

H. M. ASHLEY.  
STEAM BOILER AND ITS SETTING.

APPLICATION FILED JULY 26, 1901.

NO MODEL.

2 SHEETS—SHEET 1.

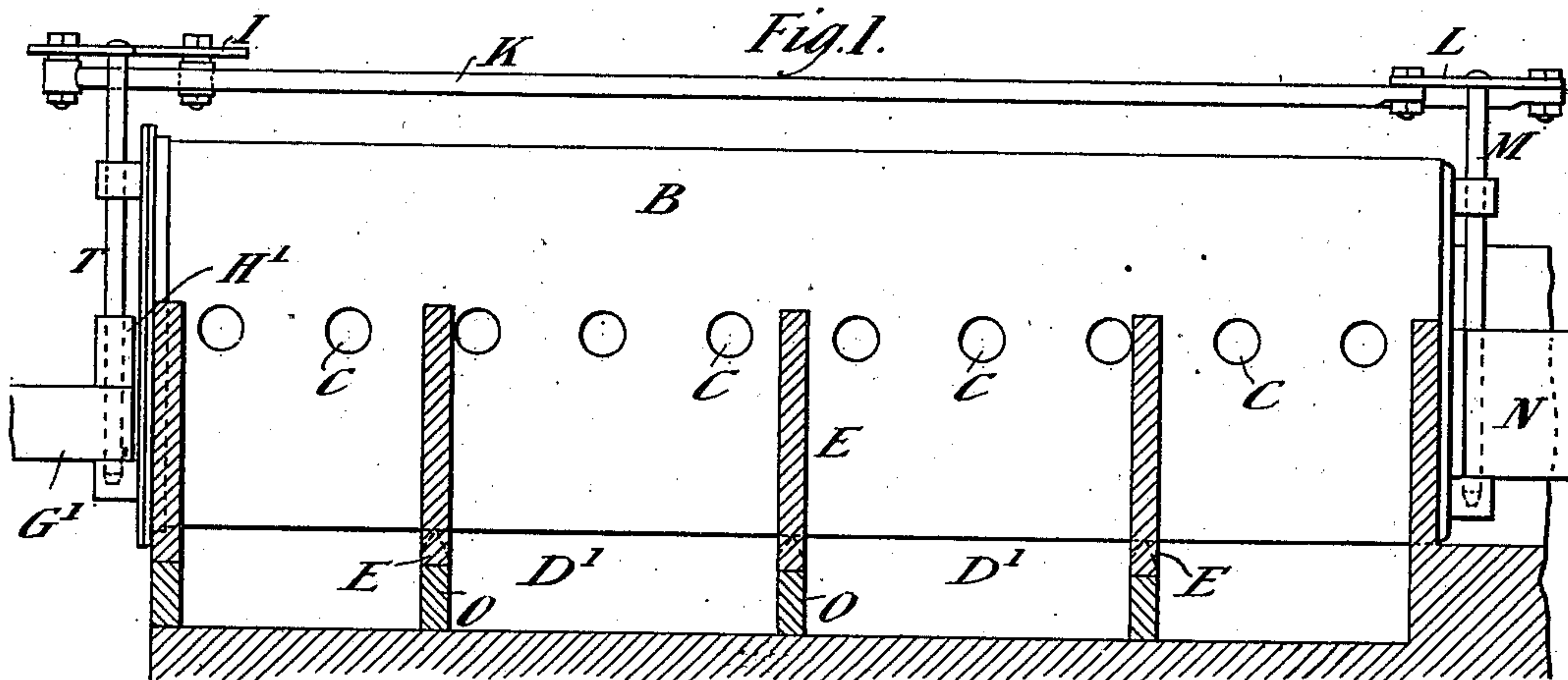
