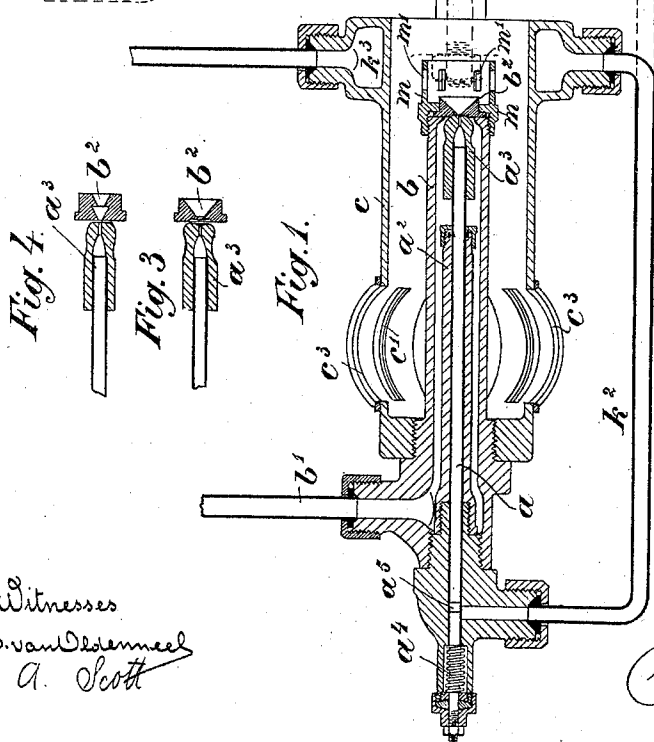
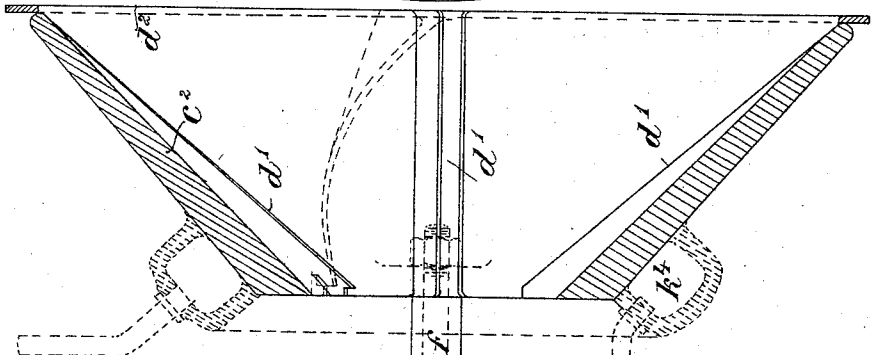
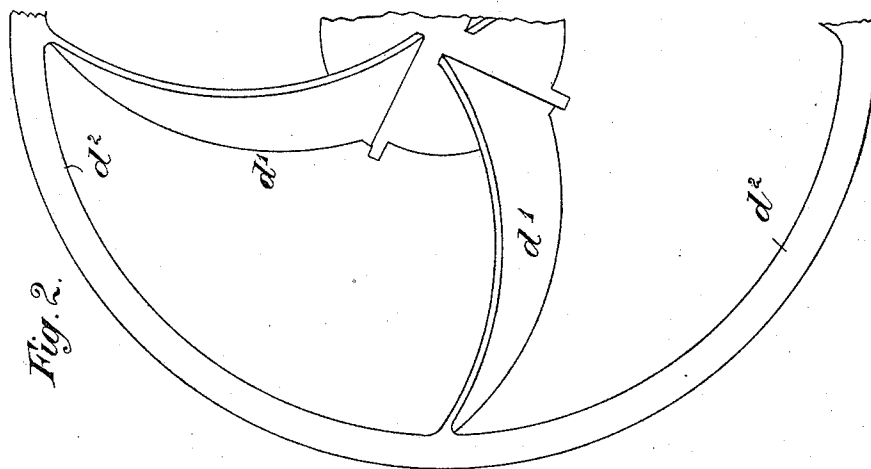


G. A. ONCKEN.
INJECTOR.

No. 586,201.

Patented July 13, 1897.



