March 3, 1931. W. H. RADFORD 1,794,642

EXHAUST PIPE CONSTRUCTION

Filed May 8, 1929

FIG. 1.

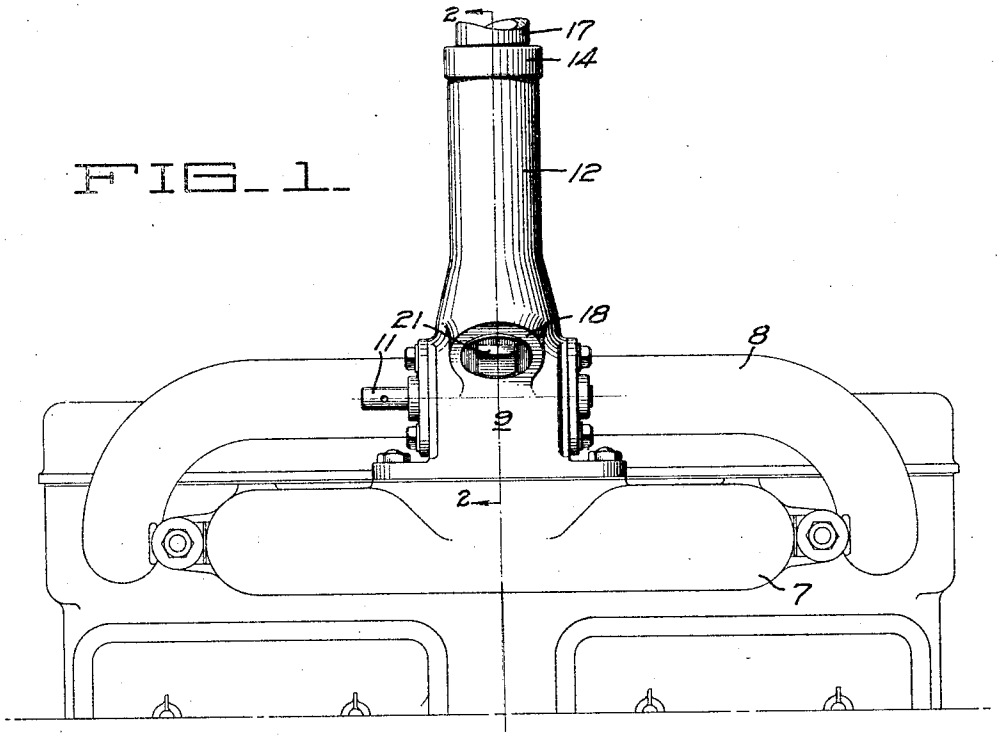


FIG. 2.

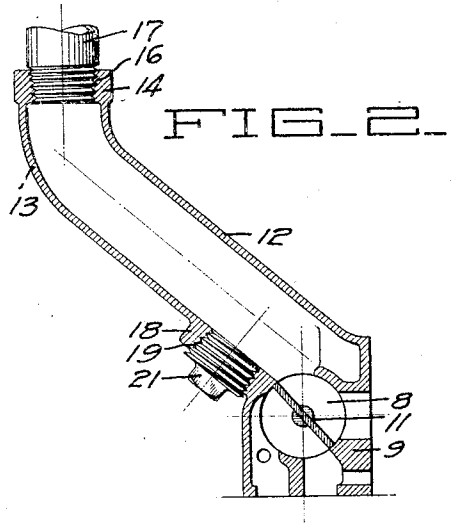
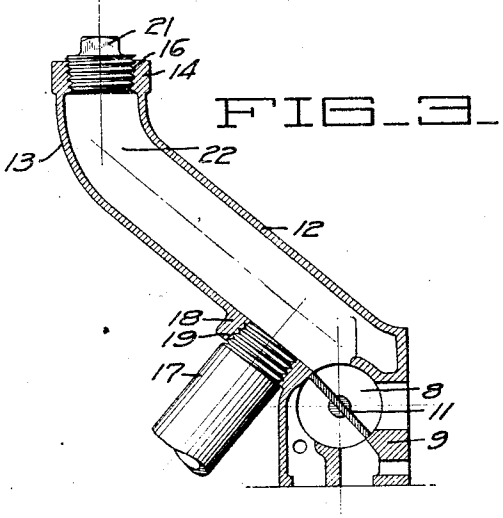


FIG. 3.



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UNITED STATES PATENT OFFICE

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EXHAUST-PIPE CONSTRUCTION

Application filed May 8, 1929. Serial No. 361,424.

My invention relates particularly to the manner of construction an exhaust pipe adapted for use with an internal combustion engine and finds a particular field of application on engines for use in tractors.

It is well known that tractors customarily operate with their engines at approximately full throttle during normal use. Ordinarily a governor is provided for maintaining the engine at approximately maximum speed. The exact power output at which the engine function is controlled by the governor, which can be set at any one of several different values depending upon the particular conditions under which the tractor is working. It is also well known that one of the major factors which effect the efficiency of an internal combustion engine, is the back pressure in the exhaust line. By selecting certain critical values for the exhaust conduit dimensions, it is possible to secure an effect comparable to an ejector effect so that the back pressure on the engine is materially reduced and the efficiency of the engine is considerably increased. Such critical values for the exhaust line proportions are somewhat dependent upon the engine speed and load. Thus, an exhaust pipe may have characteristics capable of reducing back pressure at one speed and load, but incapable of this effect at a different speed and load.

