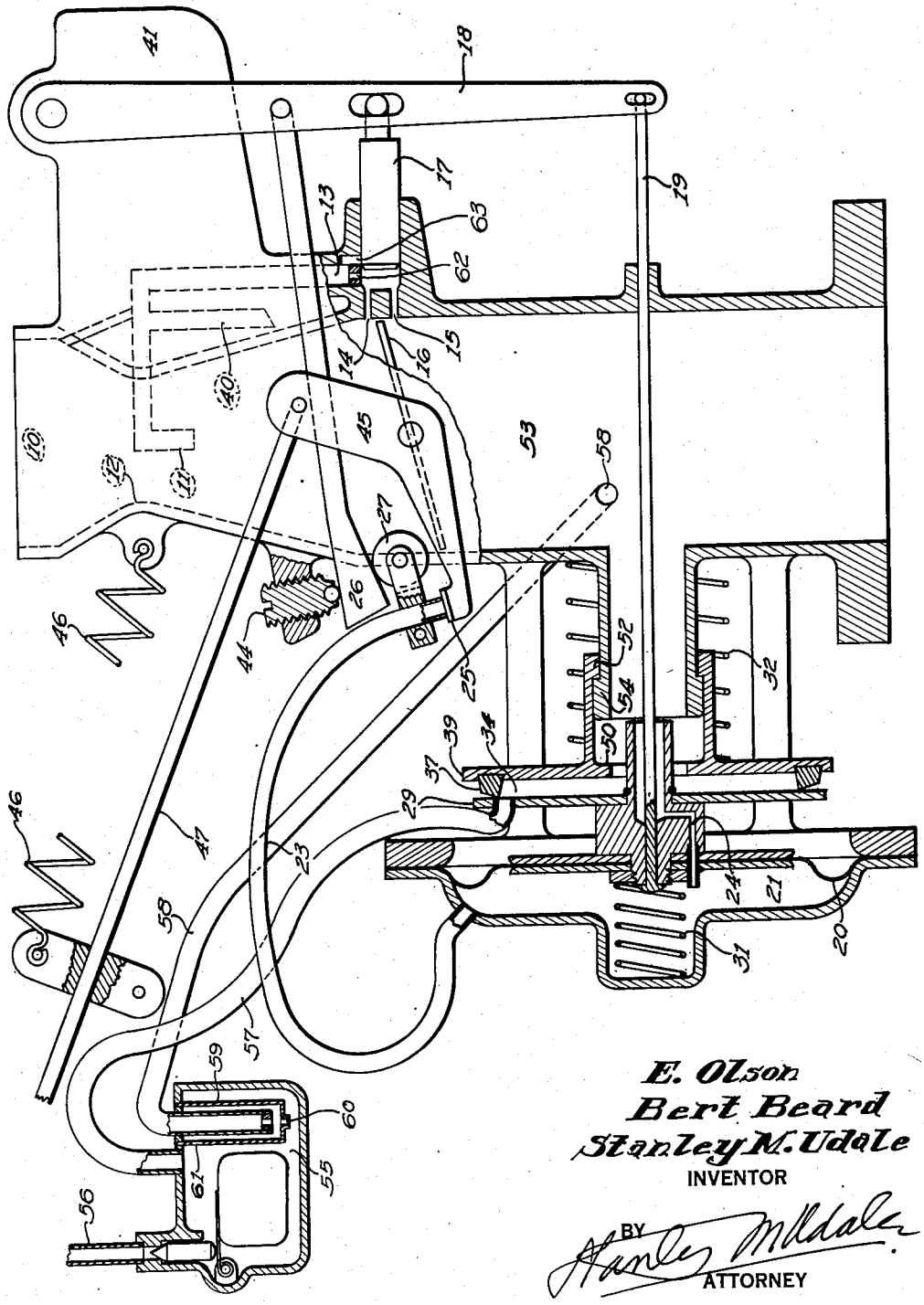
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DECELERATOR

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DECELERATOR

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The object of this invention is in general to improve the operation of an automobile engine during and after deceleration.

