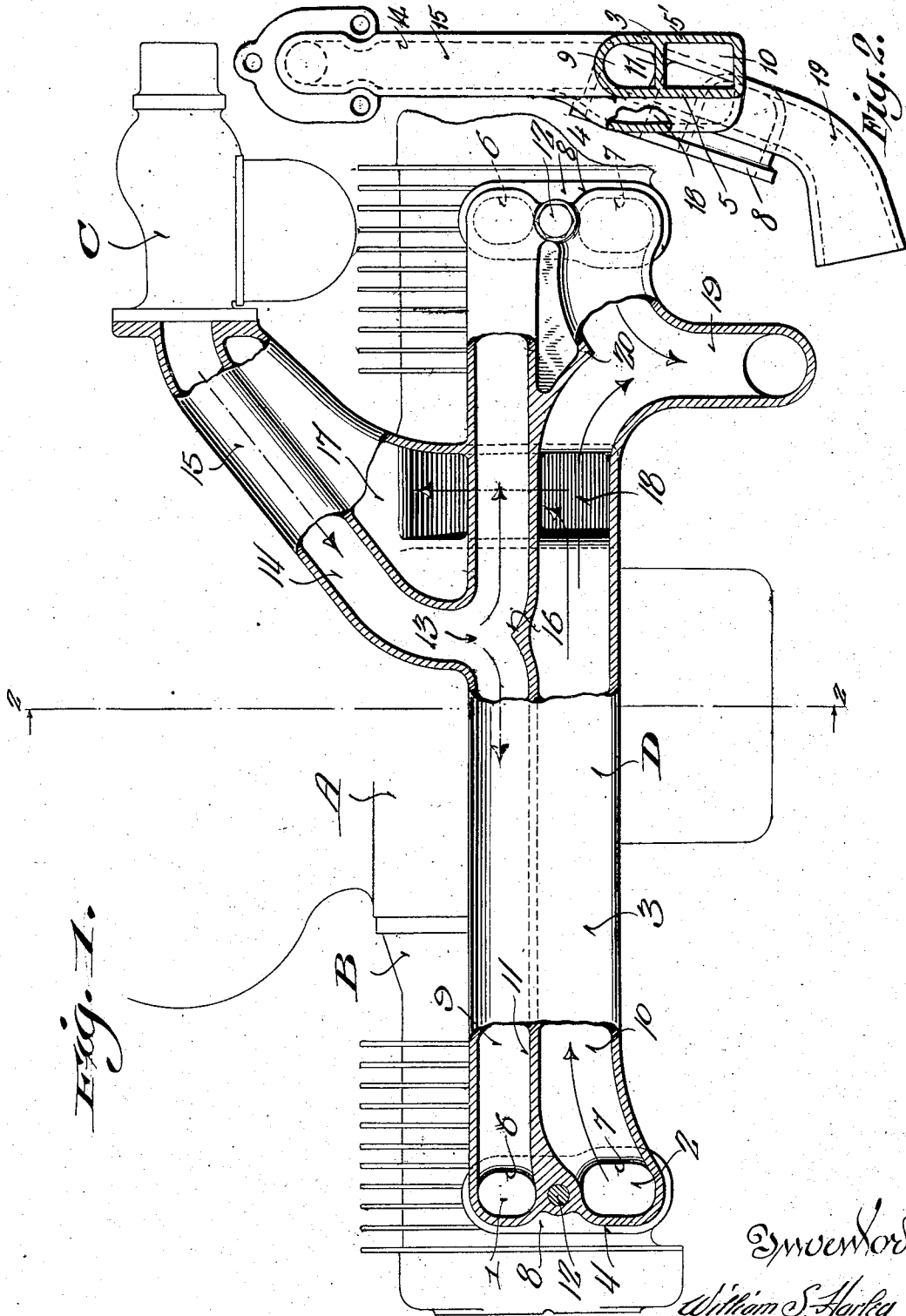


W. S. HARLEY.
 COMBINED INTAKE AND EXHAUST MANIFOLD.
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1,328,150.

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COMBINED INTAKE AND EXHAUST MANIFOLD.

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To all whom it may concern:

Be it known that I, WILLIAM S. HARLEY, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Combined Intake and Exhaust Manifolds; and I do hereby declare that the following is a full, clear, and exact description thereof:

My invention consists in new and useful improvements in manifolds for internal combustion engines, particularly motor-cycle engines of the type shown in my pending application Serial No. 192,116.

Heretofore it has been difficult to secure proper mixing of the gaseous fuel and air prior to the combustion of the same in engines having opposed cylinders such as illustrated in the above referred to patent application, this being due to the relatively great distance between the intake ports of the engine cylinders and the outlet of the carbureter. In other words owing to the fact that the carbureter is necessarily spaced a considerable distance from the intake ports of the cylinders of such type of engine, the gaseous fuel is cold practically until it enters the cylinders and therefore proper mixing with the air cannot take place. It is necessary for the gaseous fuel to be expanded to some extent before it can be properly mixed and this is only procurable by means of heat radiated from the engine cylinders or by any other application of the same to the intake manifold. Therefore, it is the principal object of the present invention to provide an arrangement whereby the gaseous fuel is heated and such heat continuously applied from the time the said fuel leaves the carbureter until it enters the intake ports of the engine cylinders.

It is another important object of my invention to combine the intake and exhaust manifolds in such a manner that the foregoing object is accomplished.

Still another object is to provide an intake and exhaust manifold which can be cast in one piece from any suitable material.

With these general objects and advantages in view the invention resides in the novel features of construction and arrangements of parts which will be hereinafter more particularly described and claimed.

