Feb. 7, 1928. 1,658,477

A. D. CHANDLER

INTAKE MANIFOLD FOR INTERNAL COMBUSTION ENGINES

Filed Dec. 26, 1924

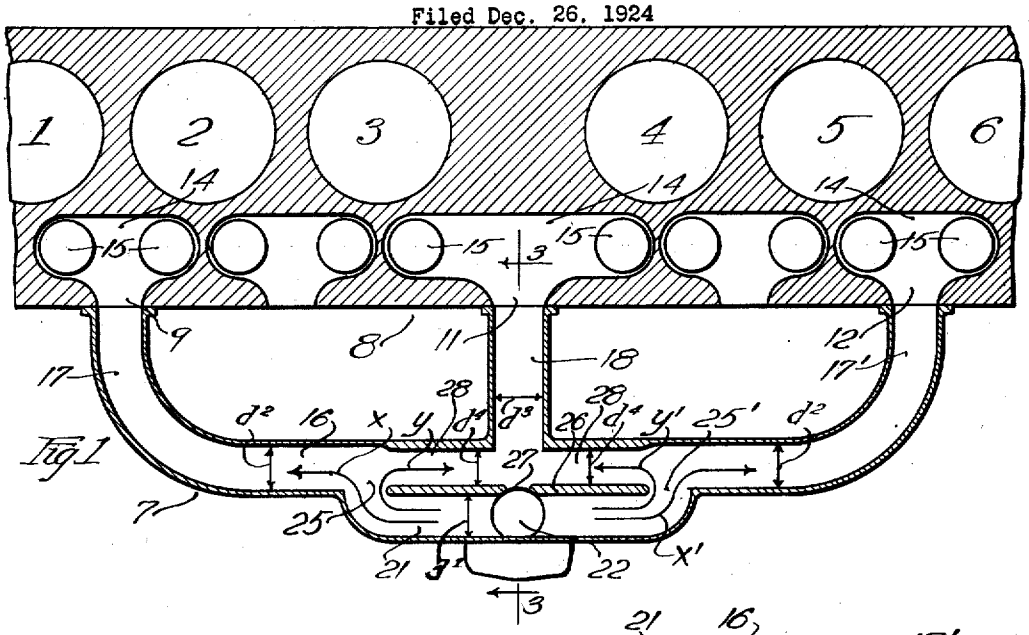

Fig 1

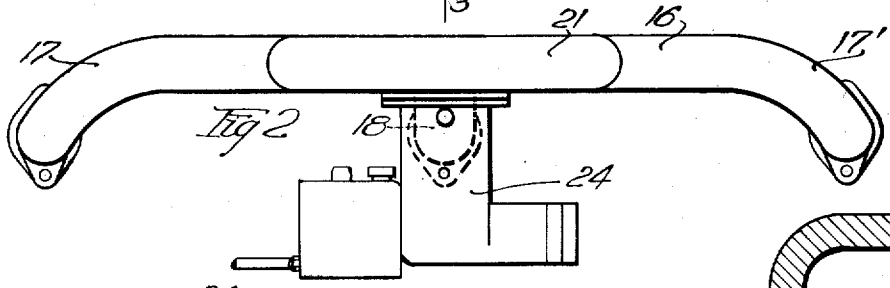

Fig 2

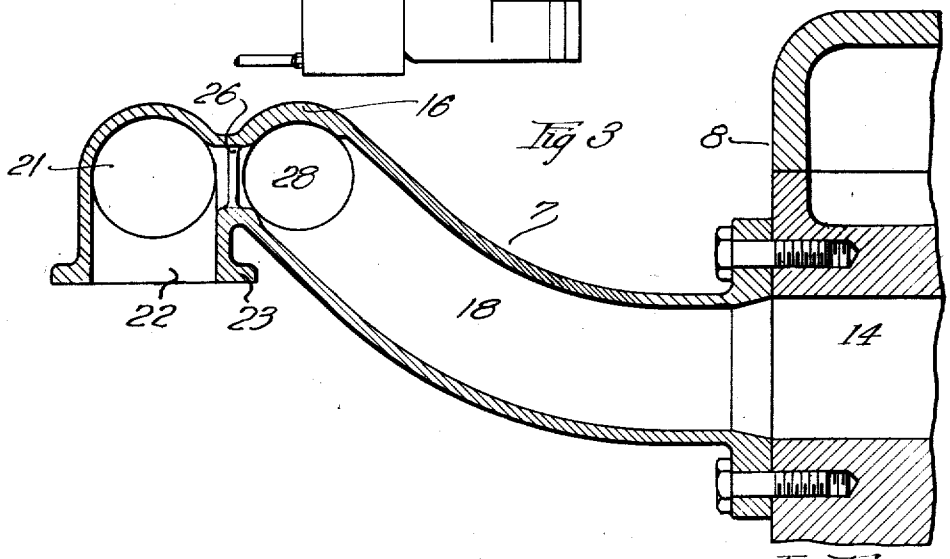

Fig 3

Inventor

Aquila D. Chandler

Williams, Bradbury, McCaleb & Hinkle

Attys

Patented Feb. 7, 1928. 1,658,477

UNITED STATES PATENT OFFICE.

AQUILA D. CHANDLER, OF CHICAGO, ILLINOIS.

INTAKE MANIFOLD FOR INTERNAL-COMBUSTION ENGINES.

Application filed December 26, 1924. Serial No. 757,981.

My invention relates to intake manifolds for internal combustion engines. The present manifold is primarily designed for six cylinder engines, although the essential features of the invention have application to intake manifolds in general.

One of the largest sources of power loss in a six cylinder engine is poor distribution of mixture supply between the several cylinders. In the ordinary type of intake manifold the inrush of mixture to certain of the cylinders has the tendency to rob other portions of the manifold and to create disturbing counter-currents and surges which retard the subsequent flow of mixture to the other cylinders. Thus, certain cylinders will receive an ample or over-abundant proportion of the mixture supply at the expense of other cylinders in the engine, and in consequence these latter cylinders will operate at a low efficiency and the power impulses of the several cylinders will be uneven. This is the principal reason why six cylinder engines frequently fail to deliver the proportionate increase in power expected over four cylinder engines.

The fundamental object of the present invention is to provide a manifold in which substantially uniform distribution will be had between the several cylinders and in which disturbing counter-currents and surges will be reduced to a minimum.