Specifically the objects are:

(1) To control a valve admitting air on the engine side of the throttle during the deceleration period when the automobile drives the engine and the suction exceeds the idling suction.

(2) To cause this air admission valve to snap into its wide open position the moment it begins to open.

(3) To decarbonize the combustion chamber by admitting a definite quantity of decarbonizing liquid during each of these deceleration periods.

(4) To cut off the flow of low speed fuel through the idle fuel passage during such periods.

(5) To close the passage admitting the air on the engine side of the throttle when the suction falls to approximately one-half the high suction at which air is admitted.

(6) To prevent stalling after deceleration by automatically opening the throttle more than its idling position so as to anticipate the fact that the engine will show a tendency to stall following deceleration, especially in cold weather.

(7) To increase the low speed fuel flow during this post-deceleration period.

The figure shows diagrammatically the essential elements of our invention.

In the figure, 10 is the air entrance, 11 is the fuel nozzle supplied from constant level chamber 41 and discharging into the throat of the venturi 12, 13 is a low speed fuel bypass, which derives its fuel from the main fuel passage 40, which is supplied with fuel from the constant level fuel supply chamber 41, which chamber is vented to the atmosphere.

The orifices 14 and 15 are the low-speed fuel outlets supplied with fuel and air from passage 13 and discharging into the mixture outlet 53. The upstream lip of the butterfly throttle 16 is located so that at idle, the fuel discharges from the nozzle 15 and air enters at 14. The moment the throttle is opened more than the idling position, fuel discharges from both the fuel outlets 14 and 15, this low speed fuel means being in universal use. The rod 17 is the low speed fuel cut-off valve moved by the operating lever 18, 19 is the operating rod connecting the low end of the lever 18 with a diaphragm 20 located to the right of chamber 21. The diaphragm 20 is held in the position shown by the springs 31 and 32 and also by the suction in the mixture outlet 53, which is transmitted through the restricted passage 24. An elastic pipe 23 admits atmospheric air to the chamber 21 at all times except when the throttle 16 is in its idling position, in which position it closes the mouth of the tube 23. The roller 27 and wedge element 26 determine the idling position of the throttle 16.

A ring joint 25 of plastic material seals the entrance to the pipe 23 when the bell crank lever 45 is closed to the idling position of throttle 16 by the action of a spring 46. This tension spring 46 acts through the link 47, which is connected to the bell crank lever 45 and presses the seal 25 against the opening of the elastic pipe 23. Lever 45 when moved and rotated counter-clockwise rotates the throttle 16 at the same time opening the entrance to the pipe 23 so as to admit atmospheric air to the chamber 21 so as to overcome the vacuum admitted through the restricted passage 24.

A diaphragm 20 engages with a disc 29, which engages with the seal 37 of the disc 39 so as to make an air-tight joint for the flat chamber 34. A flat chamber 34 is thus formed between the discs 29 and 39, the area of the ring 37 being ½ the area of the diaphragm 20. A rod 19 passes through the wall of the mixture outlet 53. The disc 39 is provided with a stop 52; compression spring 32 holds this stop 52 in the position shown (when the engine is idling) so that the stop 52 engages with stop 54, which is stationary. Hence, the parts are held in the position shown by the compression spring 32 assisted by the suction in the chamber 21. A roller 27 is mounted on the end of the flexible pipe 23 and engages with a movable cam 26, which in its turn is supported by the adjustable stop 44, which is provided with a ball to reduce friction. The cam 26 is connected to and moved by the link 18. The port 50 is made the equivalent of a ½'' opening so as to admit enough air for an ordinary car engine of 70–80 horsepower. An auxiliary float chamber 55 is supplied with a decarbonizer liquid from a pipe 56. A flexible pipe 57 connects the upper portion of the float chamber 55 with the chamber 34, a stationary pipe 58 dips into a well 59 having a restricted lower opening 60 and an unrestricted upper opening 61. The other end of pipe 58 discharges into the mixture outlet 53.

