

(No Model.)

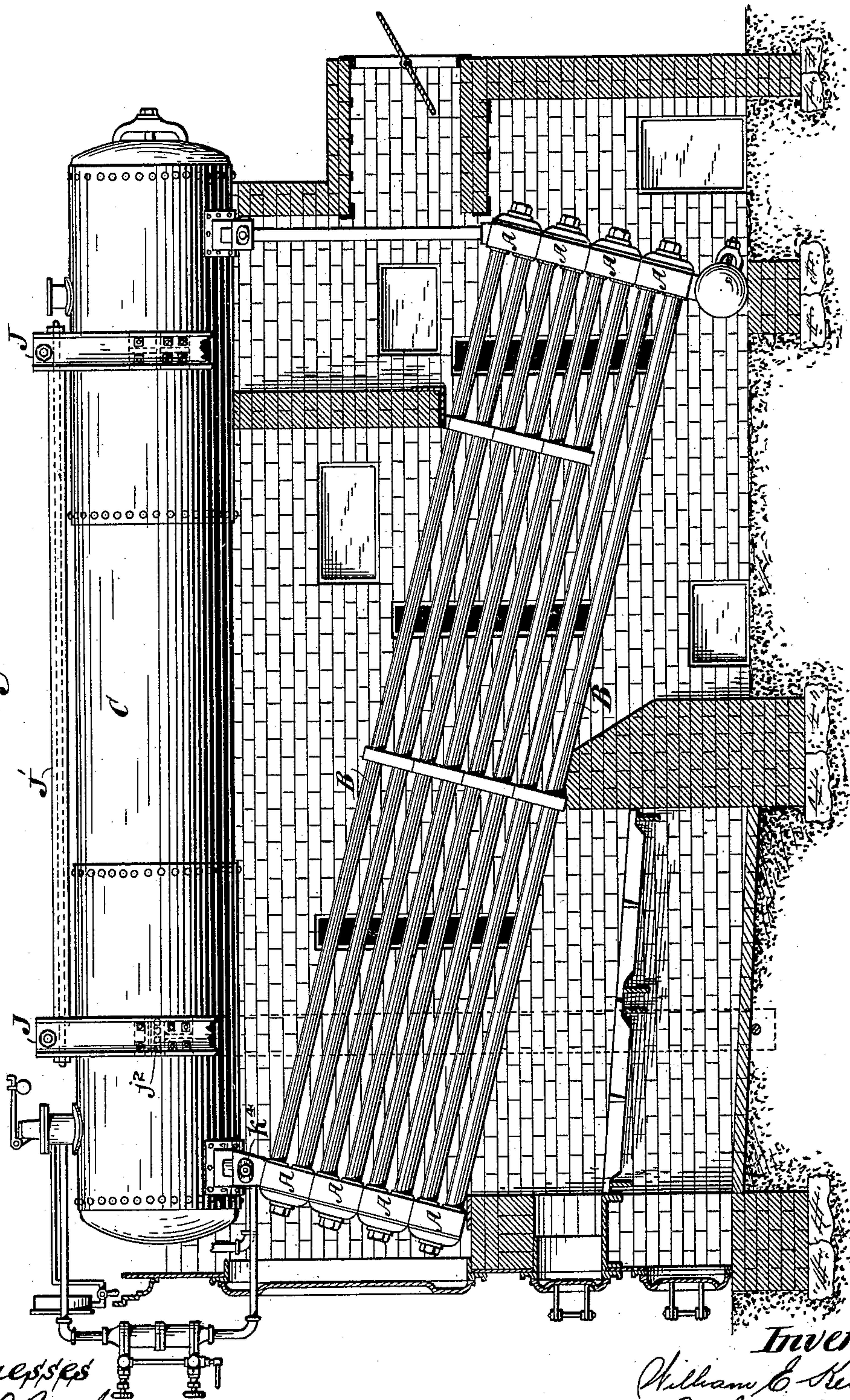
4 Sheets—Sheet 1.

W. E. KELLY.
STEAM BOILER.

No. 397,130.

Patented Feb. 5, 1889.

Fig. 1



Witnesses
M. J. Roach.
A. P. Ferguson.

Inventor
William E. Kelly
By his attorneys
Gifford & Brown

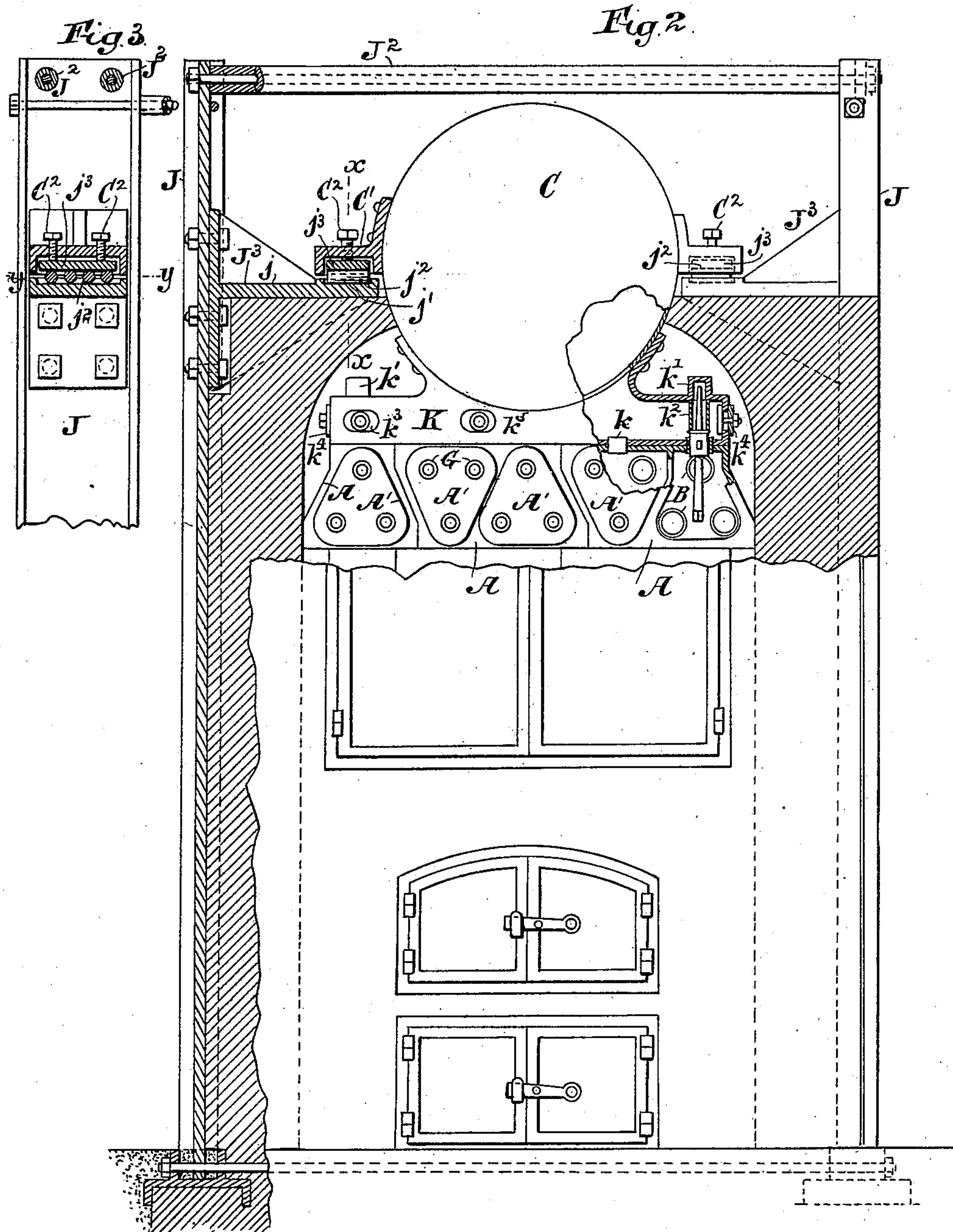
(No Model.)