Other objects will be apparent from the following description taken in connection with the accompanying drawing illustrating the preferred embodiment of my invention. In this drawing:

Figure 1 is a horizontal sectional view of the manifold, the engine to which it is connected being illustrated more or less diagrammatically;

Figure 2 is a front elevational view of the manifold; and

Figure 3 is an enlarged sectional view taken transversely through the center of the manifold substantially on the plane of the line 3—3 of Figure 1.

The manifold constituting the present invention is indicated at 7, being connected to a six cylinder engine indicated at 8. The engine cylinders are numbered 1 to 6, inclusive, the first two cylinders being supplied through an end port 9, the two intermediate cylinders being supplied through a central port 11, and the two other end cylinders being supplied through another end port 12. These supply ports in the side of the cylinder block or blocks communicate with the usual valve pockets 14 in which operate the intake valves 15. The foregoing three port arrangement is typical of practically all six cylinder engines.

The manifold comprises a main conduit or channel 16, the ends of which curve into end branches 17—17′, which connect with the end ports 9 and 12, respectively. Leading from the central part of the main conduit 16 is a central branch connection 18 which connects to the central port 11. It will be observed from Figures 2 and 3 that the end branch connections 17—17′ and the central branch connection 18 all slope downwardly below the plane of the main portion of the manifold. This insures the discharge of condensation accumulating on the walls of the manifold to the engine ports.

These three branch connections 17—17′ and 18 are all of substantially the same internal diameter so that they all have substantially the same resistance to flow of the mixture.