Witnesses
H. van der Meer
C. A. Scott

Inventor
Gustavus Adolphus Oncken
By *Richard R.*
Attys

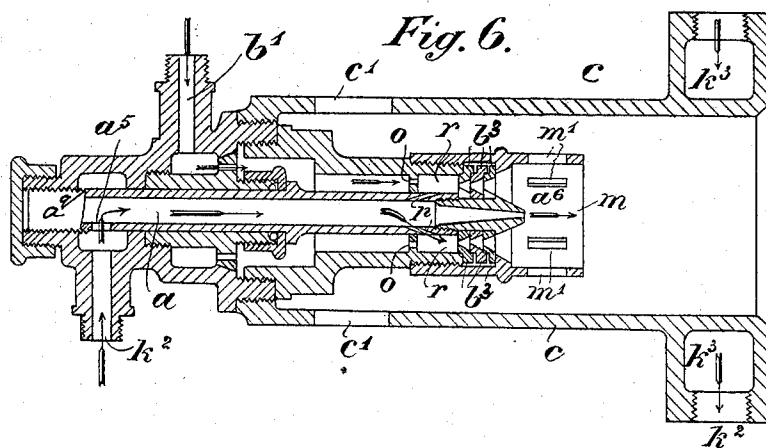
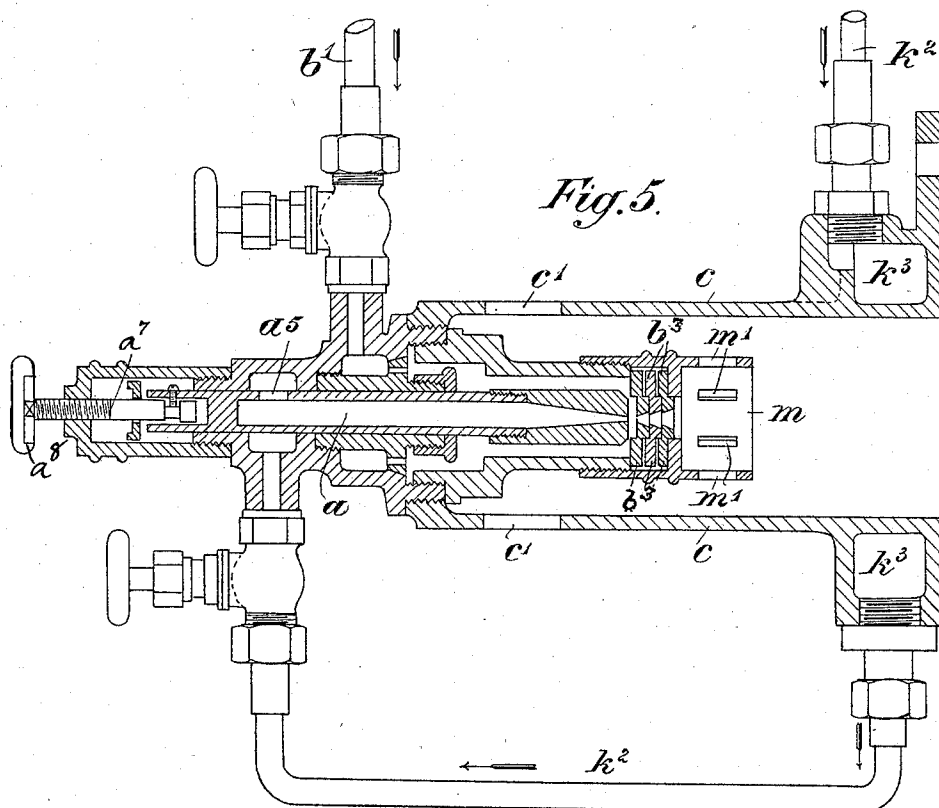
(No Model.)

2 Sheets—Sheet 2.

G. A. ONCKEN.
INJECTOR.

No. 586,201.

Patented July 13, 1897.



Witnesses
H. van Oldenmeel
E. A. Scott

Inventor
Gustavus Adolphus Oncken
by Richards
Attys

UNITED STATES PATENT OFFICE.

GUSTAVUS ADOLPHUS ONCKEN, OF HAMBURG, GERMANY.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 586,201, dated July 13, 1897.

Application filed October 17, 1896. Serial No. 609,209. (No model.)

To all whom it may concern:

Be it known that I, GUSTAVUS ADOLPHUS ONCKEN, a citizen of the United States of America, residing at Hamburg-Eppendorf, in the Empire of Germany, have invented new and useful Improvements in Injectors, preferably for liquid fuel, of which the following is a specification.

This invention relates to a construction of injector specially suitable for use with liquid fuel, whereby the flame is prevented from being extinguished by an increased supply of the spraying fluid and whereby a development of smoke is prevented, the liquid fuel being also extremely finely divided by the apparatus.