4 Sheets—Sheet 2.

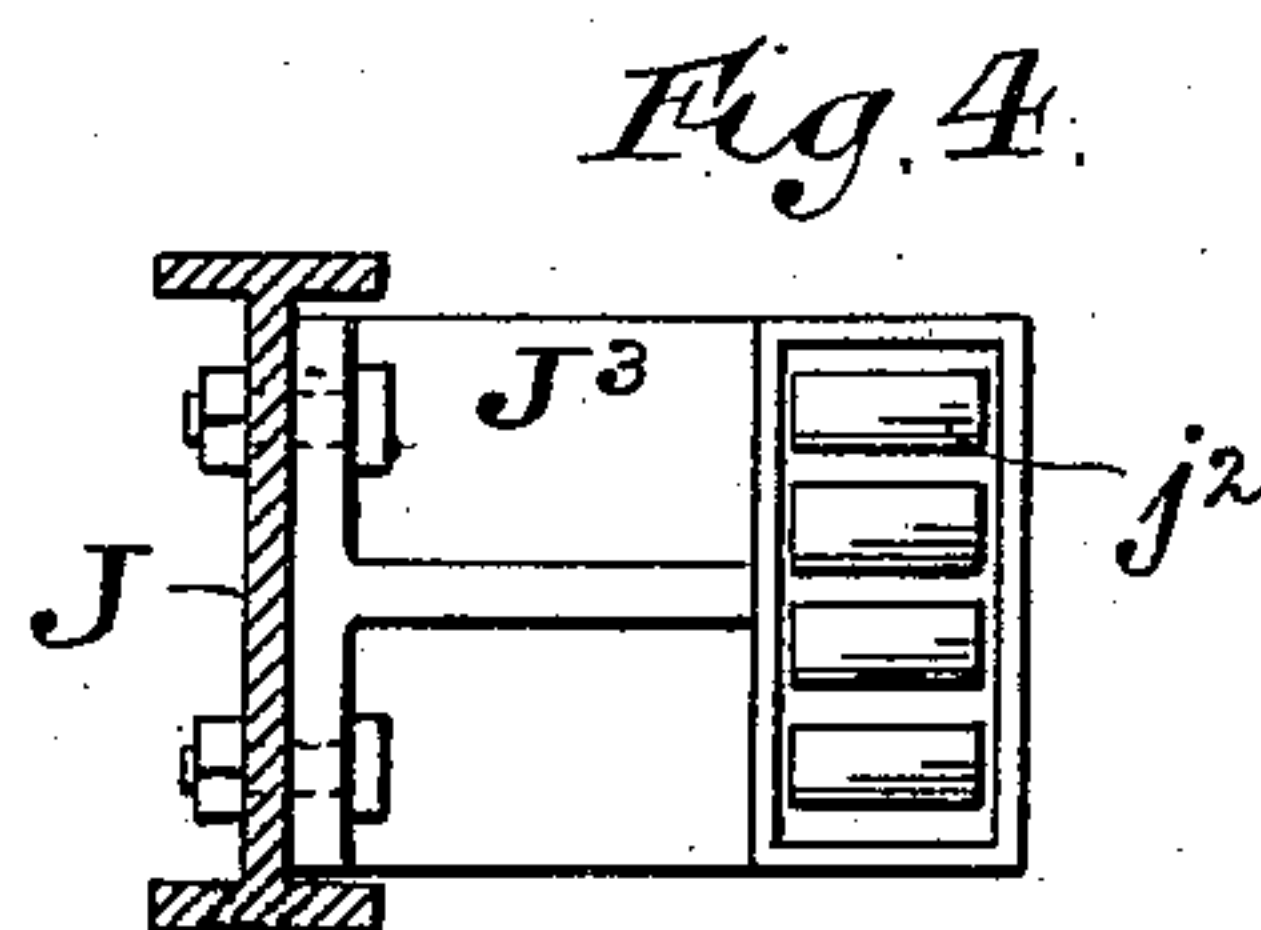
W. E. KELLY.
STEAM BOILER.

No. 397,130.

Patented Feb. 5, 1889.



Witnesses
M. Roach.
C. Ferguson.



