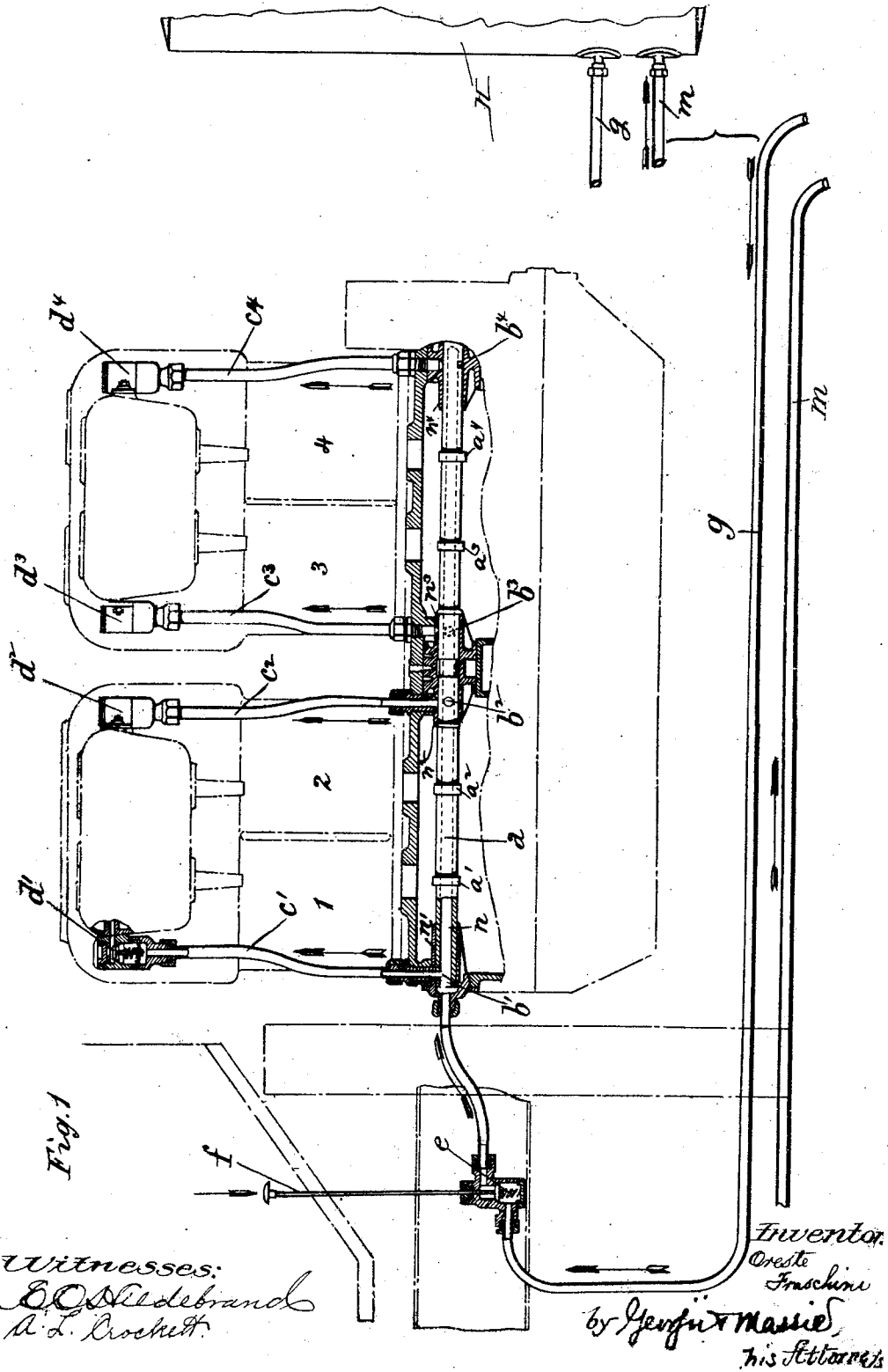


O. FRASCHINI.
 STARTING DEVICE FOR INTERNAL COMBUSTION ENGINES.
 APPLICATION FILED JUNE 16, 1908.

1,039,504.

Patented Sept. 24, 1912.