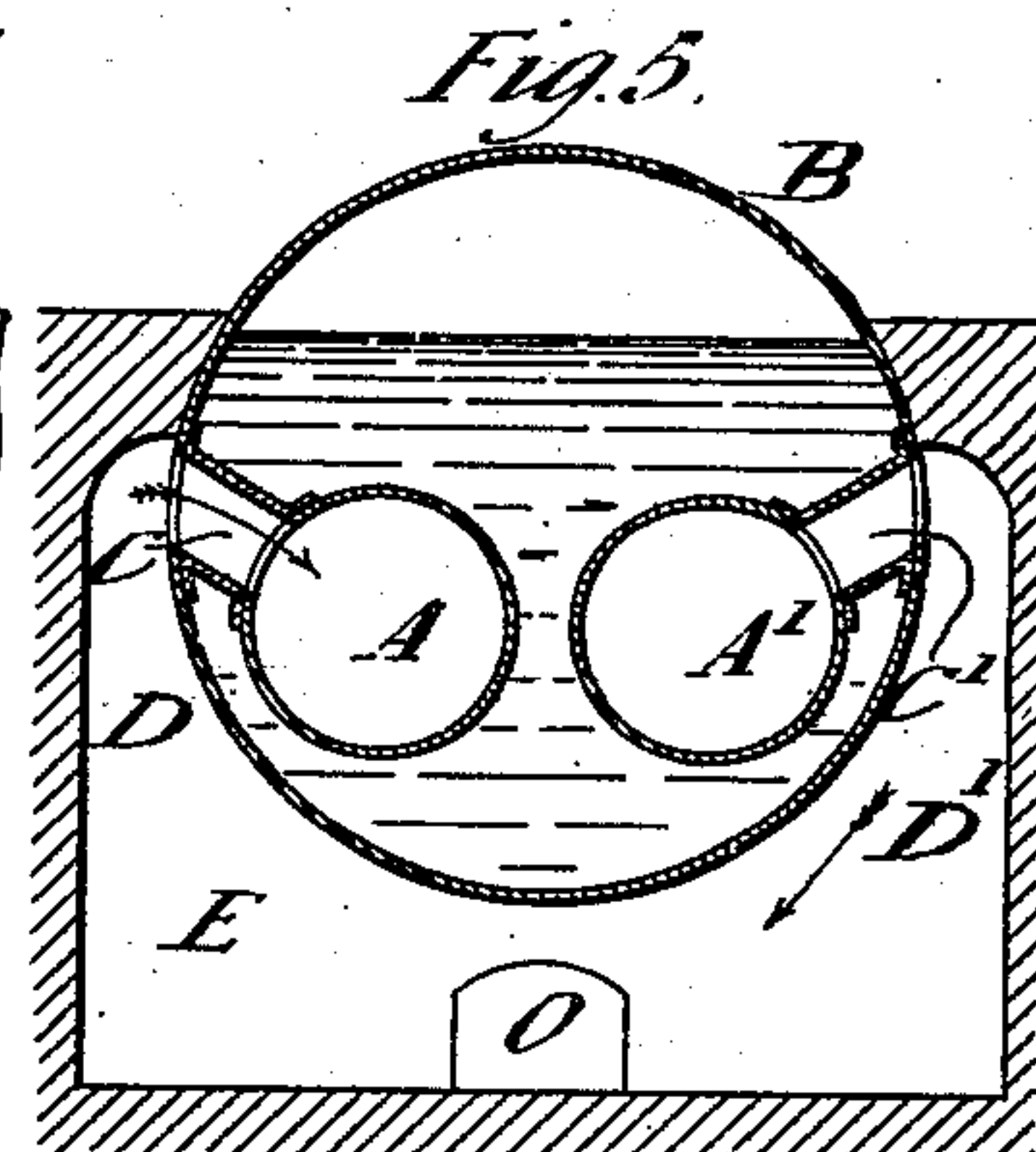
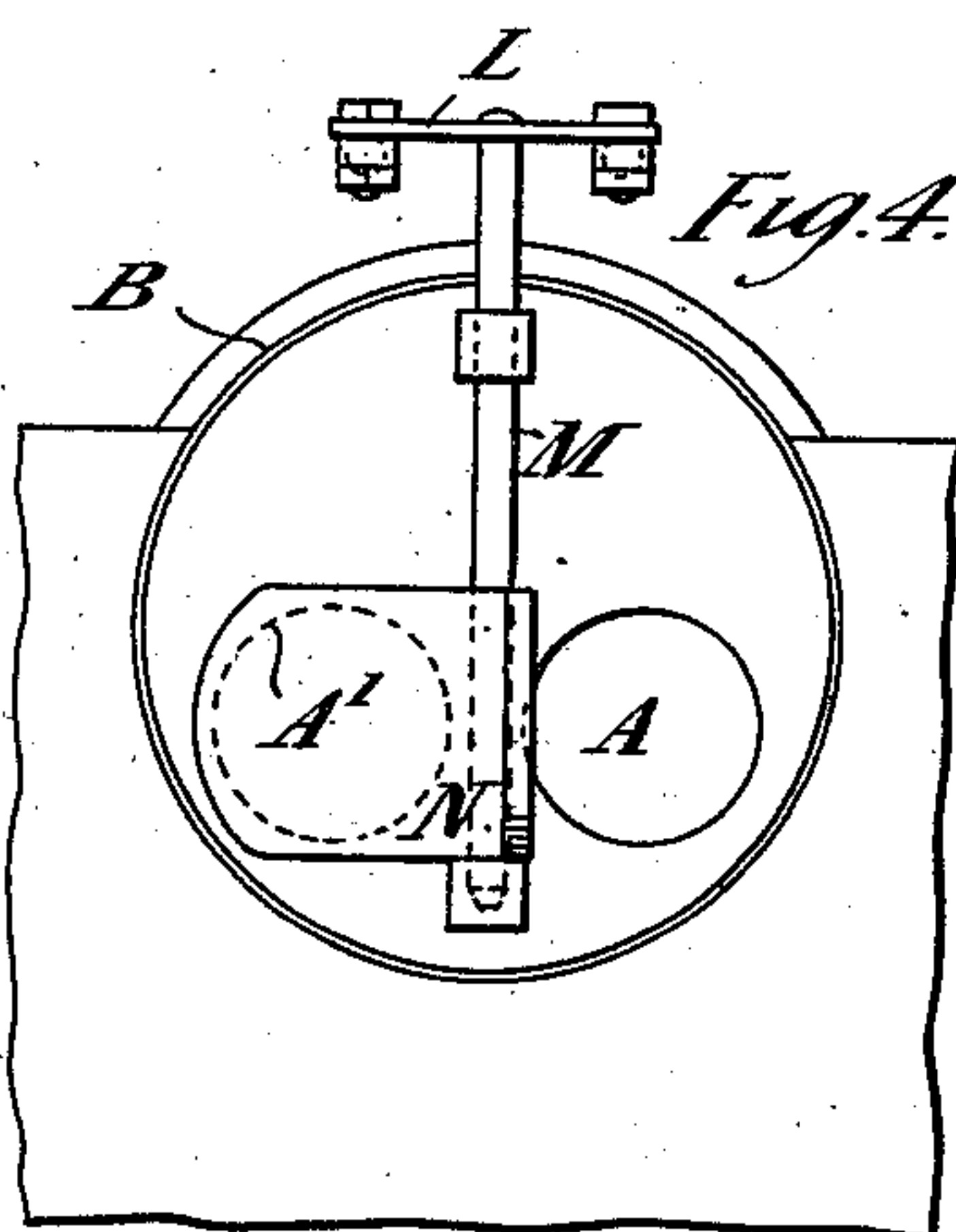