Inventor
William E. Kelly
By his attorneys
Gifford & Brown

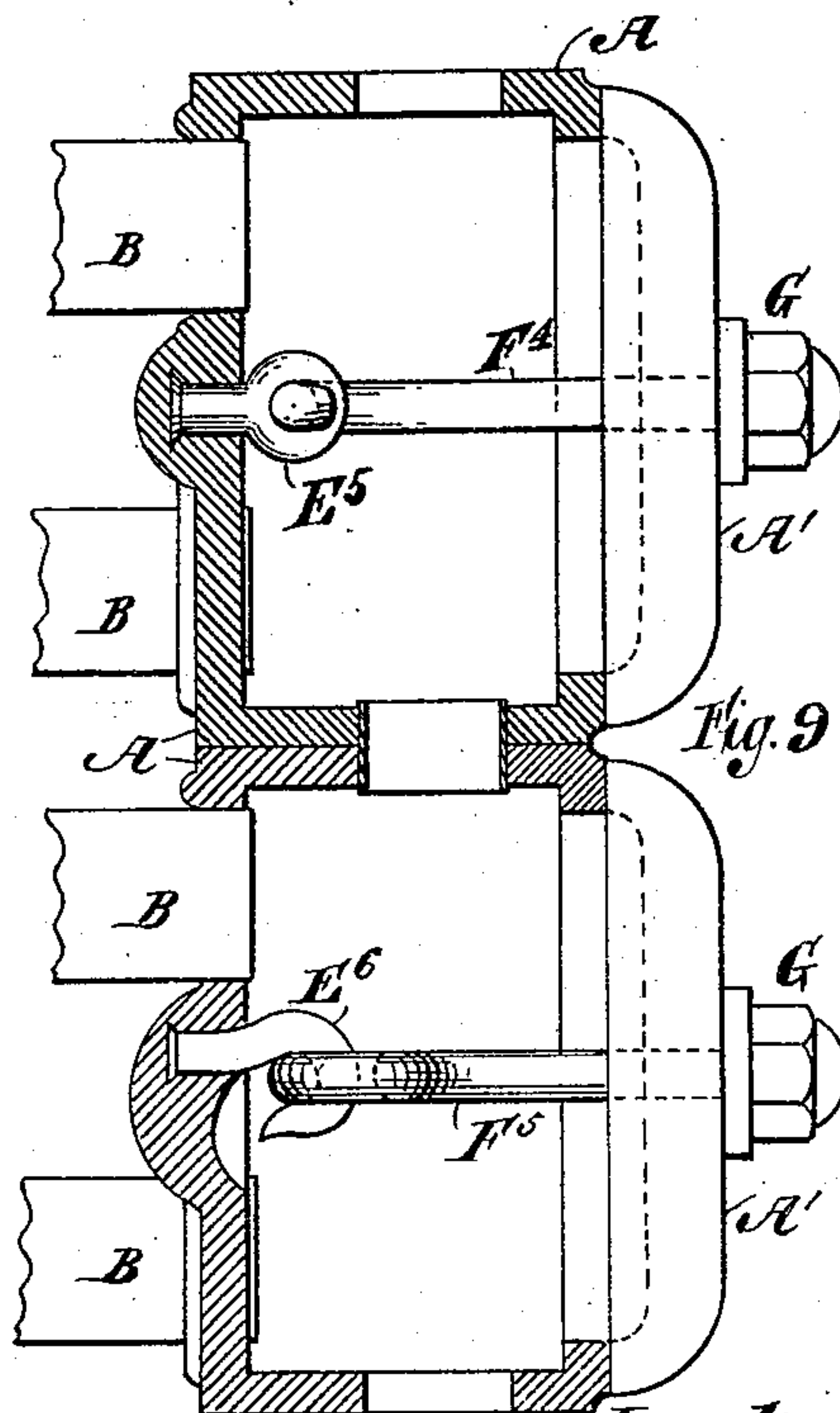
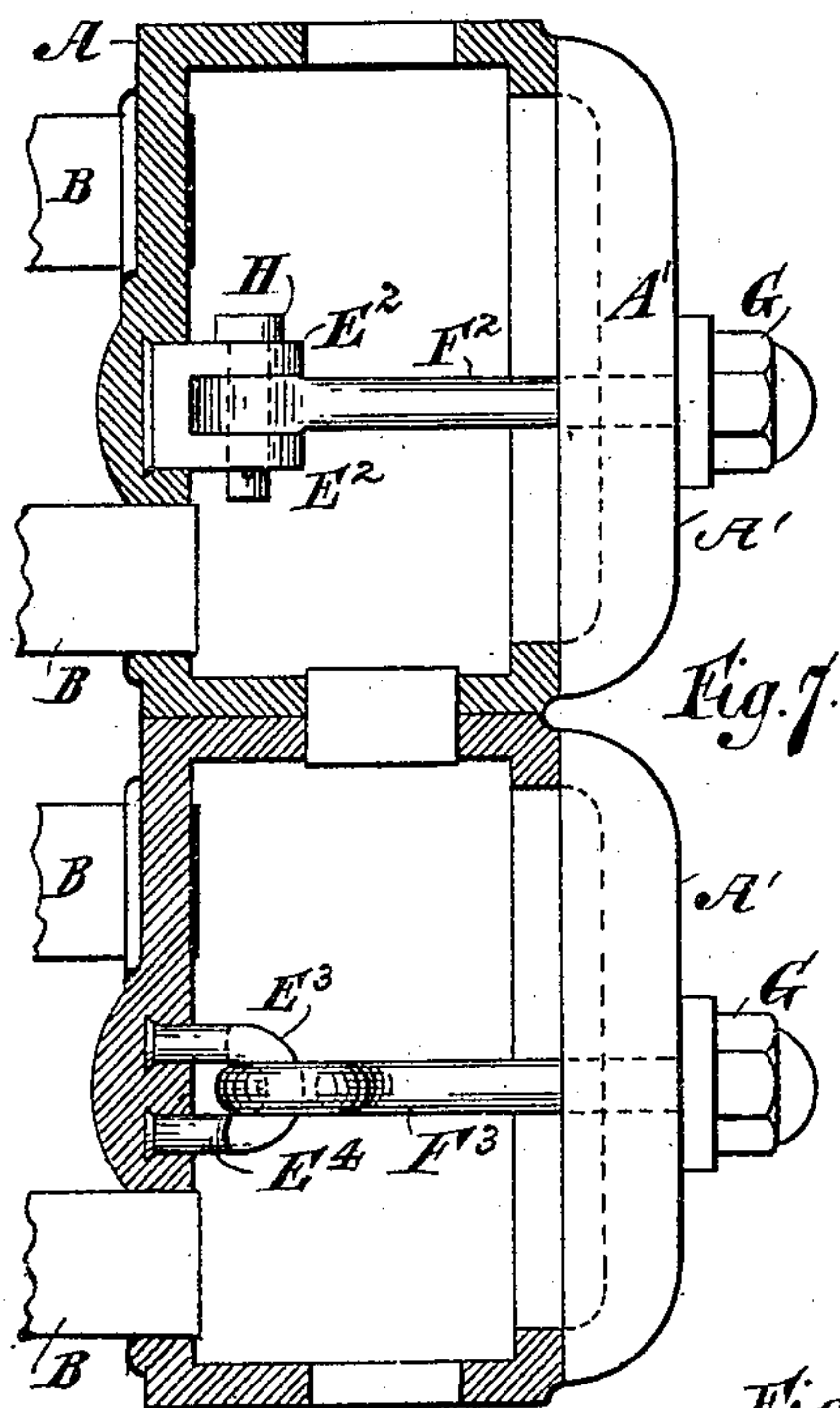
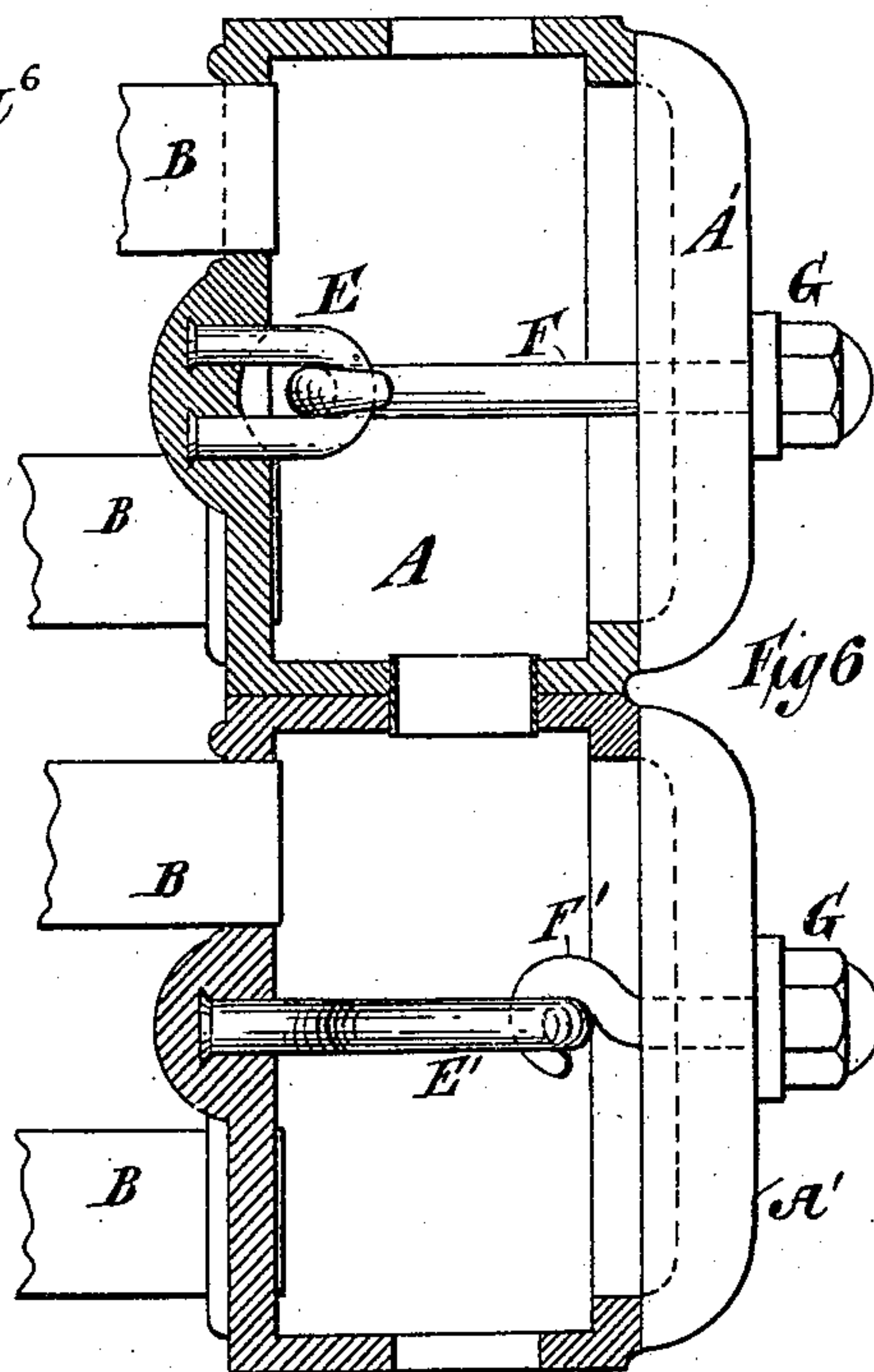
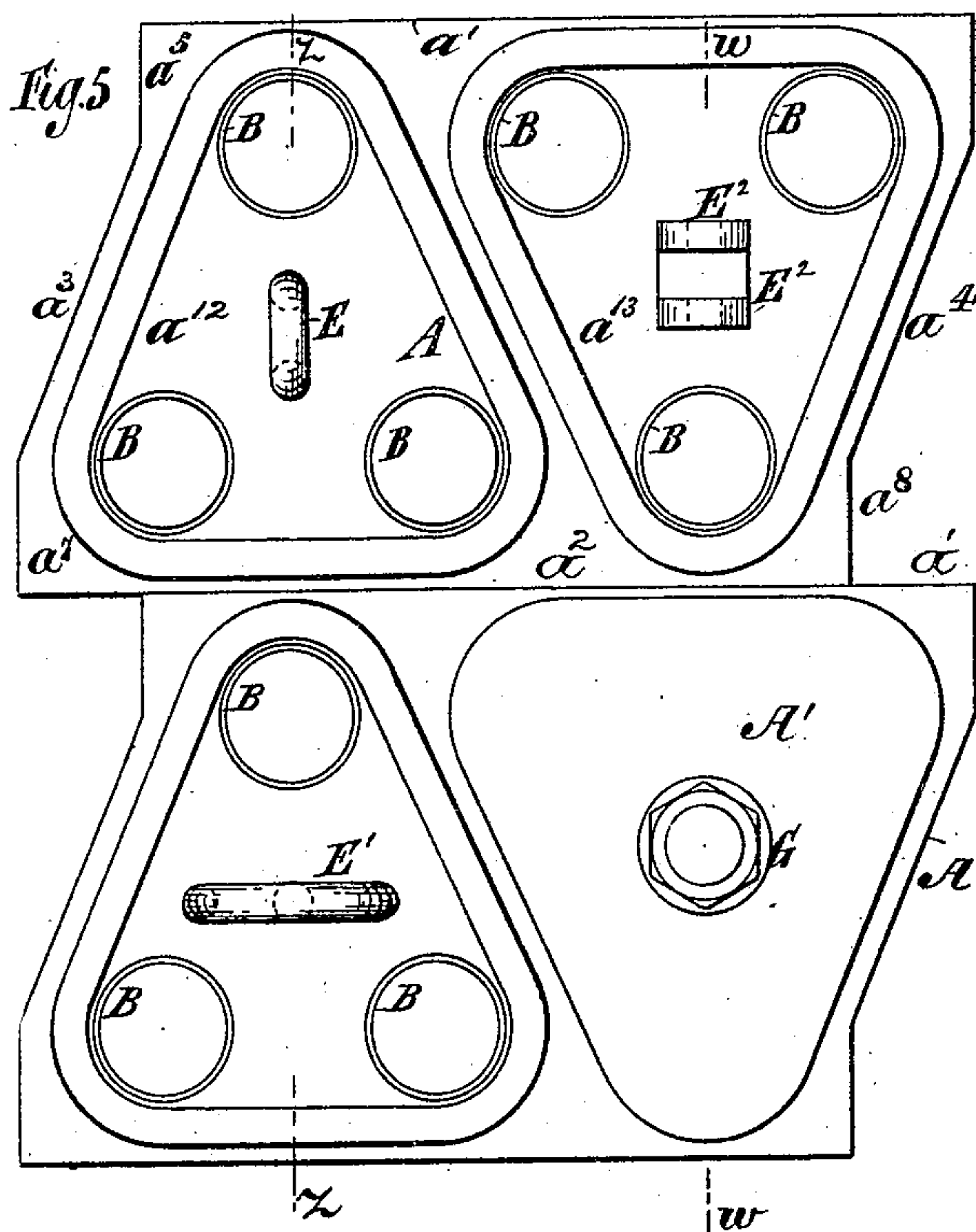
(No Model.)

