

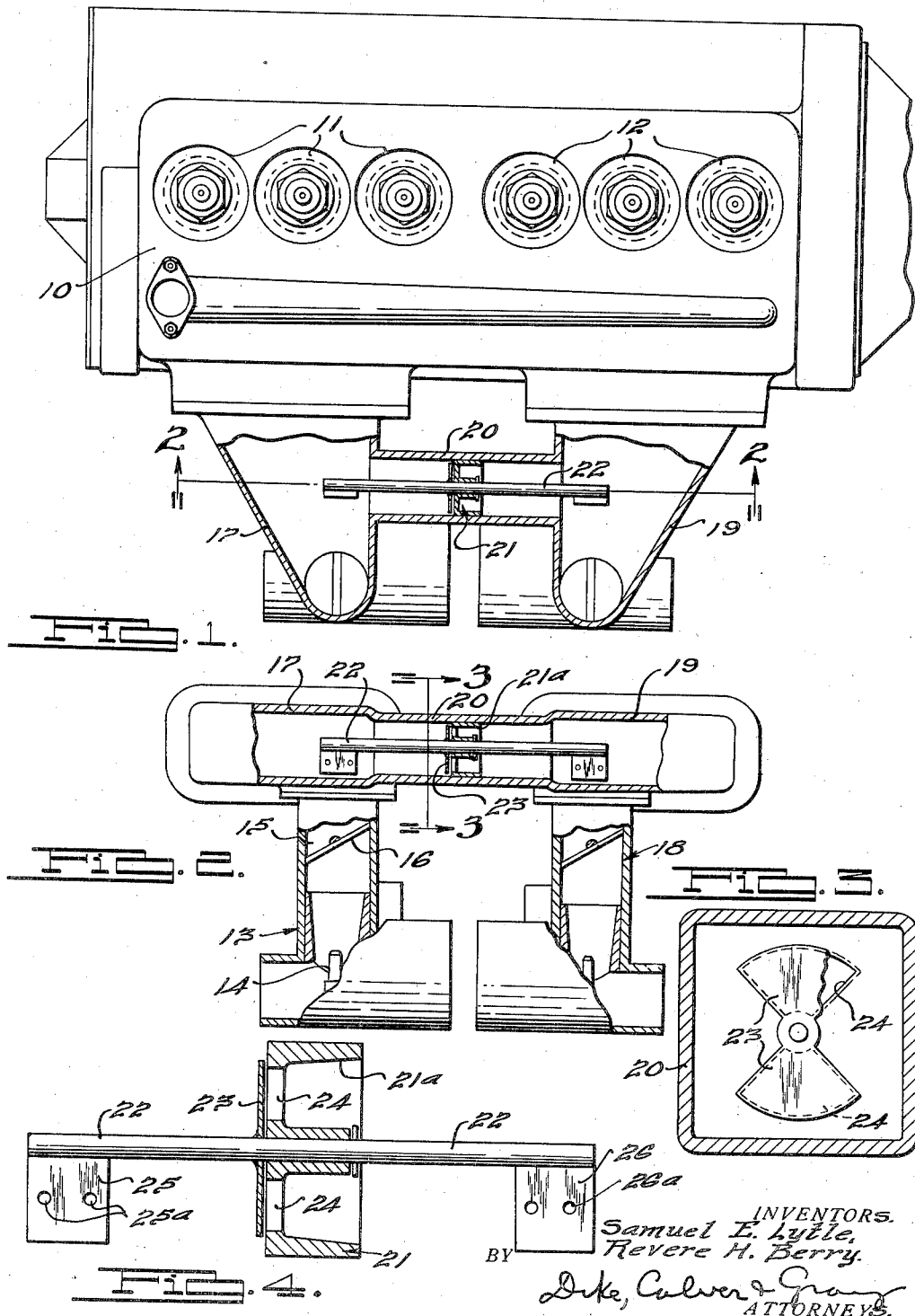
Aug. 9, 1938.

