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W. E. JOHNSTON

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VACUUM TORCH

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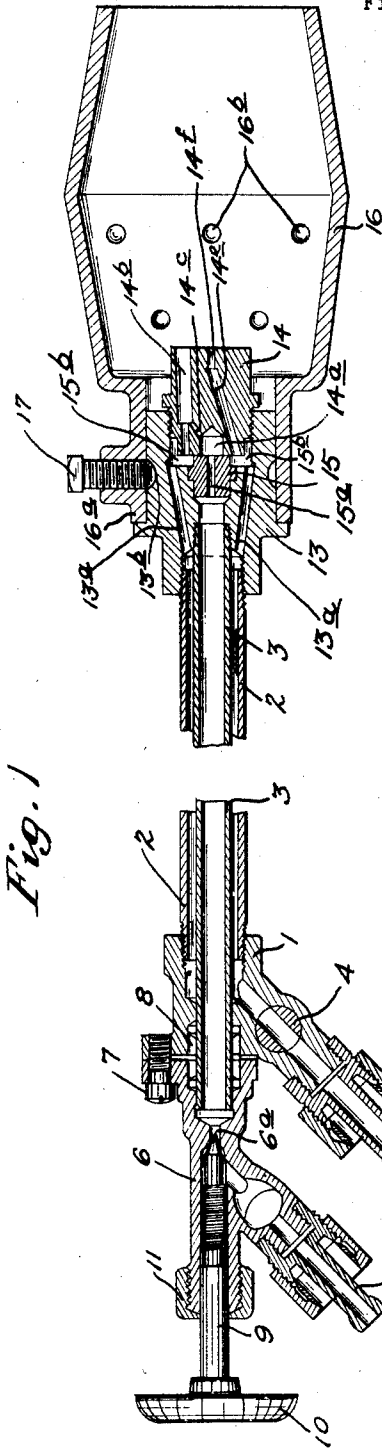


Fig. 3

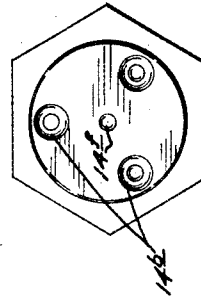


Fig. 2

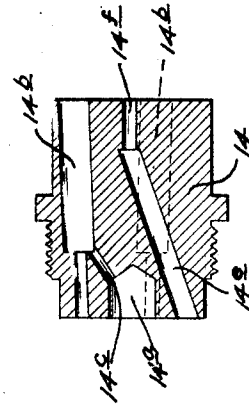
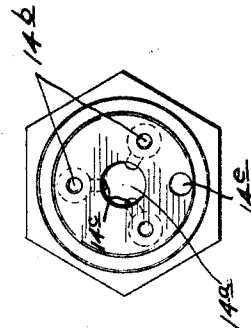


Fig. 4



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VACUUM TORCH.

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This invention relates to an oil burning torch of the vacuum type. Oil burning torches are now commonly used in railroad car repair work, firing locomotives and other
5 boilers, starting coal fires in locomotives, etc. The torches are of two types, namely, the pressure type in which the oil used is fed under pressure, and the vacuum type in which the oil is fed in an induced current caused by
10 the current of compressed air. Owing to the inconvenience, expense and possibility of accident, it is very desirable not to have the supply of oil under pressure and vacuum torches, therefore are much preferable. How-
15 ever, it has been found with the vacuum torches of the prior art, that the same would go out or become extinguished when used at any considerable height above the oil reservoir. This, of course, was a very serious dis-
20 advantage as it is often desirable to use the torch at such heights, especially on railroad car work. The applicant has found that this action is due to the intermittent action of the inducing air current. The vacuum formed in
25 the torch which induces the current of oil is, therefore, lost or dropped momentarily and if the oil column is being raised to a considerable height it drops back and a break is formed in the fuel supply so that the flame is
30 extinguished. Such intermittent action of an inducing jet has long been experienced in injectors and is exceedingly difficult, if not, as yet, impossible to overcome. The problem of eliminating the trouble of the torch becom-
35 ing extinguished had to be attacked from another angle.

It is an object of this invention, therefore, to provide a vacuum torch which will continue to operate efficiently at levels quite a
40 distance above the oil supply, which torch has means for discharging a plurality of jets of mixed oil and air.

It is a further object of the invention to provide such a torch, the discharge head or
45 top of which has a plurality of spaced passages for the discharge of mixed oil and air, each of which communicates with the supply passages for the oil and compressed air.

It is also an object of the invention to provide such a torch having a plurality of spaced

discharge passages for the mixed oil and air and also having means therebetween for discharging a current of air.

It is still further an object of the invention to provide a torch having a plurality of
55 equally and circumferentially spaced passages for discharging mixed oil and air, which passages diverge toward their outer ends.

