

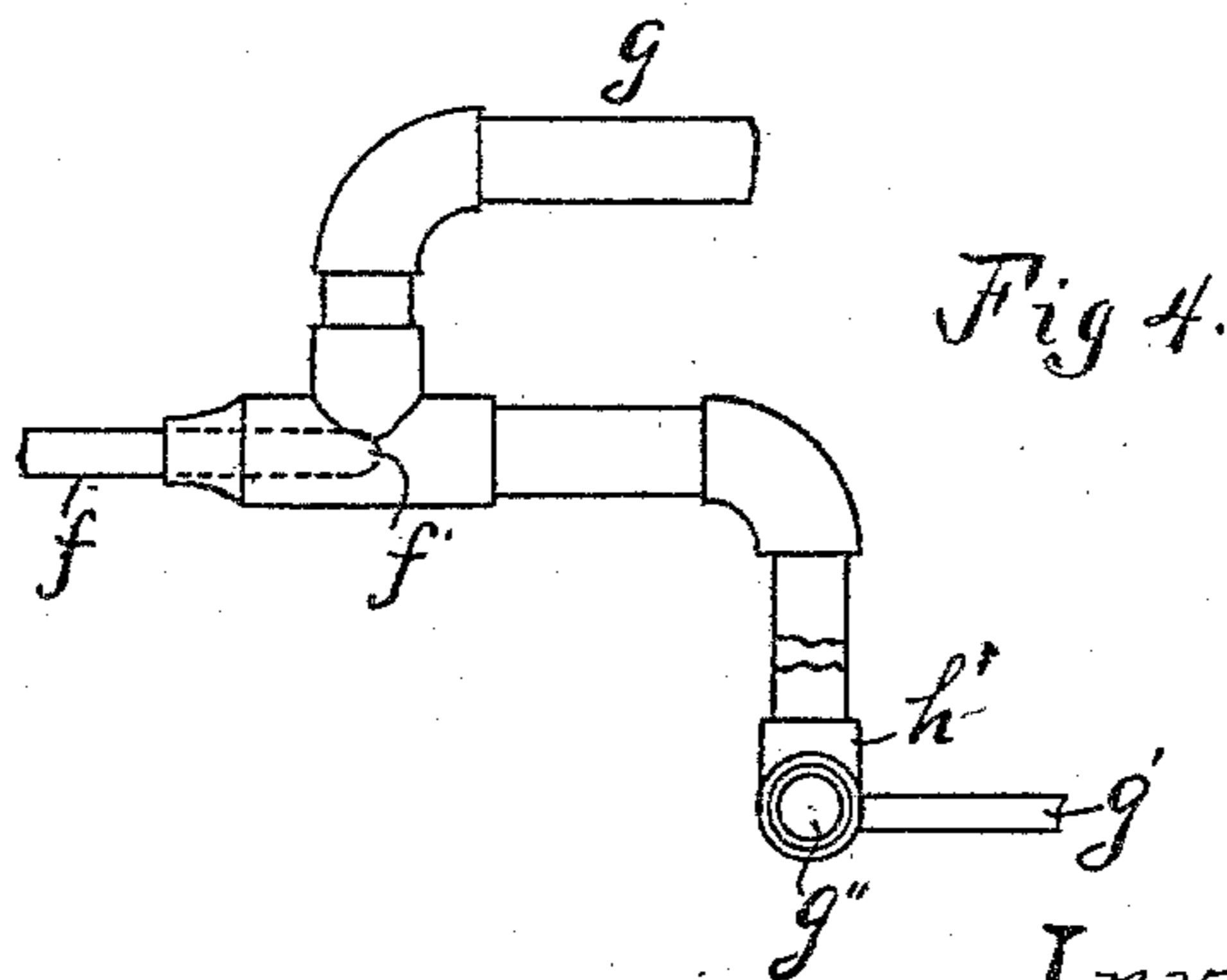
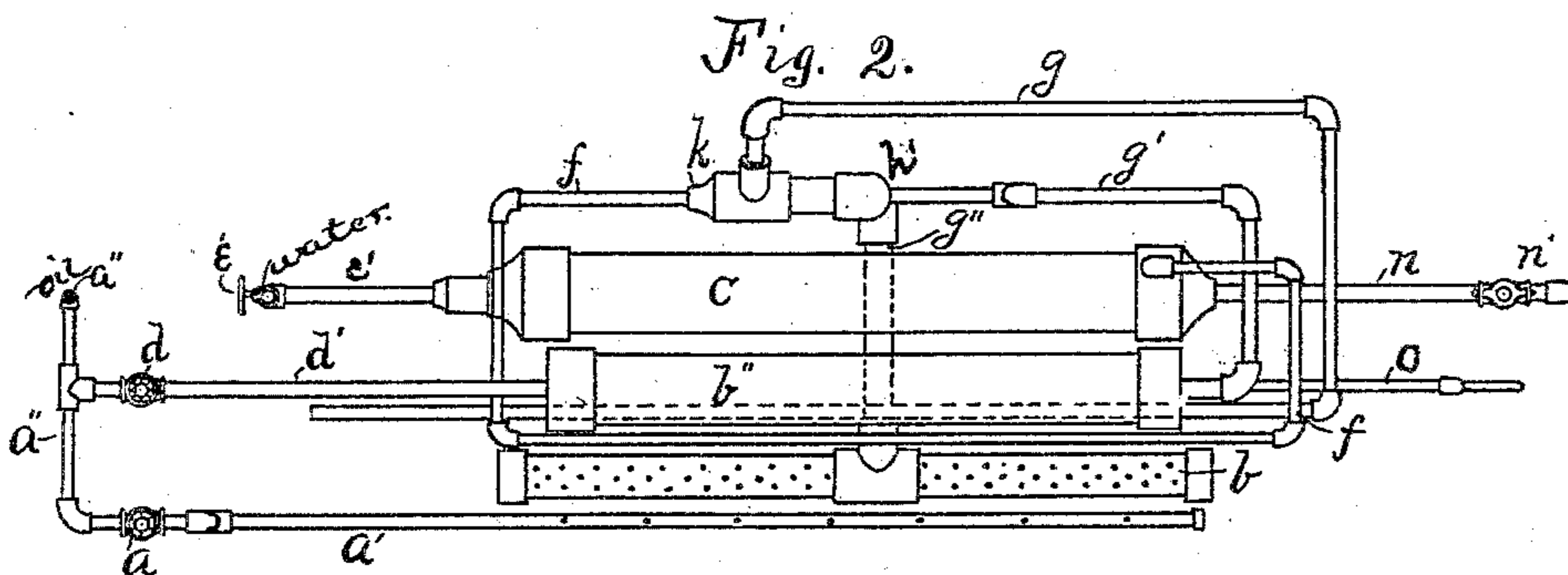