4 Sheets—Sheet 3.

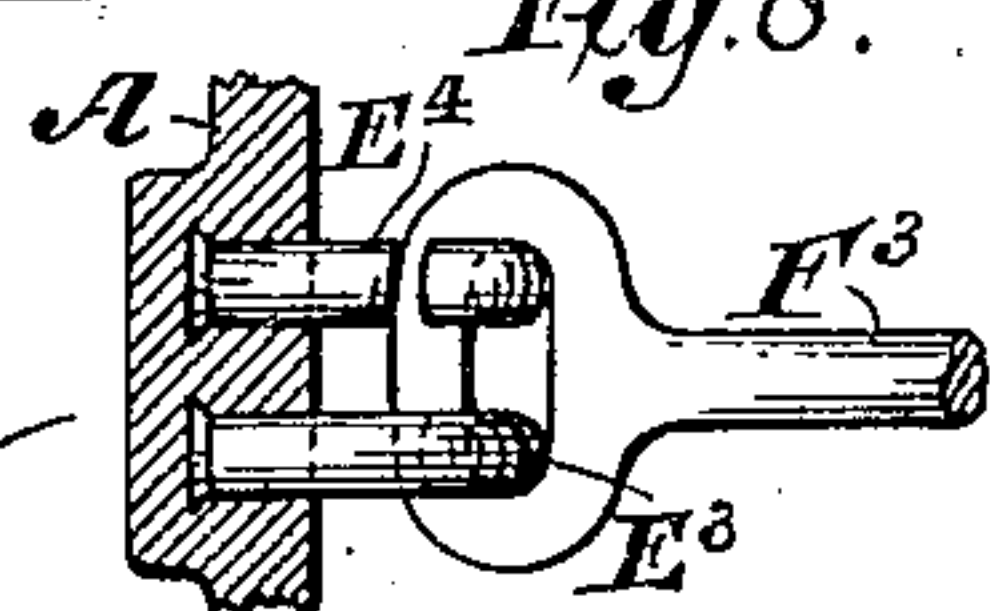
W. E. KELLY.
STEAM BOILER.

No. 397,130.

Patented Feb. 5, 1889.



Witnesses
M. H. Arch.
O. Burgess



Inventor
W. E. Kelly
By his attorney
Gifford Brown

(No Model.)

4 Sheets—Sheet 4.

W. E. KELLY.
STEAM BOILER.

No. 397,130.

Patented Feb. 5, 1889.

