

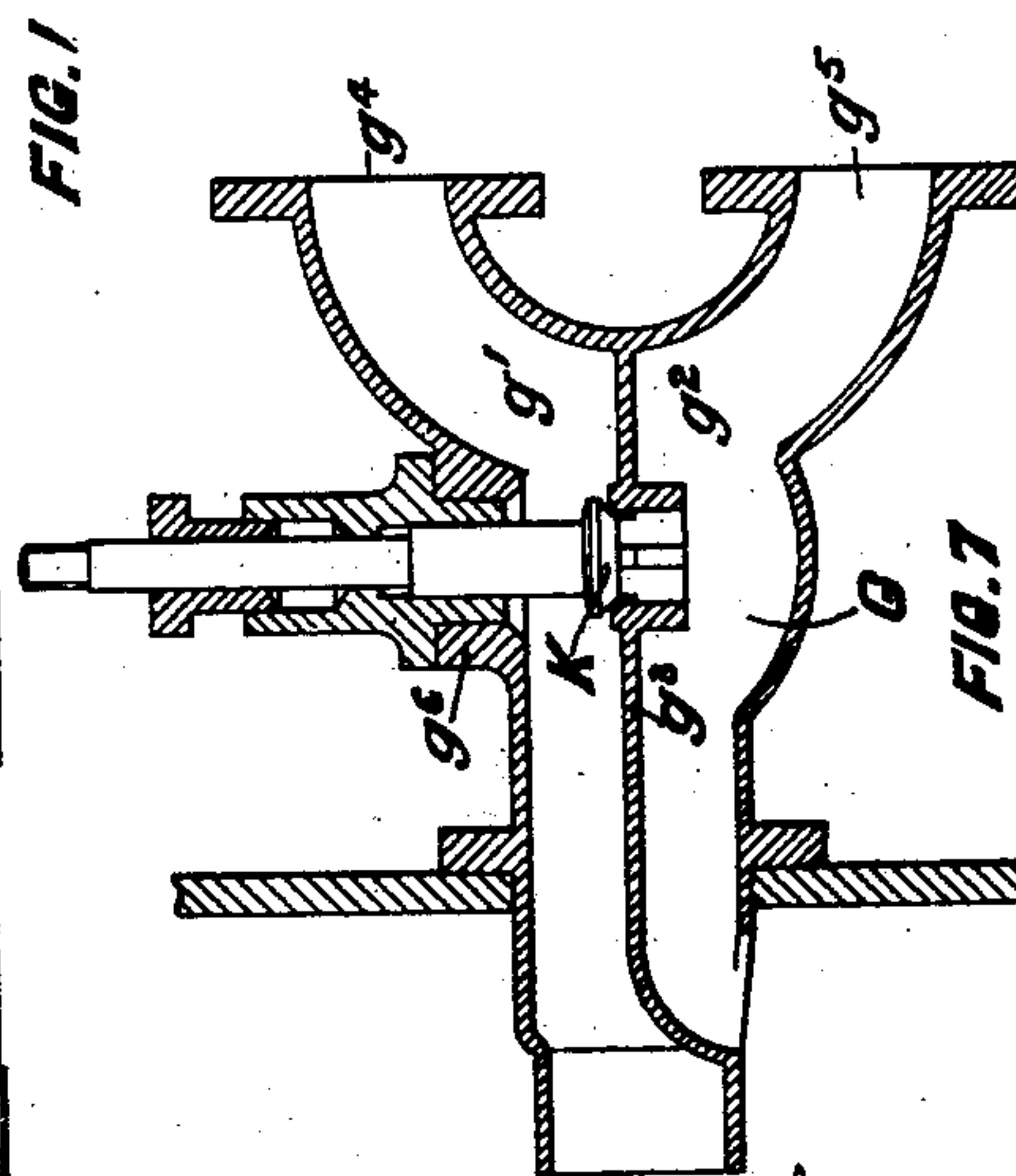
