No. 884,053.

PATENTED APR. 7, 1908.

H. L. F. TREBERT.

EXPLOSIVE ENGINE.

APPLICATION FILED MAR. 20, 1905.

2 SHEETS—SHEET 1.

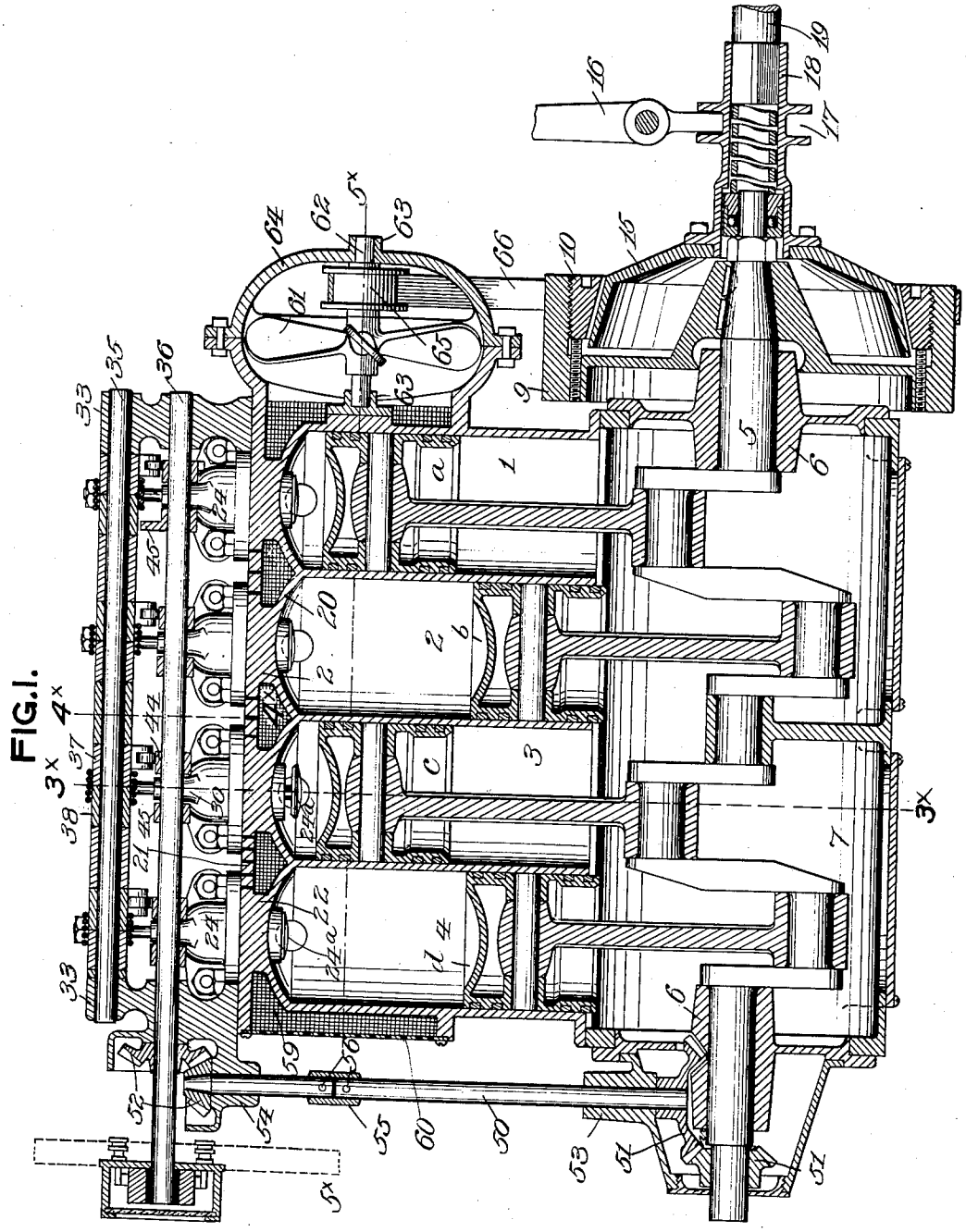


FIG. I.

