M. TIBBETTS.

HYDROCARBON MOTOR.

APPLICATION FILED FEB. 21, 1918.

1,384,281.

Patented July 12, 1921

3 SHEETS—SHEET 1.

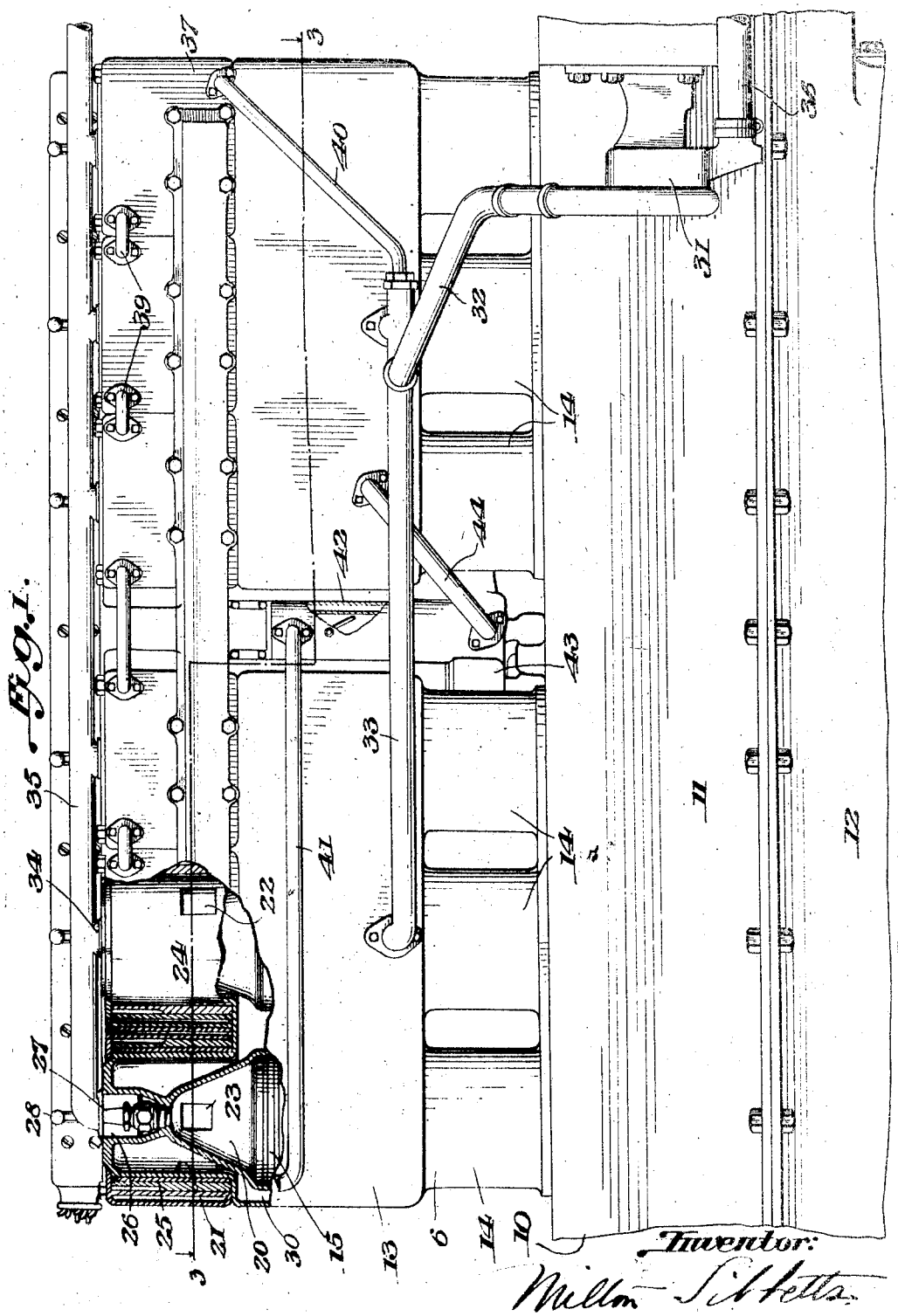



FIG. 1.