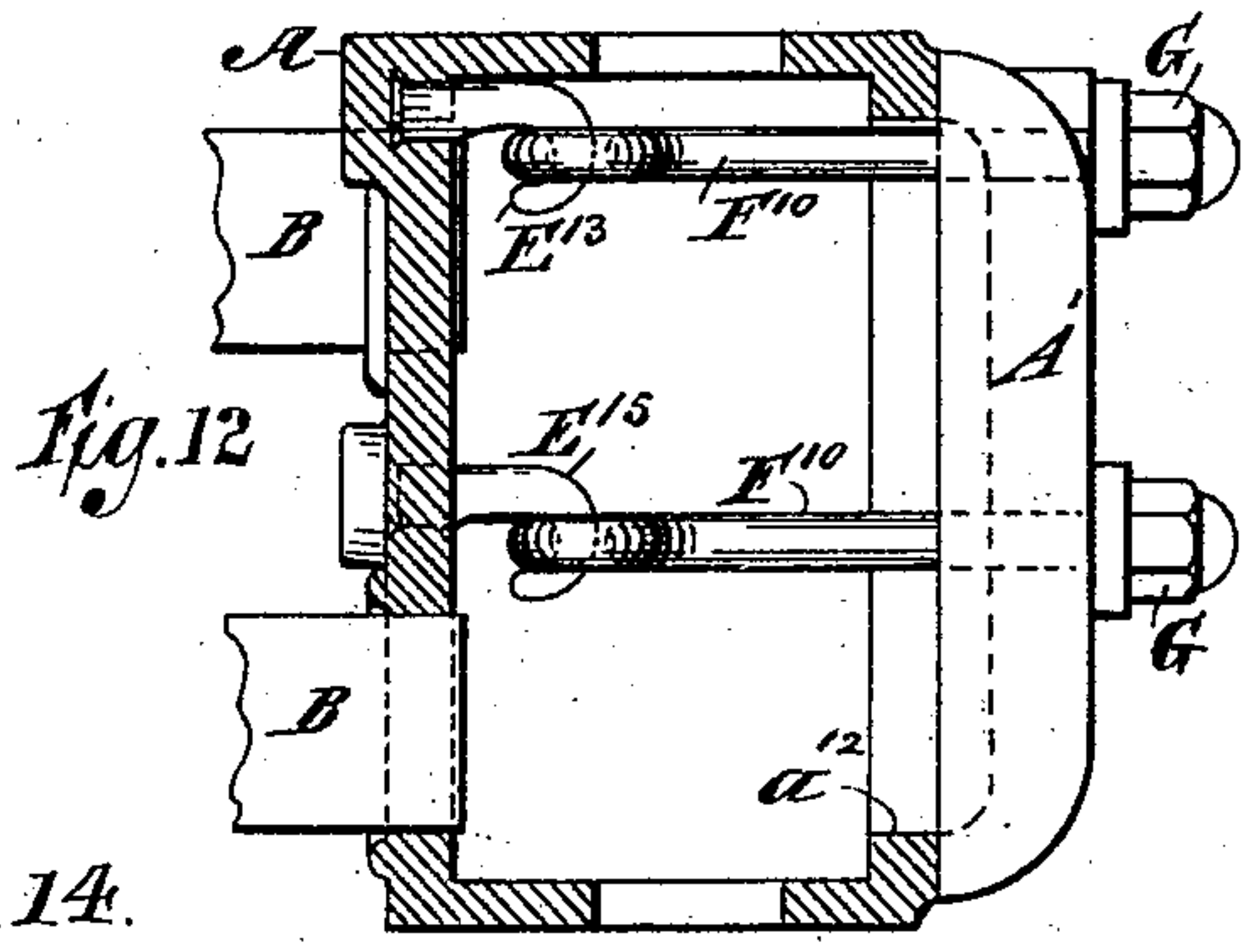
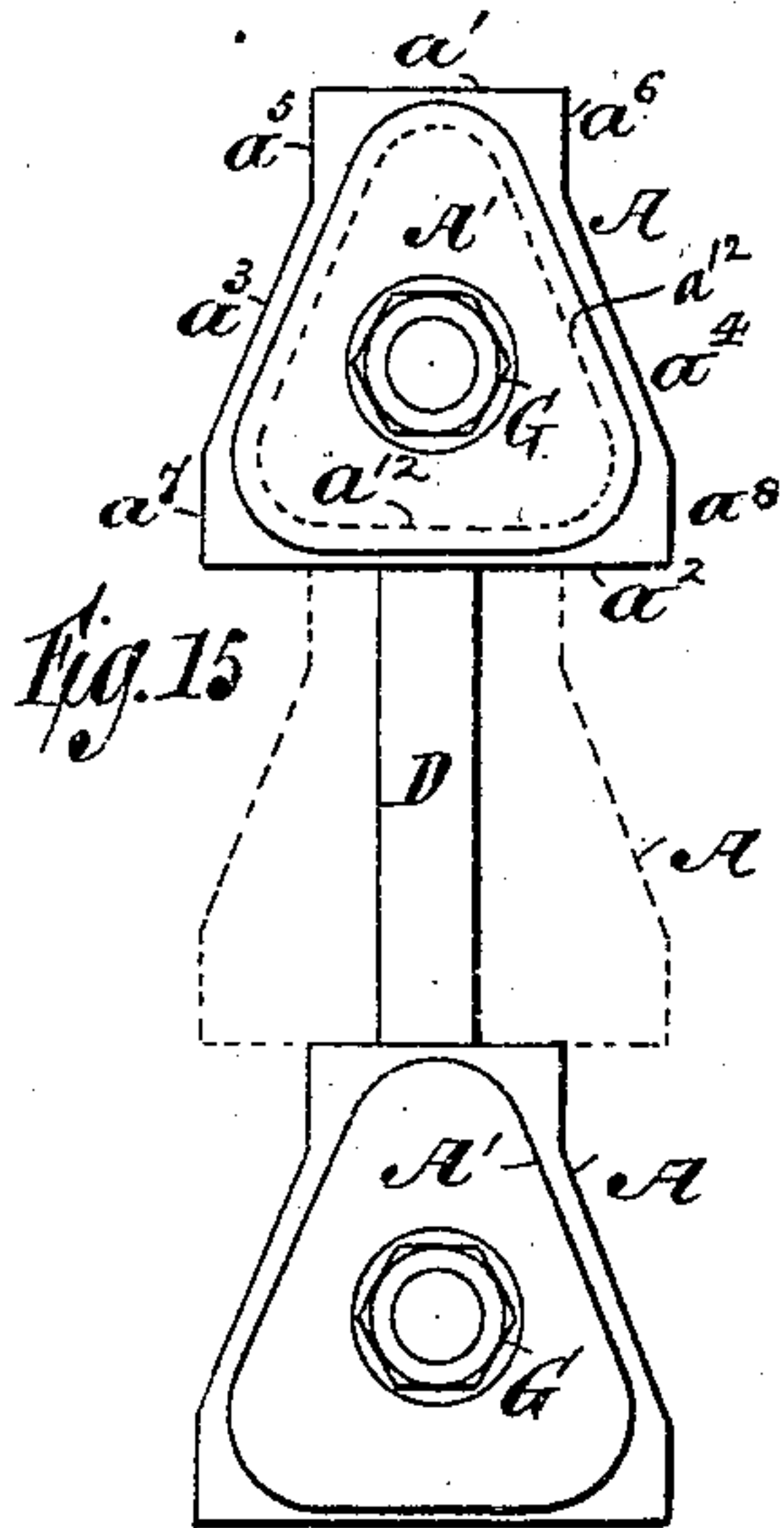
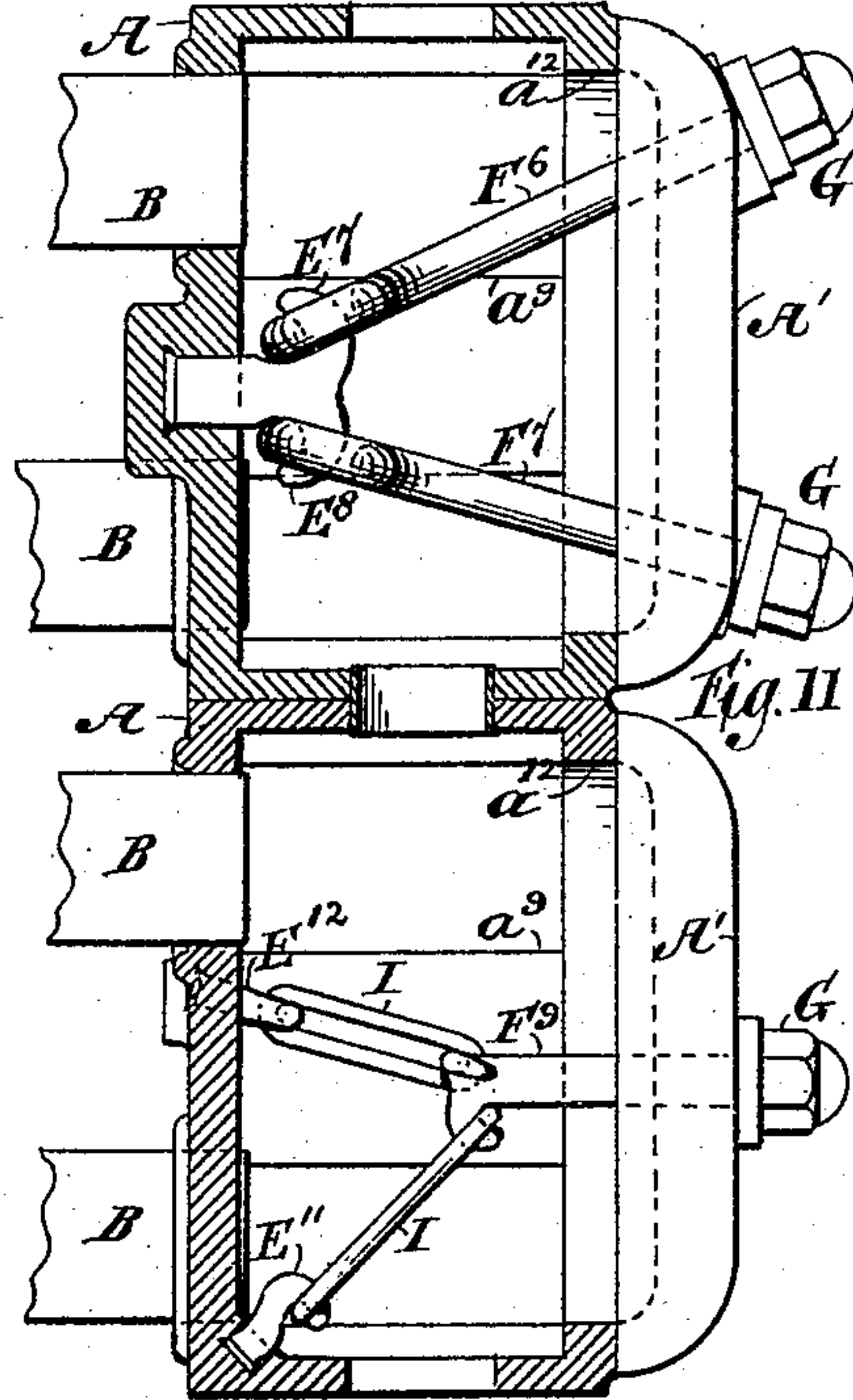