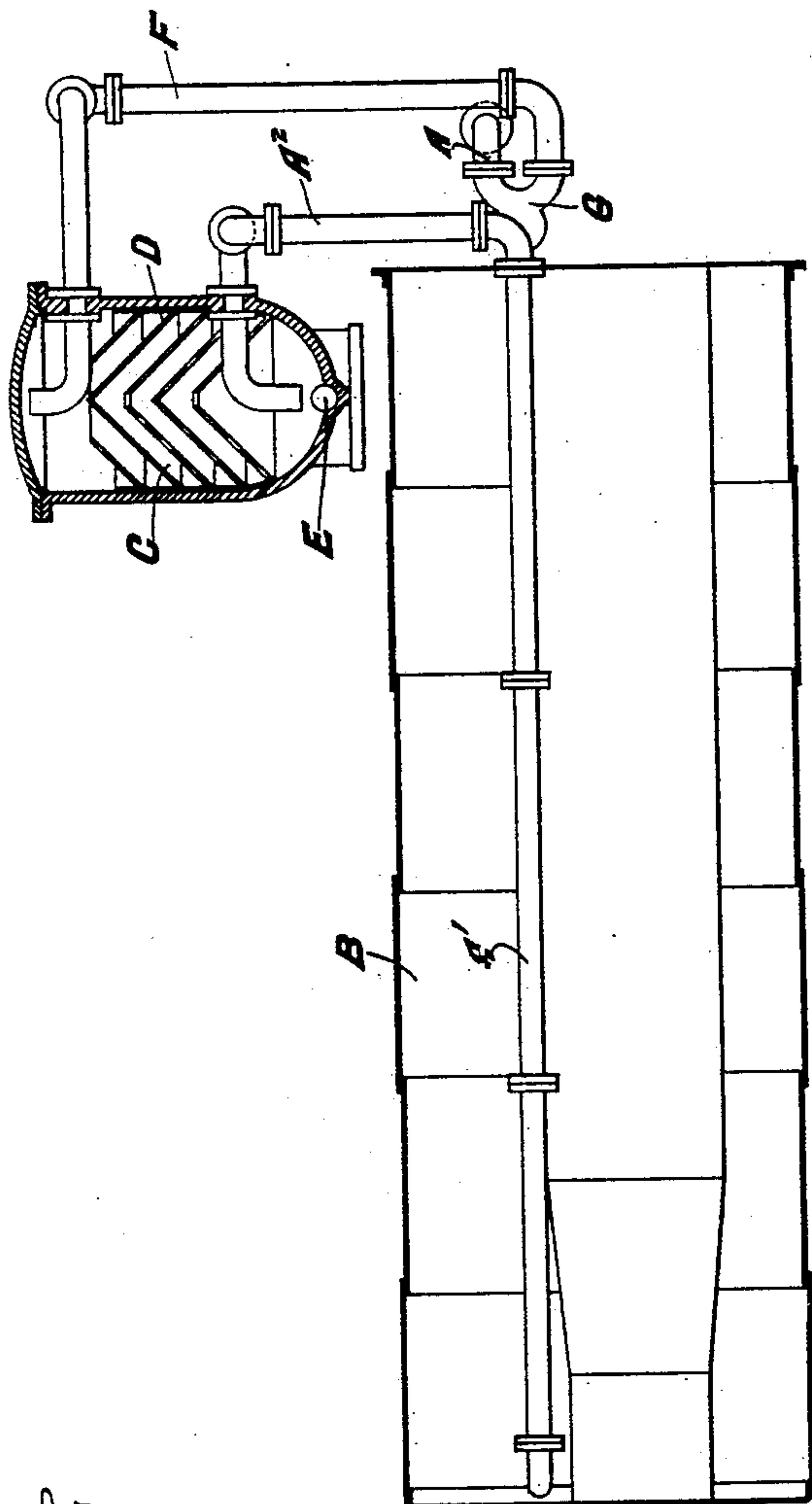