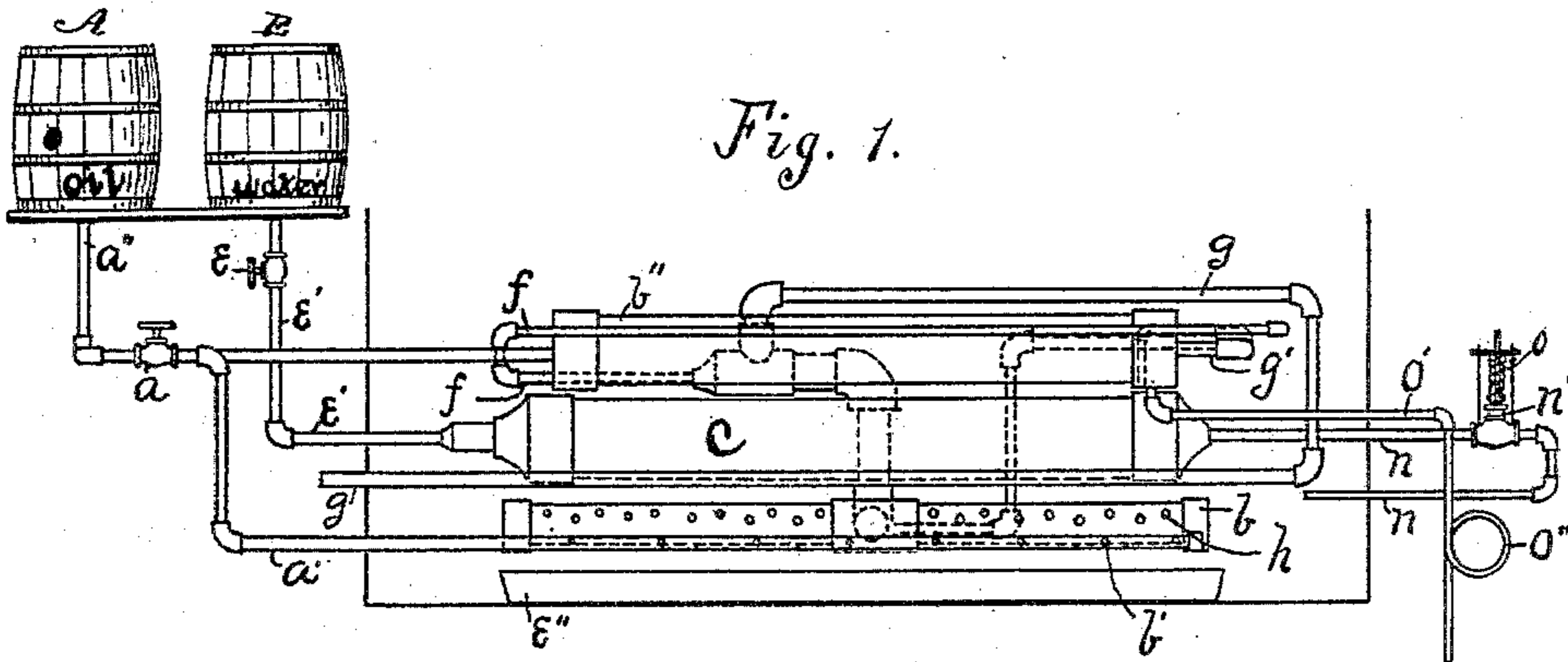
(No Model.)

