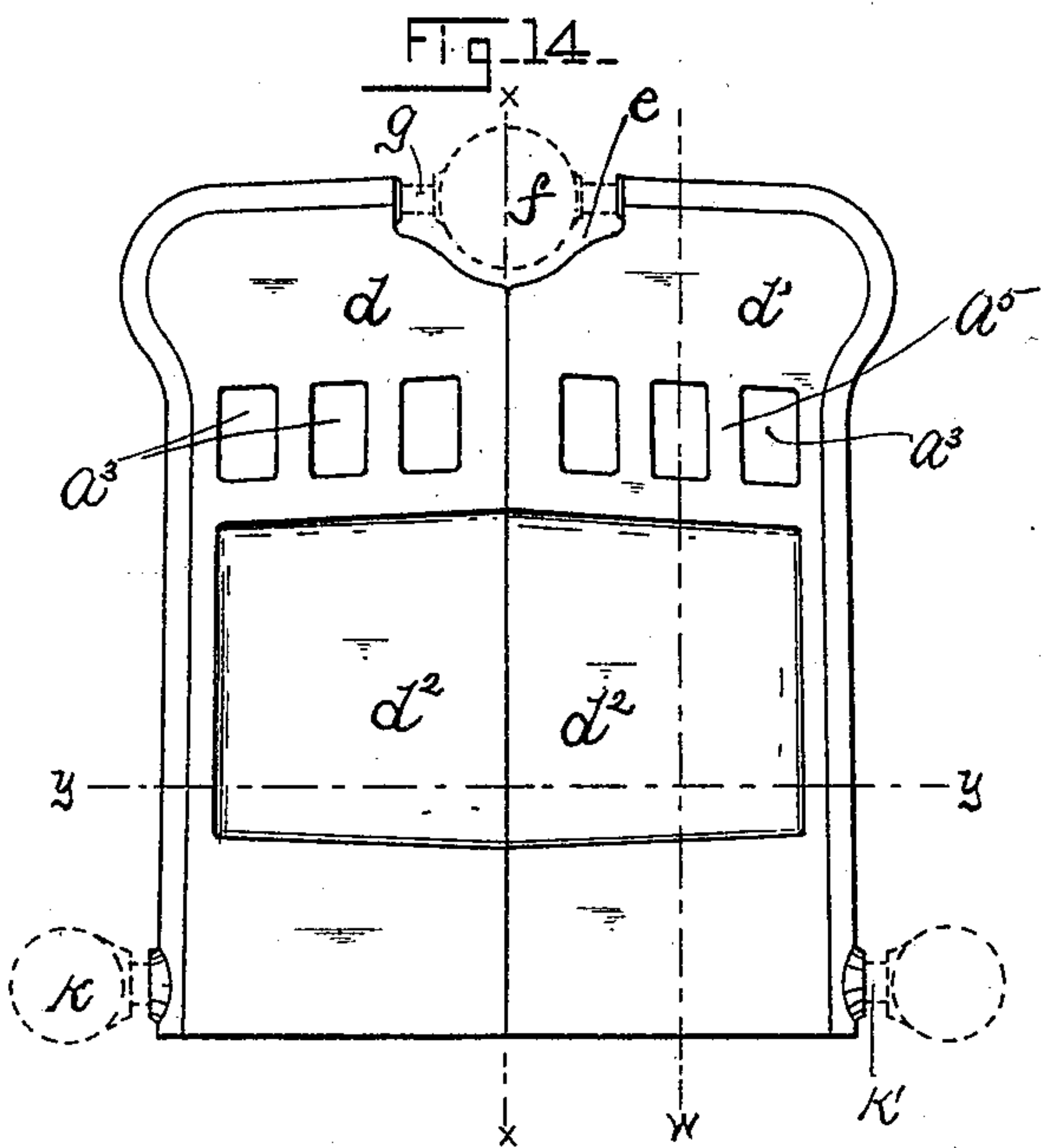
