This invention relates generally to upright exhaust pipes for tractors and like vehicles and in particular to an attachment for such exhaust pipe adapted to keep moisture from entering the exhaust pipe when the vehicle is standing idle in the open.

Tractors now in general use for road construction and farm work usually have their engines provided with upright exhaust pipes which protrude upwards through the engine hood a distance such that the exhaust gases are carried away from the tractor operator. When these tractors are left in the open with the top of the exhaust pipe left uncovered, rain, snow and the like enters the exhaust pipe and travels therethrough into the engine cylinders. As a result the cylinders and valves operatively associated therewith, are apt to become rusted so as to reduce their service life. More important, however, is the fact that when appreciable moisture becomes entrapped in the cylinder, and the engine is then started, serious injury generally results to the crank shaft or piston connecting rods. This occurs because of the relative non-compressibility of the moisture and the resultant failure of a piston to move to its normal up-stroke position. Because of this condition the connecting rod and engine shaft are either bent or broken.

In order to prevent moisture from entering into the engine cylinders it is a usual practice to cover the upper end of the exhaust pipe with a canvas or an inverted tin can. However, this procedure is often neglected or forgotten by the tractor operator. As a result exhaust pipe cover attachments have been provided which are operatively associated with the engine throttle or ignition system to automatically open the exhaust pipe when the throttle is opened or the ignition system closed and to automatically close the exhaust pipe when the engine is stopped. These devices, however, are generally complicated and are a source of inconvenience in usual engine service work because of the time required for their removal from and assembly with the exhaust pipe. Further it is apparent that the exhaust pipe will be opened on any accidental opening of the throttle or closing of the ignition as frequently occurs in the case of children playing on tractors standing idle on a farm.

It is an object of this invention, therefore, to provide an improved exhaust pipe cover attachment.

A further object of this invention is to provide an attachable cover for an exhaust pipe which is automatically opened in response to the exhaust pressures in the pipe, and is automatically closed by the action of gravity on stopping of the engine.

Yet another object of this invention is to provide an attachable cover for an exhaust pipe which does not interfere with the free passage of the exhaust gases from the pipe, and away from the tractor operator.

A still further object of this invention is to provide an attachable cover for an exhaust pipe which is of a simple and compact design, readily and quickly assembled or removed from the exhaust pipe, and automatically operable to keep moisture out of the exhaust pipe when the engine is at a standstill.

Further objects, features and advantages of this invention will become apparent from the following description when taken in connection with the accompanying drawings, in which:

Fig. 1 is a fragmentary perspective view of the front portion of a tractor showing the attachment of this invention in assembly relation with an upright exhaust pipe;

Fig. 2 is a plan view of one form of the exhaust pipe attachment of this invention;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a plan view of a second form of the exhaust pipe attachment of this invention;

Fig. 5 is a sectional view as seen along the line 5—5 in Fig. 4;

Fig. 6 is a plan view of a third form of the exhaust pipe attachment of this invention;

Fig. 7 is a sectional view as seen along the line 7—7 in Fig. 6;

Fig. 8 is a fragmentary side elevation looking toward the left in Fig. 7.

Referring to the drawings there is illustrated in Fig. 1 the front portion of a tractor having an engine 10, an exhaust gas manifold 11, and an upright exhaust pipe 12 projected through the top of the engine hood 13. The exhaust pipe attachment of this invention is indicated generally at 15 in assembly relation with the upper end 16 of the exhaust pipe 12.

With reference to Figs. 2 and 3 there is shown one form of the exhaust pipe attachment of this invention which comprises a lower round tube member 17 concentrically arranged end to end with a square tube 18, with the adjacent ends 19 and 21 of the tubes 17 and 18, respectively, being in an overlapped relation. The end 19 of the tube 17 is in a spaced relation within the end 21 of the tube 18. Spacing members 22 are welded or otherwise connected at one end to the lower ends 21 of the tube 18, and at their opposite ends
to the upper end 10 of the tube 17. It is seen, therefore, that the space between the tubes 17 and 18 is open except for the members 22.