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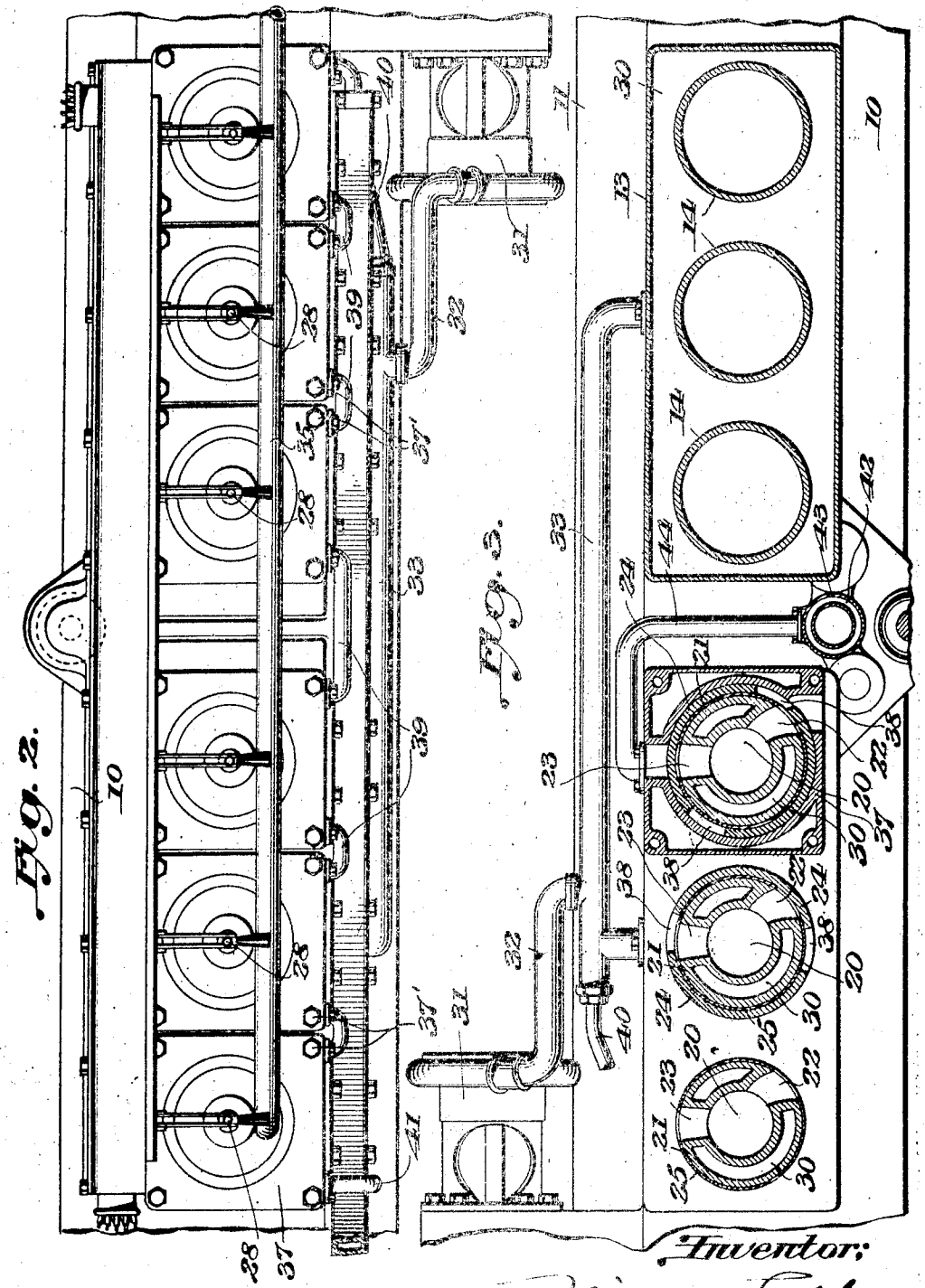


Fig. 2.