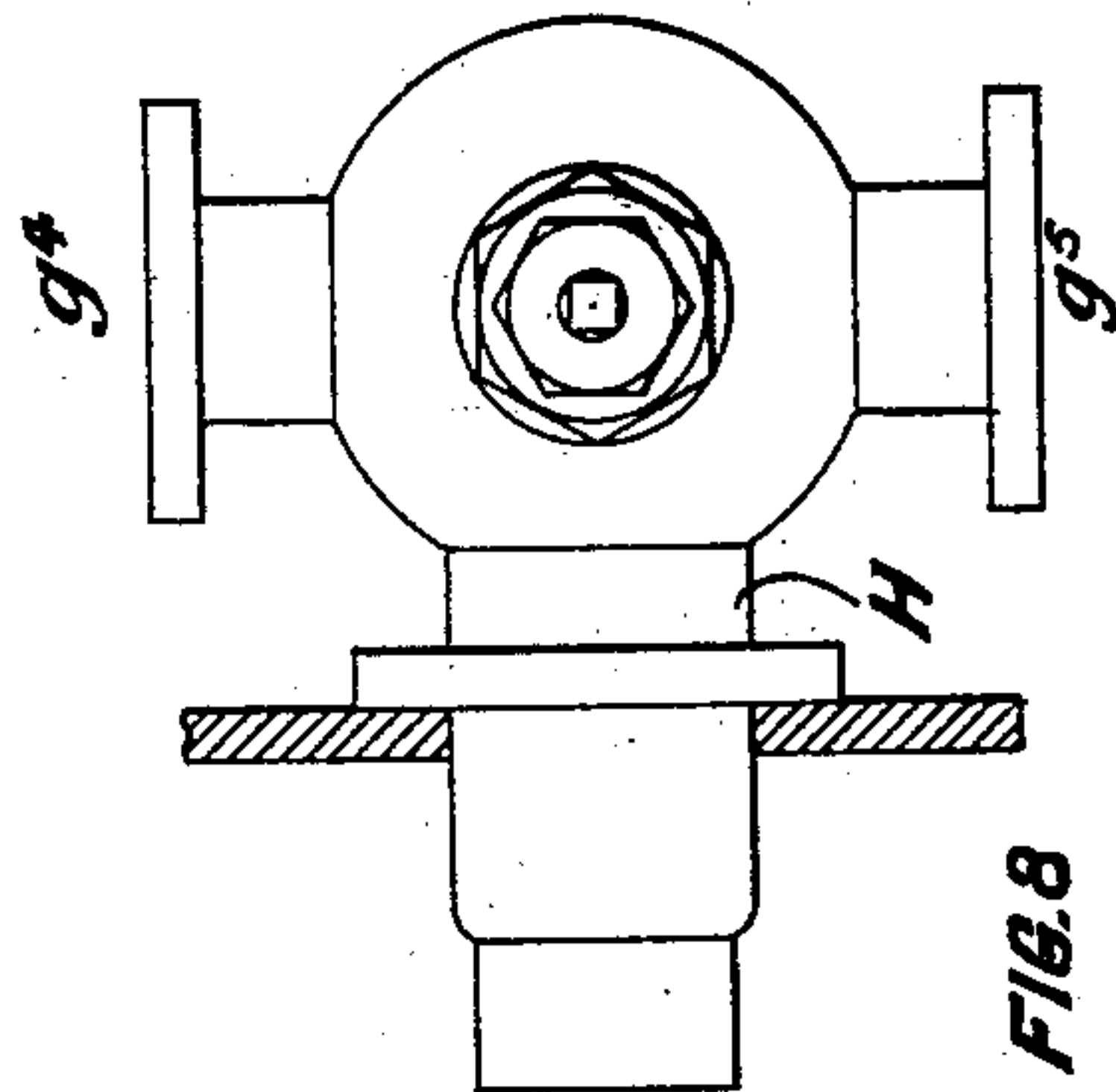