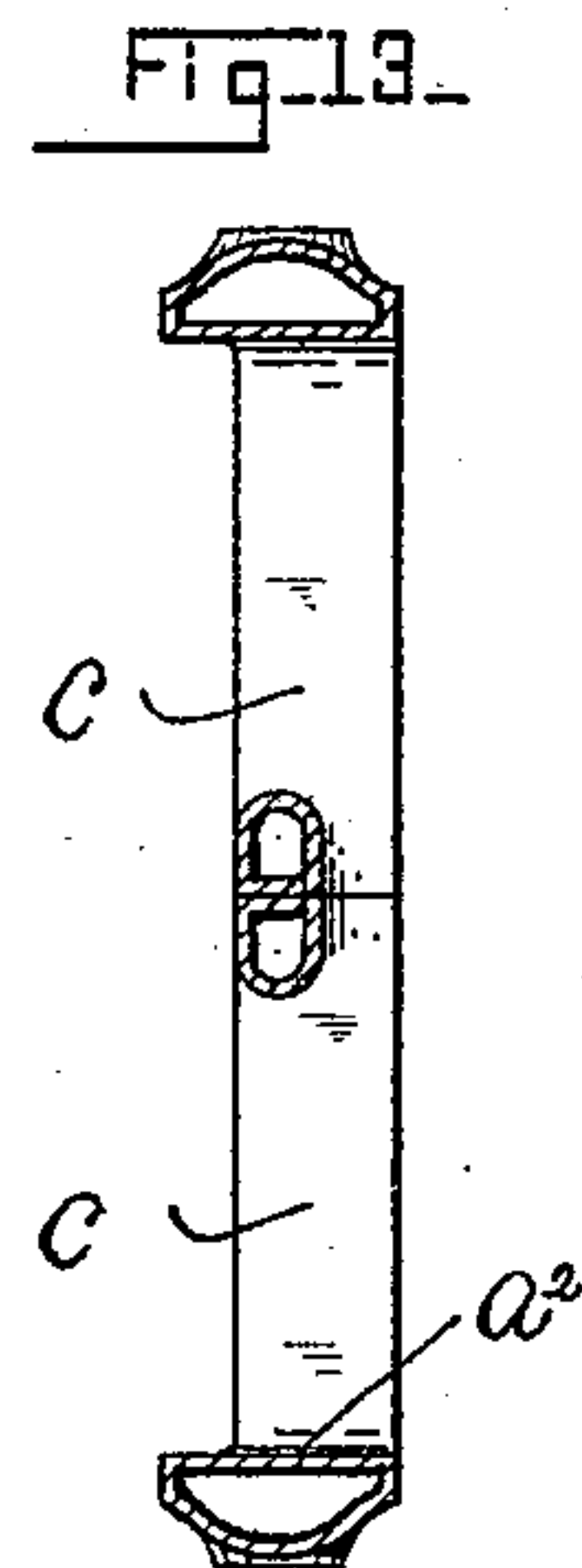
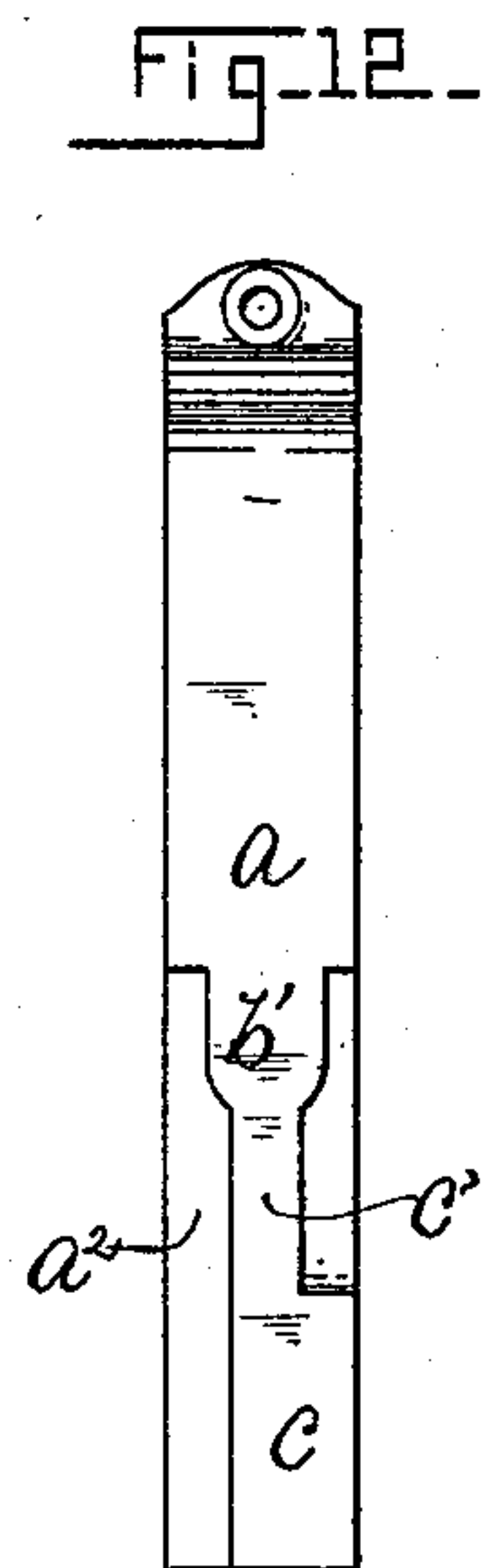