Fig. 3.

Inventor:

Milton Tibbetts.

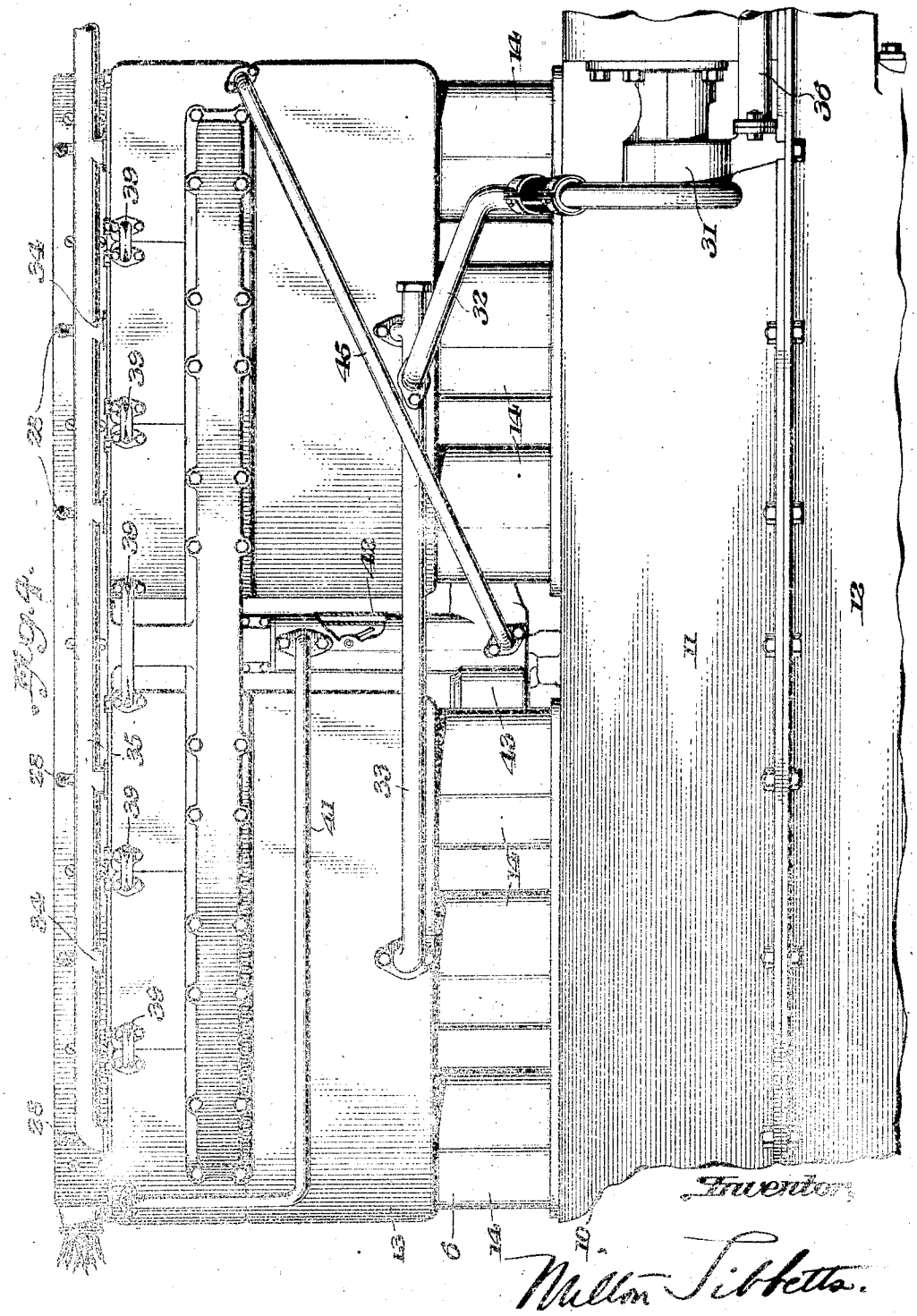
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3 SHEETS—SHEET 3.