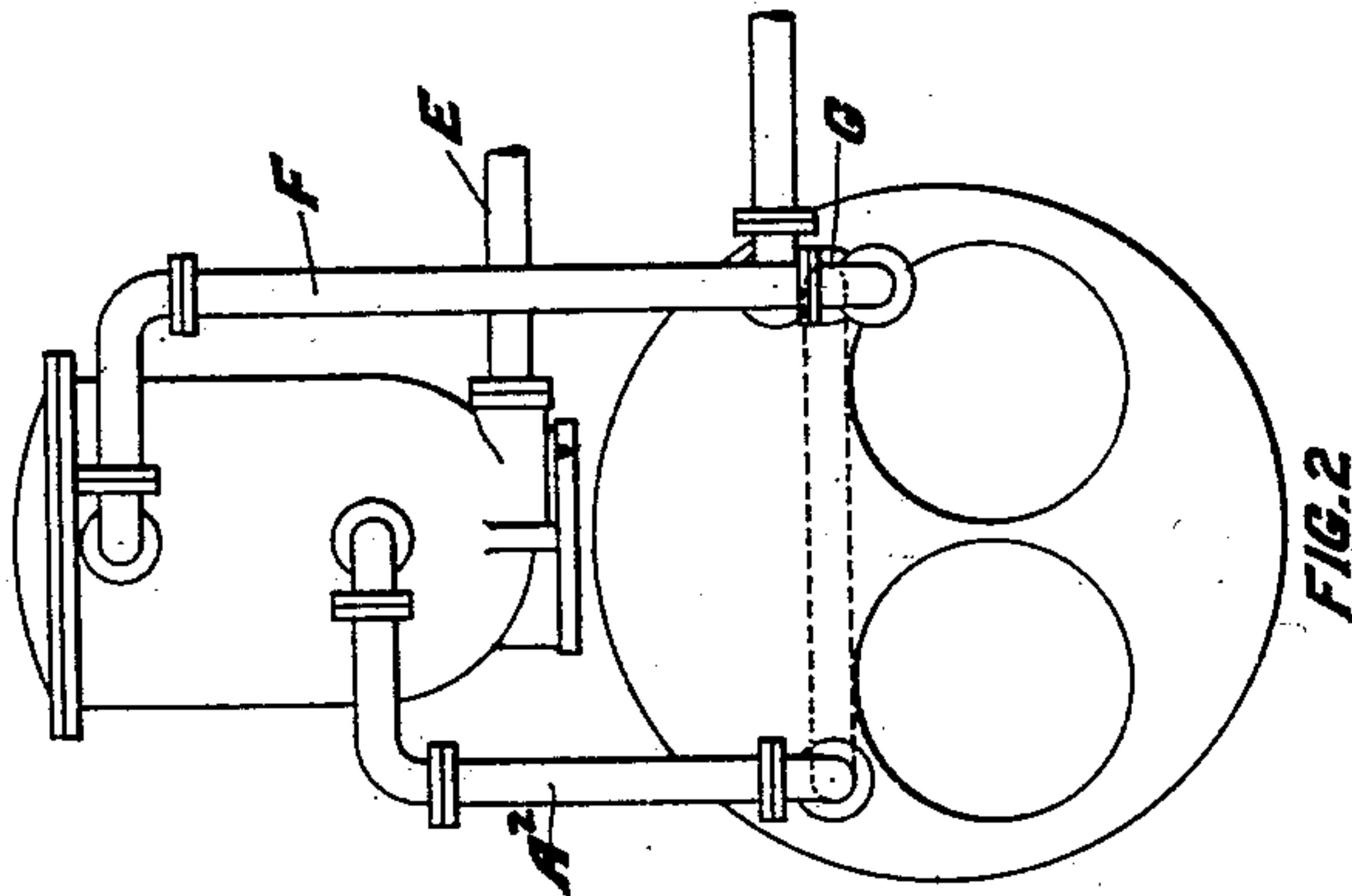
(No Model.)