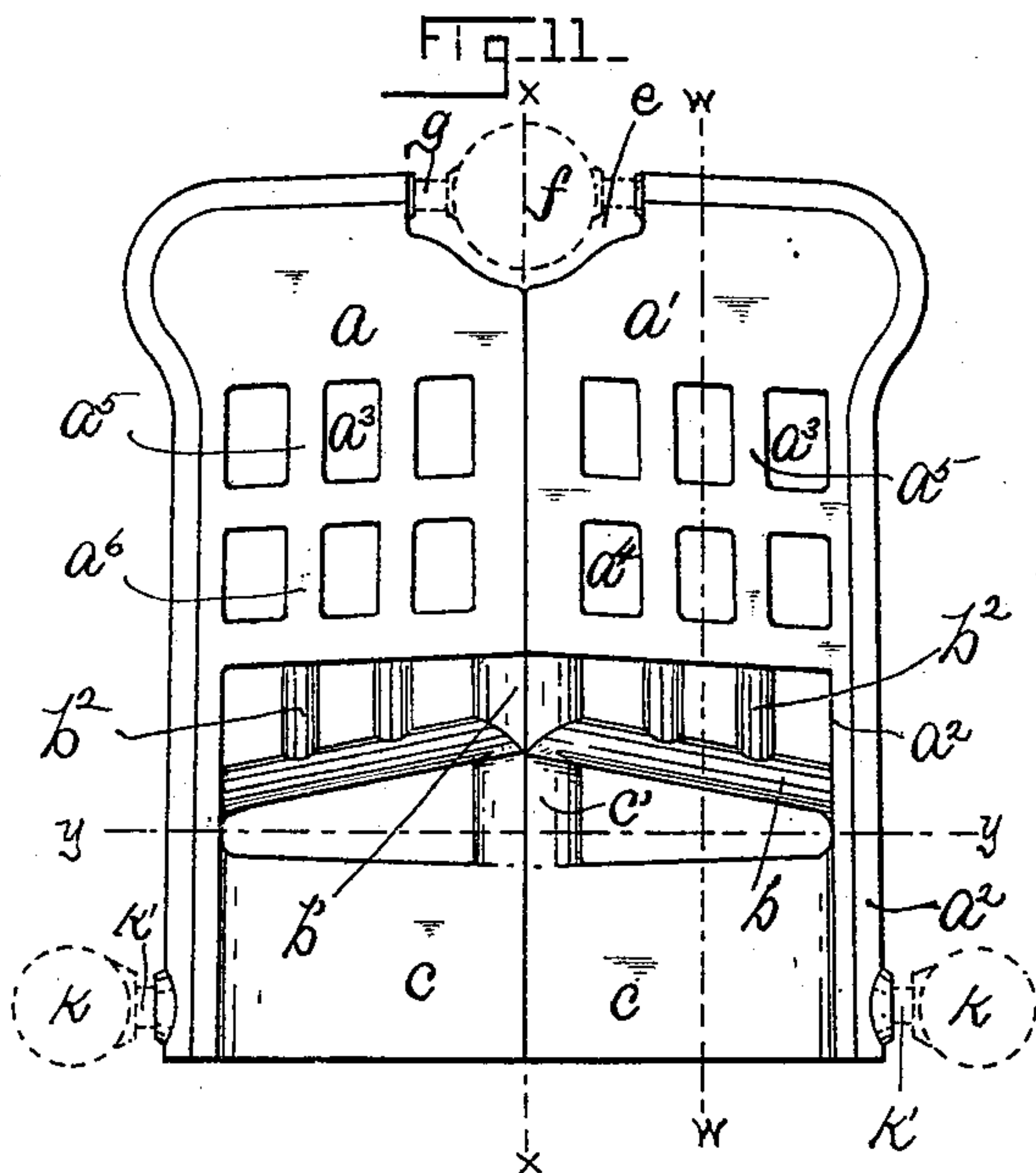
W. C. HIGGINS.