2 SHEETS—SHEET 1.



Witnesses:
 E. C. Debrand
 R. L. Crockett

Inventor:
 Oreste
 Fraschini
 by *Genfu & Massie*
 his Attorneys

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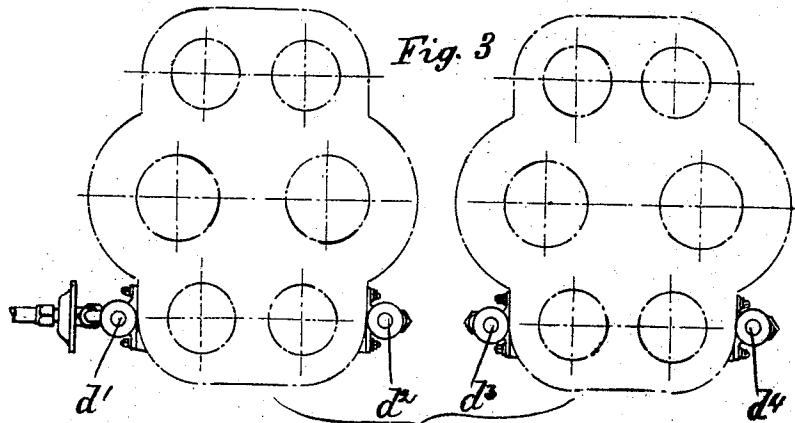
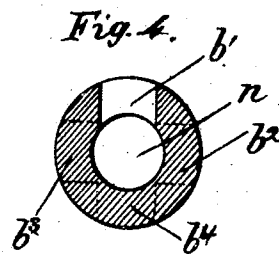
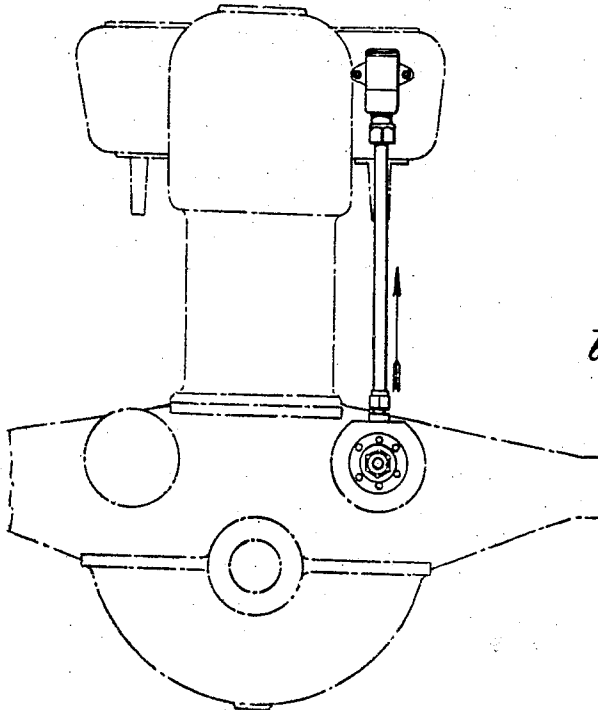


Fig. 2.



Witnesses:

E. O. Hildebrand
 M. B. Taylor.

Inventor:

Orest. Franchini
 by George D. Massie
 attorney

UNITED STATES PATENT OFFICE.

ORESTE FRASCHINI, OF MILAN, ITALY.

STARTING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

1,039,504.

Specification of Letters Patent.

Patented Sept. 24, 1912.

Application filed June 16, 1908. Serial No. 438,732.

To all whom it may concern:

Be it known that I, ORESTE FRASCHINI, mechanical engineer, subject of the King of Italy, residing at 79 Via Monte Rosa, Milan, Italy, have invented certain new and useful Improvements in Starting Devices for Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to starting devices for internal combustion engines, and particularly those having a plurality of cylinders. The starting of the engine, according to the present invention, is accomplished by means of compressed air supplied to each cylinder at a time corresponding to the moment of explosion when the engine is running normally, and the invention has for its object the attaining of this result, in itself not new, by a simple and particularly efficient form of construction.

The invention is particularly set out in the accompanying claims which will now be described in detail in connection with the accompanying drawings illustrating a preferred embodiment of the same, in which drawings—

Figure 1 is a front elevation partly in section of an engine embodying the invention; Fig. 2 is an end elevation; Fig. 3 a plan; and Fig. 4 a sectional detail on an enlarged scale.

A storage tank H, for compressed air, is supplied from any suitable source, as, for instance, a pump through the pipe *m*, and a feed pipe *g* leads from said tank by way of a manually operable valve *e* with a valve stem *f* to a rotary distributing valve *n*. The hollow stem *a* of this valve serves as the cam shaft *a* provided with cams *a*¹, *a*², *a*³ and *a*⁴ for operating the valves of the respective engine cylinders, 1, 2, 3 and 4.