Witnesses:

Walter B. Pierce

Russell B. Griffith

Inventor:

Henry L. F. Trebert

by Frederick H. Church

his attorney

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2 SHEETS—SHEET 2.

FIG.2.

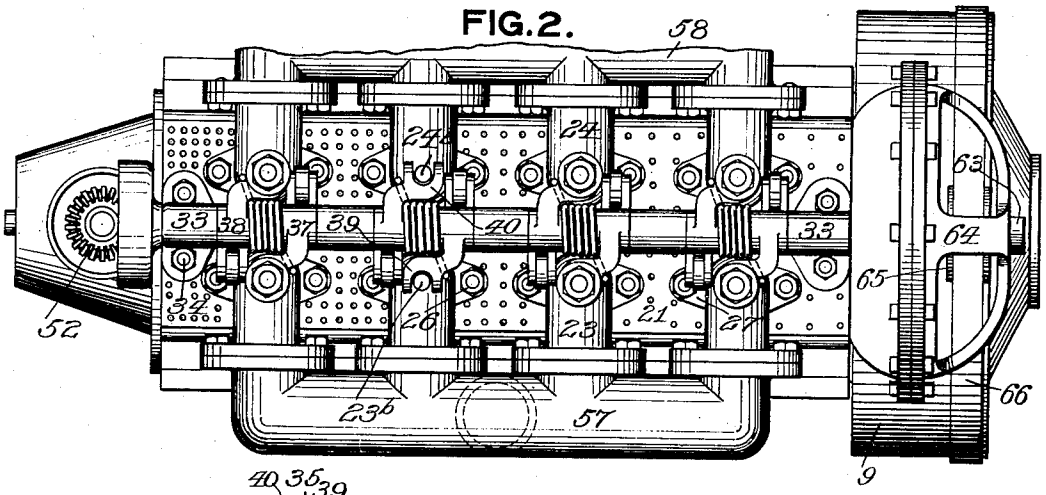


FIG.3.

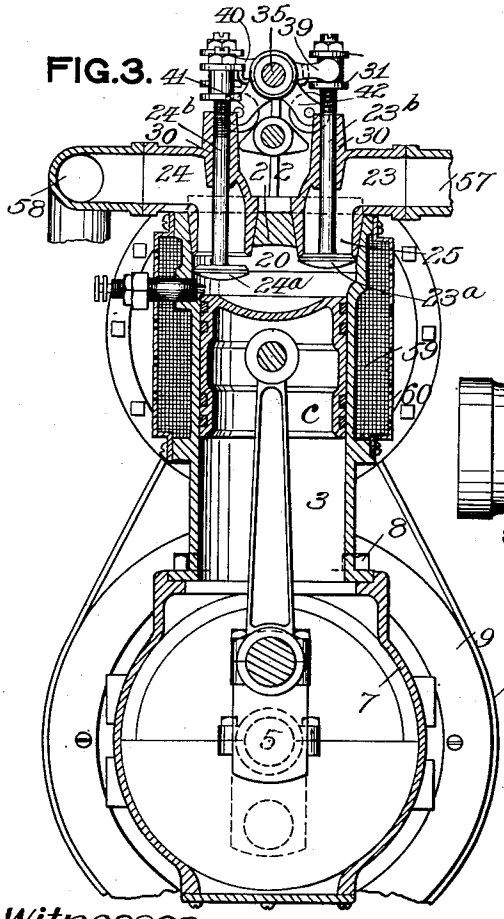
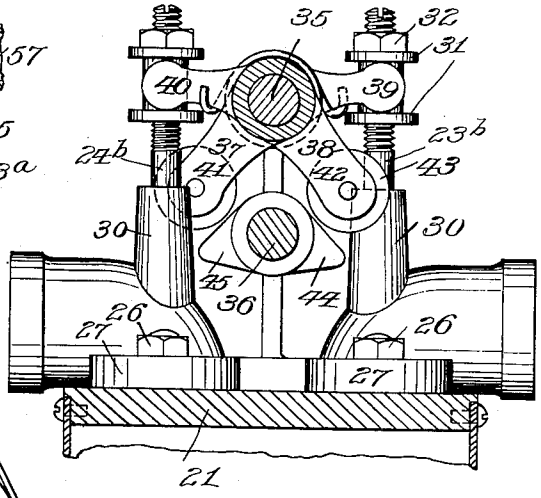


FIG.4.