In the accompanying drawings:—

Figure 1 represents a more or less dia-

grammatical view of a portion of a two cylinder internal combustion engine, said cylinders being opposed and having a carbureter disposed thereadjacent, said carbureter and the opposed ends of the cylinders being connected with a combined intake and exhaust manifold constructed in accordance with my invention, the portions of the latter being broken away and in section to more clearly illustrate the internal construction, and

Fig. 2 is a vertical cross sectional view taken substantially on the plane of the line 2—2 of Fig. 1.

By reference to the drawings it will be seen that character A designates the crank case of an internal combustion engine from the opposite sides of which extend cylinders B, said cylinders being opposed, and disposed adjacent and above one of said cylinders is a carbureter C of conventional design. My improved intake and exhaust manifold D is arranged with respect to these parts so that the intake portion thereof connects the carbureter and the intake ports 1 of the cylinders, and the exhaust portion thereof receives the spent gases from the exhaust ports 2.

In this type of engine the cylinders are disposed in a horizontal plane and the intake and exhaust ports thereof are therefore arranged vertically, the intake port being directly above the exhaust port, the distance between the same being relatively slight. This close proximity of the two ports of each cylinder is taken advantage of in casting my improved combined intake and exhaust manifold in one piece.

Specifically this combined manifold comprises an elongated horizontally disposed main casing 3 of a length approximately equal the distance between the ports in the opposite cylinders and of substantially rectangular shape in cross section. The ends of this casing 3 are closed by walls 4, while adjacent each of these walls 4 and formed through the inner side wall 5 is a pair of holes 6 and 7 respectively, these holes being vertically spaced and adapted to aline with the ports 1 and 2 in each cylinder when said casing is arranged in juxtaposition to said cylinders as shown in Fig. 1. Each pair of openings is surrounded by a continuous flange 8 which seats against the material of the cylinders surrounding the ports 1 and 2.

This main casing 3 is divided into a pair of longitudinally extending elongated, pipe-like compartments 9 and 10 by a horizontally and longitudinally extending partition wall 11 which extends from one end wall 4 to the other and is formed integrally therewith as well as with the rear and front walls 5 and 5' respectively. From Fig. 1 it will be seen that the material forming the partition 11 adjacent each wall 4 is enlarged and provided with a transversely extending aperture, these apertures being adapted to receive clamping bolts 12 which extend through said material into the cylinders B to secure the manifold thereto.

Access is gained to the compartment 9 which connects with the intake ports 1 through an opening 13 formed in the top wall of the main chamber 3 intermediate the ends thereof, and this opening is connected with the outlet of the carbureter C through the compartment 14 of a two compartment supplemental casing 15, the upper end of which is detachably connected to said carbureter while the other end is formed integrally with the walls of the main chamber 3. The compartments 9 and 14 form the intake manifold portion of my invention. Adjacent the opening 13 and opposite the same on the partition wall 11 is formed a deflector 16 for directing the incoming gas and air from the compartment 14 in both directions through the compartment 9 so that an equal amount of combustible mixture is distributed to the cylinders B. This deflector also aids in combining the gaseous fuel and air and has a still further purpose which will hereinafter be more particularly pointed out.

The other compartment 17 of the two compartment supplemental casing 15 has only one opening thereinto, this opening being by way of a passage 18 from the compartment 10 of the main chamber 3. From Fig. 2 it will be noted that this passage is substantially offset from the other parts of the combined manifold, and that it is formed integrally therewith.

From the compartment 10 an outlet pipe 19 leads to the open air or to a muffler as desired, this outlet pipe being connected with the bottom of the main casing 3 intermediate the ends thereof, and preferably between one exhaust port 2 and the passageway 18 as clearly shown in Fig. 1. A deflector 20 is formed on the lower side of the partition wall 11 opposite the opening of the outlet pipe 19 for substantially the same purpose as the deflector 16.

In the use of this combined manifold the same is connected to the engine cylinders by the bolts 12 as hereinbefore mentioned

and to the carbureter C. The exhaust gases from the exhaust ports of the cylinders are forced into the compartment 10 of the main casing and are expelled therefrom through the outlet pipe 19. The heat of this exhaust gas warms the partition wall 11 to a relatively high degree and inasmuch as this wall forms one side of the compartment 9 through which the combustible mixture passes to the intake the same is heated and therefore the gaseous fuel and air is more thoroughly comingled. The deflector 16 is quite hot and being extended into the compartment 9 adjacent the inlet thereof of the combustible mixture it will materially aid in heating such mixture.

Although most heat is imparted to the fuel while it is in the compartment 9, yet nevertheless it is warmed to some extent while in the compartment 14 of the supplemental casing 15, this being due to the fact that the compartment 17 is filled with hot spent gas by reason of its being connected with the compartment 10 through the passage 18. The flow of fuel gas and also spent gases is shown by the arrows in Fig. 1. With such an arrangement as this the combustible mixture will always be heated and thoroughly comingled before it reaches the intake ports of the engine cylinders even though the latter are spaced a considerable distance from each other as well as from the carbureter C.

I claim:—

In a device of the class described, a combined exhaust and intake manifold comprising a one piece cast elongated main casing, each end of the casing having a pair of spaced openings, a longitudinally disposed wall extending from end to end of the casing between the openings to form a pair of pipe-like compartments each having a hole at each end, a laterally extending two compartment supplemental casing having its walls formed integrally with the wall of the first mentioned main casing, one end of one of the compartments of the laterally extending casing being in communication with one of the compartments of the main chamber, the other end of said compartment of the laterally extending casing being open, a passageway from the other compartment of the laterally extending casing to the other compartment of the main casing, and an outlet from the last named compartment of the main casing.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee, in the county of Milwaukee, and State of Wisconsin.

WILLIAM S. HARLEY.