

No. 785,236.

PATENTED MAR. 21, 1905.

W. SMETHURST.

BURNER.

APPLICATION FILED NOV. 18, 1904.

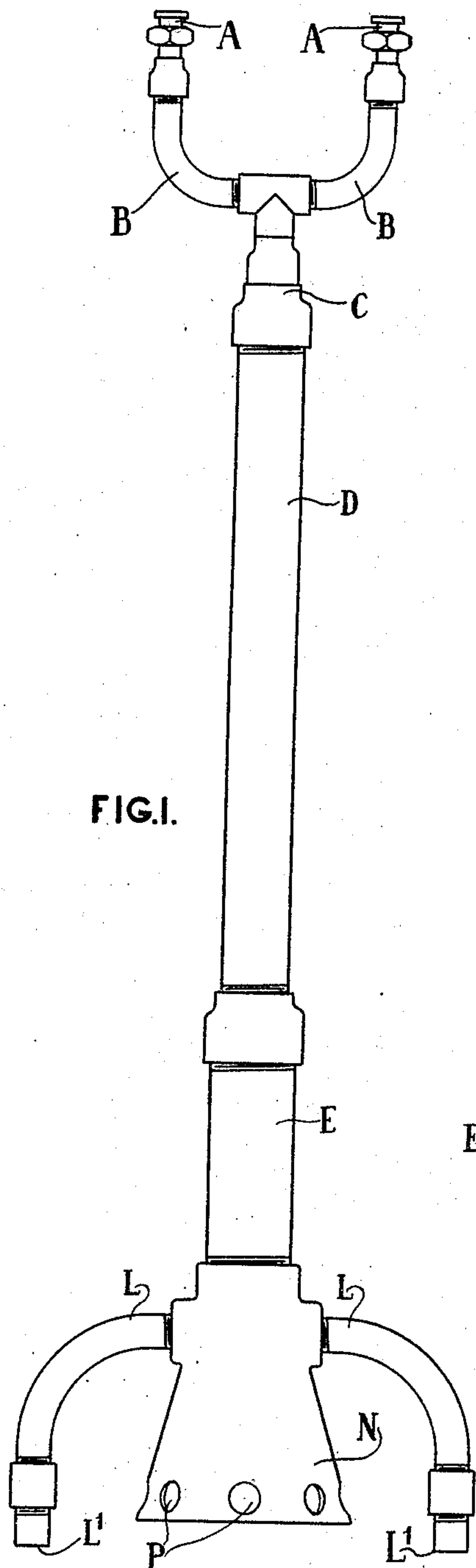


FIG. 1.

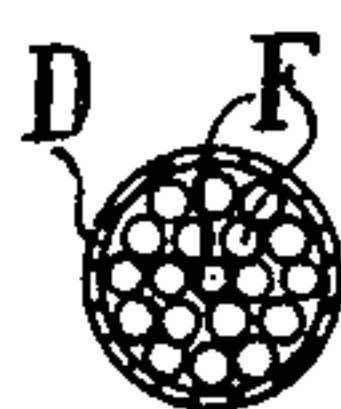


FIG. 3.