STEAM GENERATOR AND HOT WATER HEATER.

(Application filed Apr. 13, 1898.)

(No Model.)

3 Sheets—Sheet 3.



WITNESSES.

Alfred H. Luther.
May F. Ritchie.

INVENTOR

Walter C. Higgins,
BY
Frank H. Allen.
ATTORNEY.

UNITED STATES PATENT OFFICE.

WERTER C. HIGGINS, OF NORWICH, CONNECTICUT.

STEAM-GENERATOR AND HOT-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 619,413, dated February 14, 1899.

Application filed April 13, 1898. Serial No. 677,513. (No model.)

To all whom it may concern:

Be it known that I, WERTER C. HIGGINS, a citizen of the United States, residing at Norwich, in the county of New London and State of Connecticut, have invented certain new and useful Improvements in Steam-Generators and Hot-Water Heaters, of which the following is a full, clear, and exact description.

This invention is in the class of generators in which a multiple of vertical hollow water-sections are provided, said sections being so combined and secured together that they become practically a single structure.

The aim of my present invention is to improve the details of such generators, and particularly to provide for the easy handling and assembling of the sections of large generators of this class.

In the drawings accompanying this specification, Figure 1 is a vertical sectional view of a generator of my new form, taken through the longitudinal center thereof, and Fig. 2 is a rear elevation of said generator. Fig. 3 is an elevation of the front section, Fig. 4 is a side elevation, and Figs. 5 and 6 cross-sectional views of the same, taken, respectively, on lines *w* and *y* of said Fig. 3. Fig. 7 is an elevation of an "intermediate" section of my improved generator, Fig. 8 an inner edge elevation, and Figs. 9 and 10 are cross-sectional views of the same, taken, respectively, on lines *y* and *z* of said Fig. 7. Fig. 11 is an elevation of the "bridge-wall" section, Fig. 12 an inner edge elevation, and Fig. 13 is a horizontal sectional view of the same, taken on line *y* of said Fig. 11. Fig. 14 is an elevation of the complete "rear" section of my generator, Fig. 15 an inner edge elevation, and Fig. 16 a cross-sectional view of said section, taken on line *y* of said Fig. 14.

In this generator the front section is cast as a single piece and the several other sections—to wit, the intermediate, bridge-wall, and rear sections—are each of two half parts that are separable at their vertical centers, thus rendering it easier to mold, cast, and assemble said parts than if each of the sections was a single casting. This fact, taken in connection with the peculiar arrangement of water chambers and passages which I shall describe, enables me to produce a practical generator

of extraordinary size more conveniently than has been possible heretofore.

Referring now particularly to Figs. 7, 8, 9, 55 and 10, which illustrate one of the intermediate sections of my generator, the letters *a* and *a'* indicate, respectively, the left and right hand half parts of said section, said parts being separable on the line *x* of Fig. 7. 60 Each of the parts *a a'* is cored to provide water-chambers, and at their outer sides said parts extend downward, as at *a²*, to form the side walls of the fire-pot and combustion-chamber of the generator. Openings *a³*, which 65 serve as draft-flues, are provided in each part, and immediately below the openings *a³* are similar openings *a⁴*, by means of which I am able to provide an indirect draft, as I shall explain more specifically later on. 70

It should be particularly noted that the hollow walls *a⁵* that separate the upper flues *a³* are in vertical alinement with the walls *a⁶* that separate the lower flues *a⁴*, thus providing for the free and unobstructed upward flow of the 75 superheated water immediately over the combustion-chamber, and in order that said water may be subjected to the influence of the hottest portions of the fire I provide a pipe *b*, that leads from the side of each half part of 80 the section to the center of the complete section, where it connects with and discharges into a hollow chamber *b'*, that opens at its upper end into the main section. I also provide vertical pipes *b²*, that connect the said 85 pipe *b* with said main section at points immediately below the vertical waterways *a⁵ a⁶*, already referred to. The described arrangement of water chambers and passages allows the heated water in pipes *b* to flow directly 90 upward without hindrance through the passages *a⁵ a⁶*, whence said water is discharged into the chamber forming the boiler proper in the upper part of the sections *a a'*. As the water in said boiler becomes slightly lowered 95 in temperature it passes downward at the sides of the section, thence into pipes *b*, where it is quickly raised in temperature and again rises to the boiler proper through the described vertical waterways. A perfect and continuous 100 circulation of hot water is thus induced and maintained.