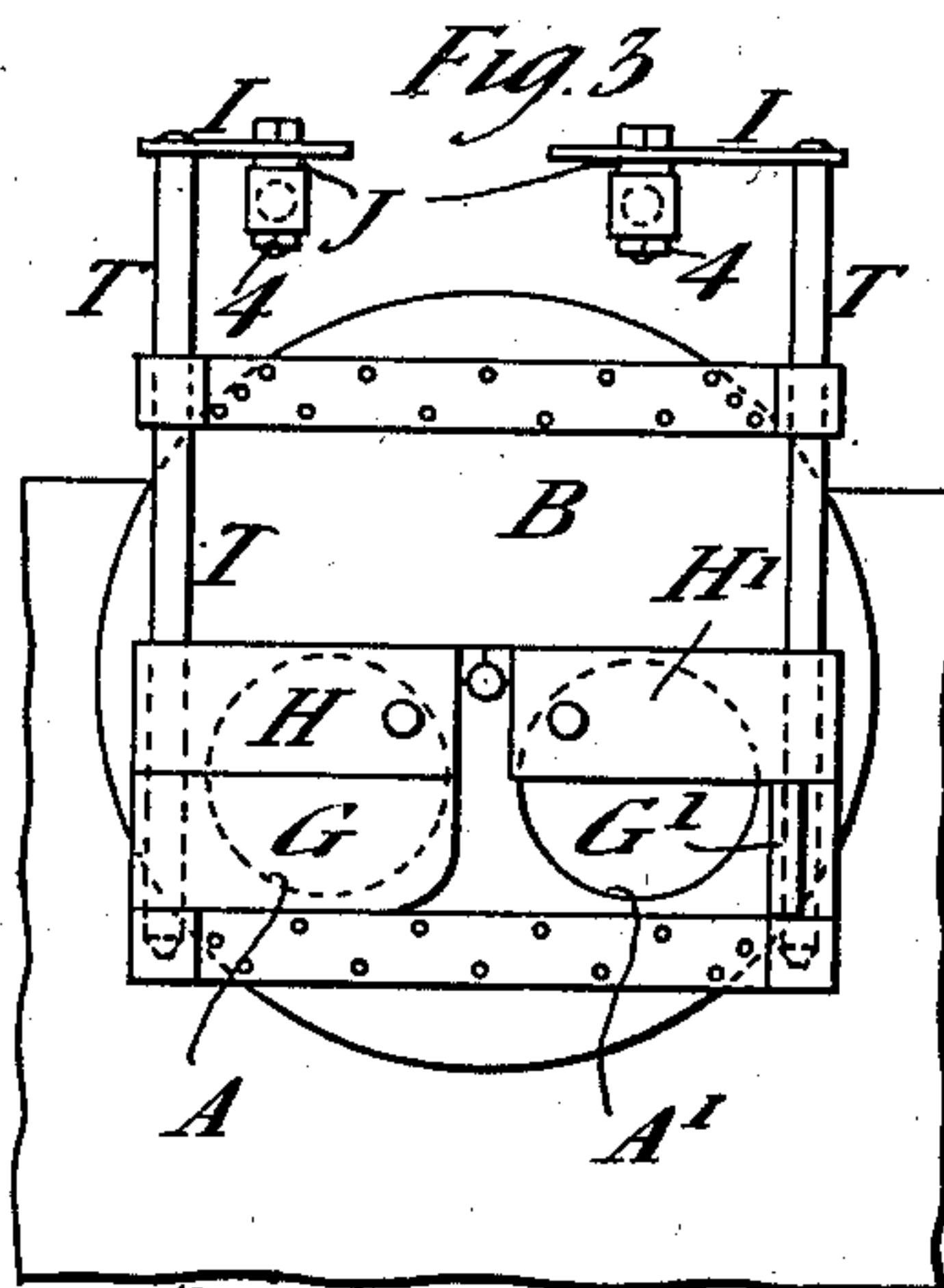
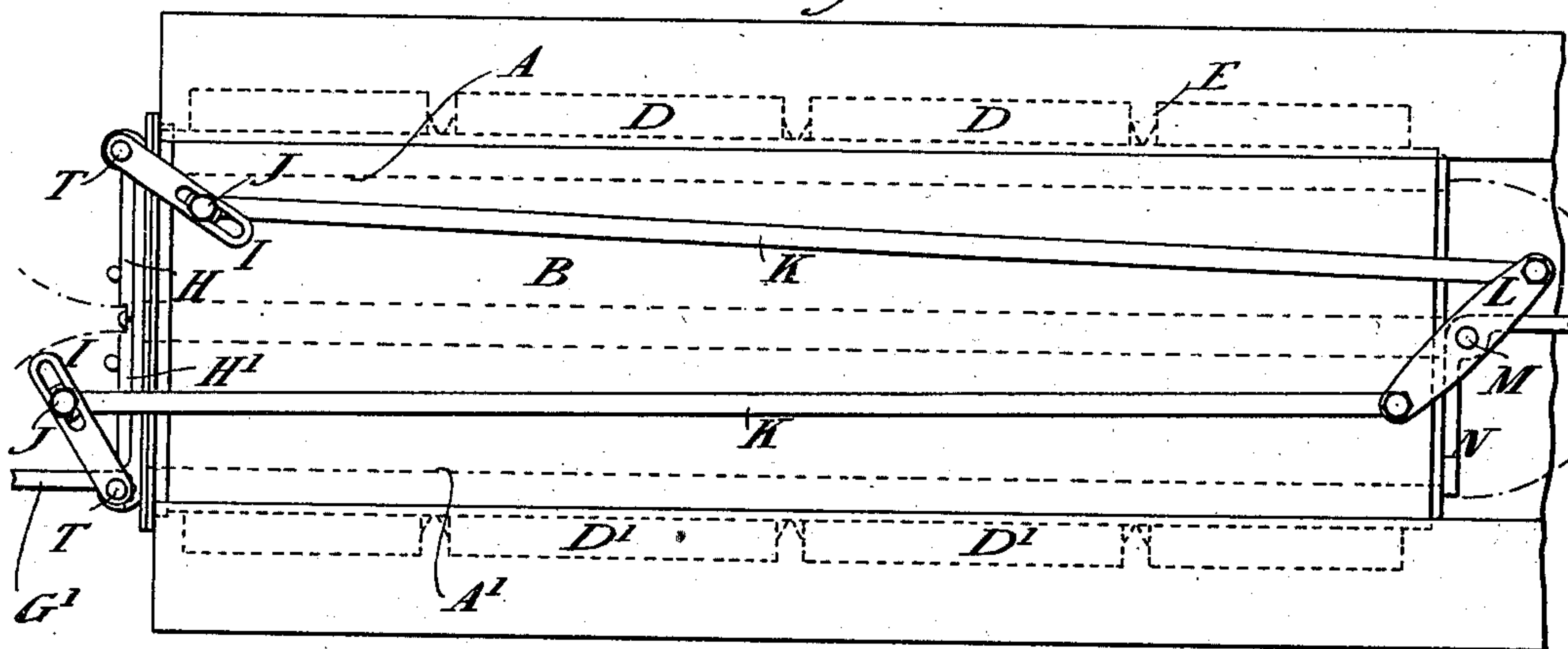


