F. W. THURSTON.

GASEOUS HEATER.

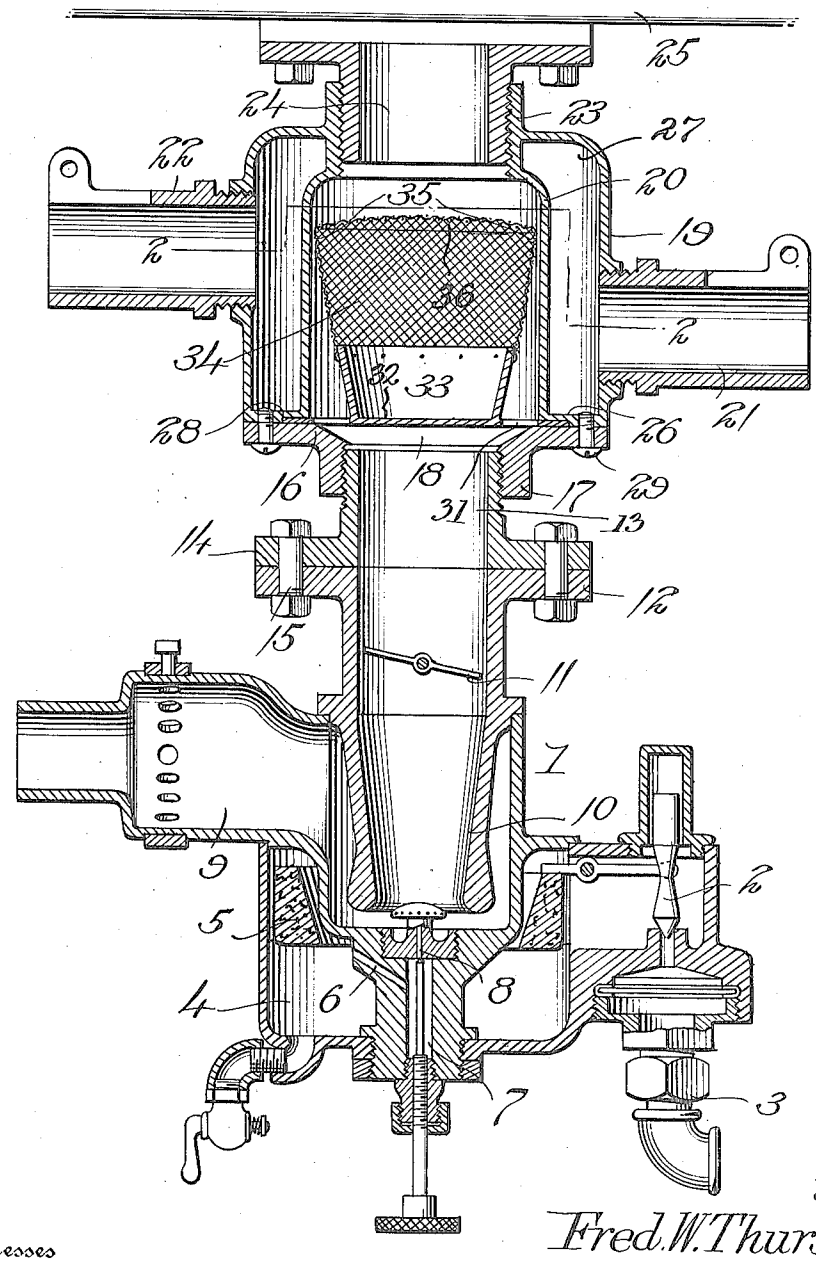
APPLICATION FILED SEPT. 3, 1914.

1,207,664.