The bridge-wall section (illustrated in Figs. 11, 12, and 13) is also made in two half parts

$a a'$, that are separable at the vertical center of the complete section, and each half part is formed with draft-flues, vertical waterways, and pipes b, b' , and b^2 , as in the intermediate section, which I have described. Said bridge-wall sections are also formed with a hollow plate c , whose outer edge is joined to and opens into the side walls a^2 and whose inner end is connected by a pipe c' with the described pipe b' , thus providing for the ready upward flow of the heated water within the hollow plate or bridge-wall c .

The rear section (illustrated in Figs. 14, 15, and 16) is made in two half parts $d d'$, the upper portion being provided with the draft-flues a^3 . The central portion of the inner face of said rear section is recessed, as at d^2 .

The upper central portion of the intermediate, bridge-wall, and rear sections is recessed, as at e , to receive a steam-drum f , that is connected by nipples g with the said sections.

The front section (shown in Figs. 3, 4, 5, and 6) is formed of a single hollow casting h , having a feed-door opening h' and openings h^2 , through which the spaces between pipes b^2 may be reached for cleaning out the same. Openings h^3 are also provided in said front section, that register with and are equal in height to the combined height of the upper and lower flue-spaces $a^3 a^4$ of the intermediate sections, the relative arrangement of said flues being best seen in Fig. 1 of the drawings. This front section is connected with the drum f by a nipple i , that leads from the rear upper portion of the front section directly into the end of said drum, as shown by dotted lines in Fig. 4 of the drawings.

At the opposite sides of the generator and near the bottom thereof are pipes $k k$, that are connected with each section by nipples k' , thus providing a manifold connection by means of which the water may circulate from section to section and thus maintain a uniform temperature as well as a uniform pressure throughout the several sections of the complete generator. Steam is taken from the drum f through pipes f' , and the "drip" caused by condensation in said drum is conveyed thence to the manifold-pipes $k k$ by a pipe m , that extends downward from said drum at the rear of the generator and connects with lateral pipes m' , that discharge into said manifolds.

The arrangement of draft-flues is best seen in Fig. 1. The products of combustion pass from the combustion-chamber rearward over the bridge-wall and into the recess d^2 of the rear section, whence they pass upward and

forward through the lower flue a^4 to the recess h^3 in the front of the generator. There said products pass upward and then rearward through the upper flue a^3 to the rear of the generator, where they are discharged into any conveniently-arranged smoke-pipe.

At the front of the generator is a feed-door n , also a "cleaning-out" door o , that registers with the flues $a^3 a^4$, and I preferably provide doors p , through which the spaces between pipes b, b' , and b^2 may be reached for cleaning.

By making the front section of a single casting I am able to provide a stiffer structure than if it, as well as the several other sections, was in two half parts, for the reason that the single-piece front serves as a binder to prevent the spreading and separation of the two-part sections and also serves as a guide and support for the two-part sections when the generator parts are being assembled.

I do not seek to claim at this time the particular arrangement of vertical water-passages whereby an unobstructed upward flow of water is attained, as I have already filed a separate application for a patent covering that feature.

What I do claim is—

1. In a steam-generator, the front section formed from a single piece, combined with intermediate sections, each of which is formed of two parts which are separable at the vertical section of the generator, and means for connecting said sections; each section being provided with vertical pipes b', b^2 , inclined pipes b which are connected with the water-legs at their outer ends, and with the pipe b' at their inner ones; said vertical pipes being arranged in a line with the water-passages formed in the upper portions of the sections between the flue-openings, substantially as shown.

2. In a steam-generator, the front section formed from a single piece, and intermediate sections, each of which is formed of two parts, the steam-drum which is arranged in a recess formed in the tops of the intermediate sections, and pipes connecting the steam-drum with all of the sections except the front one, combined with the vertical pipe m , and the horizontal ones m' , and the manifolds placed outside of the sections of the generator, substantially as described.

Signed at Boston, Massachusetts, this 24th day of March, 1898.

WERTER C. HIGGINS.

Witnesses:

JAMES A. HARDING,
ALEXANDER DUNCAN.