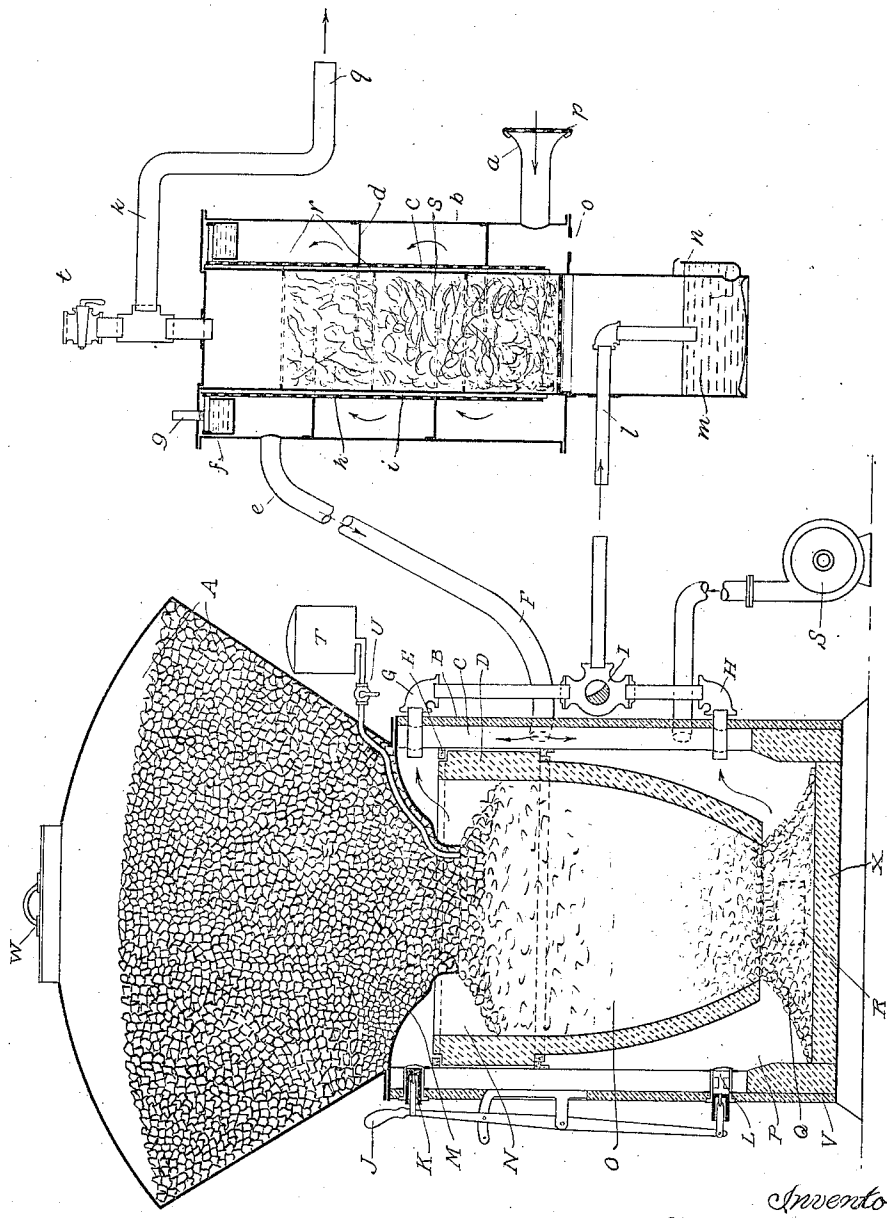
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APPARATUS FOR PURIFYING AND COOLING COMBUSTIBLE GAS

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APPARATUS FOR PURIFYING AND COOLING COMBUSTIBLE GAS.

Original application filed December 20, 1921, Serial No. 520,580, now Patent No. 1,480,183, dated January 8, 1924. Divided and this application filed August 15, 1923. Serial No. 657,588.

To all whom it may concern:

Be it known that WILLIAM W. ODELL, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, has invented certain new and useful Improvements in Apparatus for Purifying and Cooling Combustible Gas, of which the following is a specification.

The invention relates to improvements in apparatus for purifying and cooling combustible gas, and is a division of my application, Serial No. 520,580, filed December 20, 1921, Patent No. 1,480,183 dated January 8, 1924.

Briefly stated, this invention covers an improved cooling system for a gas producer, particularly designed for use on motor vehicles, but adapted for uses in other relations.

One of the objects of the present invention is to provide a gas producer with a cooling system suitable for use on motor vehicles, power boats, locomotives, cars, tractor engines and the like, and also for small power units.