Witnesses:

Walter B. Payne.

Russell B. Griffith

Inventor:

Henry L. F. Trebert

by Fredenhagen & Church

his Attys

UNITED STATES PATENT OFFICE.

HENRY L. F. TREBERT, OF ROCHESTER, NEW YORK, ASSIGNOR TO BROWNELL-TREBERT COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

EXPLOSIVE-ENGINE.

No. 884,053. Specification of Letters Patent. Patented April 7, 1908.

Application filed March 20, 1905. Serial No. 250,908.

To all whom it may concern:

Be it known that I, HENRY L. F. TREBERT, a citizen of the United States, and a resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Explosive-Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference numerals thereon.

My present invention relates to gas or explosive engines and it has for its objects to provide an improved form of the supply and exhaust conduits connected to the engine cylinder and the valves controlling the passage of the gas therein, whereby these parts may be readily applied and removed from the cylinder, and also mechanism for controlling said valves which is capable of being readily detached from the valves.

To these and other ends my invention consists in certain improvements and combinations of parts, all of which will be more fully described and the novel features pointed out in the claims at the end of the specification.

In the drawings: Figure 1 is a longitudinal sectional view of a multiple cylinder explosive engine illustrating the devices embodying the features of my invention applied thereto. Fig. 2 is a top plan view thereof. Fig. 3 is a cross sectional view taken on the line $3^{\times}$ $3^{\times}$ of Fig. 1. Fig. 4 is a similar view taken on the line $4^{\times}$ $4^{\times}$ of Fig. 1.

Similar reference numerals in the several figures indicate similar parts.

In illustrating my present invention I have shown it in connection with a multiple cylinder gas engine to which it is particularly applicable, although it may be used with equal success on an explosive engine having a single cylinder. The engine illustrated comprises the cylinders 1, 2, 3 and 4, in which are arranged the pistons *a*, *b*, *c* and *d* connected by the usual piston rods to their respective cranks on the driving shaft 5. This shaft is supported in bearings 6 at the ends of the casing 7 inclosing the cranks and which is attached by bolts 8, to the casting in which the several cylinders are formed, as shown in Fig. 3. At the rear end of the shaft is a flywheel 9 having the overhanging edge 10, provided with an inner conical surface with which coöperates the corresponding surface on a relatively movable clutch member 15 adapted to be operated relatively, into and out of engagement therewith, by a lever 16 having an end extending into an annular channel 17 formed between flanges on a sleeve 18, which is connected in any suitable manner to a continuation 19 of the driving shaft.

Each of the cylinders of the engine is provided with a head 20 which, in the present instance, is dome shape and is surmounted by a supplemental head formed by the plate 21 providing a flat horizontal surface on which other working parts of the engine may be clamped. The head 20 and the supplemental head 21 are connected by broad ribs 22 extending transversely of the cylinders and extending therethrough are perforations or apertures with which the gas supply and exhaust conduits, or pipes, 23 and 24 respectively, are connected. In the present instance these pipes extend horizontally over their respective cylinders at opposite sides thereof and are provided with downwardly-extending conical ends 25 which fit the corresponding tapered walls of the apertures, as shown in Fig. 3, in which they are rigidly secured by means of bolts 26 extending through perforated ears or lugs 27, on the pipes, and engaging the cylinder head 21. At the lower ends of the extensions 25 are formed valve seats and coöperating therewith are valve heads 23^{a} and 24^{a} arranged to control the passage of gas in the supply and exhaust passages respectively. The valve stems 23^{b} and 24^{b} extend upwardly above the cylinder head and project through bearings 30 on the pipes or conduits and threaded on their outer ends are spools having flanges 31 which are secured in adjusted position by lock-nuts 32. By this arrangement it will be seen that the supply and exhaust pipes, and the respective valves controlling them may be independently disconnected from the engine cylinder and that by extending them laterally at different sides thereof space is provided between the valve stems in which the controlling mechanism therefor may be located, as will be further described.

