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SPRAY BURNER.

APPLICATION FILED FEB. 27, 1909.

943,567. Patented Dec. 14, 1909.

Fig. 1.

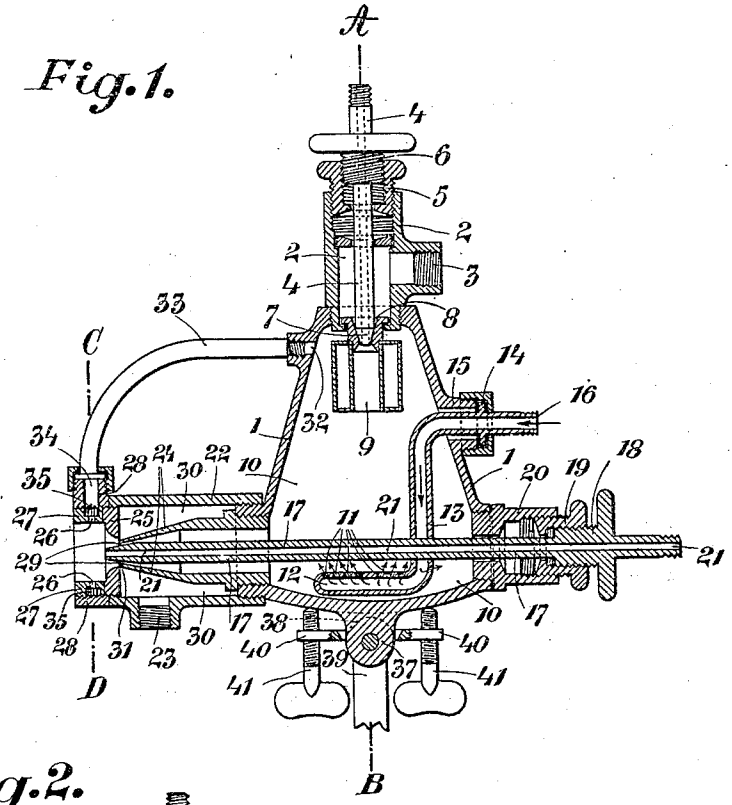


Fig. 2.

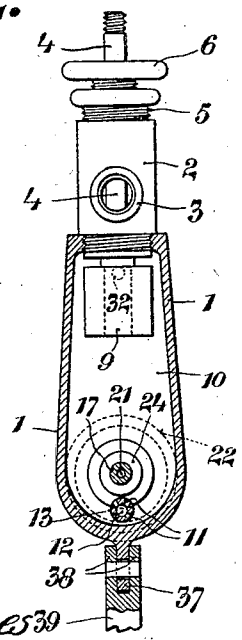
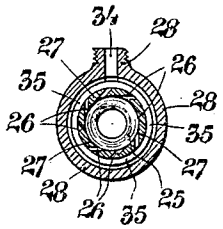


Fig. 3.



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AUGUST ROHRBACH, OF ERFURT, GERMANY, AND WILHELM DIECKMANN, ANTON GRIBLING, AND LUDWIG GROTE, OF LONDON, ENGLAND.

SPRAY-BURNER.

943,567. Specification of Letters Patent. Patented Dec. 14, 1909.

Application filed February 27, 1909. Serial No. 480,443.

To all whom it may concern:

Be it known that we, AUGUST ROHRBACH and WILHELM DIECKMANN, subjects of the German Emperor, residing, respectively, at Erfurt, Germany, and London, England, and ANTON GRIBLING, a subject of the Queen of the Netherlands, and LUDWIG GROTE, a subject of the German Emperor, residing at London, England, have invented certain new and useful Improvements in Spray-Burners, of which the following is a specification.