Another object is to provide an economical cooling system in which the gas is cooled and the heat of the gas simultaneously received and transferred to the air used for combustion.

A further object is to provide a means for cooling the gas by both air and water in one apparatus.

A further object is to provide means for forcing air into the cooler and generator by means of the motion of the vehicle, thus reducing the vacuum on the engine.

Another object is to provide means for automatically and uniformly distributing the water over the surface of the gas cooler and automatically regulating the supply of moisture to the generator.

A further object is to provide means for preventing the filler in the purifier from bunching in the middle and permitting the gas to pass up around the walls.

The invention will be more clearly understood by reference to the accompanying drawing in which is shown an illustrative embodiment of the invention.

The figure of the drawing is a view in central vertical section showing the producer and gas cooler complete, some of the parts being shown in elevation.

It will be noted that the various parts of the producer are lettered in capitals while the cooler and other parts are designated by small letters.

As shown A represents the storage magazine for the fuel supply, B is the outer shell of the producer proper, C is the air space between inner and outer shells, D is the generator pot or producer lining, E and E_1 are the packing ring supports for the generator pot, F is the air intake to the air space surrounding the producer and G and H are the off-takes for the gas made when the producer is operated as an updraft and down draft producer respectively. I is the valve through which the gas all passes on its way to the cooler after leaving the producer. J is a lever used to operate the valves K and L which make the producer an up-draft or a down-draft producer accordingly as the air is admitted thru L or K respectively. Preferably the gas valve I is connected to the blast valve operating lever J whereby it may be operated in synchronism with the air valves L and K. M is the hopper base (fuel magazine base), N is the annular space for gas when the producer is operated by updraft and for air when operated as a down draft producer. O is the fuel bed in generator pot, P is the air space in which generator pot is suspended, Q is the ash pit and R is the door for removing ashes. S is the blower for starting a fire in the generator pot or for bringing fuel bed up to operating temperatures after stand-by periods. T is the liquid fuel tank and U is the valve controlling the supply of same to the fuel bed. V is an insulating casing for the producer, W is the lid of fuel magazine and X is the floor supporting ashes and fuel. The parts designated by small letters are as follows:—
a is the air inlet to purifier and cooler which latter has an outer shell *b* and an inner shell *c* with baffles *d* in between. *e* is the outlet for hot air from cooler; *f* is the water reservoir for supplying water to the cooling surface and *g* is the water supply pipe to this reservoir. *h* is the wicking or fibrous surface surrounding shell *c*, and *i* is a wire gauze or screen surrounding and holding the wicking *h* in place. *k* is the producer gas offtake from cooler to engine, and *x* is the gas outlet to cooler. *m* is the liquid seal and *n* is the automatic overflow for tarry matter or other condensate. *o* is a dust clean-out and drain for excess water fed to cooler; *p* is a screen over air inlet *a*. The

rings for holding the purifying material in place are shown at *r*. *s* is the purifying material.

To operate this producer I proceed as follows:—A fire is kindled in D and fuel is added till the magazine A is about full. The cover W is left open and the air fan S is started, supplying air to the fuel bed from beneath, and blasting is continued till fuel bed is sufficiently hot for gas making purposes. During this blasting period valve I is turned so that none of the blast gas can pass out thru it. The cover W is now closed and the blast from S discontinued and valve I is turned as shown in the figure. Lever J is also placed in position so that the producer air supply comes thru F into air space C around the producer and thru valve L to the fuel bed from beneath. Gas is generated in fuel bed O by the well known producer gas reactions. The engine is started and sucks the gas from the producer by the following route: Gas from fuel bed O passes to space N above fuel bed, thru off-take G and valve I, thence thru pipe *x* to the cooler and purifier, thru filling material *s* and out thru *k* and *q* to the engine. The complete course of the air to the producer is from *p* around the inner shell of the cooler as directed by baffles *d*, out thru *e* and F to C and from there to the fuel bed thru valves K or L according to the position of lever J.

At times I find it desirable to operate the producer as a down shaft producer for the purposes of maintaining a more uniform temperature in the fuel bed; relieving clinker troubles by changing not only the temperature in the lower fuel mass but also the nature of the atmosphere prevailing in this zone; preventing the passage of excess of fuel into the ash; for carbonizing fuel and for cracking oil or other liquid fuel. By operating lever J so that either valves J or L are open, and by simultaneously adjusting valve I to take the gas from H or from G accordingly, the producer is at once a down draft or an updraft producer. This arrangement permits charging the fuel magazine without interfering with the gas supply since during this period the producer is operated as a down-draft producer. Likewise, the ash is removed thru the clean-out door R without affecting the gas supply since during this operation the producer is operated as an up draft producer.