Fig. 2.



Witnesses:

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Inventor:

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by *R. L. Ewin, Attorney*

No. 723,805.

PATENTED MAR. 31, 1903.

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2 SHEETS—SHEET 2.

Fig. 6

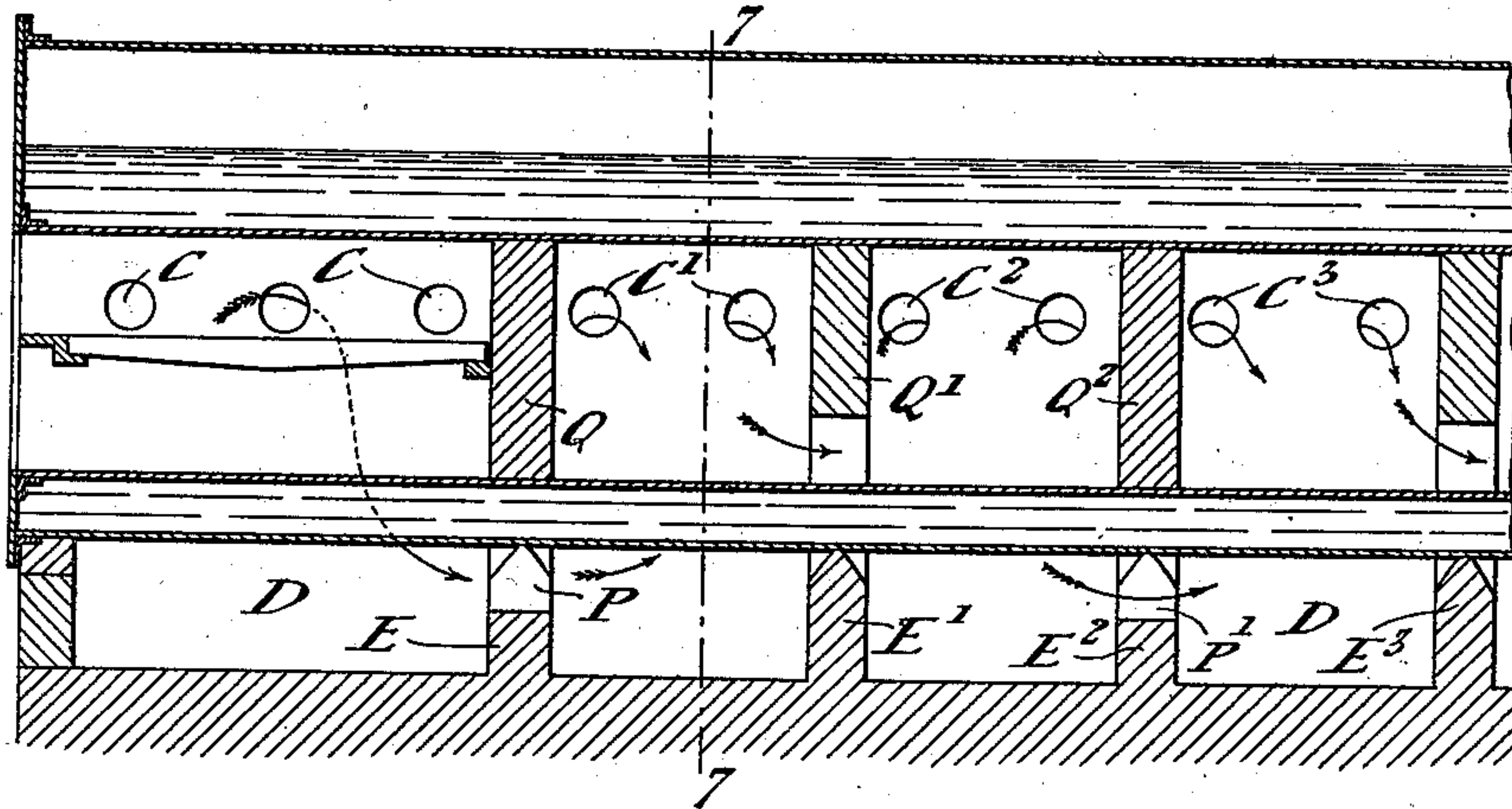
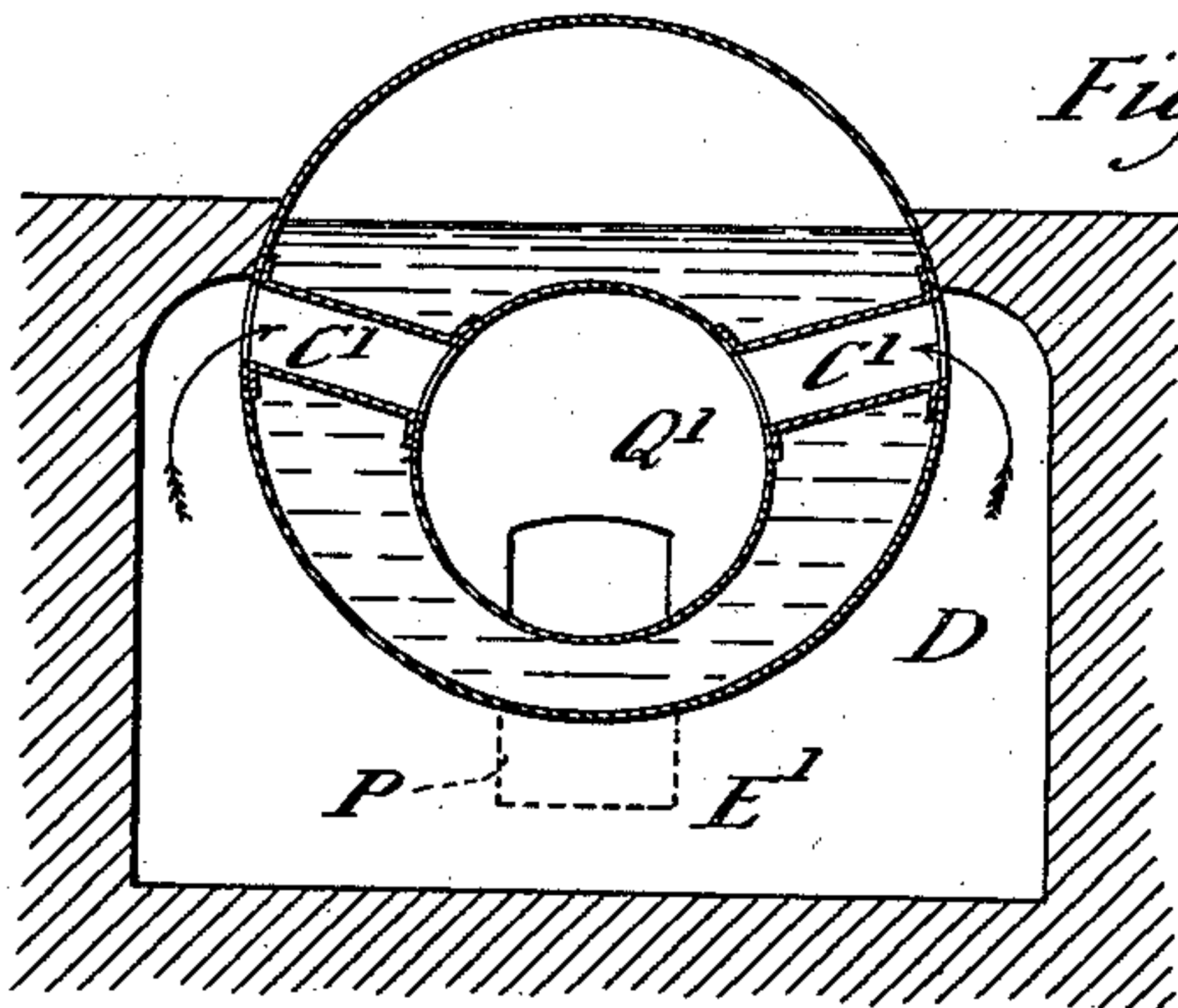



Fig. 7



Witnesses:

A. M. Long.  
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Inventor.

Howard Matramers Ashley  
by  Attorney



# UNITED STATES PATENT OFFICE.

HOWARD MATRAVERS ASHLEY, OF FERRYBRIDGE, ENGLAND.