The spraying nozzle or injector according to this invention is intended for the thorough preliminary mixing of heavy liquid hydrocarbons, such as for instance, tar, petroleum residue and the like, and has for its object and effects the mixing of the said heavy and liquid hydrocarbons with air in such manner as to insure a complete combustion of the mixture at the outlet nozzle. To that end in the injector according to this invention, the hydrocarbon supplied is first mixed with compressed air, and in that way a thorough mixture of the hydrocarbon with the air is formed, and with the coöperation of the moisture which is in any case contained in the compressed air, a kind of emulsion is produced. This emulsion is mixed in the air chamber with more compressed air and discharged from a conical nozzle. More air is fed energetically on to the outside of the flame of the nozzle, and the escaping current of atomized fuel is, moreover, exposed to a central compressed air jet, so that its complete combustion is insured in a reliable manner from the inside also. Moreover, the air separating at the top of the emulsion chamber, and charged with a great proportion of hydro-carbon gas, is caused to escape in a tangential direction through a ring provided with oblique inlet openings, at the point where the nozzle flame is already burning, so that a strong "rolling" of the nozzle flame and the mixing of the same with hydro-carbon gas, and thus a considerable increase of the temperature of the flame, takes place. The injector or spraying nozzle is arranged in such manner that the admission of the heavy liquid hydrocarbon, and consequently the supply to the nozzle is automatically regulated by a float device in accordance with the consumption of the hydrocarbon emulsion.

Figure 1 shows a longitudinal section of the injector or spraying nozzle according to this invention, Fig. 2 is a cross-section on line A—B of Fig. 1, and Fig. 3 a cross-section on line C—D through the outer nozzle ring with the tangential conduits.

The construction is as follows: The casing 1 which is of conical shape, forms the emulsion chamber 10. The said casing 1 is connected at the top with a cylinder 2 provided at 3 with a lateral branch to which is connected the pipe for the supply of heavy hydrocarbon. The hydrocarbon is supplied either under pressure, or flows by gravity from a tank situated at a higher level. In the cylinder 2 is mounted in a vertically adjustable manner a pipe 4 by means of a screw threaded pin 6 engaging with the inner stuffing box thread 5. The said pipe 4 is turned at the bottom to form a cone valve 7 which has a valve seat 8 situated at the bottom end of the cylinder 2, the said valve seat 8 being provided at its bottom end projecting into the emulsion chamber, with a suitable float 9. Through the bore of the pipe 4 compressed air is admitted into the emulsion chamber, for which purpose the pipe 4 is connected at its upper screw threaded end to a compressed air supply pipe. On the valve cone being screwed upward and lifted from its seat 8, heavy hydrocarbon passes from the branch 3 into the emulsion chamber 10 formed by the valve casing and forms an emulsion with the air supplied through the pipe 4.

After the mixture of petroleum and air in the emulsion chamber 10 has reached a certain maximum level, the float 9 raises the valve seat 8 against the valve cone 7 and gradually shuts off further supply of hydrocarbon. Vice versa, when the chamber 10 is emptied, the float 9 sinks, whereby the hydrocarbon can again pass into the emulsion chamber.

In order that the mixture of partly atomized hydrocarbon and air in the emulsion chamber may be further energetically stirred and mixed with more air, there is inserted in the chamber 10 a pipe 14 provided with nu-

merous fine openings 11 and closed at the end 12. The joint of the said pipe is rendered tight at 14 in a branch 15 of the casing 1, and the projection 16 of the said pipe 13 is connected to the compressed air pipe. The compressed air flowing through the pipe 13 in the direction of the arrows and escaping through the nozzle openings 11, becomes mixed with the emulsion in the interior of the emulsion chamber 10 and brings about a further atomization of the emulsion contained in the chamber 10.

Transversely through the bottom end of the casing 1, passes the nozzle pipe 17 mounted in a longitudinally adjustable manner in the stuffing box gland 19 of the plug 20 by means of its screw threaded pin 18. Compressed air passes through the bore 21 of the pipe, to which end the pipe is also connected to the compressed air pipe. At the end opposite the plug 20, the nozzle device is screwed on to the casing 1. The said nozzle device comprises a cylinder 22 with a tubular branch 23, a conical nozzle 24, a nozzle mouth piece 25 and a ring 27 provided with tangential conduits 26 and secured in front of the nozzle mouth piece 25 and held by means of the screw ring 28. The nozzle pipe 17 is turned conically at its nozzle end, and between its outer wall and the inner wall of the double conical nozzle 24 is left a narrow annular slot 29 through which the emulsion from the emulsion chamber 10 can escape, after it has been thoroughly mixed with air from the nozzle openings 11 of the pipe 13. The regulation of the annular outlet cross-section is effected by suitable adjustment of the screw-threaded pin 18 provided with a hand wheel, at the nozzle pipe 17.