The low speed passage 13 may have a restricted outlet 62 and a bypass 63 so located as to be uncovered by the movement of the rod 17 to the right when the throttle is opened.

Operation

Assuming the engine is idling in the position shown and that the parts are in equilibrium, the spring 31 pushes the diaphragm 20 to the right;

spring 32 pushes the discs 29 and 39 and the diaphragm 20 to the left. The annular area between the diameter of the ring 37 and the diameter of the diaphragm 20 is exposed on the outside to atmospheric pressure and, on the inside, to the suction in the mixture outlet 53. When the throttle 16 is open, atmospheric pressure is admitted to the chamber 21 so as to destroy this vacuum. When the throttle is closed suddenly after-running at high speed, diaphragm 20 is rapidly drawn to the left due to the 22" (of mercury), suction in 53 created by the sudden closing of the throttle 16.

When the diaphragm 20 moves to the left, atmospheric pressure is immediately applied to the entire area of the diaphragm 20 and its movement to the left is thus accelerated. The disc 39 cannot follow 20 to the left all the way because of the stops 52 and 54. When these two stops engage, discs 29 and 39 immediately separate and air is admitted through the port 50 to the mixture outlet 53. The diameter of port 50 determines the quantity of air admitted. At the same time the valve 17 is moved to the left by rod 19 and passage 13 no longer admits low speed fuel to the mixture outlet. The throttle 16 may also be closed depending on the shape of the wedge 26.

Until such time as the pressure in the mixture outlet 53 falls to 11" (of mercury), the parts remain as described. When 11" is reached, the spring 31 pushes the diaphragm 20 to the right closing disc 29 onto the ring 37 and port 50 is thus closed. The mixture outlet suction is immediately established in chamber 34. When this happens, the depression in 53 will be below that for idle =18" (of mercury), in which event the disc 39 is moved to the right, opening the throttle 16 by means of wedge 26 beyond the idling position; meanwhile, the valve 17 moves to the right.

The passage 63 is thus opened to engine suction and this increases the suction on the fuel outlet from nozzle 40 and openings 14 and 15, thus discharging more fuel so that the engine gets enough fuel so that it does not stall. The suction in the mixture outlet is then restored to the normal idling suction of 18" (of mercury), and the parts are then restored to the position shown in the drawing, and the throttle 16 is thereafter closed to the normal idling position in which it is shown.

By this means, full advantage can be taken of the economy possible during deceleration, without the danger of the engine stalling during the subsequent pick up.

The tendency of an engine to stall depends on manifold design, quality of fuel, temperature of the air under the hood, the temperature of the engine generally and the temperature of the jacket specifically.

It follows therefore that the bypass 63 may not be needed in all cases, and in any event must be arrived at by cut and try methods.

In all cases carbon will form in the cylinders, and the permissible compression ratio will be lowered ½ ratio to allow for this. Hence, there is a very definite improvement in mileage to be obtained if carbon accumulation can be prevented and be removed as it is formed.

The liquid in 55 will contain a decarbonizing liquid and during deceleration the small quantity of liquid which has entered and accumulated in the well 59 will be discharged as a body into the mixture outlet 53 through the pipe 58.

The difference in pressure between chamber 34 and mixture outlet 53 is sufficient to carry the contents of the well 59 through the pipe 58 during the time interval during which the chamber 34 is open to atmospheric pressure, which pressure in the upper part of the float chamber 55 empties the well 59 into the pipe 58.

Water, water and alcohol, alcohol or a solution in alcohol of some oxygen-containing substance will be the liquid used.

As the contents of well 59 will be discharged at one instant in the outlet 53, all of the contents will probably be discharged into one cylinder. However, by the law of averages, each cylinder will eventually get a shot of decarbonizing liquid.

What we claim is:

1. Means for decarbonizing an internal combustion engine comprising a supply of decarbonizing fluid, a constant level supply chamber connected thereto, an air-vented well therein, a restricted entrance thereto, an air entrance to said engine, a throttle valve therein, means responsive to the abnormal suction created by the sudden closing of said throttle for discharging the contents of said air-vented well into the air entrance of said engine.