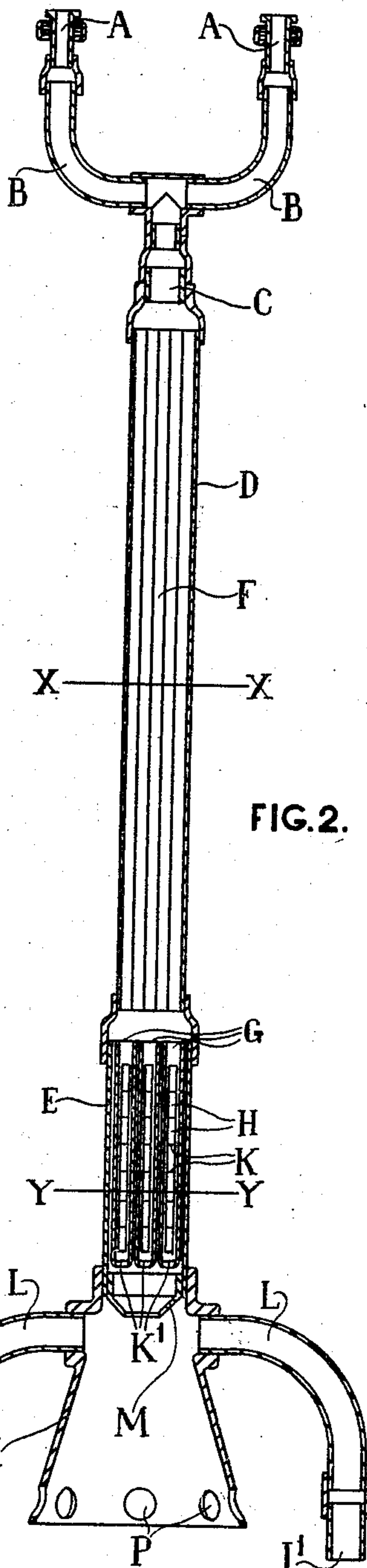


FIG. 2.



FIG. 4.

Witnesses
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WILLIAM SMETHURST, OF DOLGELLY, ENGLAND, ASSIGNOR TO THE
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BURNER.

SPECIFICATION forming part of Letters Patent No. 785,236, dated March 21, 1905.

Application filed November 18, 1904. Serial No. 233,341.

To all whom it may concern:

Be it known that I, WILLIAM SMETHURST, a subject of the King of Great Britain and Ireland, residing at Dolgelly, England, have invented new and useful Improvements in Burners for Burning Under Water or other Liquids, of which the following is a specification.

This invention relates to that type of burner in which intimate mixtures of combustible and combustion-supporting gases are adapted to be burned submerged under water or other liquids, and has for its object the prevention of the firing back of the combustible mixture within the supply tubes or chambers and the effective circulation of the submerging water or liquid about or through the nozzle of the burner, so as to prevent back shocks of the liquid against the gas-nipples and the deposit of crystals or fur within the nozzle of the burner or upon the nipples of the gas-burners.

The type of burner employed is a movable burner connected by flexible piping to a supply of carefully proportioned and mixed gases which are adapted to completely combine and burn when submerged under water or liquid, the movable burner being thus adapted to be inserted within a tank or other receptacle of liquid to effect the evaporation of the same.

The improvement consists, in the first place, of the provision in the upper part of the neck of the burner of a series of nests of tubes, reducing in diameter from the burner toward the gas-supply, and through which nests of tubes the gas passes in succession toward the nozzle of the burner. This arrangement is to insure the prevention of the gas firing back toward the source of supply. The said tubes may have a series of layers of gauze within them to aid their efficiency, and the apertures of all the tubes toward the burner are coned or reduced in diameter.

The improvement, in the second place, consists in introducing the liquid or water in which the burner is submerged toward the flame of the burner by induction, somewhat after the fashion of an injector, in order that the liquid evaporated into steam by contact with the flame of the burner may continually and quickly pass away from the burner with

the gases of combustion and steam and a fresh supply of liquid may be continually induced to follow such flow by suitable induction-inlets at or about the rear of the burner-nozzle. This prevents conflict between the outgoing products of combustion and steam and the incoming fresh supply of liquid, thus preventing return shock, tending to back firing, and, further, by the scouring action of the circulation through the burner, always in an outward direction, preventing the deposit of crystals or fur and the resulting caking up of the burner. As a convenient mode of effecting such induced circulation through the burner outward an adjustable induction-cone is provided below the gas-nipples of the burner, and behind such induction-cone the liquid from the surrounding tank is induced through a suitable number of downwardly-bent tubes, which must extend below the bottom edge of the bell-mouth attached to the burner. This downward extension of the circulating-supply tubes is necessary to prevent the rush of the flames and steam from seeking an outlet by such liquid-supply tubes, which otherwise might be the case. The effect of the arrangement as described is a vigorous and constant circulation of the submerging liquid through the bell-mouth of the burner always in the same direction, preventing return shocks, with tendency to back-fire, and preventing all deposit of fur or crystals upon the operative parts of the burner, while at the same time its evaporative efficiency is increased.