Patented Dec. 5, 1916.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

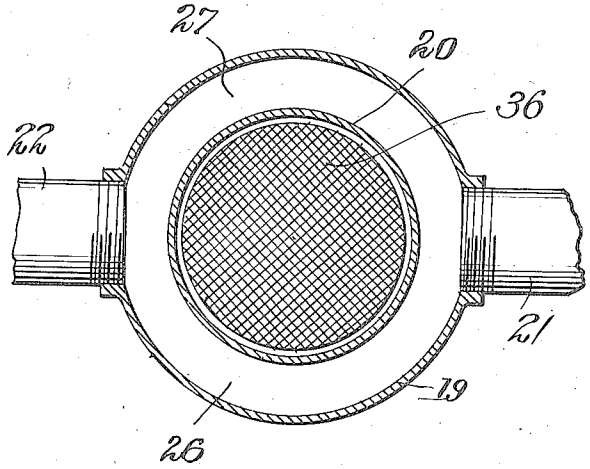


Fig. 3.

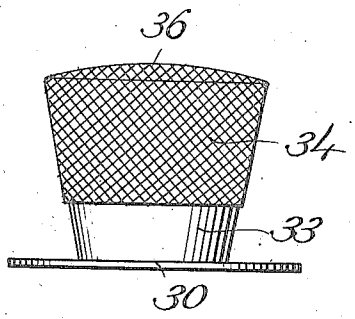
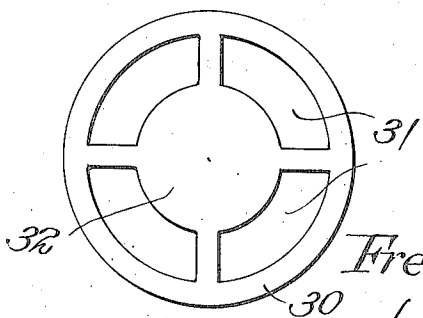


Fig. 4.



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UNITED STATES PATENT OFFICE.

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GASEOUS HEATER.

1,207,664. Specification of Letters Patent. Patented Dec. 5, 1916.

Application filed September 3, 1914. Serial No. 860,030.

To all whom it may concern:

Be it known that I, FRED W. THURSTON, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Gaseous Heaters, of which the following is a specification.

One object of this invention is an improved gaseous heater for explosive engines and the invention has to do more particularly with the provision of gasifying means interposed between the mixture supplying means and the engine for the purpose of completely gasifying the mixture supplied to the latter.

A further object is in the gasifier improved means for breaking up the fuel particles in such a manner as to aid in the production of a substantially perfect burning mixture.

A still further object of the invention is the provision in the gasifier of a heating sheet having a surface against which the mixture is deflected and in engagement with which it is maintained during a portion of its travel through the gasifier, the breaking means being associated in such novel relation with respect to the heating surface as to act upon the conveyed mixture a plurality of times.

Further objects and features of the invention will be more fully described in connection with the accompanying drawings and will be more particularly pointed in and by the appended claims.

In the drawings:—Figure 1 is a vertical sectional view of one form of my invention incorporating a carbureter and gasifier in one unitary structure. Fig. 2 is a sectional view on line 2—2 of Fig. 1. Fig. 3 is a view in side elevation of my improved vapor-breaking and deflecting device. Fig. 4 is a bottom plan view looking in the direction of arrow 4 of Fig. 3.

Like characters of reference designate similar parts throughout different figures of the drawings.

The device of my invention is illustrated in connection with an improved form of carbureter, indicated as a whole at 1, the carbureter being very generally referred to in this application.

A valve 2 controls fuel supply through a pipe 3 to a tank 4, the valve being controlled by a float 5 in the usual manner. A port 6 delivers liquid fuel to a chamber 7 from which it passes through a valve 8 to mix with air supplied through pipe 9 and delivered to pipe 10. In pipe 10 which is the intake conduit of the engine, is a throttle valve 11 which controls passage of the mixture to that portion of the apparatus which more particularly constitutes my invention and which I will now describe in detail.