2. A decelerator and anti-stall device including a carburetor having an air entrance, a fuel nozzle discharging therein, a mixture outlet, a throttle valve therein, a low speed fuel nozzle discharging into said mixture outlet adjacent to and on the engine side of said throttle valve, a valve in said low speed fuel passage, a chamber, a moving wall therefor, a second moving wall connected and of considerably less area than the first moving wall, a third moving wall, a cylindrical wall thereon adapted to engage with said second moving wall forming a second chamber located between said second and third moving walls, a restricted passage leading from said first chamber to said mixture outlet, a restricted passage leading from said second chamber to said mixture outlet, means for admitting air to said mixture outlet when the second and third moving walls separate, spring means in said first chamber for moving said second moving wall against said third moving wall, second spring means opposing said first spring means and adapted to move said third moving wall against said second moving wall, a stop limiting the movement of said third moving wall, said first spring means being adapted to yield under the influence of suction higher than normal idling suction and to withdraw the second moving wall away from third moving wall, the movement of which is checked by said stop, said separation of second and third moving walls being adapted to admit air to the mixture outlet, a passage connecting said first chamber to the atmosphere, a valve in said passage operatively connected to said throttle so as to be opened whenever the throttle is moved away from its idling position, a movable throttle stop, means interconnecting said first moving wall and said throttle stop whereby when the pressure in the mixture outlet rises above a predetermined value, the first spring moves the second wall against the third wall to reform the second chamber and thereby reduce the opposition to said first spring and so causes the first, second and third moving walls to be moved together as a unit under the influence of first spring so as to open the throttle beyond the normal idling position.

3. A decelerator and anti-stall device for a carburetor having an air entrance, a mixture chamber, a mixture outlet, a throttle valve therein, a low speed nozzle discharging into the mix-

ture outlet adjacent to and on the engine side of said throttle valve, a shut-off valve in said low speed fuel passage, a chamber, a moving wall therefor, a second moving wall connected to and of substantially smaller area than first moving wall, a third moving wall adapted to engage with the edge of said second moving wall so as to form a second chamber, a stop limiting the movement of said third moving wall, restricted passages connecting both chambers to the mixture outlet, spring means for moving said second moving wall against third moving wall, second spring means opposing said first spring means and adapted to move said third moving wall against said stop and against said second moving wall, said second spring means being weaker than said first spring means so that under normal idle suction the third moving wall engages with said stop, means for admitting air to said mixture outlet operatively connected to said first moving wall whenever second moving wall is separated from third moving wall and atmospheric pressure is admitted to said second chamber when the suction in said first chamber exceeds normal idling suction, means for moving said first moving wall in the opposite direction when the suction in said first chamber is substantially less than normal idling suction, means for opening the throttle whenever the first, second and third moving walls are moved in a reverse motion by said first spring means.

4. An engine suction regulating device for an internal combustion engine having an air entrance, a carburetor therefor and a throttle valve therein, a restricted auxiliary air passage leading to the air inlet of the engine on the engine side of the throttle, adapted to admit air during deceleration, first chamber having a restricted connection with the engine suction, a moving wall in said chamber, a second chamber having a moving wall, said moving wall being rigidly connected to the first moving wall, a third wall engaging with the second wall and forming therewith a second chamber, said second chamber being connected on the atmospheric side of said auxiliary air inlet passage, said second and third moving walls having approximately one-half the area of the first moving wall so that one-half of the engine vacuum acting on the large moving wall is offset by the engine vacuum acting on the smaller moving wall, spring means in said first chamber for pressing the first and second walls against the third wall, a stop limiting the movement of the third wall whereby the movement of the second wall away from the third wall under the influence of high suction during deceleration admits atmospheric pressure to said second chamber and thus immediately doubles the force acting on the first moving wall, means for admitting atmospheric air pressure to said first chamber, responsive to the initial opening movement of the throttle away from its idling position.