It is obvious that this submerged burner is eminently adapted for the economical evaporation of water, however liable to fur, and particularly of chemical solutions from which crystals may be deposited as a result of the evaporation.

In order that this invention may be the better understood, I will now proceed to describe the same with reference to the drawings hereto annexed and to the letters marked thereon.

Figure 1 is an outside elevation of my improved burner. Fig. 2 is a vertical section through the same. Fig. 3 is a transverse section on X X, and Fig. 4 is a transverse section on Y Y.

The supply of inflammable mixture is supplied to the burner by divided pipes A A, which are of small diameter as compared with successively-increasing areas of successive pipes and the burner-tubes. Where the inlet-pipes A A are one inch in diameter, it increases at B to one and one-fourth inches in diameter. This is increased at the uniting pipe C to two inches in diameter, with further increases in the burner-pipes to three inches at D and four inches at E, respectively. The burner-pipe D is filled with tubes F of an internal diameter of not more than one-half an inch and of about three feet in length. The next ensuing burner-pipe E is filled with tubes G of one inch internal diameter, in which are placed short pieces of tube H of smaller diameter, between each of which is a transverse sheet of gauze K of about thirty meshes to the inch. The lower ends of the tubes G are coned or bent inward to contract the flame and increase its velocity past the mouths of the side induction-pipes L. The mouths of these tubes G are also protected by gauze K'. It is found that the above relative dimensions are of importance, particularly the small diameter of the tubes F, and their length are of importance to prevent the firing back of the inflammable mixture. Around the orifices of the tubes G is arranged a cone M, which is adjustable vertically by screw-threads in the interior of the pipe E or in other convenient way. This cone further concentrating the issuing flame which begins to burn at the orifices of the tubes G forms an induction-nozzle past the side induction-pipes L, through which is thereby induced a flow of the surrounding water or liquid toward the issuing flame. The liquid is thus brought into intimate contact with the flame just at its nascent point of combustion, and the combined flame and liquid issues downward in a forcible stream through the expanding trumpet-mouth N, the said trumpet-mouth being provided with apertures P about the lower rim for the lateral spread of the boiling liquid. The side induction-pipes L must have their lower orifices L' brought down below the level of the trumpet edge to insure a perfect circulation, and these lower orifices L' may be adjustable as to depth, as shown, or in any convenient manner. The circulation

of the boiling liquid thus set up in the trumpet-orifice of the burner always in the same direction, following and induced by the issuing flame, prevents any return shocks of liquid against the burner with tendency to back-fire, and, further, prevents all deposit of fur or crystals upon the operative parts of the burner, while at the same time the constant regular circulation of colder liquid toward the flame increases the evaporative efficiency of the burner.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An inflammable gas-burner having its incasing pipes gradually enlarged from a minimum at the inlet to a maximum at the outlet and having within such incasing pipes a double series of nests of metallic tubes, of which the first series are of considerable number and length, and of a fractional diameter to the gas-inlet, and the second series shorter and of larger diameter than the first, containing within them sectional smaller tubes with transverse diaphragms of gauze to prevent back-firing, substantially as described.

2. In a device of the class described, a trumpet-shaped extension, having lateral inlets, issuing-nozzles having contracted ends opening into said extension and an inwardly-coned shield about said nozzles, said shield being adjustable as to position relatively to the said inlets, substantially as described.

3. In a burner, the combination with a trumpet-shaped extension of the burner, of lateral pipe-inlets from the surrounding liquid such pipe-inlets being inserted in the throat of the trumpet-shaped extension and being bent over, so that their lower mouths are situated below the edge of the trumpet-shaped extension, to determine a more effective circulation of the submerging liquid through the said trumpet-shaped extension of the burner, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM SMETHURST.

Witnesses:

GEORGE SAMUEL NESBITT HULL,
ARTHUR HOWARD DAVIES.