

J. P. EDWARDS.  
GAS ENGINE STARTER.  
APPLICATION FILED JULY 23, 1910.

999,763.

Patented Aug. 8, 1911.

Fig. 1.

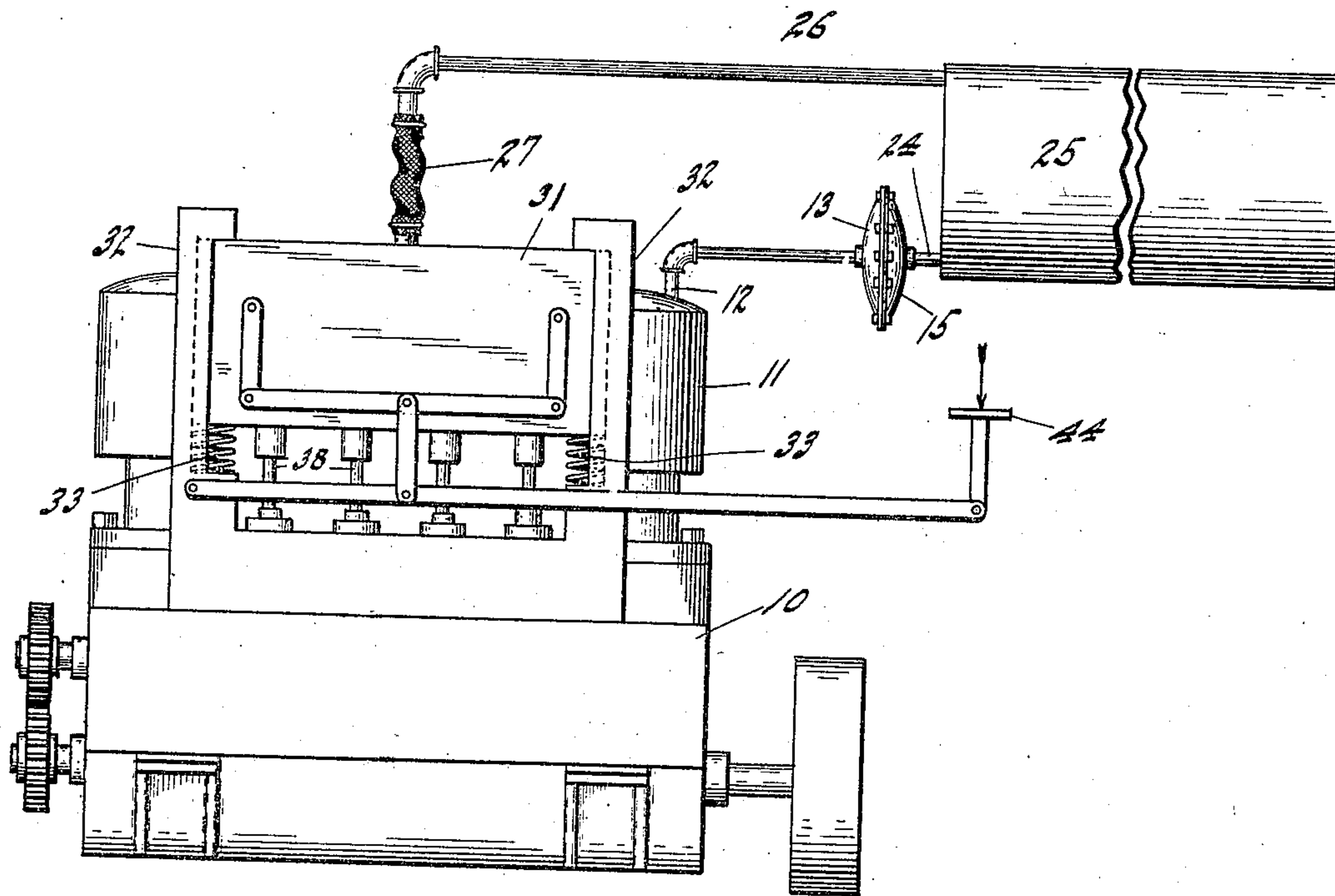
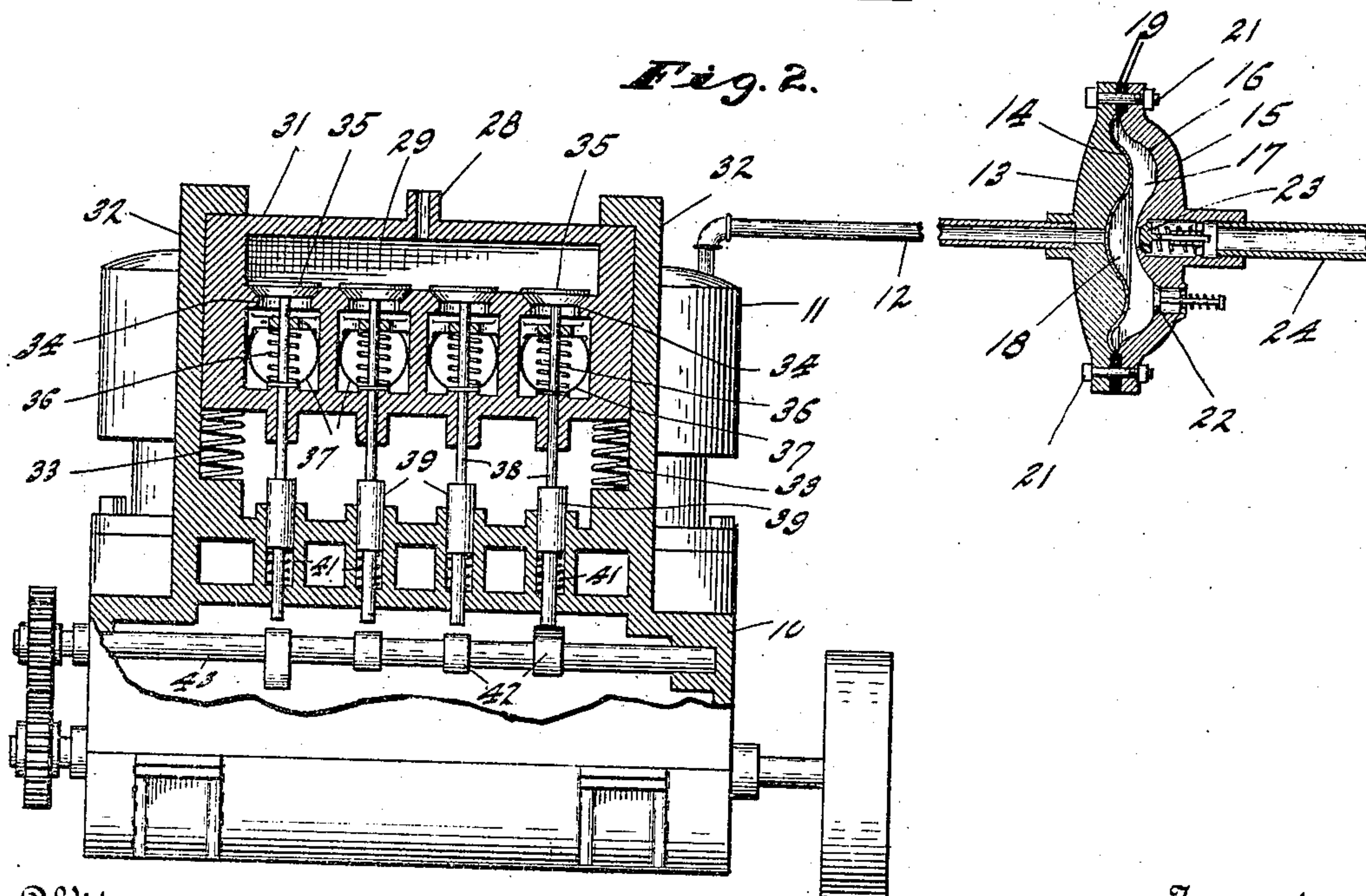


Fig. 2.