Pipe 10 is flanged at 12 and a threaded pipe 13, also flanged as at 14, is fixed on the flange 12 by means such as bolts 15. The pipe 13 is exteriorly threaded and there is turned upon said pipe an interiorly threaded base ring 16, having a threaded hub 17. The base ring 16 forms a support on which my heater is shown to be mounted and the bore of the base ring 16 is flared, as at 18, for a purpose which will presently appear. On the base ring 16 is secured a hollow structure which is shown formed integral and which comprises an outer casing 19 and an inner heating shell 20. The shell and casing are spaced apart for passage therebetween of exhaust gases from the engine or other heating medium, pipes 21 and 22 being shown connected with the casing 19 for ingress and egress of exhaust gases or other heating agent through casing 19. It will be readily seen by reference to Fig. 2 that the incoming gases passing through either pipe will play most effectively upon the heating shell 20 during passage through casing 19 and outwardly through the remaining pipe. Shell 20 therefore functions as a heating conduit through which the mixture passes toward the engine and in which the mixture is completely rendered into a dry and substantially perfect gas. The shell 20 and casing 19 terminate in a threaded annular nipple 23 which has threaded connection with a coupling 24 connected to the engine cylinder 25.

The lower ends of the shell and casing terminate in a bottom wall 26 to form a closed interior chamber 27. I preferably recess the bottom wall 26, as shown at 28, to provide an annular space between the same and the base ring 16 for anchorage of my improved deflector means. I have shown the structure secured to the base ring 16 by means such as screws 29.

My improved deflector comprises a supporting disk 30 having its outer margins clamped between the bottom wall 26 and

the base ring 16. The deflector disk 30, inwardly of its outer margin, is provided with segmental openings 31 through which the mixture passes from pipe 13 into the shell 20. In order to force all of the mixture through said passages, the central portion of the deflector disk is imperforate, as indicated at 32. Now this deflector extends transversely of the direction of flow but the passages 31 are radially outwardly disposed sufficiently in coöperation with flare 18 to cause the mixture to be deflected radially outwardly at an angle to its normal direction of flow through pipe 13 and the flared portion of the latter accommodates for this change of direction. The foregoing structure may be termed a transverse deflector by reason of its position with respect to the direction of flow. There is incorporated, however, in my improved deflector structure, a longitudinal deflector which is in the form of a truncated obconic extension 33 which is shown formed integral with the transverse deflector and which extends longitudinally of the heating shell 20 and substantially longitudinally with respect to the direction of flow of the mixture.

The foregoing deflector structure first deflects the mixture outwardly against the interior of the shell 20 and the longitudinal deflector 33 tends to maintain the mixture against said shell during a portion of the travel of the mixture longitudinally therein. Now it will be understood that the explosive mixture, especially when it is formed from a heavy oil of the several kinds of which gasolene may be numbered, consists of a heavy vapor which is frequently heavily ladened with oil particles, and immediately upon its contact with the highly heated interior of the member or shell 20, it will be transformed in large part into a dry gas having the highest efficiency as an explosive fuel.

It is also an object of the invention to break up this gas and any ungasified drops or globules and sub-divide the same before it gets into the engine, and I consider it an especially important feature of the invention to incorporate the homogenizing means in the gasifier, or in other words, to so dispose said breaking means that it will be operative while the mixture is being subjected to the heat in the gasifier. Accordingly, I dispose a cap of any suitable foraminous material, as indicated at 34, within the shell 20, preferably in a manner so that it will form a continuation of the longitudinal deflector 33. The screen cap 34 is in the form of a truncated obconic body and is proportioned so that its upper and large end 35 will lie very close to the heating surface of the shell 20 thereby preventing the gaseous fuel, from passing upwardly between the breaking means and said heating surface and forcing the fuel to pass into the cap 34 below the line where the latter and the shell 20 converge. Not only does the gaseous fuel pass into the cap 34, but outwardly and upwardly through the foraminous top 36 thereof whence it discharges through coupling 24 on its way to the engine 25. Thus it will be seen that the gaseous fuel is twice forced through foraminous walls of the cap 34 and effectively sub-divided as regards not only the gas itself but any liquid particles which may be carried thereby. Of course it will be understood that the temperature in the interior of shell 20 will reach a comparatively high point and that not only will the gas be subjected to the heated interior shell 20 but also to the heated breaking screen or cap 34.