# UNITED STATES PATENT OFFICE.

MILTON TIBBETTS, OF DETROIT, MICHIGAN, ASSIGNOR TO PACKARD MOTOR CAR COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

## HYDROCARBON-MOTOR.

1,384,281. Specification of Letters Patent. Patented July 12, 1921.

Original application filed May 11, 1914, Serial No. 838,623. Divided and this application filed February 21, 1918. Serial No. 218,556.

*To all whom it may concern:*

Be it known that I, MILTON TIBBETTS, a citizen of the United States, and resident of Detroit, Wayne county, State of Michigan, have invented certain new and useful Improvements in Hydrocarbon - Motors, of which the following is a specification.

This application is a division of application Serial No. 838,623, filed May 11, 1914.

This invention relates to hydrocarbon motors, and particularly to multi-cylinder motors. One embodiment of the invention is shown and includes a six cylinder motor in which there are two block castings of three cylinders each mounted on a suitable base or crank case.

One of the objects of the invention is to produce a multi-cylinder motor of clean external appearance and one in which various parts of the motor are housed or inclosed.

Another object of the invention is to improve the water circulation system through the various jackets of the motor, carbureter, etc.

Other objects of the invention will appear from the following description taken in connection with the drawings which form a part of this specification, and in which:

Figure 1 is a side elevation and vertical sectional view of a motor embodying this invention;

Fig. 2 is a plan view of the motor shown in Fig. 1;

Fig. 3 is a horizontal sectional view on the line 3—3 of Fig. 1 with certain of the cylinder heads and valve sleeves omitted; and

Fig. 4 is a view similar to Fig. 1, illustrating a slightly different form of the invention.

In the embodiment of the invention shown herein, the motor comprises six cylinders cast in two blocks of three cylinders each. It will be understood that a lesser or greater number of cylinders may be employed and the cylinders may be otherwise cast.

Referring to the drawings, the base or crank case 10 is formed in two parts, the upper or supporting part 11 and the lower part or bottom cover 12. The cylinder blocks or castings are shown at 13, there being three cylinders 14 to each casting.

The upper end of each of the cylinders 14 is somewhat contracted, as shown particularly in Fig. 1 forming a dome-shaped combustion space 20 immediately above the upper limit of travel of the piston 15. This contracted part of the cylinder is double walled and is of outward cylindrical form and constitutes a water-jacketed head for the cylinder. In it are arranged suitable inlet ports 22 and exhaust ports 23, preferably arranged in the same zone and both of which are adapted to be controlled by a cylindrical or sleeve valve 24. For the purpose of getting a more perfect fit for the valve 24, it is sometimes desirable to place a lining sleeve or collar 25 on the outside of the head 21, said lining sleeve of course being provided with inlet and exhaust ports alining with the ports 22 and 23 formed in the cylinder head.

The cylinder head 21 is also provided with a central depression or cavity 26 in which a spark plug 27 is suitably arranged in communication with the interior of the cylinder or combustion space 20. The central terminal 28 of the spark plug extends above the top of the cylinder head and the cavity 26 is closed by a suitable cap 29 of insulating material.

It will be seen that the cylinders 14 are water-jacketed as at 30 and this jacketing space continues up into the head 21. Water is supplied for cooling purposes by a pump 31 operated by suitable connections from the motor crank shaft through pipes 32 and 33, to the lower part of each of the cylinder castings 13, as shown particularly in Fig. 1. There is a water outlet from each of the heads 21 as shown at 34 in Fig. 1, and to all of these outlets is connected a pipe 35 which runs across the top of the cylinders and connects with a suitable radiator, not shown in the drawings. Of course it will be understood that the pump 31 draws the water from the bottom of the radiator through pipe 36 shown in Fig. 1, thus causing a constant circulation of water through the motor water-jackets and the radiator.

Each of the cylinder heads 21 is surrounded by a head piece 37 removably secured to the cylinder as by bolts 37′ which head piece is double-walled to form a water jacket as shown in the various figures, and these head pieces 37 are substantially square exteriorly, so that they will fit closely to-

gether on the tops of the cylinders and form a compact arrangement thereon.