G. W. CRAWFORD & W. A. ROSS.

APPARATUS FOR VAPORIZING AND BURNING CRUDE OIL.

No. 411,785.

Patented Oct. 1, 1889.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

GEORGE W. CRAWFORD AND WILLIAM A. ROSS, OF KENTON, OHIO.

## APPARATUS FOR VAPORIZING AND BURNING CRUDE OIL.

SPECIFICATION forming part of Letters Patent No. 411,785, dated October 1, 1889.

Application filed October 25, 1888. Serial No. 289,154. (No model.)

*To all whom it may concern:*

Be it known that we, GEORGE W. CRAWFORD and WILLIAM A. ROSS, citizens of the United States, residing at Kenton, in the county of Hardin and State of Ohio, have jointly invented a new and useful Apparatus for Vaporizing and Burning Crude Oil, of which the following is a specification.

The object of our invention is to provide an apparatus with which vapor may be generated from crude oil or the partially-refined product known as "stove-oil," and mixed with atmospheric oxygen and steam and burned in stoves and boiler-furnaces and used for general heating purposes whenever ordinary fuel is used.

The principal elements of our apparatus as used in stoves consist of two reservoirs—one for oil A and the other for water E—both which reservoirs may be located and supported in the most convenient manner outside of the stove, each of which is respectively connected by small pipes with an oil and a steam retort within the stove. From each of these retorts a small pipe leads to a mixer into which superheated air is siphoned by the steam, and the vapor, air, and steam mixed and conveyed by a larger pipe to a perforated burner, from which the mixed gases flow to the flames, where perfect combustion takes place, producing no smoke or soot whatever.

Our invention is illustrated in the accompanying drawings, in which Figure 1 is an elevation of the apparatus as seen from the front of the stove. Fig. 2 is a top view of the same. Fig. 3 is a detail showing the construction of the water or steam retort, and Fig. 4 is a detail of the mixer.

To start our apparatus into operation, open the valves *a*, *d*, and *e*. The valve *e* admits water from a reservoir through the pipe *e'* into the steam-retort *c*. The valve *d* admits oil from a reservoir through the pipes *a''* and *d'* into the oil-retort *b''*. The valve *a* admits oil from the oil-reservoir through the pipe *a''* into the pipe *a'*, which extends a little beneath and in front of the burner *b* and has upon its upper side the perforations *b'*, from which the oil issues, and as a flame is applied burns with sufficient intensity to heat the oil-retort *b''* and the water-retort *c* to such a de-

gree that oil is vaporized in the one and steam in the other. Beneath the pipe *a'* is a drip-pan *e''*, which is set upon the grate or bottom of the stove to catch any drippings of oil which may escape from the pipe *a'* unburned. As soon as the vaporization of oil and the production of vapor has commenced in the retort *b''* the valve *a* may be closed and the production of vapor in the retort *b''* and steam in the retort *c* made continuous by their own perfect combustion, which is accomplished by the following arrangement and construction: The water which flows from the water-reservoir through the pipe *e'* into the retort *c* is converted into steam, which passes out through the pipe *f*, leading forward and across above the burner *b*, where it is superheated and then returned to the rear, where it passes from the pipe *f* through the reduced nozzle *f'*, which forms a part of the mixer shown in detail in Fig. 4. The pressure of the steam thus generated in the retort *c* is great enough to flow from the nozzle *f'* with sufficient force to siphon in both air and vapor through the pipes *g* and *g'*, respectively, and intermix them and force the entire volume of combined gases through the pipe *g''* into the burner *b* and out through the perforations *h* in a strong current, where it comes in contact with and feeds the flames. The pipe *g*, which supplies the air, passes into the stove and across above the burner *b* and around to the rear, where it connects with the mixer *k*. The air which is siphoned through this pipe *g* from the outside is thus superheated before passing into the flames. The pipe *g'* conducts the gas from the oil-retort *b''* and admits it into the mixer at the elbow *h'*.