These and other objects and advantages of
60 the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to the same parts throughout the different views, and in
65 which—

Fig. 1 is a view in longitudinal vertical section through the torch;

Fig. 2 is a vertical section through the novel
70 discharge head or tip thereof;

Fig. 3 is a view in elevation, as seen from the right of Fig. 2; and Fig. 4 is a view in elevation, as seen from the left of Fig. 2.

Referring to the drawings, in Fig. 1 a torch of the vacuum type is shown comprising the body member 1, into the forward end of which is threaded the tube 2 forming the air supply tube, and through which passes the tube 3 for the oil or fuel supply. The member 1 has a regulating cock 4 therein
80 and has a coupling member 5 secured thereto adapted to be connected with a hose or other air supplying conduit which will be connected with the source of compressed air. The body member 1 is connected to the rear end member 6 by suitable bolts 7, said members being
85 provided with packing cavities 8. The member 6 receives the outer end of the tube 3 with which a passage 6^a communicates, which is controlled by a needle valve 9 having an operating handle or wheel 10 thereon and which
90 passes through a suitable packing gland 11. The member 6 also has a coupling 12 secured thereto to which will be connected a pipe or flexible conduit which will, in turn, extend to
95 the oil supply reservoir. The tube 2 carries at its outer end the head or block 13 which is also threaded to receive the outer end of the tube 3. A tip member 14 is threaded into the
100 outer end of the head 13 and a short plug 15

having a single central aperture 15^a extending therethrough abuts the rear end of member 14. The interior of tube 3 communicates with the aperture 15^a extending through plug 15 and said aperture, at its outer end, communicates with a recess of large diameter 14^a formed in the rear end of the tip member 14. Passages 13^a extend from the annular passage formed between tubes 2 and 3 which is the passage for the compressed air, and communicate with an annular passage 15^b extending around the rear of member 14 in the block 13. It will be seen that the passage 15^b is in direct communication with the compressed air passage. Extending outwardly through the member 14 from the passage 15^b are a plurality of passages 14^b having their inner ends of small diameter and their outer portions which extend for the greater part of their length, of larger diameter. A passage 14^c of comparatively small diameter extends from the recess 14^a outwardly in an inclined direction into the outer portion of each passage 14^b communicating with the same substantially at the shoulder formed between their larger and smaller diameters. The passages 14^b are equally spaced circumferentially about the axis of member 14 and said passages are spaced a greater distance radially at their outer ends than at their inner ends so that said passages diverge toward their outer ends. A passage 14^e also extends from the passage 15^b diagonally toward the outer end of member 14 and communicates with a small central passage 14^f disposed substantially centrally or axially of the member 14. A nozzle member 16 is shown having a sleeve 16^a fitting on the block 13 and abutting against a flange on said block, which nozzle is held in place by a set screw 17 extending through sleeve 16^a and contacting the block 13 in a groove 13^b extending circumferentially thereabout.

In the operation of the torch, the air is supplied through the coupling 5 and member 1 and the cock 4 is turned to open position, the air passes through an annular passage between tubes 2 and 3 into the passage 15^b. From here the air passes through the small end of passages 14^b and passes into the larger portions of said passages, where it expands and, as it discharges outwardly, forms a partial vacuum in said larger portions of the passages 14^b. This vacuum extends back into recess 14^a and passage 15^a and into the tube 3 to the valve controlled passage 6^a. The degree of vacuum will be slightly less in the tube 3 owing to the friction of the induced current of oil. This vacuum results in the oil from the oil reservoir being projected upwardly through its supply conduit into the member 6^a and outwardly through the tube 3. The oil passes through passage 15^a and into the recess 14^a from whence it passes through the passages 14^c into passages 14^b.

As the oil enters the passages 14^b it is struck by the current of compressed air moving at high velocity, is disintegrated thereby and mixed therewith so that a mixture of air and oil spray is projected from each of the passages 14^b. This sprayed mixture is ignited as it leaves the member 14 and the flame formed issues through the nozzle 16. Said nozzle 16 is provided with holes 16^b through which additional air enters. By providing a plurality of discharge passages 14^b, instead of just one passage, as has been the practice in the prior art, if the compressed air jet passing through any one of the small portions of a passage 14^b intermits or pulsates so that the vacuum is momentarily dropped, the flame will not be extinguished as fuel will be supplied through one of the other passages 14^b. Even if the intermittent action should occur simultaneously in two of the passages 14^b, fuel would be supplied through the other passage to maintain the flame. It is practically certain that all three of the inducing jets will not intermit or drop the vacuum at the same time so that the possibility of the torch being extinguished by such intermittent action is practically eliminated. It was found that by projecting the mixture of oil and air from the circumferentially spaced passages 14^b that sufficient air did not reach the interior of the projected mixture, and the passages 14^b were thus formed with an outward inclination so that they diverge, thus giving a large opening at the center of the discharged mixture. More air was thus enabled to reach the inside portion of this projected mixture to form more perfect combustion. Even with the diverging passages it was found that it was difficult for the outside air to reach the interior of the projected mixture and for this reason, the air discharging passages 14^c and 14^e were provided. Compressed air is therefore discharged through the center or at the center of the projected combustible mixture and this air furnishes an ample quantity of oxygen to form a perfect combustion. The heat resulting from the flame of the torch is of a very high degree. Standard iron or steel wire 1/8th inch in diameter held in the torch flame is instantly melted. This is an unusually high degree of heat and an unusual result for a vacuum torch. The torch has been subjected to severe tests and has been found to be unusually efficient and successful in practice. The torch operates just as well at high levels as at lower levels and can be used at a distance of eighteen or twenty feet above the oil level which is the limit of the flexible connections usually provided.