The internal arrangement of the new injector is formed in the known way by a nozzle-pipe b and an inner pipe a , to the former of which is conveyed, through a pipe b' , the liquid to be sprayed, say a liquid fuel, and to the latter, through another pipe k^2 , the spraying means, say compressed air or vapor, hereinafter called the "spraying" fluid. If such an arrangement is used for spraying liquid fuel, it often occurs that the flame fed by the sprayed fuel is extinguished in front of the injector-mouth when the quantity of the spraying fluid is increased or when the spraying fluid is supplied under an increased pressure because a correspondingly greater supply of liquid fuel does not take place. The hereinafter-described arrangement has for its object to obviate this drawback by automatically regulating the quantity of supplied liquid fuel according to the pressure or to the quantity of the spraying fluid supplied to the said liquid fuel. Such a regulation may also advantageously be employed when liquids other than liquid fuels are sprayed by the injector.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a central longitudinal section of a nozzle. Fig. 2 is a partial face view of the funnel. Figs. 3 and 4 are detail views of the mouthpiece and nozzle-mouth, and Figs. 5 and 6 are sectional detail views of modified forms.

According to this invention the inner pipe a (hereinafter called for distinction the "blast-

pipe") is movable in a tubular piece a^2 and is provided at its forward end with a mouthpiece a^3 , that is pressed by means of a spring a^4 against the nozzle-mouth or outlet b^2 of the outer nozzle-pipe b , the arrangement being such that the front surface of the mouthpiece a^3 closes the nozzle-mouth b^2 if the surfaces are pressed tightly one against the other. As shown in Figs. 1, 3, and 4, the said surfaces may have a concave, convex, or plain shape.

The supply-pipe k^2 for the spraying fluid is advantageously arranged to form at the front of the mouth of the injector an annular channel k^3 , wherein the spraying fluid is preparatorily heated by the flame or is maintained in a heated condition if it is supplied in a heated state. An orifice a^5 is provided in the blast-pipe a , through which the spraying fluid enters the said pipe.

At the commencement of working the spraying fluid is caused to enter the blast-pipe a , and it escapes through the mouthpiece a^3 at the forward end thereof, the well-known recoil action of the escaping fluid against the mouthpiece pushing the latter and the blast-pipe backward, so that on liquid being now introduced into the nozzle-pipe b it will escape around the side of the mouthpiece a^3 and through the nozzle-mouth b^2 of the injector. If the supply of spraying fluid should be increased or reduced in quantity or pressure, the recoil against the mouthpiece a^3 will be correspondingly increased or reduced and the outlet-opening between the mouthpiece a^3 and the nozzle-mouth b^2 will become respectively larger or smaller, so that more or less liquid will be sprayed according as more or less spraying fluid is supplied.

If the liquid is a fuel serving to produce a flame, first only a small quantity of spraying fluid—say water-vapor—is supplied, and only after the flame has been ignited and has been somewhat developed is the vapor-supply increased until the flame has reached its normal size. It will then be found that when the vapor-current is altered it will not extinguish the flame, because the quantity of liquid fuel supplied is correspondingly altered. The desired gradual increase in the supply of the spraying fluid from the commencement of working up to a determined

amount can take place automatically if at the commencement of working the greater portion of the inlet-opening a^5 in the blast-pipe is covered by the inner guide-rod of the tubular piece or pipe a^2 . Under this condition only a small quantity of the spraying fluid can flow to the mouthpiece a^3 at the forward end of the blast-pipe. Owing to the backward movement of this pipe produced by the recoil action the portion of the said inlet-opening a^5 allowing the steam or other spraying fluid to pass through is widened and gradually a larger quantity of spraying fluid flows in until the blast-pipe a has reached its normal position.

In order to divide the liquid as finely as possible, the nozzle-mouth b^2 may be provided with several inner plates b^3 , Figs. 5 and 6, arranged one behind the other and against which the liquid is repeatedly thrown and sprayed.

If the nozzle-mouth is annularly shaped, as shown in Fig. 6, these plates lie annularly in front of the outlet-opening, and according to the construction of the nozzle-mouth they may be arranged outside or inside the ring to which they are attached.

If the above-described injector be used to supply liquid fuel to a flame, there is arranged around the nozzle and blast-pipes a b a large air-supplying jacket or pipe formed with air-inlet slots c' , which can be more or less narrowed by means of an annular slide c^3 for controlling, as may be required, the air-supply to the base of the flame. At some distance in front of the injector-mouth there is provided a large funnel c^2 , the inner wall of which is furnished with paddle-like vanes or plates d' , having for their object to allow the fuel and the flame to expand and to spread largely in order to avoid thin jets of flames. The conducting-surfaces d' of the vanes or plates may be held together in front by means of a ring d^2 .