The invention is especially designed for the use of low grades of hydrocarbons and I provide means interposed between the mixture supplying means and the engine so that no matter how imperfectly the cheap and low grade liquid fuel is vaporized by whatever carbureting or mixture supply means is used, it will be completely gasified and rendered into a highly efficient explosive gas prior to its admission to the engine cylinder.

It will be seen that the interior of the shell 20 presents a heating and breaking surface to the gaseous fuel which is at an angle with respect to the direction of flow of the fuel against said surface. The fuel flows through the openings 31, to glance against or strike the interior of shell 20 at an angle thereto, or substantially tangentially. Now the fuel is thence drawn upwardly through outlet 24 and it will be seen that the open mesh breaker 34 is at an angle to the direction of flow and has its mesh openings or the axes thereof at an angle with respect to the direction of flow of the fuel leaving or passing from glancing contact with shell 20 toward outlet 24. Any fuel particles or beads of liquid fuel that have not been broken up by contact with 32 and 20, will engage breaker 34 at such an angle with respect to the mesh openings that the fuel particles will be broken up by contact with, and the heat of breaker 34, so as to be completely gasified before passing through said breaker 34. Thus complete gasification will be effected prior to admission to the engine. Now if the open mesh breaker 34 were in such a position that the axes of the mesh openings were coincident with the direction of flow of the fuel therethrough, this final breaking up, to the utmost efficiency, could not occur, because fuel particles of a minute character would pass right through the mesh openings.

I further consider it a very material advantage to have the breaker 34 within the shell 20 so as to be maintained at a tem-

perature substantially equal to the temperature of shell 20. This results in the breaker 34 functioning both as a breaker and a heater.

It will be understood that the valve 11, will seldom be fully opened and therefore the fuel passing through openings 31 will be in the form of a relatively attenuated annular spray which will pass between the shell 20 and the breaker 34, for consecutive contact therewith, the breaker 34 being last engaged, in this particular form shown, and the convergence of the breaker 34 and the shell 20 being in the direction of the incoming fuel, as will be clearly seen by reference to Fig. 1.

It is believed that the advantages and utility of my invention will be fully understood from the foregoing description and while I have herein shown and described one specific form of my invention, I do not wish to be limited thereto except for such limitations as the claims may import.

I claim:—

1. In a fuel heater for explosive engines, a chamber through which the fuel passes to the engine, a heating surface therein, longitudinally disposed imperforate deflecting means extending obliquely toward the said heating surface in the direction of flow of the fuel current to positively maintain the fuel in proximity to the heated surface for a substantial distance and a foraminous surface extending obliquely from the outer portion of said imperforate deflecting means into proximity to the heating surface.

2. In a fuel heater for explosive engines, a chamber through which the fuel passes to the engine, a heating surface therein, a deflecting plate disposed substantially transversely to the direction of flow of the fuel through the chamber, longitudinally disposed imperforate deflecting means extending obliquely from adjacent the outer portion of the deflecting plate toward the said heating surface in the direction of flow of the fuel current to positively maintain the fuel in proximity to the heating surface and a foraminous surface extending obliquely from the outer portion of said imperforate deflecting means into proximity to the heating surface.

3. In a fuel heater for explosive engines, a substantially cylindrical chamber through which the fuel passes to the engine, means to heat the walls of such chamber, a frustoconical imperforate plate disposed longitudinally of the chamber and extending obliquely outwardly in the direction of flow of the fuel current and a foraminous continuation of such deflecting plate extending therefrom to close proximity to the heated walls of the cylindrical chamber.

4. In a fuel heater for explosive engines, a substantially cylindrical chamber through which the fuel passes to the engine, means to heat the walls of such chamber, an imperforate deflecting plate disposed substantially transversely to the direction of flow of the fuel through the chamber, a frustoconical imperforate deflecting plate disposed longitudinally of the chamber and extending obliquely outwardly in the direction of the flow of the fuel from the outer portion of the transversely disposed deflecting plate and a foraminous continuation of such obliquely disposed deflecting plate extending from the outer portion of such plate to close proximity to the walls of the cylindrical chamber.