5. A device as set forth in claim 4 in which the third moving wall is also a moving wall, spring means for pressing said third moving wall against said first and second moving walls, said spring means yielding to permit the three moving walls when the engine suction falls to below approximately one-half the normal idling suction responsive to said first spring means, means connected to said three moving walls, adapted to open said throttle slightly when the first spring means moves said third moving wall to prevent the engine stalling after the auxiliary air passage has been closed due to the resulting decrease in engine suction.

6. Means responsive to engine suction and connected between the air inlet leading to an internal combustion engine and the carburetor attached to the air inlet, a supply of decarbonizing fluid for said engine, said carburetor having a low speed fuel passage and a throttle valve, comprising, an auxiliary air passage leading to the air inlet on the engine side of the carburetor throttle, means responsive to the abnormally high degree of engine suction characteristic of deceleration for simultaneously opening said auxiliary air passage, closing said low speed fuel passage and adding a specific quantity of decarbonizing fluid to said air inlet on the engine side of said throttle, means responsive to a relatively low degree of suction after the auxiliary air passage has been opened and reclosed for opening said throttle beyond its normal idle position to prevent stalling.

7. Means responsive to engine suction and connected between the air inlet to the internal combustion engine and the carburetor attached to the air inlet, a supply of decarbonizing fluid for said engine, said carburetor including a low speed fuel passage and a throttle valve, comprising, an auxiliary carburetor adapted to supply a specific quantity of decarbonizing fluid, means responsive to an abnormally high degree of engine suction characteristic of deceleration for simultaneously opening said auxiliary air passage, closing said low speed fuel passage and adding a specific quantity of decarbonizing fluid to said air inlet, said means being also responsive to a relatively low degree of suction for opening the throttle beyond its idle position, after the auxiliary air passage has been first opened and then closed, to prevent stalling.

8. An engine vacuum regulating device for an internal combustion engine having an air entrance, a carburetor therefor, and a throttle valve therein, an auxiliary air passage adapted to admit air to the engine on the engine side of said throttle during deceleration, a low speed fuel passage, discharging fuel on the engine side of said throttle, a cut-off valve therefor, a first air chamber having a restricted connection with the engine suction, a moving wall therein, yielding means opposing the movement of said wall in response to engine suction, a second moving wall rigidly connected to first moving wall and having an effective area approximately one-half that of first wall, a second air chamber, said second wall forming a wall thereof, a restricted connection from said second chamber to the engine on the engine side of said throttle forming the auxiliary air passage, a mechanical connection from said moving walls to said cut-off valve whereby when the high suction during deceleration unseats the second moving wall and admits atmospheric pressure to said second chamber, said shut-off valve is closed and the second chamber remains open and shut-off valve remains shut until the engine suction falls to one half the suction reached during deceleration.

9. A device as set forth in claim 8 in which there are means for admitting air to said first air chamber whenever the throttle is moved from its idling position.

10. A device as set forth in claim 8 in which there is a movable stop, means for limiting the closing position of said throttle, yieldable means for supporting said second moving wall in op-

position to first yieldable means, means responsive to a fall of suction below normal idle suction to cause said first mentioned yieldable means to move said first and second moving walls, mechanical means connected with said two moving walls to said movable stop, means to open said throttle so as to prevent the engine stalling due to low engine suction.

11. A device as set forth in claim 8 in which there is a source of decarbonizing fluid, a constant level supply chamber connected thereto, an air-vented well therein, a pipe connecting the well with the engine on the engine side of said throttle, a pipe connecting said float chamber with said second air chamber, whereby the opening of said second air chamber to atmospheric pressure discharges the contents of said well into said engine.

12. A device as set forth in claim 8 in which there are movable stop means for limiting the closing position of said throttle and an additional low speed fuel passage, a shut-off valve therein, normally closing said passage, yieldable means for supporting said second moving wall in opposition to first yieldable means, means responsive to a fall of suction below normal idle suction to cause said first mentioned yieldable means to move said first and second moving walls, mechanical means connected with said two moving walls and to said movable stop means and to said shut-off valve, to open said throttle and to open said auxiliary low-speed fuel passage so as to prevent the engine stalling due to low engine suction.

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