As the gas passes thru dip pipe and seal *m* and on thru the cooler it is not only cooled but is also purified and freed from tarry matter by contact with purifying material *a* which may be glass wool, mineral wool or other contact material. The sensible heat of this gas is imparted to the metal shell *c* which is so arranged that water coming into the reservoir *f* from *g* overflows and uniformly distributes itself over the surface *c* by means of the wicking or fibrous material arranged at *h* around *c* for this purpose. This wicking not only distributes the water uniformly over the surface *c* but, rapid evaporation takes place and a greater cooling action results. In this manner it is possible to supply the producer with air of a higher degree of saturation than otherwise. It should be noted that the supply of moisture is automatically controlled in this manner, for obviously when the fuel bed is not particularly hot the gas will not impart as much heat to the shell *c* as when the fuel bed is very hot. Under this condition the temperature of the gas leaving producer is higher and consequently more evaporation takes place per unit volume of air space surrounding *c*. This increase in the moisture content of the air causes a greater cooling of the fuel bed and affords an automatic check on sudden temperature changes, in the fuel bed.

The air which comes into the outer shell *b* of the cooler and thru *p* under pressure—(due to the motion of the vehicle with *p* facing in the direction of travel)— also aids in cooling the gas and condensing the tarry matter since its temperature is increased in passing to *e*. This moist air is further heated in air space C surrounding producer. The air is forced to travel around producer since it is supplied at the opposite side from which it enters the producer proper.

While the invention has been described in great detail for the purpose of illustration, it is to be understood that many of the details may be varied without departing from the spirit of the invention.

What I claim is:—

1. In an apparatus for producing gaseous fuel, the combination of a scrubber and cooler consisting in; two connected concentric shells the inner shell partly filled with purifying material and supplied with rings fitting close to its inner wall but not connected therewith, for the purpose of holding the purifying material in place and diverting the gas from wall channels, a means of causing the gas to pass thru said inner shell, a means of supplying water uniformly to the outer surface of this shell consisting in a coating of a porous water absorbent around its outer surface and a water supply chamber to supply water by the overflow principle; the outer shell equipped with baffles for directing air around the inner shell in a spiral course for the purpose of cooling the gas and heating and saturating the air by means of the sensible heat of the gas; and a means for supplying air to the annular space between the shells substantially as described.

2. A combined gas purifier and cooler, adapted for use on moving vehicles, comprising two concentric shells, the inner of

said shells containing purifying material through which the gas is passed, and means for supplying air under pressure to the space between the shells, said means comprising a funnel-shaped air inlet to the cooler facing in the direction of motion of the vehicle and of sufficient size to produce the desired pressure.

3. In an apparatus for producing purified gas, a combined gas purifier and cooler consisting in two concentric shells, the inner one containing purifying material and the external one having baffles on its inner wall for circulating air, in which gas is purified by passing upwardly through said purifying material and cooled by both air and water by indirect contact, and in which the water flows downwardly about said inner shell, and said air circulates in an upward direction about said shell in contact with it.

4. In an apparatus for purifying gaseous fuel, a combined purifier and cooler comprising two concentric shells, the inner shell containing purifying material, and the external shell having baffles on its inner wall for circulating air, means for distributing water uniformly over the outer surface of the inner shell comprising a wicking of fibrous material surrounding the inner shell, and means for supplying water to said wicking.

5. A combustible gas purifier having cooling jackets comprising an inner shell containing purifying material, a wicking surrounding said inner shell, means for supplying water to said wicking, means for circulating air about the saturated wicking, whereby the gas is cooled and the air heated, and an outer shell surrounding said wicking and spaced therefrom.

6. A combined purifier and cooler for combustible gas comprising an inner shell containing purifying material through which the gas is passed in an upward direction, a wicking surrounding said shell and means for supplying water to said shell.

7. A combined purifier and cooler for combustible gas comprising a shell provided with purifying material through which hot gas is passed in an upward direction, and means for supplying water uniformly and in thin layers over the surface of the shell in a downward direction.

8. A combined purifier and cooler for gaseous fuel comprising a body of purifying material surrounded by a cooling jacket of porous material, means for supplying water to the cooling jacket and means for circulating air in contact with the saturated porous material, whereby the gaseous material is cooled and the air heated.

In testimony whereof I affix my signature.

WILLIAM W. ODELL.