As the steam, air, and oil-vapor are united and intermixed at the mixer *k*, the entire volume is carried forward by the momentum of the steam-current into the burner *b*, as above described, and as it flows to the flames through the perforations *h* the oil and atmospheric oxygen first burn and the steam unites with the incandescent flame, producing water-gas, and thereby deriving a large percentage of the heat obtained directly from the steam in its chemical combination with the incandescent oil-gas flame. It is in this

combustion of the three combining gases—air, steam, and oil-vapor—that we produce perfect combustion with the entire absence of smoke or soot.

5 The construction of the steam-retort *c* is an important feature of our apparatus and attains results in the uniformity of steam-pressure which are essential in its successful operation.

10 As shown in Fig. 3, the retort *c* is composed of the three cylinders *m*, *m'* and *e'*, each within the other. The cylinder *m'* and the cylinder *e'*, which is the pipe *e'* continued into the retort, are both closed at their extreme ends and have upon their upper surfaces the perforations *l''* and *l'*, respectively, which are arranged opposite each other in such a manner that as the hot water and steam are constantly discharged from the cylinder *e'*, by its intensely-heated condition, it strikes against the walls of the cylinder *m'* and is thrown down and again discharged similarly from the cylinder *m'* through the perforations *l''* into the exterior cylinder *m*. At this point the water is wholly converted into steam and passes out through the pipe *f*. By this arrangement the throbbing or vibrations incident to generating steam in a single cylinder are entirely overcome. At the same end of the retort *c* from which the pipe *f* is taken a pipe *n* is also connected, extending outside the stove and having in it the spring regulating-valve *n'*, from which the pipe *n* returns again inside the stove. By means of this valve *n'* the water-valve *e* may be left open, and any flooding which may occur in the retort *c* by the admission of an excess of water will be discharged intermittently by the slightest variations in the steam-pressure within the retort *c*. The tension of the spiral spring *o* of the valve *n'* may be so finely adjusted that the light steam-pressure in the retort *c* can be uniformly maintained, thus supplying the same proportions of steam to the volume of oil-vapor and air at all times. By thus preserving constant pressure and proportions in the three united gases both perfect combustion and a steady fire are produced.

50 From the bottom of the oil-retort *b''* the small pipe *o'* leads outside the stove to conduct away the tar which is deposited in the

bottom of the retort. This pipe *o'* is bent so as to form the coil *o''*, which traps the gas and prevents its escape from the retort *c*. This pipe *o'* is only used when crude oil is used. When our apparatus is used in boiler-furnaces where a small quantity of smoke is no objection, the tar from the pipe *o'* may be discharged into the fire and consumed. If an extremely light fire is required, the air-pipe *g'* may be closed and combustion supported by the steam only and the oxygen which it contains.

This apparatus may be made of such dimensions as to be inclosed in a stove adapted to the purpose, with openings (holes) for the passage of the pipes supplying oil and water from the reservoirs *A* and *E*, the valves in which should be outside the stove.

In applying our apparatus to furnaces or in using them in any place where steam may be drawn from a boiler the retort *c* may be dispensed with and the steam conveyed directly to the mixer *k*.

Having thus illustrated and described the construction and operation of our apparatus, we desire to claim and secure by Letters Patent—

1. In a hydrocarbon generator and burner, the retorts for supplying superheated steam, consisting of the outside cylinder, the two inside perforated cylinders *e'* *m'*, and the pipe *f* and pipes *n*, in combination with the automatic spring-valve *o n'*, all as shown and described.

2. In a hydrocarbon generator and burner for use in a stove, and having oil and water reservoirs connected therewith, the combination of the superheating steam-retort *c* with internal concentric perforated cylinders *e' m'*, and pipe *f* with diminished nozzle *f'*, and pipe *n* with automatic spring-valve *o n'*, the oil-retort *b''* with pipe *g'*, and pipe *o'* with trap *o''*, and the air-supply pipe *g*, mixer *k*, down-pipe *g''*, and burners with connecting supply-pipes, all constructed and arranged as shown and described.

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