Extending parallel with the intermediate portion of the main channel 16 and in substantially the same horizontal plane therewith is a distributing conduit or channel 21 which is preferably formed integral with the main channel 16. This distributing channel 21 receives the mixture from the carburetor, and for a vertical type of carburetor this channel would be provided with a downwardly extending carburetor inlet 22 (Fig. 3) having a conventional bolting flange 23 around its lower edge for attaching the carburetor. A typical carburetor, representative of any preferred design or make, is indicated at 24.

The ends of the distributing channel 21 open into the outer side of the main channel 16 through openings 25—25′ which are located intermediate the respective end branches 17 and the central branch connection 18. The baffle or wall 26 which separates the distributing channel from the main channel has a central opening 27 of somewhat restricted diameter which connects the two channels in line with the central branch connection 18.

The distributing channel 21 has an internal diameter d^1 which is preferably of the same diameter as the internal diameter d^2 of the main channel and the internal diameter d^3 of the central branch connection 18. From the openings 25—25′ inwardly towards

the central branch connection 18, the wall of the main channel and the separating baffle or wall 26 are formed of greater sectional thickness to restrict the passageways 28 leading to the central branch connection, the diameters of these passageways being indicated by d^4. As illustrative of the general proportions which may be used for these passageways, one design of my improved manifold has diameters d^1, d^2 and d^3 of two inches, and diameter d^4 of one and one-half inches. In this same design the central connecting opening 27 has a diameter of approximately one inch.

It will thus be evident that when one of the end cylinders 1—2 or 5—6 makes an intake stroke, the path of least resistance from the carburetor 24 to that particular cylinder will be along the line of the direction arrow, x or x' through the distributing channel and through the outer ends of the main channel. This line of flow is through a passageway which is of substantially uniform diameter throughout. Because of the construction d^4 in the passageways 28, there will be a very slight tendency for the sudden inrush of mixture to one of these end cylinders from robbing the opposite end or the central branch of the manifold; i. e., from creating a counter-current or surge in either of these portions which might deplete the supply of mixture in these portions or retard the subsequent forward flow in these portions of the manifold.

When one of the central cylinders 3 or 4 makes a suction stroke, the major portion of the mixture flow is around the ends of the separating wall or baffle 26, as indicated by the direction arrows y—y'. It will be noted that each path y and y' is of very nearly the same length as the path x and x' to the corresponding end cylinder. Thus the length of path from the carburetor to each of the six cylinders is substantially the same. Because the mixture stream is divided and taken into the central branch through two paths, the restricting diameters d^4 will not diminish the desired volume of mixture to be delivered to this central branch 18, the aggregate area of these two passageways being ample to supply all of the mixture required. Furthermore, the small opening 27 forms a supplementary path for a smaller portion of the charge which may be carried direct to the central branch connection 18. By drawing its supply from both directions through the restricting diameters d^4, the central branch 18 transmits a relatively smaller suction to the end portions of the main channel 16, and thus any tendency to rob these end portions is greatly diminished.

I do not intend to be limited to the particular details and proportions herein shown and described, except as they are specifically set forth in the appended claims.

I claim:

1. In an intake manifold, a main conduit, end branches leading therefrom for connection to the end cylinders, a central branch leading therefrom for connection to the two middle cylinders, a distributing conduit, a wall separating said conduits, said distributing conduit communicating with said main conduit around the ends of said wall, and restricting areas in said main conduit intermediate the ends of said wall, the proportion of said restricting areas to the area of said main conduit being substantially in the ratio of one and one-half to two.

2. In an intake manifold, a main conduit, end branches leading therefrom for connection to the end cylinders, a central branch leading therefrom for connection to the two middle cylinders, a distributing conduit, a wall separating said conduits, said distributing conduit communicating with said main conduit around the ends of said wall, restricting diameters in said main conduit intermediate the ends of said wall and an opening in said wall intermediate the ends thereof for connecting said conduits, the combined areas of said restricting diameters and said latter opening being substantially equal to the effective area of said central branch.