5. In a heater for previously carbureted fuel for explosive engines, the combination with a primary heating surface arranged at an angle to the direction of flow of the gaseous fuel for initial engagement by the latter to heat said fuel and partially gasify and break up the beads or particles carried thereby, means for directly applying heat to said primary surface, and a fine screen disposed in such close relation to said primary heating surface as to be heated to substantially the temperature of the latter and arranged at such an angle to the direction of flow of fuel leaving said primary heating surface that fuel particles or beads will strike against said screen and be broken up before passing through said screen, and means for delivering a partially gasified or carbureted fuel to said heater, substantially as described.

6. In a fuel heater for explosive engines, a primary heating surface, means directly applying heat to said surface, a deflector for abruptly arresting the fuel under suction flow to break up the liquid particles and deflect the fuel at an angle against said primary heating surface to heat and further break up and gasify the fuel, said primary heating surface being disposed beyond said deflector with respect to the flow of incoming fuel, and a screen disposed beyond said deflector with respect to the incoming fuel and in such close proximity to said primary heating surface as to be maintained at substantially the same temperature as the latter, said screen surface being disposed with respect to the direction of flow of the fuel leaving said primary heating surface so that the axes of the mesh openings will be angular to the direction of flow of said fuel whereby liquid particles carried by the fuel will strike against said screen and will be broken up by heat of impact prior to the passage through said screen, and means for supplying a partially carbureted fuel to said heater, substantially as described.

7. As a means for heating or gasifying fuel for explosive engines, a heater comprising heating and breaking surface portions disposed in converging relation with respect

to each other with the point of greatest convergence remote from the incoming fuel passing therebetween and said portions presenting surfaces for consecutive engagement of the fuel thereagainst, such surface portion last engaged by the fuel being a fine mesh screen, means for directly applying heat to the other heating surface, and means for delivering a partially gasified fuel to said heater, substantially as described.

8. As a means for heating and breaking suction drawn previously carbureted gaseous fuel, a heater having primary and secondary heated breaking and gasifying surfaces extending alongside each other and longitudinally along the path of fuel for movement of the fuel between said surfaces and said secondary surface being a fine mesh screen, means for directly applying heat to the primary surface to heat the latter and said screen, said heater having an outlet disposed in such lateral relation with respect to said screen that the fuel will glance against and frictionally engage said screen to break up the fuel particles by impact with and heat of said screen to gasify the fuel before the latter passes through said screen, said heater having means for initially deflecting the fuel in glancing engagement against said primary heating and breaking surface prior to engagement of the fuel with said screen, and means for delivering the partially gasified or carbureted fuel to said heater, substantially as described.

9. As a means for heating and breaking up suction drawn gaseous fuel, a heater having substantially annular primary and secondary heated gas breaking or gasifying surfaces disposed one within the other and extending alongside each other and longitudinally of the path of the fuel for passage of incoming fuel between said surfaces in an annular body, the innermost surface being a fine mesh screen, said heater having an outlet disposed sufficiently radially inward from said screen so that the fuel will glance against and frictionally engage said screen along the exterior surface of the latter to break up the fuel particles by impact with and by heat of said screen to gasify the fuel before and while the fuel is being drawn through said screen, said heater having means for initially deflecting the fuel in a substantially annular body in glancing engagement against the interior of said outer surface prior to engagement of the fuel with said screen, means directly applying heat to said primary surface, and means for delivering a partially gasified or carbureted fuel to said heater, substantially as described.

10. In a device of the character described, a tubular primary heating device provided near one end with relatively stationary permanently open angularly arranged inlet means for causing the gaseous fuel to diverge upon entering the tubular primary heating device and directly contact with the inner wall thereof, means for heating the primary heating device, and a secondary tubular heating device arranged within the primary tubular heating device and formed of a fine screen, said secondary tubular heating device being tapered and increasing in diameter away from the angularly arranged inlet means, as and for the purpose specified.

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