Aug. 6, 1929. C. G. HAWLEY 1,723,034

SMOKE CLEANER FOR OIL ENGINES

Filed March 11, 1926

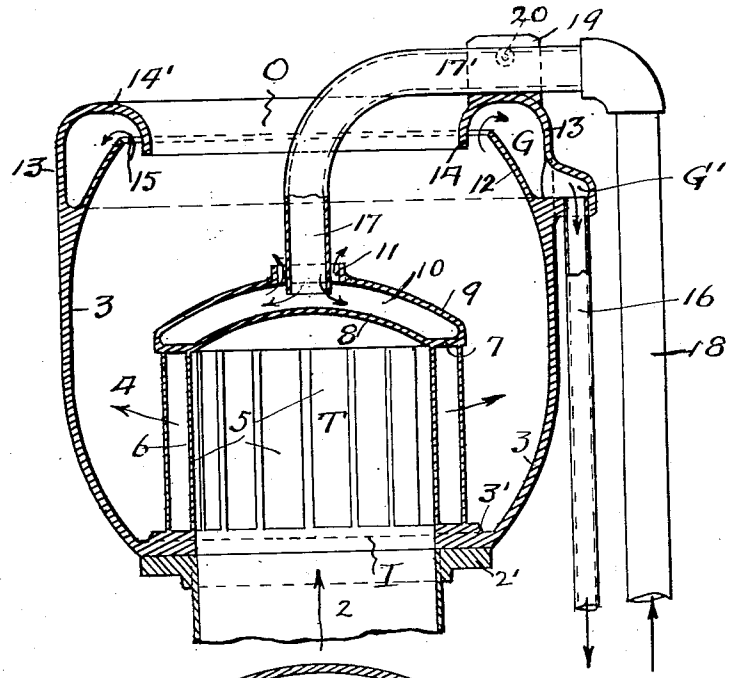



Fig. 1.

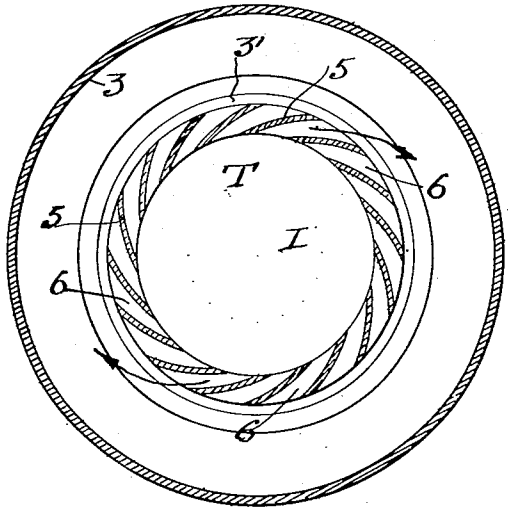



Fig. 2.

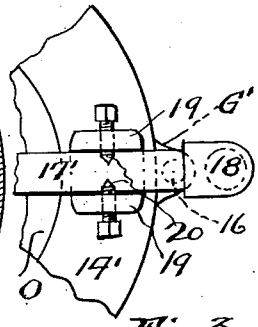



Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## SMOKE CLEANER FOR OIL ENGINES.

Application filed March 11, 1926. Serial No. 94,086.

My invention relates to means for removing oil particles and solids from the gases or smoke exhausted by internal combustion engines and the like. By so doing, the exhaust may be clarified and rendered substantially unnoticeable and in every event the usual shower of oil particles from the exhaust pipe is avoided. Such is the main purpose of the invention. A further object is to accomplish the desired results by a means or apparatus in the nature of an exhaust head that shall be attractively small and of little weight and of relatively low cost, considering the character of work performed. A further and incidental object of the invention, but quite as important as any other, is to provide a centrifugal tuyère or tuyère unit that shall be of minimum weight, maximum strength and of the highest efficiency, as required by the exacting performance demanded of an oil exhaust head, and which unit shall each be complete in itself.

My invention will be readily understood on reference to the accompanying drawing in which Fig. 1 is a vertical section of an exhaust head and smoke clarifier embodying my invention; Fig. 2 is a horizontal section thereof and discloses the tangential blades of the whirl promoting tuyère, which is a component of the unit; and, Fig. 3 is a detail of the top showing how the air blast pipe is held.

This exhaust head usually partakes of a flat top globular shape and is fastened on the upper end of the large exhaust pipe 2, leading from the internal combustion engine or the like. The unit has a base portion 3′ that fits the flange 2′ of the exhaust pipe. From that point the generally cylindrical wall 3 rises to the top of the unit where it is formed into the inwardly turned extension 12, the outside extension 13 spaced therefrom and the inwardly curved top 14′, which latter turns downward and forms the portion 14. And the latter is of less diameter than the upper margin of the part 12 and thus a peripherical opening 15 is formed in communication with the annular chamber G which exists between the parts 12 and 13. The part 14 contains the outlet O of the exhaust pipe and said outlet, as shown, is preferably of about twice the area of the inlet 2.