3. In an intake manifold, a main conduit, end branches leading therefrom for connection to the end cylinders, a central branch leading therefrom for connection to the two middle cylinders, said central branch being of substantially the same effective area as each of said end branches, a distributing conduit having a mixture inlet, a wall separating said conduits, the said distributing conduit communicating with said main conduit around the ends of said wall and through an opening 27 in said wall, and restricting diameters d^4 in said main conduit intermediate each end of said wall and said central branch, the combined areas of said restricting diameters d^4 and said opening 27 being substantially equal to the effective area d^3 of said central branch.

4. In an intake manifold, a main conduit, end branches for connection to the end cylinders, a central branch for connection to the middle cylinders, a distributing conduit having connection with said main conduit at points intermediate said end branches and said central branch, a wall separating said conduits, and restrictions in said main conduit intermediate the ends of said wall.

5. In an intake manifold, a main conduit, end branches leading therefrom for connection to the end cylinders, a distributing conduit, a wall separating said conduits, openings at the ends of said wall for connecting said distributing conduit to said main conduit, a central branch leading from said main conduit intermediate said openings,

and restricting diameters in said main conduit intermediate the ends of said wall.

6. In an intake manifold, a main conduit, end branches leading therefrom for connection to the end cylinders, a central branch leading therefrom for connection to the two middle cylinders, a distributing conduit, a wall separating said conduits, said distributing conduit communicating with said main conduit around the ends of said wall, that section of the main conduit which is in communication with said central branch being of reduced diameter intermediate the ends of said wall.

7. In an intake manifold, a main conduit, end branches leading therefrom for connection to the end cylinders, a central branch leading therefrom for connection to the two middle cylinders, a distributing conduit, a wall separating said conduits, said distributing conduit communicating with said main conduit around the ends of said wall, that section of the main conduit which is in communication with said central branch being of less diameter throughout its extent than said distributing conduit.

8. In an intake manifold, a main conduit, end branches leading therefrom for connection to the end cylinders, a distributing conduit, a wall separating said conduits, openings at the ends of said wall connecting said conduits, a central branch connection leading from said main conduit intermediate said openings, restricting diameters in said main conduit intermediate said openings and said central branch connections, and a third opening in said wall between the ends thereof for connecting said conduits.

In witness whereof, I hereunto subscribe my name this 6th day of December, 1924.

AQUILA D. CHANDLER.

and restricting diameters in said main conduit intermediate the ends of said wall.

6. In an intake manifold, a main conduit, end branches leading therefrom for connection to the end cylinders, a central branch leading therefrom for connection to the two middle cylinders, a distributing conduit, a wall separating said conduits, said distributing conduit communicating with said main conduit around the ends of said wall, that section of the main conduit which is in communication with said central branch being of reduced diameter intermediate the ends of said wall.

7. In an intake manifold, a main conduit, end branches leading therefrom for connection to the end cylinders, a central branch leading therefrom for connection to the two middle cylinders, a distributing conduit, a wall separating said conduits, said distributing conduit communicating with said main conduit around the ends of said wall, that section of the main conduit which is in communication with said central branch being of less diameter throughout its extent than said distributing conduit.

8. In an intake manifold, a main conduit, end branches leading therefrom for connection to the end cylinders, a distributing conduit, a wall separating said conduits, openings at the ends of said wall connecting said conduits, a central branch connection leading from said main conduit intermediate said openings, restricting diameters in said main conduit intermediate said openings and said central branch connections, and a third opening in said wall between the ends thereof for connecting said conduits.

In witness whereof, I hereunto subscribe my name this 6th day of December, 1924.

AQUILA D. CHANDLER.

CERTIFICATE OF CORRECTION.

Patent No. 1,658,477. Granted February 7, 1928, to

AQUILA D. CHANDLER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 24, for the word "construction" read "constriction"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of March, A. D. 1928.

Seal.

M. J. Moore,
Acting Commissioner of Patents.

CERTIFICATE OF CORRECTION.

Patent No. 1,658,477. Granted February 7, 1928, to

AQUILA D. CHANDLER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 24, for the word "construction" read "constriction"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of March, A. D. 1928.

M. J. Moore,
Acting Commissioner of Patents.

Seal.