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INTERNAL COMBUSTION ENGINE

2,126,649

Filed April 24, 1937

2 Sheets-Sheet 1



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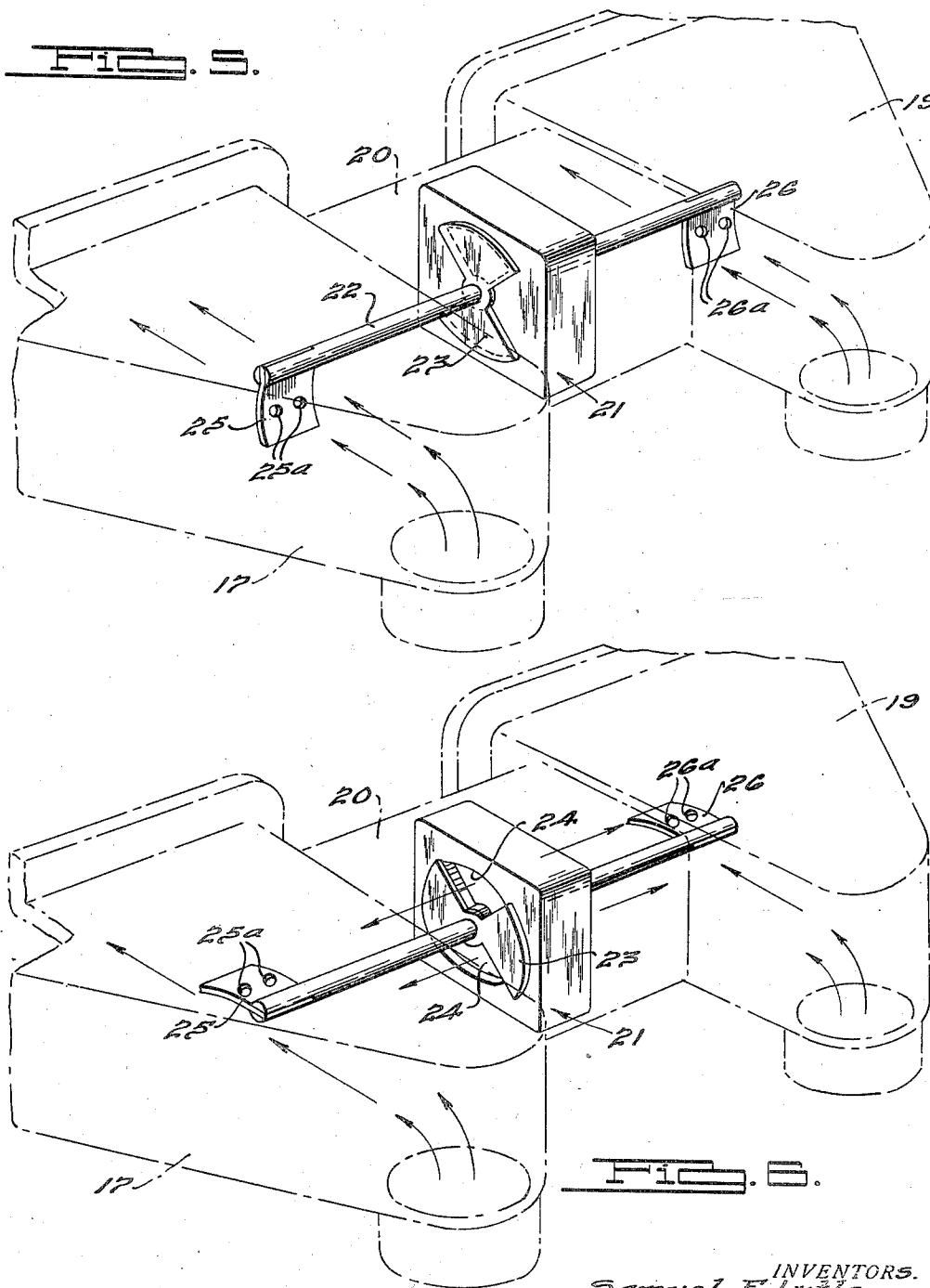
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UNITED STATES PATENT OFFICE

2,126,649

INTERNAL COMBUSTION ENGINE

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Application April 24, 1937, Serial No. 138,708

9 Claims. (Cl. 123—52)

This invention relates to internal combustion engines and more particularly to devices for equalizing pressures in the passages of such engines delivering fuel mixture to the engine cylinders.

One of the objects of the present invention is to provide an improved internal combustion engine of the multi-carburetor type, in which means are provided to equalize operation pressures in the intake manifolds of the engine at high loads, thereby making it possible to secure substantially maximum power output in said engine.

Another object of the invention is to provide means of the foregoing character which ensure independent operation of the carburetors and their respective cylinder groups at light loads or when idling, thereby preventing decrease of vacuum in the intake passages of the engine beyond the point when it becomes insufficient to draw the fuel from the carburetor jets.

Still another object of the invention is to provide an improved compensating device for multi-carburetor internal combustion engines, which is simple in construction and dependable in operation, and is relatively cheap to manufacture.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a top view of an internal combustion engine, partly in section, embodying the present invention.

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1 in the direction of the arrows.

Fig. 3 is a transverse vertical sectional view taken on the line 3—3 of Fig. 2 in the direction of the arrows.

Fig. 4 is an enlarged view of the valve assembly removed from the connecting conduit.

Fig. 5 is a perspective view of the compensating means, the manifolds being indicated by dotted lines, said view illustrating operation of the device when the engine is idling.