2 Sheets—Sheet 1.

W. & W. A. CLARK.
FEED WATER HEATER.

No. 591,816.

Patented Oct. 19, 1897.



Witnesses
H. van Oldenmeel
E. A. Scott.

Inventors
William Clark
William Alexander Clark
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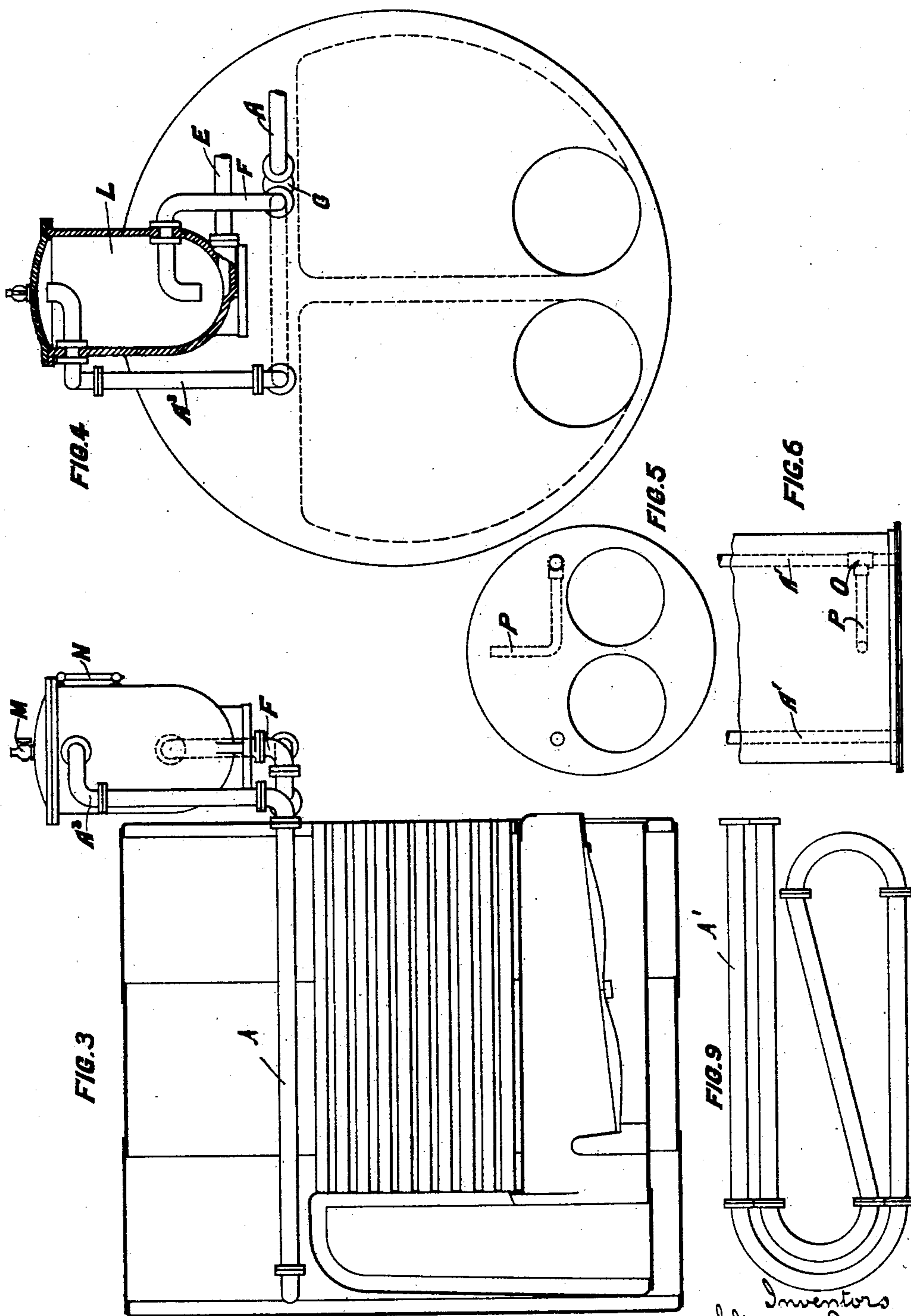
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William Clark
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UNITED STATES PATENT OFFICE.

WILLIAM CLARK AND WILLIAM A. CLARK, OF LONDON, ENGLAND.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 591,816, dated October 19, 1897.

Application filed June 15, 1896. Serial No. 595,597. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM CLARK and WILLIAM ALEXANDER CLARK, citizens of Great Britain, residing at No. 37 Whitworth Road, Plumstead, London, in the county of Kent and Kingdom of England, have invented certain new and useful Improvements Relating to the Heating and Purifying of Feed-Water for Steam-Boilers and Like Vessels, of which the following is a specification.

This invention has reference to the manner in which we construct and arrange apparatus and fittings for supplying feed-water to boilers and for purifying the water from the impurities contained in it before introduction into the boiler, and also for extracting oil, grease, or other fatty matter held in suspension in the water employed for general engine-work, for marine engines, and for like purposes.