Located within the tube 18 is a flat valve 23 of a substantially square shape pivotally supported at 24 to the inner side of the wall 28 of the tube 18. As shown in Fig. 3 the pivotal support 24 is at a position above the top level of the upper end 10 of the tube 17. The valve 23 is in a closed position, indicated in dotted lines at A in Fig. 3, has its marginal edge in a spaced relation with the inner peripheral surface of the tube 18 and is in a covering relation with the upper end 10 of the tube 17. The closed position of the valve 23 is defined by a stop member 27 carried on the wall 28 of the tube 18 at a position above the pivotal support 24, whereby the valve 23 is sloped downwardly toward the pivotal support 24. The valve 23 is pivotally movable upwardly to its dotted line position, indicated at B in Fig. 3, in which its free end 29 is located substantially at the top level of the upper end 31 of the tube 18 for a purpose which will appear later.

In the assembly of the attachment of Figs. 2 and 3 with the exhaust pipe 12, the lower end of the tube 17 is positioned about the upper end 16 of the exhaust pipe. This assembly is facilitated by the provision of a longitudinally extended slot 32 in the lower end of the tube 17, which is detachably secured to the exhaust pipe 12 by a usual clamping ring or strap 33.

In the operation of the attachment assume that the valve 23 is in its closed position indicated at A in Fig. 3. On starting of the engine 10 the exhaust gases may initially pass through the valve 23 and outwardly from the tube 18 and to the atmosphere through the space 34 between the adjacent ends 19 and 21 of the tubes 17 and 18, respectively. Thus even though the valve 23 is in a closed position it does not effect any back pressure on the engine 10 when the engine is initially started.

As the engine 10 is operated the pressure of the exhaust gases discharged from the exhaust pipe 12 pivotally moves the valve 23 to its open position at B in Fig. 3, at which the valve 23 is unobstructed to the inner surface of the wall 28 of the tube 28. The exhaust gases are thus free to travel, without any interference from the valve 23, through the tubes 17 and 18 and outwardly through the upper end 31 of the tube 18 to the atmosphere. By virtue of the free end 29 of the valve 23 being substantially at the level of the upper end 31 of the tube 18 there is no deflection of the exhaust gases to either one side or the other of the tube 18 as they are discharged therefrom. The exhaust gases are thus discharged upwardly from the tube 18 and away from the tractor operator.

On stopping of the engine 10, and in turn of the passage of exhaust gases through the exhaust pipe 12, the valve 23 is automatically returned to its closed position A by the action of gravity. To assure a gravity action on the valve 23 the wall 28 carries an adjustable stop screw 36 engageable with the valve 23 to define its open position B. By manipulation of the screw 36 the open position of the valve 23 is adjusted so that the valve will freely fall to its closed position A on stopping of the engine 10.

When the engine stopped and the valve 23 in its closed position any moisture collected on the top of the valve is drained downwardly toward its pivotal support 24 or off the marginal edge of the valve by virtue of the spaced relation of the valve 23 within the tube 18. The moisture thus collected drains downwardly on the inner peripheral surface of the tube 18 and through the space 34 to the top of the engine hood 13. Moisture is thus positively prevented from entering the exhaust pipe 12 and in turn the engine 10, while the valve 23 is automatically operated to its open position B by the pressure of the exhaust gases discharged from the exhaust pipe 12, and to its closed position A by the action of the corresponding parts of the tractor operator.

In serving the engine of a tractor in which the engine exhaust pipe 12 is projected through the top of the hood 13 it is usually necessary to remove the hood 13. This is done by lifting the hood 13 upwardly over the upper end 16 of the exhaust pipe 12, as indicated at D in Fig. 1 for a lifted position of the hood. Since the attachment is secured to the exhaust pipe 12 only by the clamping ring 33 it is readily and quickly removed without requiring to be disconnected from operating portions of the engine 10, such as the throttle or ignition system. Further because the valve 23, in both an open and closed position, is within the tube 18 it is not exposed to the action of wind. As a result any possibility of the valve 23 being opened by wind, when the engine 10 is at a standstill, is entirely eliminated.