Between the outer casing of the nozzle 24 and the cylindrical casing 22, is provided a space 30 to which compressed air is supplied through the screw-threaded branch 23. The said air escapes from the annular slot 31 provided between the outer casing of the nozzle 24 and the inner edges of the nozzle mouth piece 25, so that the atomized or emulsified mixture escaping through the slot 29 and igniting, is surrounded by an air casing. As compressed air also passes through the bore 21 of the nozzle pipe 17, the emulsion escaping through the annular slot 29 will be thoroughly surrounded by the air inside and outside, so that a perfect combustion is insured.

The emulsion chamber 10 is provided at the top with a branch 32 connected by means of a pipe 33 with a conduit 34 formed in ring 28, which conduit opens into a circular groove 35 formed in ring 27. The tangential conduits 26 open at their outer ends into this groove. The air collected in the upper portion of the emulsion chamber 10 and saturated with hydrocarbon thus flows through branch 32, pipe 33, conduit 34 and groove 35, and through the conduits 26 tangentially around the jets, escaping through the slot 29 and igniting, and owing to the tangential direction of the escaping carbureted air, brings about a rotation, that is to say, a rolling of the said jet about itself, and thereby a thorough mixture of the atoms of the said jet with each other and with the air charged with hydro-carbon and escaping from the upper portion of the emulsion chamber and igniting at the flame; owing to its high proportion of hydrogen and to the high combustion temperature of hydrogen, the heat of the nozzle flame is considerably increased. In that way an absolutely perfect atomization even of the heaviest hydrocarbons is insured.

The present nozzle or injector is applicable to furnaces of any kind, namely for melting ceramic material, glass, porcelain, clay, for land and marine boiler furnaces and for stationary boilers, in metallurgy, in the manufacture of iron and the like.

The valve casing is provided at the bottom with a boss 37 rotatable between bosses 38 of a frame 39 and can be adjusted by means of the bridge 40 and the spindles 41, in such manner that the direction of the jet of the nozzle can be modified within certain limits.

We claim:

1. In an apparatus of the class specified, the combination of a casing provided with a hydro-carbon inlet; a valve seat located within the casing below said inlet; an air-supply pipe opening into said casing and having its outlet end arranged for reception in said seat, to control the flow of hydrocarbon into the body portion of said casing; an air-supply pipe opening into said body portion; a nozzle attached to said body portion; an air-supply pipe extending through said body portion and nozzle; a mouth-piece arranged at the outlet end of the nozzle and surrounding the same; a perforated ring arranged against the outer face of said mouth-piece; means for supporting said mouth-piece and ring; and a pipe for supplying air to the perforations in said ring.

2. In an apparatus of the class specified, the combination of a casing; air and hydrocarbon supply pipes opening into the casing; a nozzle attached to said casing; a ring arranged at the outlet end of the nozzle and formed with inwardly-opening tangential conduits; means for supporting said ring; and a pipe communicating at one end with the top of the casing and at the other end with said conduits, for supplying carbureted air through the latter tangentially against the flame at the mouth of the nozzle.

3. In an apparatus of the character speci-

fied, the combination of a casing having a tubular extension opening thereinto and provided with a hydro-carbon inlet; a member movable within said extension below said inlet and provided with an opening forming a means of communication between said extension and casing; an air supply pipe projecting into said extension and having its outlet end arranged to seat itself in said opening upon movement of said member in one direction to close such communication; and a float attached to said member and controlled by the level of the liquid in said casing, for moving said member.

In testimony whereof we have hereunto set our hands in presence of subscribing witnesses.

AUGUST ROHRBACH.
WILHELM DIECKMANN.
ANTON GRIBLING.
LUDWIG GROTE.

Witnesses to signature of August Rohrbach:

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