Fig. 6 is a view similar in part to Fig. 5, the valve being shown in its fully open position for illustrating operation of the device at high loads.

Before explaining in detail the present invention, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or

terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention claimed herein beyond the requirements of the prior art.

In the drawings there is shown, by way of example, an internal combustion engine of the multi-carburetor type, constructed in accordance with one embodiment of the present invention. Referring to the drawings, said engine comprises a cylinder block 10 in which there are provided a plurality of cylinders, in the present instance six, which cylinders are divided into two groups 11 and 12. The group 11 is supplied with fuel mixture by means of a carburetor 13 provided with a fuel jet 14 and an air passage 15 in which there is operatively disposed a throttle valve 16. The carburetor 13 is connected to the intake manifold 17 which connects the air passage 15 of said carburetor 13 with the cylinders of the group 11. The cylinder group 12 is supplied with fuel mixture by means of a similar carburetor 18 connected to the intake manifold 19. The structure so far described presents with respect to fuel distribution two separate three cylinder engines having a common crankshaft. The operation of the carburetors 13 and 18 is completely independent from each other, and different pressures may actually exist in the intake manifolds 17 and 19 at the same moment of time. However, it should be noted that the firing order and the shape of the crankshaft are such that the cylinders draw the fuel mixture and fire one after another in a predetermined order, and that only one piston at a time sucks the fuel mixture through the carburetors of the respective group of cylinders.

In accordance with the present invention the pressures in the intake manifolds 17 and 19 are equalized when the engine is operating at high loads, but the independent operation of the carburetors and manifolds is retained when the engine is idling or is operating at light loads. The above result is attained by means of a conduit 20 connecting said manifolds 17 and 19, in which conduit there is arranged a partition 21 provided with flanges 21a holding said partition in a desired place in said conduit by friction or in any other suitable manner. In the center of said partition 21 there is journaled a shaft 22 carrying a valve 23 comprising in the present embodiment of the invention two wings or sectors. In said partition 21 there are provided two ports or openings 24 adapted to be fully covered by said wings of the valve 23. Rotation of the shaft 22 moves the wings of the valve 23 and uncovers said

ports or openings 24. The opposite ends of the shaft 22 protrude into the intake manifolds 17 and 19 and are provided with curved blades 25 and 26 secured thereto.

5 The operation of the above described means at light loads is illustrated in Fig. 5, and referring to said figure it can be seen that when the engine is operating at light loads and low speeds or is idling, the amount of air taken into each of the
10 carburetors is relatively small, and therefore the flow of the fuel mixture to the manifolds 17 and 19 is not sufficient to lift the blades 25 and 26 from their respective vertical positions. In such positions of the blades the ports 24 are closed
15 or substantially so, and no substantial equalizing flow of fuel mixture between the manifolds 17 and 19 can take place. This ensures independent operation of the carburetors 13 and 14 in the above specified operation conditions of the
20 engine. Since volumetric efficiency of the engine at idling speed is of sufficient magnitude, it is not necessary to seek the increase thereof by causing separate pistons to suck the fuel mixture through two carburetors simultaneously. When, however,
25 the throttle valves of the carburetors 13 and 14 are fully opened and the engine is running at high speed, or is delivering a high power output, the flow of the fuel mixture through the manifolds 17 and 19 will be strong enough to hold the
30 blades 25 and 26 in a substantially horizontal position. Such conditions are illustrated in Fig. 6, and referring thereto, it can be clearly seen that under such conditions the valve 23 fully opens the ports 24. If the pressure in one of
35 the manifolds 17 or 19 is higher than in the other, the gaseous fuel mixture will flow through the conduit 20 and the openings 24 from the manifold with the higher pressure to the manifold with the lower pressure, whereby substantially equal
40 pressures will be maintained in said manifolds with only minor, negligible fluctuations. It can be clearly seen from an examination of the drawings that under such conditions of operation each piston sucks or draws the fuel mixture through
45 two carburetors simultaneously, thereby increasing the volumetric efficiency of the engine. It should also be noted that because of such an arrangement, the velocity of the fluid in any particular manifold or carburetor remains substantially uniform through the entire engine cycle,
50 since the fuel mixture is drawn through each of two carburetors at every intake stroke of the engine irrespective of the fact to which group of cylinders the fuel drawing piston belongs. Therefore, detrimental intermittency of flow of fluid
55 flowing at a very high velocity is eliminated. Such intermittency occurs in non-communicating manifolds wherein there is no flow of fuel mixture when the fuel drawing piston is one belonging to the opposite group of cylinders. It is also important to note that intermittency of fluid flow under idling operation of the engine is not objectionable, since the velocity of fluid flow and the density thereof are rather low.