The form of the invention shown in Figs. 4 and 5 is similar in many respects to the attachment shown in Figs. 2 and 3 so that like numerals of reference will be used to designate corresponding parts. Referring to Figs. 4 and 5 the attachment comprises a tube 17 provided with a slot 32 and a clamping ring 33. The tube 17 is concentrically arranged end to end with an upper round tube 35, and with the adjacent ends 19 and 41 of the tubes 17 and 35, respectively, being in a spaced relation. This arrangement of the tubes 17 and 35 is maintained by a perforated flat ring 42 connected between the outer periphery of the tube 17 and the inner periphery of the lower end 18 of the tube 35.

A substantially concave-convex valve 43 of circular shape within the tube 39 is pivotally supported adjacent one end 44 on the tube 39 at a position above the upper end 19 of the tube 17. The valve 43, in its closed position indicated in full lines in Fig. 5, is in a covering relation with the upper end 19 of the tube 17 and is pivotally movable upwardly to an open position indicated in dotted lines at E, which is defined by an adjustable stop screw 36. The operation of the valve 43 is similar in all respects to the valve 23 in Fig. 3 so that a further discussion of such operation is believed to be unnecessary.

With the valve 43 in its closed position any moisture collected on the top thereof is drained downwardly over its marginal edge and through the perforated ring 42 to the top of the hood 13 whereby the moisture is prevented from entering the exhaust pipe 12.

In the form of the invention shown in Figs. 6, 7 and 8 the construction of the tube 17 and its assembly with the upper end 16 of the exhaust pipe 12 is similar in all respects to that previously described in connection with Figs. 3 and 5. The tube 17 is concentrically arranged in and to end relation with a tube 45 of a substantially square shape except for a rounded side portion 47, with the adjacent ends 19 and 48 of the tubes 17 and 45, respectively, being in an overlapped relation. The tubes 17 and 45 are retained in this arrangement by a flat connecting member.
5 connected between the outer periphery of the tube 17 and the inner periphery of the lower end 46 of the tube 46.

A pivoted valve 51 located within the tube 46 is in the form with a contour corresponding to the cross sectional shape of the tube 46, and has a rounded free end portion 52 arranged oppositely from a flat end portion 53 which is adjacent to the straight wall 54 of the tube 46. The end 53 of the valve 51 is pivotally connected at 56 to one side 55 of a gutter member 57, extended about the inner periphery of the tube 46, with the pivot 56 being above the level of the upper end 19 of the tube 17.

The valve in its closed position F, shown in dotted lines in Fig. 7, is in a covering relation with the upper end 19 of the tube 17 and slopes downwardly toward its pivotal support 56. This closed position is defined by the engagement of the valve 51 with the U-shaped portion 60 of the gutter 57, which portion constitutes a stop for the valve 51. The valve is pivotally moveable upwardly to an open position, indicated in dotted lines at G in Fig. 7, defined by the screw 38 which is adjustably supported in the wall 54. The operation of the valve 51 is in all ways similar to the operation of the valve 23 in Fig. 3.

With the valve 51 in the closed position F any moisture collected on the top thereof is drained into the gutter member 57 which slopes downwardly toward the gutter side 55 which is adjacent to the tube wall 54. The wall 54, opposite the gutter side 55, is formed with apertures 58 (Fig. 8) for draining the moisture from the gutter to the outside of the tube 46, and in turn to the outside of the tube 17 and exhaust pipe 12. The moisture thus drained drops on the engine hood 13. The gutter 57 provides for a directed flow of the collected moisture to one side or the other of the exhaust pipe 12 which may be desirable in those cases where a manual or the like (not shown), operatively associated with the engine 18, may be located near the lower end of the exhaust pipe 12.

Although the invention has been described and illustrated with respect to several embodiments thereof it is to be understood that it is not to be so limited since changes and modifications can be made therein which are within the full intended scope of this invention as defined by the appended claims.