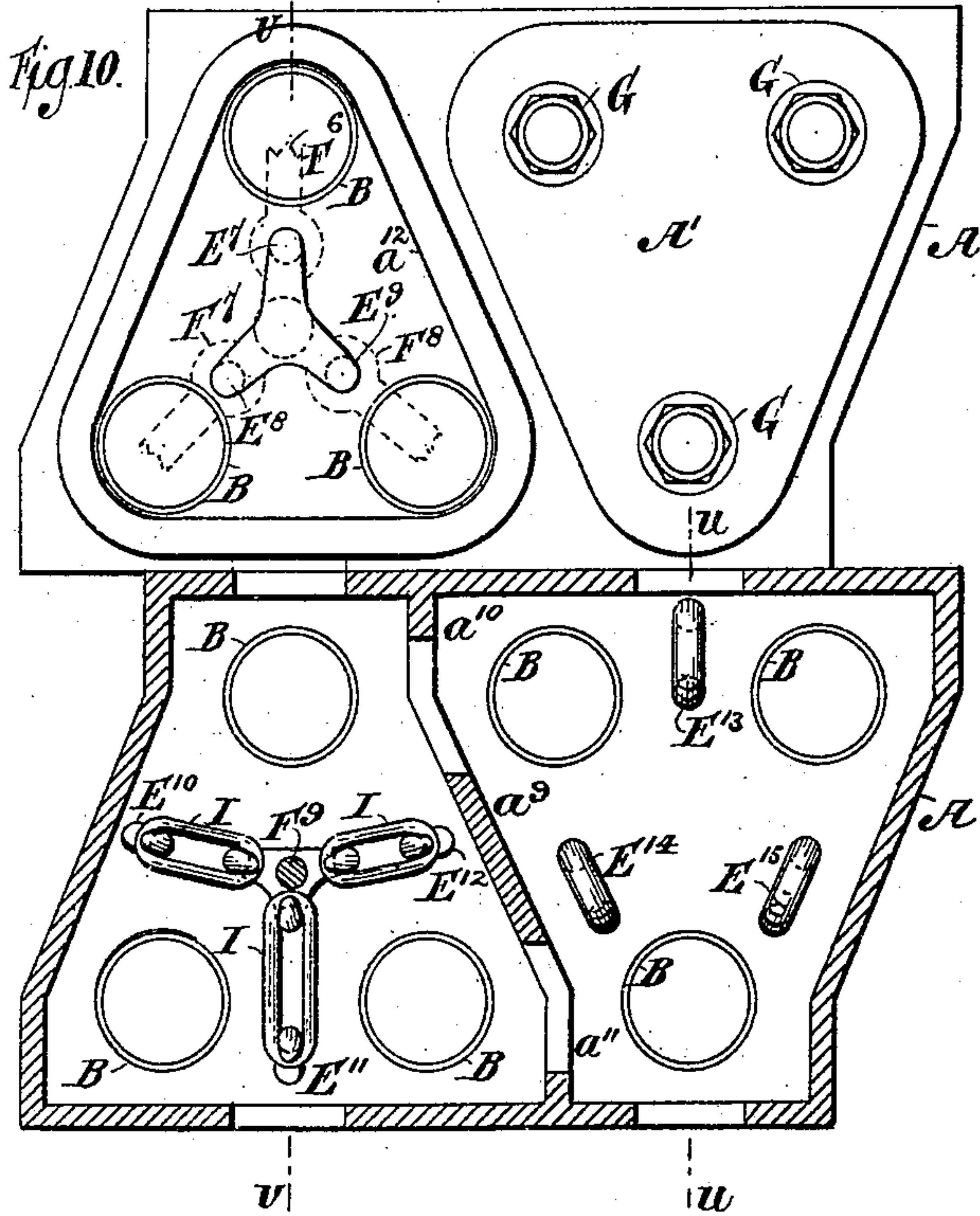
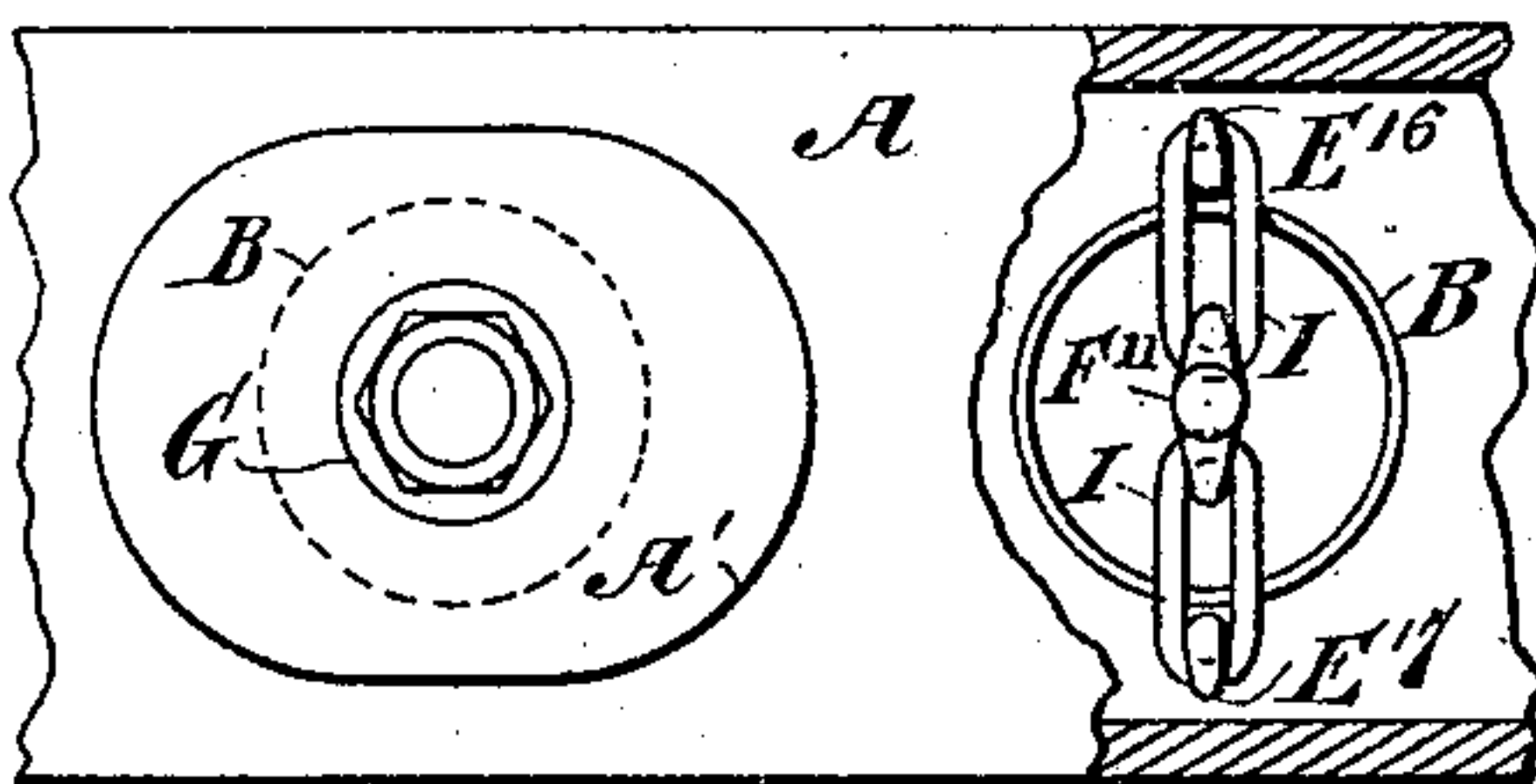
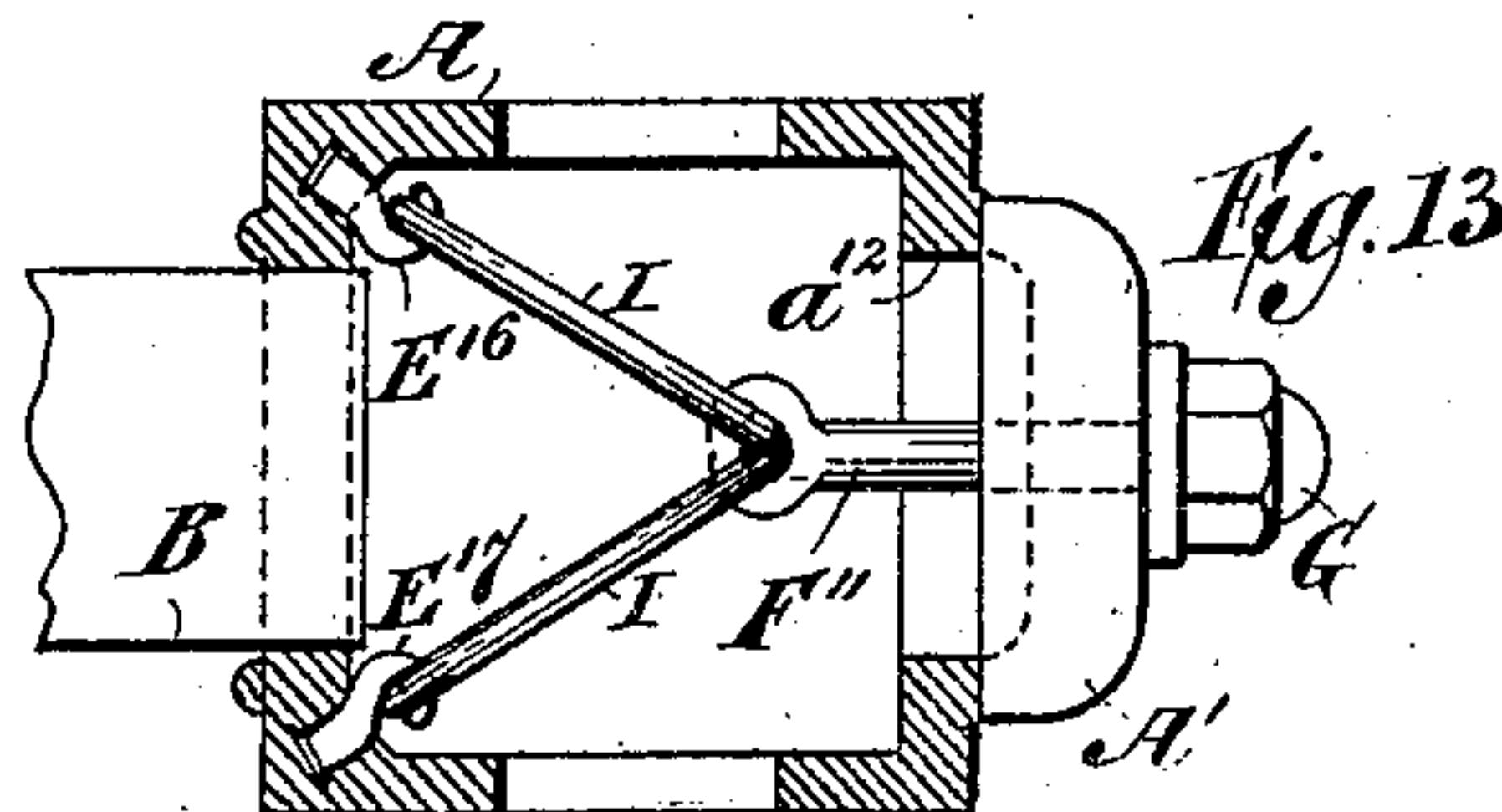