The valve casing is formed in four parts *n*¹, *n*², *n*³ and *n*⁴, provided with ports all in the same plane, leading by way of the pipes *c*¹, *c*², *c*³ and *c*⁴, past the check valves *d*¹, *d*², *d*³ and *d*⁴, to engine cylinders 1, 2, 3 and 4. The hollow valve stem *n* is provided with ports *b*¹, *b*², *b*³ and *b*⁴ displaced respectively at an angle of 90° to each other.

The manner of operation is as follows: The engine being at a standstill, the piston of one of the cylinders, for instance, cylinder 1, occupies the proper starting position, and

the port in the part *n*¹ and *b*¹ will be in register so that as the driver pushes down on the valve stem *f* opening the valve *e*, that particular cylinder is charged with compressed air and the piston forced to the opposite end of the cylinder. In doing so the valve shaft *a* being rotated, the port in the part *n*¹ and the part *b*¹ are closed and another one of the ports in the hollow distributing valve stem, formed by said shaft, will be brought into register with its port to supply the next cylinder with compressed air. Thus the compressed air is supplied in proper sequence to the several cylinders until the engine is running and the cylinders ready to receive their explosive charge when the valve *e* is closed by the driver and the engine proceeds normally.

It will be observed that according to the present invention the valve shaft *a* serves a double function, viz: to operate the fuel valves of the cylinders and also as the hollow valve stem of a rotary distributing valve to supply the compressed air to the respective cylinders in succession. The one element serving to operate both sets of valves, the number of parts is not only reduced but also the danger of the parts getting out of order or out of time with reference to each other is avoided. The invention is the same whether the number of cylinders be increased or diminished, or whether there be a combined distributing valve and cam shaft for each cylinder or all united in one as shown.

What I claim and desire to secure by Letters Patent is:—

1. In an internal combustion engine, the combination, with a cylinder, and a valve controlling a fuel inlet thereto, of an air inlet, a compressed air pipe leading to such air inlet, a valve controlling the passage of the air through the air pipe, and means carried by the air valve stem to actuate the fuel inlet valve.

2. In an internal combustion engine, the combination, with a cylinder, and a valve controlling a fuel inlet thereto, of an air inlet, a compressed air pipe leading to such inlet, a rotary valve controlling the passage of the air through the air pipe, and a cam device carried by the rotary valve stem to actuate the fuel inlet valve.

3. In an internal combustion engine, the combination, with a plurality of cylinders, and valves controlling the fuel inlets there-

to, of a compressed air pipe, a rotary distributing valve communicating with said pipe, a pipe leading from said valve to each cylinder, and a cam device carried by the rotary valve stem to actuate each of the fuel inlet valves.

4. In an internal combustion engine, the combination, with a plurality of cylinders, and valves controlling the fuel inlets thereto, of a compressed air pipe, a tubular rotary shaft provided with cams to actuate the several fuel inlet valves, the interior of said shaft communicating with the air supply pipe and provided with laterally opening angularly displaced ports, a casing surrounding said shaft and provided with ports arranged to register in succession with the ports in said shaft and forming therewith a rotary distributing valve, and branch pipes leading from each of the ports of said distributing valves to one of the cylinders.

5. In an internal combustion engine, the combination, with a plurality of cylinders, and valves controlling the fuel inlets thereto, of a compressed air pipe, a tubular rotary shaft provided with cams to actuate the several fuel inlet valves, the interior of said shaft communicating with the air supply pipe and provided with laterally open-

ing angularly displaced ports, a casing surrounding said shaft and provided with ports arranged to register in succession with the ports in said shaft and forming therewith a rotary distributing valve, branch pipes leading from each of the ports of said distributing valve to one of the cylinders, a manually operable valve in the compressed air pipe, and a check valve in each of the branch pipes.

6. In a starting device for internal combustion engines, the combination, with a plurality of cylinders, valves controlling the fuel inlets thereto, and a cam-shaft to operate the fuel inlet-valves in proper sequence, said cam-shaft being formed as a pipe for compressed air and provided with ports leading, one to the explosion chamber of each cylinder, said ports being controlled directly by the cam-shaft to open the air-inlet port leading to that cylinder which is starting on the working stroke.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

ORESTE FRASCHINI.

Witnesses:

R. CARLO SALVOTE,
MICHAEL SINSCHAFER, Jr.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."