It will be understood that a suitable cylindrical space is left between the exterior of each of the cylinder heads 21 and the interior walls of the head pieces 37, to form a valve chamber in which the valve 24 operates, being rotatated by suitable mechanism to control the inlet and exhaust ports.

Means are provided for supplying cooling water to the head pieces 37, either from the pump 31 as shown in Fig. 1 in full lines, or by an entirely separate circulation system which would include a slight modification of the piping arrangement shown in Fig. 1, such as shown in Fig. 4. In the drawings, the jackets of the various head pieces 37 are connected in series by short sections of pipe 39 (see Figs. 1 and 4) and in Fig. 1 a pipe 40 leads from the pipe 33 to the lower part of the head piece 37 of cylinder number 1, and an outlet pipe 41 leads from the upper part of the head piece 37 of cylinder number 6 to the water-jacketed part 42 of the carbureter 43. Also a pipe 44 leads from the lower part of the carbureter water jacket to the water jacket of one of the cylinder castings 13. As above suggested, a modified form of this system is shown in Fig. 4 and comprises the elimination of pipes 44 and 40 and the substitution therefor of a pipe 45 extending from the lower part of the carbureter jacket 42 to the head piece 37 of cylinder number 1. By the latter arrangement, there is a constant circulation of water serially through the various head pieces, and from head piece number 6 through the pipe 41 and carbureter water jacket 42 and from there through the pipe 45 back again to head piece number 1. Thus the cooling action of the carbureter 43 acts as a radiator for the heated water from the head pieces, while on the other hand the hot water passing through the water jacket of the carbureter assists materially in vaporization of the gasolene. This arrangement of piping gives an entirely separate water circulation system for the head pieces and carbureter. With the system shown in Fig. 1, the water pumped into the pipe 33 is divided therein, part of it going to the rear cylinder casting 13, part of it to the front cylinder 13 and some of it to the head pieces 37 through the pipe 40. Of course the heat in the cylinder water jackets and the head pieces assists materially in the circulation of the water through them.

It will be further understood that various modifications of the embodiment of the invention herein shown may be made without departing from the spirit or scope of the invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. In a hydrocarbon motor, the combination with a plurality of water jacketed cylinders and water jacketed head pieces for each cylinder having water jackets separate from the cylinder water jackets, of means for circulating water through several of said head pieces in series.

2. In a hydrocarbon motor, the combination with a plurality of water jacketed cylinders and water jacketed head pieces for each cylinder having water jackets separate from the cylinder water jackets, of means for circulating water through all of said head pieces in series.

3. In a hydrocarbon motor, the combination with a plurality of water-jacketed cylinders and separate water jacketed head pieces for each cylinder, of means for circulating water through said cylinders and independently through said head pieces in series.

4. In a hydrocarbon motor, the combination with a plurality of water-jacketed cylinders and separate water jacketed head pieces for each cylinder, of means for circulating water through said head pieces independently of the cylinders.

5. In a hydrocarbon motor, the combination with a plurality of water-jacketed cylinders and separate water jacketed head pieces for each cylinder, of means for circulating water through said cylinders by forcing it in at the bottom and out at the top thereof and for independently circulating water through said head pieces in series.

6. In a hydrocarbon motor, in combination, a water jacketed portion and a water jacketed carbureter, and means for circulating water in series through the jackets of said portion and carbureter in a direction from the water jacket of said portion to the jacket of said carbureter.

7. In a hydrocarbon motor, in combination, a water jacketed cylinder, a water jacketed head piece, a water jacketed carbureter, means for circulating water through said cylinder for cooling it, and means for circulating water through the jackets of said head piece and carbureter in series.

8. In a hydrocarbon motor, in combination, a plurality of water jacketed cylinders, separate water jacketed head pieces for each of said cylinders, a water jacketed carbureter, means for circulating water through said cylinders for cooling them, and means for circulating water through said head pieces in succession and in series with the water jacket of said carbureter.

In testimony whereof I affix my signature.

MILTON TIBBETTS.