Witnesses  
Frank A. Hall  
May Layden

Inventor  
Josiah P. Edwards,  
By Bradford Hood  
Attorneys.



# UNITED STATES PATENT OFFICE.

JOSIAH P. EDWARDS, OF KNIGHTSTOWN, INDIANA.

GAS-ENGINE STARTER.

999,763.

Specification of Letters Patent.

Patented Aug. 8, 1911.

Application filed July 23, 1910. Serial No. 573,577.

*To all whom it may concern:*

Be it known that I, JOSIAH P. EDWARDS, a citizen of the United States, residing at Knightstown, in the county of Henry and State of Indiana, have invented a new and useful Gas-Engine Starter, of which the following is a specification.

The object of my invention is to produce a simple yet efficient device by means of which a gas engine may be started by means of air pressure from an auxiliary reservoir which air pressure is obtained by means of a pump automatically operated by the direct action of the explosions within one or more of the engine cylinders.

The accompanying drawings illustrate my invention.

Figure 1 is a side elevation of an apparatus embodying my invention, and Fig. 2 is a vertical section through the valve chamber and pump.

In the drawings, 10 indicates the main body of the engine and 11 one of its cylinders. Leading from the upper end of cylinder 11 is a pipe which leads into a pump head 13 having a face 14 provided with circumferential corrugations. Mating with head 13 is a head 15 having a face 16 with circumferential corrugations which partly mate with the corrugations of face 14 but sufficiently depart therefrom to form a chamber 17 in which is mounted a flexible corrugated diaphragm 18 normally lying close to face 14. The straight circumferential edge of the diaphragm is clamped between yielding gaskets 19 and the circumferential edges of the two heads 13 and 15, suitable clamping bolts 21 being provided for that purpose. Leading into chamber 17 through head 15 is a suitable air inlet valve 22 and leading out from said chamber is a suitable air outlet valve 23 which delivers into a pipe 24 leading into reservoir 25. Leading from reservoir 25 is a pipe 26 to the end of which is secured a flexible pipe 27 which, in turn is connected to a nipple 28 leading into a valve chamber 29 which is formed within a shifting valve-box 31 mounted in suitable guide ways 32 formed on the main frame 10. Springs 33 serve to normally hold the box 31 in the position shown in the drawings. Leading from chamber 29 is a suitable series of outlet passages 34 in each of which is mounted a valve 35 normally held closed by a spring 36. Leading from each passage 34

is a passage 37 which leads to the inlet passage of one of the cylinders 11.

Each valve 35 is provided with a stem 38 which, at its outer end, is engaged by a plunger 39 mounted in the main frame and normally urged to the position shown in the drawings by means of a spring 41 which is lighter than the spring 36. The lower ends of plungers 39 are adapted to be engaged by cams 42 carried by a cam shaft 43. These cams may be placed on the cam shaft of the engine or on a separate one, as may be desired. Head 31 may be shifted against the action of springs 33 by any suitable means, such for instance as a foot lever 44 carried to a point within easy access of the operator.

Explosions within cylinder 11 and the resilience of the diaphragm cause reciprocations of the diaphragm 18 which thus cause inflow of air through valve 22 into chamber 17 and the outflow of such air through valve 23 into reservoir 25. With the parts in the position shown in the drawings, valves 35 are normally closed and no air flows from the reservoir. When it is desired to start the engine, the operator presses upon lever 44 so as to shift box 31 against the action of springs 33 and thus cause stems 38 to drive plungers 39 downwardly into engagement with their cams 42. One of the cams will be in such position as to cause its plunger 39 to resist further movement and thus cause an opening of the proper valve 35 to permit the compressed air to flow from reservoir 25 into that particular cylinder 11 whose piston is in proper position to receive a driving force. As long as lever 44 remains depressed, the air from the reservoir 25 will continue to flow into the engine, being distributed by the valves 35 to the proper cylinders as their pistons move. As soon as the engine has been started with sufficient speed, it will be driven by its own power and the operator will release lever 44 and the flow of air from reservoir 25 will be discontinued.