In the accompanying sheet of explanatory drawings, Figure 1 is a sectional elevation of a Lancashire boiler with our improvements attached, and Fig. 2 is an end elevation of the same. Figs. 3 and 4 are similar views of a marine boiler having our improved fittings thereon. Figs. 5 and 6 are diagrammatic views of an alternative method we sometimes adopt. Fig. 7 is a sectional elevation of our improved valve, and Fig. 8 is a plan of a modified form of the same type of valve. Fig. 9 is a detail of an alternative form.

In carrying our invention into effect when arranging our improvements for attachment to an ordinary Lancashire or Cornish boiler we arrange the parts as shown in Figs. 1 and 2. We make the pipe A from the feed-pump to pass into and around the inner space B of the boiler and through the same for the purpose of heating the water when passing through the pipe A', and we convey the water after having passed through the steam-space in its pipe-circuit to a settling-chamber or exterior sediment-casing C, in which the water will be allowed to remain comparatively at rest before it is drawn from thence for feeding into the boiler.

We make our settling-chamber C of any desired shape, and of any suitable metal, and we arrange therein a number of baffle-plates or projecting ridges D, preferably inclined within the chamber for the purpose of divid-

ing the water into thin sheets or layers when held within it, in order that the solids or other impurities which are freed when the water is raised in temperature may be deposited or slipped down free from disturbance by the gradual upward current of the feed-water within the settling-chamber. The angular or other projecting ridges or baffle-plates we make with suitable openings or perforations for allowing the sediment to fall from one ridge to the other, these openings or perforations being arranged to overlap or not to be opposite those above and below them. We prefer to incline the ridge-plates from the sides toward the center, the inclination being upward, in order that the solids or sediment deposited on one ridge or plate may pass on to another in a radial or opposite direction, thus falling gradually to the bottom, where the matter can be blown off by any ordinary blow-off-cock pipe E or by other well-known devices. We deliver the water after having passed it through the boiler to the under side of the settling-chamber and cause it to ascend, and we withdraw it from the upper surface by the pipe F to feed the boiler, making it sometimes to pass through a special combination branch pipe having an improved valve G or H therein for controlling the supply, although we do not limit the application of our invention to any particular form of branch piece or to any special form of inlet or controlling valves or cocks.

The action of our apparatus is as follows: The water is forced through the feed-pipes A A' by any ordinary force-pump or injector round the inside of the boiler B, where it becomes heated in the steam-space to a very high temperature. This temperature causes the lime and other solids held in a state of suspension or solution to be freed, and by the continual forward motion of the water in the feed-pipes the solids are carried out again into our settling-chamber C, entering through the pipe A² near the lower end, where the water being in a comparative state of rest the deposit takes place. The feed thus heated and delivered to the chamber gradually rises to the top, leaving all the solids or impurities at the bottom or on the shelves or plates D, which direct the sediment to the bottom, where it can be blown off or withdrawn as required

through E. The water at the top of the settling-chamber thus freed from solids by high temperature and continual precipitation is withdrawn from an outlet F near to the top to feed the main body of water in the boiler. Any deposit that may be left in the ordinary feed-pipes can be blown out by our improved form of cock G, having two ways g' g^2 through it, one, g' , for conveying the feed-water containing all impurities to the circuit-pipes in the boiler and the other waterway, g^2 , for conveying the purified water back from the settling-chamber to feed the main body of water in the boiler. We make this improved valve in one suitable form with a web or division plate g^3 in the main portion, as shown at Figs. 7 and 8, the one side of the division-plate being taken into a branch piece g^4 for supplying the impure water and the other side to a similar branch piece or flange attachment g^5 for supplying or receiving the purified water at each end—that is, there are two branches or flanges at one end or two union bosses, the one receiving the water from the pump and passing it through above the web-plate to the circuit-pipe on the other end, while the other similar branch or connection receives the purified water from the settling-chamber and passes it under the web-plate to another branch or connection for supplying the purified water to the boiler. We provide a boss g^6 upon the upper portion of our junction-piece body for receiving a valve-stem and ordinary gland and stuffing-box, through which we pass a spindle carrying an ordinary screw-down valve K upon its end. We provide a seat and opening within the web-plate to receive this valve, so that when the spindle is manipulated the two chambers g' g^2 may be placed one in communication with the other, and when the stop-cock or back-pressure valve is closed which supplies the water from the purifier or settling-chamber and the communication-valve is opened the water within the tube-circuit in the boiler can be made to scour out the pipes for the purpose of removing any sediment which may have become deposited at the corners, and thus the whole of the pipes can be readily cleaned by the water and steam forcing through. This result is due to the pressure within the boiler, which is free to pass from the boiler beneath the partition g^3 through the valve K and into the tube-circuit. Similarly by reversing the action and shutting off the supply from the pump and allowing the connection to and from the purifier or settling-chamber to be opened the water can be set in constant circulation throughout by the valve being opened. We are enabled by this arrangement of our improved valve to clear out all before it in the feed-pipes round the boiler and to blow everything out within the settling-chamber C when the sludge cocks or valves connected at E are opened, which we provide upon this chamber.