It will, of course, be understood, that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of applicant's invention, which, generally

stated, consists in a device capable of carrying out the objects above set forth, such as shown and described and defined in the appended claims.

5 What is claimed is:

1. A vacuum torch having an oil passage and a passage for compressed air therein, a discharge member having a recess in its rear end communicating with the oil passage, said torch having an annular recess therein in the rear of said discharge member, a plurality of circumferentially spaced passages of comparatively small diameter communicating with said annular recess, each of said latter passages having an enlarged portion at their outer ends, and a passage of comparatively small diameter extending from the recess in said discharge member to the enlarged portion of each of said latter passages substantially at the rear end of said enlarged portion.

2. The structure set forth in claim 1, a passage disposed substantially centrally of said discharge member at its outer end and a passage extending inwardly from the inner end thereof and communicating with said annular passage.

3. A vacuum torch having in combination, a passage for compressed air, a passage in which a flow of oil is induced, a plurality of circumferentially spaced discharge passages in which the oil and air are brought together and from which mixed oil and air are discharged, said discharge passages being in communication with both of said first mentioned passages and a discharge passage having an outlet disposed between the outlets of said circumferentially spaced discharge passages and communicating with said first mentioned passage.

4. A vacuum oil burning torch having in combination, means for supplying air under pressure above atmospheric pressure, means for supplying oil at atmospheric pressure, a plurality of passages having discharge outlets leading from the first mentioned means having enlarged portions, a plurality of passages leading from said second mentioned means, respectively communicating with said enlarged portions, said enlarged portions constituting discharge passages for said torch, whereby a plurality of spaced discharge passages for mixed oil and air are provided and a discharge passage for compressed air having a discharge outlet disposed substantially centrally between the outlets of said discharge outlets.

5. A vacuum feed torch having in combination, an oil supply conduit, a member having a central oil chamber therein communicating with said conduit, said member having a plurality of spaced air passages therein having discharge outlets, a compressed air supply conduit, a passage leading from said air supply conduit to each of said air

passages and smaller in cross sectional area than said air passage, a passage leading from each of said spaced air passages to said central oil chamber, and a passage for compressed air having a discharge outlet disposed between said discharge outlets of said spaced air passages whereby a vacuum is formed in each of said air passages and oil is drawn thereinto, and a torch is formed having a plurality of discharge passages for mixed oil and air.

6. A vacuum feed oil torch having in combination, an elongated central conduit forming an oil passage, an outer conduit surrounding said conduit forming an annular passage for compressed air, a member secured to said conduits at one end thereof respectively having a central passage communicating with said central conduit and having a plurality of longitudinally extending passages communicating with said annular passage, a discharge head secured to said member having a plurality of circumferentially arranged passages therein having enlarged outer portions extending to the end of said head and having reduced portions extending to the inner end of said head and communicating with said passages in said member, said head also having a central chamber therein communicating with said central passage in said member and said central conduit, said head also having a small passage extending from the enlarged portion of each of said plurality of passages to said central chamber for the passage of oil, whereby mixed oil and air are discharged from the enlarged portions of each of said plurality of passages in said head.

7. The structure set forth in claim 6, said head also having a passage extending there-through between said plurality of passages, having an outlet end disposed between the outlets of said plurality of passages, and having its inner end communicating with said passages in said member.

8. A vacuum oil burning torch having in combination, means for supplying air under pressure above atmospheric pressure, means for supplying oil at atmospheric pressure, a plurality of passages leading from said first mentioned means having enlarged outlet portions, a plurality of passages leading from said second mentioned means respectively, communicating with said enlarged outlet portions, said enlarged outlet portions constituting the discharge passages for said torch whereby a plurality of oil discharge passages for mixed oil and air are provided, and a discharge passage for air above atmospheric pressure having a discharge outlet disposed substantially centrally between said discharge passages.

9. A vacuum torch having in combination, a member having a plurality of spaced discharge passages therein through which mixed

oil and air are discharged, means for producing a partial vacuum in said passages, a passage leading to each of said passages communicating with an oil supply conduit, whereby oil is drawn into said discharge passages, said discharge passages constituting the discharge passages for said torch, and from which mixed oil and air are discharged, and a discharge passage for said torch for discharging compressed air, disposed between said discharge passages.

In testimony whereof I affix my signature.

WAYBURN E. JOHNSTON.