Fig. 14.



Witnessed
M. Roach.
C. R. Ferguson



Inventor
W. E. Kelly
By his attorney
Gifford & Brown

UNITED STATES PATENT OFFICE.

WILLIAM E. KELLY, OF NEW BRUNSWICK, NEW JERSEY.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 397,130, dated February 5, 1889.

Application filed September 22, 1888. Serial No. 286,101. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. KELLY, of New Brunswick, in the county of Middlesex, in the State of New Jersey, have invented a certain new and useful Improvement in Steam Boilers or Generators, of which the following is a specification.

I will describe a boiler embodying my improvement in detail, and then point out the various novel features in the claims.

In the accompanying drawings, Figure 1 is a sectional elevation of a steam boiler or generator embodying my improvement. Fig. 2 is a partly-sectional front elevation of the same. Fig. 3 is a vertical section taken at the plane of the dotted line $x x$, Fig. 2. Fig. 4 is a horizontal section of certain parts, taken at the plane of the dotted line $y y$, Fig. 3. Fig. 5 is a front view of two headers of the steam boiler or generator. The upper of these headers has the front covers removed. The lower has but one of its covers removed. Fig. 6 is a vertical section of this header, taken at the plane of the dotted line $z z$, Fig. 5. Fig. 7 is a vertical section of this header, taken at the dotted line $w w$, Fig. 5. Fig. 8 is a horizontal section of certain parts of this header. Fig. 9 is a vertical section of a similar header, illustrating a modification. Fig. 10 is a front elevation of two similar headers. The upper one has one of its covers removed. The lower one has the entire front removed, and is therefore shown in section. Fig. 11 is a vertical section taken at the plane of the dotted line $v v$, Fig. 10. Fig. 12 is a vertical section of a similar header, taken as indicated by the dotted line $u u$, Fig. 10, illustrating a modification. Fig. 13 is a vertical section of a header of another form embodying the improvement. Fig. 14 is a sectional front view of this header. Fig. 15 is a front view of two headers, each of which is of substantially-triangular shape, an intermediate header being illustrated in dotted outline and an intermediate tube or nipple being illustrated in full outline.

Similar letters of reference designate corresponding parts in all the figures.

It will be seen that I have illustrated my improvement in a type of boiler consisting, essentially, of inclined water-tubes B, head-

ers A, connected to the ends of these tubes and connected together up and down in series by means of nipples, and a drum, C, arranged above the inclined tubes and headers and connected near the ends to the headers.

The headers A in all the figures, excepting only Figs. 13, 14, and 15, are severally of an approximately-rhomboidal shape, having a parallel top and bottom, $a' a^2$, parallel inclined side portions, $a^3 a^4$, vertical side portions, $a^5 a^6$, above the inclined side portions, and vertical side portions, $a^7 a^8$, below the inclined side portions. Each rhomboidal header has a transverse brace consisting of an inclined portion, a^9 , a vertical portion, a^{10} , above the inclined portion, and a vertical portion, a^{11} , below the inclined portion. Each rhomboidal header is divided by said transverse brace into two substantially-triangular portions. The form of header shown in Fig. 15 corresponds with one of the two triangular portions of the rhomboidal header, being substantially of triangular shape.

Each of the rhomboidal headers has two triangular openings, $a^{12} a^{13}$. The fronts of the headers adjacent to these openings are faced suitably to receive covers A' of triangular shape. It will be seen that the triangular openings of each of these headers are reversed, so that the apex of one will extend upwardly and a corresponding angle or corner of the other will extend downwardly.

Tubes B are secured to the backs of the headers. These tubes will preferably be secured to the headers by being expanded into the same. It will be seen that there are six of these tubes secured to each of the rhomboidal headers, and that they are so disposed as to be staggered. It will be observed that three of the six are opposite each of the triangular openings of the header.

Not only is there a circulation between the tubes connected to different headers through the nipples, but also between the six tubes of each header. The latter feature is advantageous, because the circulation is thereby more nearly equalized.

The header illustrated in Fig. 15 is substantially triangular in form, it having a top, a' , a bottom, a^2 , two converging inclined side portions, $a^3 a^4$, two vertical side portions, a^5

a^6 , above the inclined side portions, $a^3 a^4$, and two vertical side portions, $a^7 a^8$, below the inclined side portions, $a^3 a^4$. This triangular header has one substantially-triangular opening, a^{12} , in the front. Fitted to this is a single triangular cover, A' .

Three tubes, B, are secured to the back of this triangular header. They are disposed in the position of the apices of a triangle, and are opposite the triangular opening in the front of the header.

I have in Fig. 15 illustrated two headers arranged one above another at such a distance apart that another header can be placed intermediate of them, as indicated in dotted lines. I have shown in this view that a header can be entirely removed and replaced by a tube, D, inserted and expanded in the holes with which the tubes and drums of the headers are provided for the nipples, which are employed to secure adjacent headers together when they are arranged in continuous series one immediately above another. This tube D will not be used as a permanent part of the structure, but merely as a connection between two headers when an intermediate header is removed because of some defect in it or in the tubes B secured thereto. It is a connection which enables the owner of a boiler to use it even after an accident to one of the headers or one or more of the tubes connected to it.

In Figs. 13 and 14 I have illustrated a header, which may be of rectangular shape, made substantially in the form of a long horizontally-extending box. It is shown as having tubes B connected to the back in one row. Opposite each tube B a hand-hole, a^{12} , is shown as arranged. A cover, A' , is applied to this opening. The cover A' in this instance is shown as of an ellipsoidal form.

Having now given a general idea of the style of boiler which I have selected to illustrate my improvement and explained some of the many forms of headers in which certain features of my improvement may be embodied, I will now take up those features of the improvement which relate to the manner of securing the covers of the headers in place.

The left-hand compartment of the upper header (shown in Fig. 5, and also appearing in Fig. 6) is represented as having a suitably-shaped eye, E, secured to the back. The ends of this eye are shown as enlarged, and are secured to the metal forming the back of the header by casting such metal around them. The rounded portion of the eye extends into the interior of the header.

F is a bolt provided at the rear end with a hook engaging with the eye E. The forward end of this bolt is externally screw-threaded, extends through the cover A' , and is fitted outside the cover with a nut, G, whereby it may be made to secure the cover in place. The hook is an open hook, and hence the bolt may be disengaged from the eye whenever desirable.

The left-hand compartment of the lower header (represented in Fig. 5, and also appearing in Fig. 6) has a large eye, E' , secured to the back. This eye is made in the form of a ring with a shank. The shank has an enlarged end. The metal forming the back of the header is cast around the enlarged end of the shank to secure the eye in place. The bolt F' of this compartment of the header is short and has at the inner end a hook capable of engaging with the eye E' . The outer end of this bolt is screwed-threaded and has a nut, G, applied to it. The eye is concentric with the nipple-holes and so large as not to interfere with the expanding-tool employed to secure the nipples.

The right-hand compartment of the upper header (shown in Fig. 5) has two cheek-pieces or lugs, E^2 , secured to it. These two lugs are formed together, with a space between them. The structure of which they form part is provided with a flanged or enlarged end, and is secured to the back of the header by casting the metal of the header around it. The bolt F^2 of this compartment is provided with an eye. A pin, H, passes through the lugs E^2 and through the eye of the bolt F^2 , so as to secure the bolt detachably to the back of the header. The front end of the bolt is externally screw-threaded and has a nut, G, applied to it outside the cover. The combination of parts last described is also illustrated in Fig. 7.

The right-hand compartment of the lower header (shown in Fig. 5) has a cover secured to it by means illustrated best in Figs. 7 and 8.