When arranging our improvements for

application to sea-going boilers, as shown at Figs. 3 and 4, in which the water-feed is mainly obtained from the condensers and the water is consequently much impregnated with oil, grease, and other fatty matters from the lubricators of the engine, we make our settling-chamber L of somewhat different form internally and we provide that its action shall be such that the inlet A^3 from the feed-pumps enters a settling-chamber near the top and the outlet to the boiler is taken from near the bottom or lower end, so that when the feed-water in its impure state mixed with oil or like matters enters the upper end of the settling-chamber these impurities being of a much less specific gravity than water will remain on the top surface, the solids only sinking to the bottom to be withdrawn by the sludge-cock attached to E while the impurities may be withdrawn by any blow-off cock and valve M arranged at the top.

We provide a gage-glass N and ordinary indicating-cocks upon our chamber to record the condition of the water within the chamber, so as to determine the blowing-off stage of the operation. We take our water from the feed-pump pipe A first round the boiler in the steam-space prior to taking it to the settling-chamber, and we may employ our improved valve (shown at G or H,) as hereinbefore described, when arranging our improvements upon an ordinary land-boiler.

We sometimes dispense with the special two-way valve or cock and allow any ordinary check or regulating single-way valve to control the admission of water to our pipe-circuit within the steam-space of the boiler, and in Figs. 5 and 6 such an arrangement is shown. We allow the feed-pipe circuit A' to have a branch piece O upon it at a position within the boiler, and to this branch we attach an open-ended pipe P or a pipe having a back-pressure or other valve attached to its upper end. When the pipe-circuit is to be scoured, we close the outer valve connected with the pipe-supply and open the sludge or blow-off valve or cock in the chamber, thus permitting the steam to pass down the open pipe P and to clear out the circuit-pipe and the chamber through which it will travel on its way to the blow-off branch. It will be readily understood that in ordinary use the water will not escape out of the open end of the branch pipe P as the steam will be acting against it.

Fig. 9 shows an alternative arrangement of a more circuitous form of pipe A' , which we sometimes employ to attain the maximum temperature of the feed-water by a longer contact with the steam in the steam-space, so as to insure total precipitation.

Having thus described our invention, we declare that what we claim, and desire to secure by Letters Patent, is—

1. In combination with the boiler, the circulating-pipes for the feed-water, the supply-pipe for the feed-water, the settling-drum

connected with the circulating-pipes, the connecting-pipe from the settling-drum to the boiler for the purified water and the duplex coupling for connecting the feed-water supply and the circulating-pipes and for also connecting the interior of the boiler with the pipe from the settling-drum, said coupling having the two waterways therethrough, substantially as described.

10 2. In combination with the boiler, the circulating-pipes for the feed-water, the supply-pipe for the feed-water, the settling-drum connected with the circulating - pipes, the connecting-pipe from the settling-drum to
15 the boiler for the purified water and the du-

plex coupling for connecting the feed-water supply and the circulating-pipes and for also connecting the interior of the boiler with the pipe from the settling-drum, said coupling having the two waterways therethrough with the valve between the said waterways, substantially as described. 20

In witness whereof we have hereunto set our hands in presence of two witnesses.

WILLIAM CLARK.
WILLIAM A. CLARK.

Witnesses:

WILLIAM EDWARD EVANS,
ALBERT EDWARD PARKER.