## STEAM-BOILER AND ITS SETTING.

SPECIFICATION forming part of Letters Patent No. 723,805, dated March 31, 1903.

Application filed July 26, 1901. Serial No. 69,833. (No model.)

*To all whom it may concern:*

Be it known that I, HOWARD MATRAVERS ASHLEY, a citizen of England, residing at Ferrybridge Foundry, Ferrybridge, in the  
5 county of York, England, have invented certain new and useful Improvements in Steam-Boilers and Their Settings, (for which I have applied for a patent in Great Britain, dated December 27, 1900, No. 23,683,) of which the  
10 following is a specification.

My invention relates to Cornish boilers, or such as have a single longitudinal fire-flue, and to Lancashire boilers, which have two  
15 such flues, and has for its object to insure a more effective action of the flame and hot gases and to provide for combustion of smoke.

I shall describe these improvements, referring to the accompanying drawings, in all the figures of which like reference letters and  
20 numerals are employed to indicate like parts.

Figure 1 is a side elevation, Fig. 2 a plan, Fig. 3 a front elevation, Fig. 4 a back elevation, and Fig. 5 a transverse section, of a Lancashire boiler with my improvements applied thereto. Fig. 6 is a longitudinal section  
25 of part of a boiler; and Fig. 7, a transverse section through 7 7, showing my improvements applied to a Cornish boiler.

Referring first to Figs. 1 to 5 of the drawings, the boiler B has two longitudinal fire-flues A A', each of which is provided with tubes C C' on their outer sides, the openings of which extend from near the crown of the fire-flues obliquely upward through the shell  
30 of the boiler to near the top of the side flues D D', which are primarily of the usual construction. I divide these side flues by partitions E, which extend down under the boiler, thus forming the flue into separate compart-  
35 ments. These partitions are built with an inverted-V edge and serve both as a support for the boiler and as guides to the flame or heated gases, compelling these to pass circumferentially instead of longitudinally over  
40 the outer surface of the boiler. The partitions may be of any number and any distance apart; but I prefer to place the first partition at about the same distance back as the usual bridge formed at the back of the furnaces.

At the front end of the boiler are provided fire-doors H H', mounted loosely on vertical  
50 spindles T, to which are also fixed the ash-pit or draft-hole doors G G'. At the top these

spindles carry slotted levers I, in the slots of which slide adjusting-pins J, which can be  
55 fixed in certain positions by lock-nuts 4 and are attached to connecting-rods K, passing to the other end of the boiler and there connected with a lever L, fixed on a pivot M, carrying an L-shaped valve N. It will be seen  
60 that by means of this arrangement the ash-pit or draft-hole doors can be so set as to close or partly close alternately and in such a manner that when the draft-hole door of the one furnace is open the back of its flue is  
65 closed, while the draft-hole door of the other furnace is closed and the back of its flue is open, and vice versa. The partitions E are provided with manhole-doors or movable parts O to enable the flues to be cleaned.

The operation of a boiler constructed as above is as follows: Assuming that the right-hand furnace in A' is being stoked and the draft-hole door G' is open, then by means of the pivots T, connecting-rods K, and pivot  
75 M the L-shaped valve N at the rear end of the flue is placed in such a position as to close that flue and leave the other flue open to the chimney-shaft. The result of this is that the flame and heated gases, not being able to es-  
80 cape at the rear end of the flue, are forced through the side tubes C' into the flues D' and are caused to travel circumferentially around the boiler into the flue D and then enter by the tubes C into the other flue A  
85 onto the top of the incandescent fire, causing this fire to consume the smoke of the newly-fed fire. This can only be accomplished by having the usual hot-air chambers fixed at the back of the fire-doors, which pass a large  
90 amount of heated air through each furnace alternately to mix with the smoke and escaped gases over the incandescent fire at the point of ignition. When the fire in the other flue A requires stoking, the opening of the  
95 draft-door G automatically reverses the direction of the flames and the heated gases by closing the opening at the end of its flue and opening the end of the other flue by reversing the position of the valve N.