$E^3 E^4$ designate two hooks having enlarged ends. They are secured to the header by casting the metal forming the back of the header around their enlarged ends. The hooks are so arranged as to cross each other—in other words so that the hooked extremity of one hook will extend downwardly and the hooked extremity of the other hook will extend upwardly. These two hooks are arranged some little distance apart, as may be best understood by reference to Fig. 8.

F^3 designates a bolt provided at one end with an eye and at the other end with an external screw-thread. This eye may be inserted between the two hooks $E^3 E^4$ and then twisted so as to engage with both hooks. The screw-threaded end of this bolt extends through the cover and has applied to its outer end a nut, G.

In the upper part of Fig. 9 I have shown an eye, E^5 , secured to the back of the header. This eye is quite a small one. Its shank has an enlarged rear end. The metal forming the back of the header is cast around the shank to secure it in place. A bolt, F^4 , is provided at the rear end with a hook adapted to engage with the eye E^5 . The outer end of the bolt F^4 is screw-threaded and extends through the cover of the header. Outside the cover it has combined with it a nut, G. The eye, being small and arranged out of

the line of the nipple-holes, is not in the way of the expander-tool employed to secure the nipples.

The lower header (shown in Fig. 9) has a single hook, E^6 , secured to its back. This hook is represented as secured in place by casting around its shank the metal forming the back of the header. A bolt, F^5 , is provided at one end with an eye adapted to engage with the hook E^6 . The outer end of the bolt F^5 is externally screw-threaded, and has combined with it outside the cover a nut, G .

The upper header (illustrated in Figs. 10 and 11) is provided with three hooks, E^7 E^8 E^9 . These are shown as made together or as a triple hook. The shank has an enlarged end, and is represented as secured to the back of the header by casting around it the metal forming the back of the header. From these hooks E^7 E^8 E^9 bolts F^6 F^7 F^8 extend. These bolts are provided at the rear ends with eyes engaging with the hooks E^7 E^8 E^9 . The bolts all diverge outwardly and extend through the cover. Their outer ends are screw-threaded externally, and have combined with them nuts G .

The left-hand compartment of the lower header (shown in Fig. 10, and appearing also in Fig. 11) has three hooks, E^{10} E^{11} E^{12} . These hooks are secured to the back of the header. They are shown as secured by having the metal cast around their shanks. They are arranged to converge toward the front of the header. A bolt, F^9 , is provided at the rear end with a triple hook. Links I engage with the triple hook of this bolt and with the hooks E^{10} E^{11} E^{12} . The outer end of the bolt F^9 is externally screw-threaded, and has combined with it a nut, G .

The right-hand compartment of the lower header (shown in Fig. 10, and also appearing in Fig. 12) has three hooks, E^{13} E^{14} E^{15} , secured to its back—in the present instance by casting the metal in the back of the shanks around the hooks. The shanks of these hooks extend directly forward, as these hooks do not converge. Bolts F^{10} , provided at the rear end with eyes, engage with these hooks, extend directly forward through the cover, and outside the cover have nuts G combined with them. These bolts, with their appurtenances, serve to secure the cover at three points.

In Fig. 14 I have shown, as before stated, a header consisting, essentially, of a long rectangular box combined with a number of tubes, B , disposed in a single row and provided with a hand-hole opening and cover at the front opposite each tube. I have shown two hooks, E^{16} E^{17} , secured to the back of this header—one above and one below the end of a tube, B . Links I engage with these hooks. It will be seen from Fig. 13 that the hooks E^{16} E^{17} converge forwardly. The links I also converge forwardly. A bolt, F^{11} , is provided at the rear end with an eye, to which the links I are secured. The forward end of this bolt is screw-threaded and extends through the

cover. A nut, G , combined with its outer end, secures the cover in place.

The covers of the headers shown in Fig. 15 may be secured in place by any of the combinations of parts shown for that purpose in the other figures.

It will be seen that in all the examples of the improvement for securing the covers of headers in place I provide a detachable connection between the bolts and the rear of the header or an appurtenance of the latter.

Although I have shown but one way of securing to the back of the header those devices with which the bolts are to engage—namely, the method of securing the same by casting the metal of the header around them—I do not wish to be restricted to this method of securing such devices, for obviously there are other appropriate ways. For instance, the device might have screw-threaded shanks and engage with tapped holes in the backs of the headers.

I will now turn to features of my improvement embodied in other parts of the boiler.

It will be observed that at the upper end of the front series of headers, A , a saddle or long header, K , is arranged. This is provided with openings opposite the compartments of the several headers A immediately below it. Nipples k are secured in these openings and in corresponding openings with which the adjacent headers A are provided. Preferably these nipples are secured by expanding their end portions. Opposite the openings in the header or saddle K , which are over the openings of the outermost compartments of the adjacent headers A , I have provided turrets k' . These turrets are to accommodate the mandrel of the expander when the mandrel is inserted from the adjacent compartment of the contiguous header A . The expander may be seen in position at the right-hand end of the saddle K in Fig. 2. A loose sleeve, k^2 , is shown as inserted in the saddle to afford a bearing for the expander during the expanding operation. The front of the saddle is provided with hand-holes having covers removably secured in place. There is a hand-hole and cover in the front of the saddle in the same vertical plane with the turret k' . Such hand-hole is covered by a cover, k^3 . This cover may be secured in place by means of a bolt and a crow-bar extending across the hand-hole within the saddle. Each end of the saddle is also provided with a hand-hole fitted with a cover, k^4 , which may be secured as just described. The saddle is also provided in the front with other hand-holes fitted with covers k^5 .

The turrets are advantageous because they afford provision for using an expander inserted from below and accessible through the large hand-hole of the adjacent header A . The loose sleeves k^2 afford suitable bearings for the expander. The hand-holes at the front in line with the turrets and those at the ends of the saddle afford opportunity for wit-

nessing the operation performed with the expander.

J (see particularly Figs. 1, 2, 3, and 4) designates standards or columns extending vertically upward at opposite points. Two are represented as arranged on each side of the boiler. Between each two which are on the same side of the boiler a brace, J', is shown as extended. It consists of a tube bearing against the opposite faces of the standards or columns and a bolt extending through the columns and through this tube. The columns which are opposite each other on different sides of the boiler are similarly connected by braces J². The columns J have secured to them near their upper ends brackets J³. These brackets are secured to the inner surfaces of the standards or columns. They are provided with inwardly-extending portions j. These inwardly-extending portions are provided with cavities j', in which are fitted rollers j². Above the rollers are loose plates j³. Brackets or arms C' are secured to the sides of the shell C, and extend outwardly over the inwardly-extending portions j of the brackets J³. The arms C' have cavities in their under sides. These cavities are opposite the cavities j' of the brackets J³. The loose plates j³ are located within the cavities of the brackets or arms C'. The brackets or arms C' are provided with set-screws C², extending through them and bearing upon the loose plates j³. This combination of parts affords a convenient means for supporting the shell C, while adapting the different parts of the boiler to expand and contract freely. The set-screws C² afford provision for adjusting the parts into desired relations.

While it is not necessary to provide the set-screws and the parts coacting with them at each end of the boiler, they may advantageously be provided at both ends.

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

1. In a header, the combination, with the back of the header, of a connection for a removable bolt, said connection being of wrought-iron or similar material fastened to

the back of the header by having the metal of the back of the header cast around it, substantially as specified.

2. In a boiler, the combination, with the back of a header, of an eye-connection for a bolt provided with a shank having an enlarged end, said eye being secured to the back of the header by having the metal of the back of the header cast around the shank, substantially as specified.

3. In a boiler, the combination, with a header having a detachable cover, of a bolt for securing the cover, an eye at the rear end of the bolt, and crossed hooks secured to the back of the header, substantially as specified.

4. In a boiler, the combination of a longitudinally-extending drum or shell, water-tubes, series of headers at the ends of the tubes, and a transverse saddle arranged between a series of headers and the drum or shell, and provided with openings opposite the headers immediately below and turrets above such openings, substantially as specified.

5. In a boiler, the combination of a longitudinally-extending drum or shell, water-tubes, series of headers at the ends of the tubes, and a transverse saddle arranged between a series of headers and the drum or shell, and provided with openings opposite the headers immediately below, turrets above such openings, hand-holes in the front in line with the turrets, and hand-holes at the ends, substantially as specified.

6. In a boiler, the combination, with a drum or shell provided with laterally-extending brackets or arms, of standards or columns provided with inwardly-extending brackets, rollers between the brackets of the columns and the brackets or arms of the drum or shell, loose plates bearing upon these rollers, and adjusting-screws extending through one pair of brackets or arms and impinging upon the loose plates, substantially as specified.

WILLIAM E. KELLY.

Witnesses:

C. S. ATKINSON,
GEORGE VENABLE.