1. The combination with an upright exhaust pipe for an engine, of an attachment for keeping moisture from entering the upper end of said exhaust pipe when the engine is not operated, including a pair of tube members one of which is of a greater diameter than the other, said other tube having its lower end adapted to be positioned about the upper end of said exhaust pipe, and said one tube having its lower end positioned about the upper end of said other tube, means supporting said one tube in a spaced relation on said other tube, a single pivoted valve member within said one tube, means pivotally supporting said valve adjacent one end on said one tube, said valve, in a closed position, being in a covering relation with the top of said other tube, and in an open position being extended upwardly within the confines of said one tube, with the marginal edge of said valve being in a spaced relation with the inner peripheral surface of said one tube whereby any moisture collected on the upper surface of said valve is gravity drained to the outside of said other tube, said valve being moved to an open position in response to the pressure of the exhaust gases discharged from said exhaust pipe, and a stop portion on said one tube for defining the open position of said valve to provide for the movement of the valve to a closed position by the action of gravity.

2. The combination with an upright exhaust pipe for an engine, of an attachment for keeping moisture from entering the upper end of the exhaust pipe when the engine is at a standstill, comprising a round tube member adapted to be positioned about the upper end of said round tube and projected upwardly from said round tube, means for supporting said round tube in a spaced relation on said round tube, a pivoted valve within said square tube, means pivotally supporting said valve on said square tube above the level of the top end of said round tube for pivotal movement to a closed position in a covering relation with the top end of said round tube, and to an open upright position within the confines of said square tube, stop means on said square tube for defining the closed position of said valve to provide for the valve, when in a closed position, being inclined downwardly to the pivoted end thereof, with the marginal edge of said valve, in a closed position, being in a spaced relation with the inner peripheral surface of said square tube whereby any moisture collected on the top side of the valve is gravity drained to the outside of said round tube, said valve being pivotally moved to an open position by the pressure of the exhaust gases discharged from said exhaust pipe, and to a closed position by the action of gravity.

3. The combination with an upright exhaust pipe for an engine, of an attachment for keeping moisture from entering the upper end of the exhaust pipe when the engine is at a standstill comprising a pair of round tube members, one of which is of a greater diameter than the other, concentrically arranged end to end and with their adjacent ends in an overlapped relation, with the outer end of said other tube adapted to be positioned about the upper end of said exhaust pipe, a perforated ring connected between said adjacent ends to maintain said pair of tubes in said concentric arrangement, a pivoted valve within said one tube, means pivotally supporting said valve adjacent one end on said one tube, said valve in a closed position being in a covering relation with the adjacent end of said other tube and having the marginal edge thereof in a spaced relation with the inner peripheral surface of said one tube, and in an open position being extended upwardly from the one end thereof and within the confines of said one tube, with the valve being of a curved contour such that in a closed position it is curved upwardly whereby any moisture collected thereon is gravity drained to the outside of said other tube through said perforated rings, said valve being moved to an open position by the pressure of the exhaust gases discharged from said exhaust pipe, and to a closed position by the action of gravity.

4. The combination with an upright exhaust pipe for an engine, of an attachment for keeping moisture from entering the upper end of the exhaust pipe when the engine is at a standstill comprising a first tube member of round shape adapted to be positioned about the upper end of said exhaust pipe, a second tube member positioned about the upper end of said first tube member and projecting upwardly from said first tube member, said second tube member being of a sub-
stantially square shape having one side of an outwardly curved contour, means for supporting said second tube member in a spaced relation on said first member, a pivoted valve in said second tube having a shape corresponding to the cross sectional shape of said second tube, means pivotally supporting said valve adjacent one end on the side of said second tube opposite said curved one side, said valve in a closed position being in a covering relation with the top end of said one tube, and in an open position being extended upwardly from said valve supporting means within the confines of said second tube, a moisture receiving gutter extended about the inner peripheral surface of said second tube and constituting a stop for defining the closed position of said valve, said gutter having side portions sloped downwardly from the curved one side of said second tube to said opposite side thereof, and said opposite side having openings therein for draining moisture collected in said gutter to the outside of said second tube, with the marginal edge of said valve being in a spaced relation with said inner peripheral surface whereby any moisture collected on the top side of said valve is gravity drained into said gutter, said valve being moved to an open position by the pressure of the exhaust gases discharged through said exhaust pipe, and to a closed position by the action of gravity.

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