Mounted on the cylinder head are brackets 33, detachably connected thereto by bolts 34, and supporting at their upper ends a stationary shaft 35 beneath which is journaled a rotary cam shaft 36.

Journaled on the shaft 33 are bell crank

levers 37 and 38 provided with laterally-extending bifurcated ends 39 and 40 engaging between the flanges of the spools on the respective valve stems 23^b and 24^b. The other arms of these levers, indicated by 41 and 42 respectively, extend downwardly at opposite sides of the shaft 37 and are provided with rollers 43 with which coöperate cams 44 and 45, secured to the shaft 36 in such position that during each complete rotation of the latter they will rock the levers 37 and 38 to alternately open the valve heads 23^a and 24^a to permit the entrance of gas to the cylinder and its outward passage therefrom. In order to open these valves relatively to the movement of the piston in the cylinder I employ a driving connection between the shaft 36 and the driving shaft 5, consisting in the present instance of a shaft 50 connected to the driving shaft by bevel pinions 51 and to the shaft 36 by similar pinions 52. The shaft 50 is supported at its lower end in a stationary bearing 53 and at its upper end in a bearing 54 formed on one of the brackets 33. Inasmuch as the valve-controlling mechanism may be removed from the cylinder head, the shaft 50 is formed in two parts which are detachably connected in any suitable manner, as for instance by means of a sleeve 55 and pins 56, one of which latter may be removed, allowing one of the sections of the shaft to be withdrawn, as will be understood.

When a plurality of cylinders are combined as illustrated, the several supply pipes 23 are preferably connected to a common header 57 and the exhaust pipes 24 are connected to a similar header 58. The brackets 33 may then be arranged at each end of the engine and the shafts 33 and 36 used as a common support for the valve operating levers and the cams coöperating therewith.

The sides of the cylinders are inclosed by a jacket 60 which is spaced therefrom sufficient to form passages 59 through which air may be caused to circulate for cooling processes, by means of a fan 61 mounted on a shaft 62 revoluble in bearings 63, one of which is supported by curved arms 64 extending rearwardly from the engine. Also mounted on the shaft 62 is a pulley 65 driven by a belt 66 passing around the fly wheel 9.

I claim as my invention:

1. In an explosive engine, the combination with a cylinder having a head provided with two apertures, and gas inlet and exhaust pipes leading over the head at opposite sides thereof in proximity thereto, and communicating with the apertures therein, of valves controlling said pipes, stems thereon extending upwardly through the pipes and mechanism located between said pipes and coöperating with the valve stems.

2. In a gas engine, the combination with a plurality of cylinders arranged one behind another, each having a head provided with two apertures, gas inlet and outlet pipes extending horizontally toward each other over the head of each cylinder having downwardly extending ends fitting the apertures and valves for controlling the pipes having upwardly extending stems, of a shaft extending longitudinally of the cylinders between the rows of valve stems, levers carried on the shaft each having one of its ends connected to a valve stem and the other end extending downwardly, a cam shaft located between the inlet and outlet pipes, cams on said shaft cooperating with the depending ends of the levers and means for rotating the cam shaft.

3. In a gas engine, the combination with a cylinder having a head, a piston and a driving shaft, gas inlet and outlet passages and valves for controlling them, having stems projecting above the cylinder head, of a removable bracket on the latter having a laterally projecting bearing, levers journaled on the bracket and engaging the stems and a shaft journaled on the bracket, cams on the shaft coöperating with the levers and a shaft composed of separable parts, one of which is supported in the bearing on the bracket and is operatively connected to the cam shaft and the other connected to the driving shaft and a detachable connection between the parts of said shaft.

HENRY L. F. TREBERT.

Witnesses:
G. WILLARD RICH,
RUSSELL B. GRIFFITH.