A projection on the side of the head contains the lateral space G′ and the pipe 16 extends downward from that space for the removal of the collected liquid, as hereinafter explained.

Rising from the base portion 3 at the margin of the inlet opening I therein are a plurality or series of tangential blades 5 which form a like series of tangential tuyères 6. At the tops of these blades is a concave baffle member or cover composed of the walls 7, 8 and 9 and preferably containing the chamber 10, for the reception of the cooling agent, as hereinafter described.

The exhaust head is thus seen to comprise a base portion and walls that rise therefrom and a whirl permitting tuyère T. As shown all those parts may be formed in a single casting but obviously they may be separate and fastened together, after being manufactured singly.

The top of the baffle contains an opening 11 and this receives the smaller end of the blast pipe 17, 17′. Conveniently the pipe is held between lugs 19, formed on the top 14′ and by opposed set screws 20 therein. 18 represents the extended connection through which a blast of air is supplied.

At this point it should be explained that my invention comprehends the use of a blast of air to cool the baffle 8 which forms the top of the tuyère T. Little water is available on locomotives and the like that are driven by large internal combustion engines, whereas it is an easy matter to provide a blast of comparatively cool air. However, water may be substituted as a cooling agent and as little thereof is required, it may be permitted to overflow at the opening 11 and will be caught along with the oil and ejected into the chamber G. Otherwise both inlet and outlet water pipes must be connected with the baffle.

The gases, steam or the like, rise through the inlet 1 and meeting the baffle 8 must find their escape through the tangential tuyère 6. They are thereby caused to whirl very rapidly in the chamber 4 and simultaneously the liquids, carbon particles and the like, carried by the gas, are centrifugally separated therefrom upon the wall 3. Thence they are forced upward by the whirling urge of the gases seeking escape at the outlet O and arriving at the opening 15 (in advance of

the actual outlet), the liquids are thrown into the cavity G. That cavity is continually drained by the open pipe 16.

All vapors must be condensed before they can be caught and to this end the baffle 8 is cooled by the flow of cooling agents from the pipe 17. Generally the oil vapors are heavier than the carrier gases and thus are impacted on the cool baffle along with the liquid particles and are successfully condensed so that when expelled through the centrifugal tuyère they are certain to be lodged upon the surface 3. Attention is called to the fact that the condensing baffle is in a large measure essential to an oil catching exhaust head for the mere reason that the oil vapors do not lose their heat as do the gases upon expansion, and would pass off still in the form of vapor if permi'ted to escape to the atmosphere with the gases. Further, the oil collecting baffle is of especial importance in that being kept coated with a film of oil it is in position to receive the impact of the carbon and ash particles in the exhaust gases and to retain them in the oil, to be later collected in the chamber G along with the oil.

Various modifications of my invention and various uses thereof, for example in the purification of steam and gases generally, will suggest themselves to those skilled in the art. Therefore it is to be understood that my invention is not limited to the precise structure herein shown and described, nor to the cited use therefor. Instead the scope of my invention is to be ascertained from the appended claims as read in the light of the foregoing.

Having thus described my invention I claim as new and desire to secure by Letters Patent:

1. The hereindescribed exhaust head comprising a base, in combination with a substantially cylindrical wall rising therefrom, said base containing an inlet opening, a plurality of tangential blades rising from said base at the margin of said opening, a baffle forming a top upon the upper ends of said blades, an inwardly inclined extension at the top of said wall, a top above and surrounding said extension and therewith forming an annular reception space, a drain for said space and said top containing a central outlet preferably of greater size than said inlet.

2. The hereindescribed exhaust head comprising a base, in combination with a substantially cylindrical wall rising therefrom, said base containing an inlet opening, a plurality of tangential blades rising from said base at the margin of said opening, a baffle forming a top upon the upper ends of said blades, independent and positive means for cooling said baffle, an inwardly inclined extension at the top of said wall, a top above and surrounding said extension and therewith forming an annular reception space, a drain for said space and said top containing a central outlet preferably of greater size than said inlet.

3. The exhaust pipe of an internal combustion engine in combination with a generally cylindrical exhaust head co-axial therewith, a plurality of tangential blades, positioned at the end of said pipe within said head and substantially parallel with the axis thereof, said blades comprising the whirl-promoting elements of a tuyère of less diameter than said head, a tuyère top resting upon the free ends of said blades, said top being hollow, and means for circulating a cooling medium through said top, to the end that a relatively cold surface shall be opposed to the blast of gas and oil vapor from said pipe, and, means for disposing of the fluids which are separated by the whirling action of the gases within said head.

In testimony whereof I have hereunto set my hand this 9th day of March, A. D., 1926.

CHARLES GILBERT HAWLEY.