It is therefore an object of my invention to provide means for varying the characteristics of an exhaust pipe, to minimize the effect of the back pressure at different speeds and loads.

Another object of my invention is to provide a simple means for changing the direction of discharge of the exhaust gases from an internal combustion engine.

An additional object of my invention, is to take advantage of the periodicity of the exhaust gases in reducing exhaust noise as well as back pressure.

The foregoing and other objects are attained in the embodiment of the invention shown in the drawings, in which:

Fig. 1 is a side elevation of a portion of an internal combustion engine with the exhaust pipe construction of my invention embodied therein.

Fig. 2 is a cross section on the line 2—2 of Fig. 1.

Fig. 3 is a cross section similar to Fig. 2 but with the exhaust pipe and the plug interchanged.

In its preferred form, the exhaust pipe construction of my invention comprises a conduit connected with the exhaust manifold of an internal combustion engine, and having a plurality of apertures therein opening in materially different directions and adapted to receive interchangeably a plug and a pipe, which by their relative positions determine the direction and place of exhaust gas discharge from the conduit.

As shown in the drawings, the device of my invention is preferably fitted to an internal combustion engine having the customary intake manifold 7 and an exhaust manifold 8. The exhaust manifold incorporates a metal body 9 preferably centrally located to receive a valve 11, which forms no part of the present invention and need not be described further herein.

Formed integrally with the body 9 is a conduit 12 preferably extending a considerable distance from the engine and terminating in a partially complete circular bend 13. the upper terminal of the conduit is enlarged by a flange 14, taper threaded on its interior as at 16 to receive a pipe 17 also threaded to engage the terminal flange 14 and continue the interior of conduit 12. The pipe 17 can be of any length and diameter deemed advisable for reducing the surges in the exhaust gases passing through the conduit 12 and is designed to reduce the back pressure in the exhaust line by taking advantage of the periodicity and ejector effect of the outflowing gases under one range of operating conditions. Preferably the pipe 17 extends vertically into the air, so that its point of discharge is a considerable distance from the engine to conduct the gases away therefrom and to reduce the exhaust noise audible immediately adjacent the engine.

The conduit 12 is also provided adjacent its lower end with an aperture bounded by

a flange 18 taper threaded as at 19, to receive a plug 21 having threads for engagement with the flange 18 to seal the aperture. This arrangement of the pipe 17 and plug 21 is shown particularly in Figures 1 and 2, and is effective under certain conditions of engine load and speed, to reduce the back pressure and the noise of the issuing exhaust gases. Under other conditions of engine load and speed however, I have found it a great advantage to interchange the pipe 17 and the plug 21 as shown in Figure 3. In this instance the plug 21 is seated within flange 14 to seal the aperture bounded thereby, while the pipe 17 is seated within flange 18 and permits egress of exhaust gases therethru. There is thus formed not only an outlet for the exhaust gases through the pipe 17 in a different direction and especially in a direction substantially at right angles to the direction of flow in conduit 12, but there is also provided at the upper end of conduit 12 a closed chamber 22, sealed by plug 21, to act as a surge space for the exhaust gases. The arrangement as shown in Figure 3 is effective at a different range of engine speeds and loads for utilizing the surges or pulsations of the exhaust gases in the manner of an ejector to reduce the back pressure and noise. There is provided by this scheme a means for changing the direction of efflux of exhaust gases so that their point of emergence from pipe 17 may be at a less objectionable point, for example when the tractor is used in harvesting work, it is desirable to discharge the gases upwardly whereas when it is used for orchard work, it is often desirable to discharge the gases downwardly in order to avoid interference between the upstanding exhaust pipe and low-hanging branches. There is also provided a means for obtaining at different conditions of engine speed and load the beneficial effects of utilizing the exhaust gas pulsations to reduce the exhaust gas back pressure upon the engine and thereby maintain its efficiency throughout either one of two fairly wide ranges of operation under different conditions of speed and load.

It is understood that I do not limit myself to the form of the exhaust pipe construction shown and described herein, as the invention, as set forth in the following claims may be embodied in a plurality of forms.

I claim:

1. In an internal combustion engine an exhaust pipe construction comprising a conduit having a plurality of apertures opening in materially different directions, a plug adapted to fit interchangeably either of said apertures, and a pipe adapted to fit the other of said apertures.

2. In an internal combustion engine, an exhaust pipe construction comprising a hollow body adapted to be secured to an exhaust manifold, a conduit integral with said body and communicating with the interior thereof, said conduit having a plurality of apertures therein opening in materially different directions, a plug adapted to fit and seal either of said apertures, and a pipe adapted to fit and continue the other of said apertures.

3. In an internal combustion engine an exhaust pipe construction comprising a conduit communicating with an exhaust manifold at one end and having an aperture at the other end, said conduit having a second aperture therein spaced sufficiently far from said other end to provide a surge chamber for exhaust gases, a plug, and a pipe, said pipe and plug being interchangeably engageable with either of said apertures.

In testimony whereof, I have hereto set my hand.

WILLIAM H. RADFORD.