Referring now to Figs. 6 and 7, which describe my invention as applied to a Cornish boiler, I provide a row of tubes C C' C<sup>2</sup> C<sup>3</sup> on each side, extending from near the crown of the flue through the shell of the boiler to near  
105 the top of the usual side flues D. I divide



these side flues by partitions  $E E' E^2 E^3$ , which extend down under the boiler and serve as a support for the same, and each alternate partition is provided with openings  $P P'$ . In the fire-flue I also build partitions  $Q$ , the first one at the end of the fire-grate and each alternate one being made to close the flue entirely, while the others have openings at their bottoms. This arrangement of partitions  $E$  and the partitions  $Q$  in the fire-flue and of their openings causes the flame and hot gases from the fire to take the following course: First, as they are stopped by the partition  $Q$  from passing along the fire-flue they pass out by the tubes  $C$  to the side flues  $D$  and descend circumferentially around the boiler to the bottom, where they pass through the opening  $P$  in the partition  $E$ . Being prevented from passing along this flue by the closed partition  $E'$ , they ascend again by the side flues  $D$  and pass by the tubes  $C'$  into the fire-flue. Passing some distance along it, they meet the partition  $Q'$  and pass under the opening at the bottom into the next space of the fire-flue, where they meet another closed partition  $Q^2$ , which causes them to pass out of the next set of tubes  $C^2$  into the flues  $D$  again. From here they pass through the opening  $P'$  into the next compartment, and being again stopped by the closed partition  $E^3$  they ascend again by the side flues  $D$  and pass by the tubes  $C^3$  into the fire-flue, and so on along the whole length of the boiler until they escape by the smoke-jack or uptake. It will be seen that by this arrangement of passages and tubes the flame and heated gases are made to pass circumferentially over both the outer surface of the boiler and the inner surface of the fire-flue instead of longitudinally along these surfaces.

I prefer to arrange boilers of the Cornish type in pairs whenever possible and to fire the two boilers alternately, making both flues meet in a common chamber where the smoke, flame, and products of combustion from the flue last fired meet the incandescent flames and gases from the other. This assists in consuming the smoke arising from fresh stoking.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

1. A horizontal boiler having one or more longitudinal flues and laterally-extending fire-tubes, in communication with each other, in combination with a setting for the same having side and bottom flues with which said fire-tubes communicate, transverse partitions dividing said side and bottom flues into sections, a fire-box or fire-boxes at the front end of the boiler, an uptake at its rear end, and means for interrupting the direct draft, whereby the combustion products are made to pass back and forth beneath the boiler from side to side thereof.

2. The combination, in a horizontal cylindrical boiler and its setting, of a fire-box at the front end of the boiler, a longitudinal flue

and lateral fire-tubes within the boiler in communication with each other, circumjacent flues formed by the setting, partitions dividing said circumjacent flues into circumferential sections in communication with such fire-tubes respectively, and an uptake at the rear end of the boiler.

3. The combination, in a boiler and its setting, of a pair of fire-boxes side by side within the boiler, an uptake common to both, flues connecting the respective fire-boxes with the uptake, flues extending from side to side beneath the boiler, fire-tubes connecting the respective fire-boxes with the flues last named, and means for interrupting the direct draft from either fire-box at will, whereby the smoke and unconsumed gases from either fire-box may be made to pass beneath the boiler and into the other fire-box above an incandescent fire in the latter for the combustion of such smoke and unconsumed gases.

4. The combination, in a boiler and its setting, of a pair of fire-boxes at one end, direct-draft flues within the boiler in communication with the respective fire-boxes, flues external to the boiler, lateral fire-tubes connecting the respective direct-draft flues with said external flues, an uptake common to said direct-draft flues, and means for interrupting the direct draft from either fire-box at will.

5. The combination, in a boiler and its setting, of a pair of fire-boxes at one end, direct-draft flues within the boiler in communication with the respective fire-boxes, flues external to the boiler, partitions dividing said external flues into sections, lateral fire-tubes connecting the respective direct-draft flues with successive sections of said external flues, an uptake common to said direct-draft flues, and means for interrupting the direct draft from either fire-box at will.

6. The combination, in a boiler and its setting, of a pair of fire-boxes at one end, direct-draft flues within the boiler in communication with the respective fire-boxes, flues external to the boiler, partitions dividing said external flues into sections, lateral fire-tubes connecting the respective fire-boxes and the respective direct-draft flues with successive sections of said external flues, an uptake common to said direct-draft flues, movable furnace-doors at the fire-box end, valves at the opposite end of the direct-draft flues, and connections between the respective valves and furnace-doors arranged to close the direct-draft flue corresponding with the fire-box whose door is open and to open the direct-draft flue whose fire-box is closed, substantially as hereinbefore specified, and for the purposes set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HOWARD MATRAVERS ASHLEY.

Witnesses:

EDWARD GARDNER,  
GERALD L. SMITH.