I claim as my invention:

1. The combination, with an internal combustion engine, of an air reservoir, a diaphragm pump arranged to be acted upon by the exploded gases of one of the engine cylinders, said pump having air inlet and outlet valves upon that side opposite that affected by the engine gases, an air reservoir, a connection between said air reservoir and the outlet valve of the pump, a valve



box, a connection between said valve box and the reservoir, passages from said valve box to the individual cylinders of the engine, a valve for each of said passages, means for normally holding each of said valves closed, means for operating said valve, and means for rendering active or inactive the connection between said operating means and said valves.

2. The combination, with an internal combustion engine, of an air reservoir, a pump arranged to be acted upon by the exploded gases of one of the engine cylinders, said pump having air inlet and outlet valves upon that side opposite that affected by the engine gases, an air reservoir, a connection between said air reservoir and the outlet valve of the pump, a valve box, a connection between said valve box and the reservoir, passages from said valve box to the individual cylinders of the engine, a valve for each of said passages, means for normally holding each of said valves closed, means for operating said valves, and means for rendering active or inactive the connection between said operating means and said valves.

3. The combination, with an internal combustion engine, of an air reservoir, a diaphragm pump arranged to be acted upon by the exploded gases of one of the engine cylinders, said pump having air inlet and outlet valves upon that side opposite that affected by the engine gases, an air reservoir, a connection between said air reservoir and the outlet valve of the pump, a valve box, a connection between said valve box and the reservoir, passages from said valve box to the individual cylinders of the engine, a valve for each of said passages, means for normally holding each of said valves closed, means for operating said valves, means for shifting the valve box to bring the valves thereof into active or inactive position relative to the operating means, and means for normally holding said valve box in position to hold the valves in inactive position.

4. The combination, with an internal combustion engine, of an air reservoir, a pump arranged to be acted upon by the exploded gases of one of the engine cylinders, said pump having air inlet and outlet valves

upon that side opposite that affected by the engine gases, an air reservoir, a connection between said air reservoir and the outlet valve of the pump, a valve box, a connection between said valve box and the reservoir, passages from said valve box to the individual cylinders of the engine, a valve for each of said passages, means for normally holding each of said valves closed, means for operating said valves, means for shifting the valve box to bring the valves thereof into active or inactive position relative to the operating means, and means for normally holding said valve box in position to hold the valves in inactive position.

5. The combination, with a gas engine, of a movably mounted starting-valve box having distributing passages leading therefrom to each of the engine cylinders, a valve arranged to lead to such passages, means for normally holding said valves closed, means for normally yieldingly holding the valve box in inactive position, a cam shaft carrying cams adapted to act upon the distributing valves when the valve box is moved against the action of its yieldingly holding means, a series of plungers interposed between said cams and valves, and springs for normally holding said plungers out of engagement with the cams, said springs being of less strength than the means for normally holding the valves closed.

6. The combination, with a gas engine, of a movably mounted starting-valve box having distributing passages leading therefrom to each of the engine cylinders, a valve arranged to lead to such passages, means for normally holding said valves closed, means for normally yieldingly holding the valve box in inactive position, and a cam shaft carrying cams adapted to act upon the distributing valves when the valve box is moved against the action of its yieldingly holding means.

In witness whereof, I have hereunto set my hand and seal at Knightstown, Indiana, this 6th day of July, A. D. one thousand nine hundred and ten.

JOSIAH P. EDWARDS. [L. S.]

Witnesses:

JESSE S. JACKSON,  
R. SCHWEITZER.