Instead of the heating-channel k^3 for the spraying fluid inclosing the jacket or pipe c a similar channel k^4 may be arranged around the base of the funnel c^2 and be connected to supply and delivery pipe k' .

If the mixture of finely-sprayed fuel and the spraying fluid does not contain a sufficient quantity of oxygen owing to the air supplied from without through the slots in the air-jacket not sufficiently combining with the combustible mixture of air and atomized fuel, a disagreeable development of smoke will take place. To avoid this inconvenience, there is arranged in front of the outlet-opening of the nozzle-pipe a socket or tubular extension m , Figs. 1, 5, and 6, provided in its circumference with slots m' for the passage of air. By this arrangement a further quantity of air can be supplied to and intimately mixed with the combustible mixture of finely-divided fuel and air prior to its combustion. By altering the extent of opening through the slots m' in the socket or tubular extension the proportion of the additional air supplied

to the mixture can be regulated, and by this means it is possible to obtain a completely smokeless combustion.

In the construction shown in Fig. 5 it will be observed that the pipe a is adjustable by means of the screw a^7 and hand-wheel a^8 .

In a further modified arrangement (shown in Fig. 6) the liquid fuel is supplied through a branch pipe b' and the spraying fluid through another branch k^2 into the apparatus, as before, but the nozzle-mouth is annularly shaped and the mixing of the liquid fuel and the spraying fluid takes place in an annular space or chamber r between the blast-pipe and the outer nozzle-pipe.

The blast-pipe a is provided at its free end with an outlet-opening a^6 and with several lateral and inclined channels p , leading into the said space or chamber r , and through which compressed air or vapor will pass and become mixed with the liquid fuel escaping, entering the said space or chamber through other openings o . By means of plates b^3 , also annularly shaped and arranged in front of the said chamber, a still finer spraying action will take place and an annular shape will be given to the base of the flame. To the so-formed flame-cone, in addition to the air supplied to the fuel while being sprayed, a further quantity of air to support combustion is supplied to the interior of the flame-cone through the central outlet-opening a^6 in the blast-pipe and to the exterior of the flame-cone through the slots m' in the socket or tubular extension m and from the slotted air-jacket c' .

In the construction shown in Fig. 6 it will be observed that the pipe a has its rear end threaded, as shown at a^9 , to engage corresponding threads in the supporting-casing.

I claim—

1. An injector-burner comprising an inner spraying-pipe, a liquid-fuel pipe inclosing the spraying-pipe, the nozzle-mouth carried by the liquid-fuel pipe, the mouthpiece carried by the spray-pipe and movable toward and from the nozzle-mouth and the spring tending normally to press the mouthpiece into contact with the nozzle-mouth, the said mouthpiece being moved backward by the recoil of the escaping fluid for the purpose of automatically regulating the escape of the liquid fuel, substantially as described.

2. An injector-burner comprising a longitudinally-movable inner spraying-pipe, a liquid-fuel pipe inclosing the spraying-pipe, the nozzle-mouth carried by the liquid-fuel pipe, the mouthpiece carried by the spray-pipe, and the spring operating upon the longitudinally-movable spraying-pipe to press the mouthpiece normally against the nozzle-mouth, substantially as described.

3. An injector-burner comprising a longitudinally-movable inner spraying-pipe, a liquid-fuel pipe inclosing the spraying-pipe, the nozzle-mouth carried by the liquid-fuel pipe, the mouthpiece carried by the spray-pipe, the spring pressing upon the movable spraying-

pipe to hold the mouthpiece in contact with the nozzle-mouth but yielding under the recoil action of the spraying fluid, and the supply-pipe for the spraying fluid, the spraying-pipe having an opening to admit more or less of the spraying fluid according to the direction of movement of the spraying-pipe, substantially as described.

4. In combination with the air-supply jacket, the fuel-supply pipe within the same, the nozzle-mouth carried by said fuel-supply pipe, the tubular extension also carried by said fuel-supply pipe and having slots or openings, the spraying-pipe within the fuel-

supply pipe movable longitudinally thereof, the supply-pipe for the spraying fluid, and the slot in the spray-pipe adapted to regulate the supply of the spraying fluid by the movement of the spraying-pipe, substantially as described.

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

GUSTAVUS ADOLPHUS ONCKEN.

Witnesses:

JOHANNES AQUITZ,
GUSTAVUS HÜLSMANN.