65 For any intermediate position of the throttle valves of the carburetors 13 and 14 there will be a corresponding intermediate position of the valve 23. It will now be understood in view of the foregoing that a point at which a given flow of fuel
70 mixture in the manifolds 17 and 19 becomes effective to move the blades 25 and 26 from the vertical position depends for a given speed of the fuel mixture upon the weights and areas of said blades. By changing the weights and areas of
75 said blades any desired response of the valve 23

to the operative positions of the throttle valves of the carburetor may be effected. One of the ways in which such an adjustment may be attained is drilling a number of holes in the blades 25 and 26, such as holes 25a and 26a provided in
5 the blades 25 and 26.

Although the present invention has been illustrated and described in connection with an engine having two separate carburetors, it is to be understood that in certain conditions it may be
10 equally advantageous when embodied in an engine of the multi-throat type.

We claim:

1. In a multi-throat intake manifold internal combustion engine, a conduit operatively connecting the throats of the engine and having a
15 restrictable opening therein, and flow actuated means restricting said opening in inverse proportion to the amount of fuel mixture passing through said throats.

2. In an internal combustion engine having a plurality of intake manifolds, a conduit operatively connecting said manifolds to provide communication therebetween at predetermined times,
20 and flow actuated means for interrupting communication between said manifolds through said conduit when the engine is idling or is operating at light loads.

3. In an internal combustion engine having a plurality of intake manifolds, means responsive to the flow of the fuel mixture in said manifolds and operating to establish communication between said manifolds as said flow increases, thereby equalizing the pressures in said manifolds
25 when the engine is operating at high loads and high speeds.

4. In an internal combustion engine having a plurality of intake manifolds, means responsive to the increase of the velocity of flow of the fuel mixture in said manifolds above a predetermined value and operating when so responding to establish a communication between said manifolds, thereby effecting equalization of intake manifold pressures when the engine is operating at high loads and high speeds and ensuring independent
30 operation of said manifolds when the engine is idling.

5. In an internal combustion engine having two intake manifolds, a conduit connecting said manifolds, a partition in said conduit having an opening, a shaft journaled in said partition and extending into said intake manifolds, a valve on said shaft adapted to close and to open said opening, blades secured to the ends of said shaft and adapted to be actuated by the fuel mixture flowing in the manifolds and arranged to rotate said shaft when so actuated, said blades being so mounted on the shaft that when they adjust themselves along the direction of the flow said
35 valve is in open position.

6. In an internal combustion engine having two intake manifolds, a conduit connecting said manifolds, a partition secured in said conduit and provided with openings, a shaft journaled in said partition and extending with its ends into said manifolds, a disk valve mounted on said shaft and adapted to close and to open said openings as said shaft rotates, two blades secured to the ends of said shaft and adapted to be actuated by the flowing fuel mixture and arranged to rotate said shaft when so actuated, said blades and said valve being so mounted on the shaft with respect to each other that the valve is fully opened when the blades assume a position substantially par-
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allel to the direction of the flow in said manifolds.

7. In an internal combustion engine having two intake manifolds, a conduit connecting said manifolds, a flanged partition mounted in said conduit and provided with openings, a shaft journaled in said partition and extending with its ends into said manifolds, a disk valve mounted on said shaft and adapted to close and to open said openings as said shaft rotates, two curved blades secured to the ends of said shaft, said blades being adapted to be actuated by the flowing fuel mixture and arranged to rotate said shaft when so actuated, said blades and said valve being so mounted on the shaft with respect to each other that the valve is fully opened when the blades assume a position substantially parallel to the direction of the flow in said manifolds, and is fully closed when the blades are disposed substantially perpendicularly to said direction of flow.

8. In an internal combustion engine having two intake manifolds, a conduit connecting said manifolds, a partition secured in said conduit and provided with openings, a shaft journaled in said partition and extending with its ends into said manifolds, a disk valve mounted on said

shaft and adapted to close and to open said openings as said shaft rotates, two blades secured respectively to the ends of said shaft, said blades being adapted to be actuated by the flowing fuel mixture and arranged to rotate said shaft when so actuated, said blades and said valve being so mounted on the shaft with respect to each other that the valve is fully opened when the blades assume a position substantially parallel to the direction of the flow in said manifolds, and is fully closed when the blades are disposed substantially perpendicularly to said direction of flow, the area and the weight of said blades and the rotational resistance of said shaft being so selected that when the engine is operating at light loads the flow of the fuel mixture in the manifolds is insufficient to move said blades to effect any substantial movement of the valve into an open position.

9. A structure as defined by the preceding claim 8, said blades being apertured to adjust said weight and areas to effect desired relative positions of said valve at predetermined throttle openings.

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